EFFECT OF INTEGRATED APPROACH OF YOGA IN NORMAL PREGNANCY- A RANDOMIZED ACTIVE CONTROL TRIAL

Thesis Submitted by

SATYAPRIYA MAHARANA

Towards

DOCTOR OF PHILOSOPHY (YOGA)

Under The Guidance of
Dr. NAGARATHNA RAGHURAM
Dr. LATHA VENKATARAM
Dr. H R NAGENDRA

To

SWAMI VIVEKANANDA YOGA ANUSANDHANA SAMSTHANA
(A Yoga University, Recognized by UGC)
19, Ekanath Bhavan, Gavipuram circle, K.G. Nagar,
Bangalore -560 019

स्वामी विवेकानन्द योग-अनुसन्धान-संस्थानम्

Swami Vivekananda Yoga Anusandhāna Samsthānam

(Declared as Deemed-to-be University under Section 3 of the UGC Act, 1956)

Eknath Bhavan, # 19, Gavipuram Circle, Kempegowda Nagar, Bangalore - 560 019

Ph: 080 - 2661 2669, Telefax: 080 - 2660 8645

E-mail: svyasa@svyasa.edu.in Website: www.svyasa.edu.in

CERTIFICATE

The Doctoral Committee approves and affirms that this is an authentic copy of the thesis titled **"EFFECT OF INTEGRATED APPROACH OF YOGA IN NORMAL PREGNANCY - A RANDOMIZED ACTIVE CONTROL TRAIL".** The committee recommends the award of Ph.D. Degree to:

Name of the Student	:	**SATYAPRIYA MAHARANA**
Title of the Thesis	:	**EFFECT OF INTEGRATED APPROACH OF YOGA IN NORMAL PREGNANCY - A RANDOMIZED ACTIVE CONTROL TRAIL**
Viva Examination Detail	:	January 02, 2015; Friday; 12.15 PM S-VYASA Yoga University, Bengaluru

Dr. R. Nagarathna,
Medical Director,
Ex-Dean: Division of Yoga and Life Sciences,
S-VYASA Yoga University, Bengaluru.
(Guide)

Dr. Aruna Muralidhar,
Consultant Obstetrician and Gynaecologist,
Rangadore Memorial Hospital, Shankarapuram, Bengaluru.
(External Examiner - National)

Dr. Latha Venkatram,
Consultant Obstetrician and Gynaecologist,
Rangadore Memorial Hospital, Shankarapuram, Bengaluru.
(Co-Guide)

Dr. H. R Nagendra,
Chancellor,
S-VYASA Yoga University, Bengaluru.
(Co-Guide)

Dr. Sudheer Deshpande,
Registrar
S-VYASA Yoga University, Bengaluru.

D E C L A R A T I O N

I, hereby declare that this study was conducted by me at Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA), Bengaluru, under the guidance of Dr. R. Nagarathna, Dean, Division of Yoga and Life Sciences, Swami Vivekananda Yoga Anusandhana Samsthana, Dr Latha Venkataram, Gynecologist, Rangadurai Hospital, Dr. H. R. Nagendra, Chancellor, SVYASA, Deemed University, Bengaluru.

I also declare that the subject matter of my thesis entitled. **EFFECT OF INTEGRATED APPROACH OF YOGA IN NORMAL PREGNANCY - A RANDOMIZED ACTIVE CONTROL TRIAL** has not previously formed the basis of the award of any degree, diploma, associate-ship, fellowship or similar titles.

Date: **SATYAPRIYA MAHARANA**

Place: Bengaluru (Candidate)

ACKNOWLEDGEMENT

I express my profound gratitude to Dr. R. Nagarathna for her encouragement, support & Guidance throughout my course. I also express my sincere gratitude to Dr. H.R. Nagendra for his motivation & guidance throughout my study.

My heartfelt thanks to Dr Latha Venkataram, who had not only guided us but also given full support & guidance during my study. I also would like to thank her team for their timely help.

I express my sincere thanks to all the participants, who participated in this study.

I would like to thank the faculty, staff & therapists of all the Hospitals (Maiya Hospital, A. V. Hospital, Bangalore Hospital & Rangadurai Hospital) for extending full cooperation during my study. There have been so many other friends and colleagues who have assisted me whenever I needed them. I express my deep gratitude and thank all of them.

I would like to thank Dr. Balaram Pradhan, Dr Sanjeeb Patra, Dr. Natesh Babu, Dr. Sudheer Deshpande, Dr. I. Ravi Kumar Dr Alex Hankey, Dr. Ramachandra Bhat, and Dr. Ravi Kulkarni for their help and support.

I thank SVYASA University for giving me this opportunity to pursue my studies.

I am thankful to my Husband and my son for their love & support.

I thank that unseen Divine without whose wish, this work wouldn't have been possible.

Date: **SATYAPRIYA MAHARANA**

ABSTRACT

Randomized prospective controlled studies have demonstrated that antenatal yoga is beneficial in many maternal outcomes including complications of pregnancy, gestational age at delivery, type of delivery, analgesia requirement, placental blood flow, and also in fetal outcomes with higher values on fetal intrauterine growth parameters (head circumference, femur length etc), Apgar score at birth and birth weight, in both normal and high risk pregnancy. The present work was planned to investigate the effect of integrated yoga on labor outcome, cognitive functions and quality of life in pregnant women, as this area has not been investigated before.

Method: A prospective randomized active control design was adopted for the current research. 96 women (age between 20 to 35 years, primi or multi-gravida with at least one live child) with normal pregnancy were recruited from three multispecialty hospitals in south Bengaluru. They were randomized to yoga (N=51) and Control groups (N=45). The experimental group practiced integrated yoga module and control group practiced standard antenatal exercises, one hour daily from 20^{th} week to 36^{th} week of gestation.

Outcome measures included both maternal and fetal parameters. Primary outcome measures were: Duration of all three stages of labor, Cognitive function tests including Fluency test, Stroop test and Working Memory tests, Heart rate variability and Quality of life.

Secondary outcome measures included: complications of pregnancy, gestational age at delivery, type of delivery, analgesia requirement, stress measures through subjective Self-administered questionnaires (Perceived stress scale, Stat-Trait anxiety scale, Hospital anxiety & Depression scale, Pregnancy related anxiety Questionnaire, Pregnancy experience questionnaire, Interpersonal relationship, fetal parameters included Apgar score and birth weight.

Mann-Whitney U test and Wilcoxon's tests were used for all continuous variables (psychological and cognitive function tests) that were not normally distributed. Repeated measure analysis of variance was used for comparison between groups of heart rate variability. Independent sample t test and Chi-squared test were used for labor outcome duration.

Results:

Primary outcome measures

Duration of labor: The first stage of labor was 4.71 ± 0.59 and 6.19 ± 0.79 hours in yoga and control groups, respectively ($p<0.001$, independent samples *t* test); the second stage was 23.41 ± 7.68 minutes in yoga and 55.19 ± 10.87 minutes in control group ($p<0.001$); the third stage took 9.07 ± 2.35 minutes in yoga and 12.96 ± 2.86 minutes in control groups ($p<0.001$).

Cognitive functions: Yoga group showed significantly better improvement than control group in Phonemic fluency ($p<0.001$, Mann Whitney), Category fluency ($p<0.001$), Free Design fluency ($p<0.001$) and Fixed Design fluency ($p<0.01$).There was better improvement in Stroop effect ($p<0.001$) and Stroop error ($p<0.05$) in yoga than control group. The scores of all the measures of verbal working memory were higher ($p<0.001$) within the yoga group. There was significant difference between groups ($p<0.001$) in the 'Hits' component of Trial II of Verbal working memory. Significant improvement was observed in all components of visual working memory test within the yoga group ($p<0.001$, Wilcoxon's) and non significant changes within the control group with significant difference between groups ($p<0.001$). There were significant differences ($p<0.001$) between groups in 'Hit' and 'error' components of both Trial I and Trial II of Visual working memory.

Quality of life: There was significant difference between groups with higher improvements in yoga than the control group in the Physical (P<0.01, Mann Whitney test), Psychological (P<0.01, Independent t Test), Social Relationships (P<0.01), and General Health (P<0.01) domains of WHOQOL-100.

Heart rate variability spectrum (HRV)

HRV was recorded continuously before (5 minutes), during (10 minutes), and after (5 minutes), a session of guided relaxation (DRT) in yoga group and after a session of supine rest (SR) in control group in 20^{th} and 36^{th} weeks of pregnancy. The decrease in LF band power (a measure of sympathetic tone) and LF/HF ratio, and increase in HF band power (indicating parasympathetic tone) during and after the practice sessions were significantly better in the yoga group than the control group (P<0.001 repeated measures ANOVA) at both 20^{th} week and 36th weeks of gestation.

Secondary outcome measures

Outcome of Pregnancy: Fewer number of women in yoga group required epidural analgesia (p<0.001). The cesarean sections (7/51 in yoga and 18/45 in control; p<0.004) and the complications of pregnancy [intrauterine growth restriction (IUGR), pregnancy-induced hypertension (PIH), and preterm labor)] were fewer (p<0.010) in yoga than in control group. Birth weight of babies (p<0.001) was higher and Apgar scores (p<0.001) were better in yoga as compared to the control group.

Psychological measures: There were significant changes within groups (Wilcoxon's) in both groups in all psychological variables. There were significant differences between groups in all the psychological variables (p<0.001).

Pregnancy related experience (PEQ) reduced in yoga by 26.86%.

State (STAI I) anxiety decreased 15.65% in yoga, increased 13.76% in control.

Trait (STAI II) anxiety decreased 8.97% in yoga, increased 5.02% in control**.**

Depression (HADS) decreased 30.67% in yoga, increased 3.57% in control.

Pregnancy related anxiety (PRAQ) reduced in yoga by 31.36 %.

Perceived stress (PSS) decreased by 31.57% in yoga group and increased by 6.60% in the control group ($P<0.001$).

Interpersonal relationship (Firo-B) Test: There was significant difference between groups in "Expressed Inclusion" ($P=0.02$, Independent Samples T-Test) and "Wanted Control" ($P=0.009$, Mann Whitney test) domains. Within group analysis showed significant improvements in all domains in yoga group (Expressed Inclusion: $P=0.038$, Wanted Inclusion: $P=0.001$, Expressed Control: $P=0.013$, Wanted Control: $P=0.01$, Expressed Affection: $P=0.007$, Wanted Affection: $P=0.001$) while no significant improvement in any domain in control group in interpersonal relationship (Firo-B) Test.

Conclusion

This RCT compared the integrated yoga module designed specifically for normal pregnancy with standard antenatal exercises in normal pregnancy. Yoga was better than antenatal exercises in reducing the duration of all stages of labor and improving the cognitive executive functions. Yoga also decreased the complications of pregnancy, need for epidural analgesia and cesarean sections, anxiety, depression, pregnancy related uncomfortable experiences and improved the Quality of life and interpersonal relations. It reduced perceived stress and improved adaptive autonomic response to a relaxation session. It improved birth weight and Apgar scores of the infant.

Key words: pregnancy, yoga, labor outcome, autonomic changes, Anxiety, depression, Quality of life, cognitive changes & stress.

CONTENTS

ACKNOWLEDGEMENTS

ABSTRACT

CHAPTER 1

INTRODUCTION

Effects of stress during pregnancy

Pregnancy is a unique state of physiological stress, which necessitates physical, mental and social adaptation. Animal experiments and human studies have shown that prenatal maternal stress is associated with increased risk for spontaneous abortion, preterm labor, fetal malformations, and asymmetric growth retardation (Mulder et al., 2002). Evidence of long-term functional disorders in the offspring after prenatal exposure to stress is limited. Both retrospective (Weinstock et al., 2008) and prospective studies support such effects (Huizink et al., 2003) on the behavioral development with attentional deficits, hyper anxiety and disturbed social behavior (Weinstock et al., 1997). Pregnant women respond differently to identical stressful stimuli, depending on genetic factors, personality traits, previous experience and social support. Anxiety and depression are two common responses to stressfully demanding situations that may affect healthy progression of pregnancy as observed by many researchers. Bennett et al. reported Prevalence rates of clinical depression at 7.4%, 12.8%, and 12.0% for the first, second, and third trimesters, respectively (Bennett et al., 2004). There are studies that have shown that high scores of Anxiety results in increased incidence of preterm labor (Lou et al., 1994), reduced birth weight and small fetal head size (Field et al., 2010). A review of preclinical and clinical studies on the deleterious effects of maternal depression showed that it affects not only the mother but also has short and long term effects on the offspring (Mian et al., 2005). Depression that continues in the postpartum period is associated with negative childbirth experience (Gausia et al., 2012) and when untreated, impairs the mother-infant

attachments and results in cognitive, emotional and behavioral consequences in childhood (Ryan et al., 2005).

Stress and labor outcome

Animal experiments and human studies have shown prenatal maternal stress to be associated with increased risks of complications of pregnancy including preeclamsia, spontaneous abortion, preterm labor, fetal malformations, and Asymmetric growth restriction (Mulder et al., 2002). Labor itself poses psychological challenge for women because of conflicting emotions of fear and apprehension coupled with excitement and happiness. Tension, anxiety, and fear may reinforce the perception of pain and affect labor duration and birth experience (Waldenstrom et al., 1996).

Cognitive functions and stress

Pregnant women are significantly impaired on some, but not all, measures of memory and specifically, memory measures that place relatively high demands on executive cognitive control (Julie et al., 2007). Memory performance was poorer and general speed of information processing was slower during pregnancy and early motherhood (de Groot et al., 2006).

How stress?

All these disorders appear to be due to abnormal activity in the maternal Sympathetic-Adrenal-Medullary System and Hypothalamic-Pituitary-Adrenocortical Axis (de Weerth et al., 2005). In a 2005 study, Weinstock et al noted that blood flow though the uterine arteries of very anxious women was impaired by the 32nd week of pregnancy, a finding that strongly correlated with increased plasma cortisol levels in both mother and fetus (Weinstock et al., 2005). These two conditions may have a direct effect on the development of the fetal brain, as

permanent alterations in early neuroendocrine programming are likely to affect responses to stress later in life, fostering such disorders as attention deficit, hyper anxiety, and disturbed social behavior (Glover et al., 1999).

Stress reduction

Several attempts are made to reduce stress during pregnancy. Complementary and alternative therapies have become very popular and recommended by health professionals for healthy progress in both normal and high risk pregnancy (Pallivalappila et al., 2013).

Yoga

The last decade has seen several quality studies of yoga applications to medicine with beneficial effects of specific yoga modules in hypertension and heart disease (Cade et al., 2010; Cohen et al., 2011), climacteric syndrome (Chattha et al., 2008), breast cancer (Banerjee et al., 2007; Chandwani et al., 2010; Rao et al., 2009) etc. Earlier studies at VYASA in healthy volunteers had shown improved physical fitness seen as improved handgrip strength, flexibility, and dexterity (Manjunath et al., 1999; Raghuraj et al., 1997), reduced stress and metabolic rate (Chaya et al., 2006) and increased autonomic stability and alertful rest (Telles et al., 1995) after the practice of integrated program of yoga that included physical postures (Āsanas), breathing practices (*Prāṇāyāma*), and meditation. Further, It has also been shown that yoga practices can reduce anxiety levels (Gupta et al., 2006), perceived stress, and cortisol levels (West et al., 2004). Evidence is growing that antenatal yoga and/or relaxation programs may improve stress indicators in pregnancy. Studies have shown breathing techniques and massage may reduce perception of pain during delivery (Yildirim et al., 2004); relaxation exercise with group psycho-education could reduce fear of delivery and cesarean section (Saisto et al., 2006); and regular "leisure physical activity" would reduce the number of low

birth weight babies (Leiferman et al., 2003). Narendran et al showed reduction in complications of pregnancy and need for caesarean sections with higher birth weight of babies after integrated yoga program in normal pregnancy (Narendran et al., 2005). Two studies have shown the beneficial effects of exercise and yoga techniques in reducing the duration of labor. (Beckmann et al., 1990; Chuntharapat et al., 2008).

There are studies that point to the negative impact of the stress of pregnancy on cognitive abilities of a woman during pregnancy (de Weerth et al., 2005). Yoga has been found to improve many cognitive functions such as memory and attention tasks in normal healthy adults (Sarang et al., 2006; Pailoor et al., 2009) and children (Pradhan et al., 2009 & Pradhan et al., 2010). Chattha et al showed improvement in cognitive functions (remote memory, verbal retention and recognition, and also in delayed and immediate recall) in perimenopausal women after 8 weeks of integrated yoga in a randomized control active control study (Chattha et al., 2008). Patients with major depression showed improvement in executive functions after Sahaja Yoga. (Sharma et al., 2006). Although these studies pointed the beneficial effects of yoga on simple and complex cognitive tasks in normal and clinical conditions, there were no published studies on the effect of yoga on cognitive functions during pregnancy at the time of designing this work.

Novelty of this work: A study by an earlier doctorate candidate of this university had looked at the effect of integrated yoga on several pregnancy parameters which was a non- randomized controlled study on a large sample size (Narendran et al., 2005). As there were no well designed RCTs before 2008 when we planned this study that compared the standard antenatal practices with integrated yoga in normal pregnancy in published literature that had looked at labor duration, cognitive functions and quality of life, the present study was planned.

CHAPTER 2

LITERARY RESEARCH

BIRTH ACCORDING TO VEDIC LITERATURE

This chapter is a compilation of available knowledge related to pregnancy and child birth from traditional texts of yoga philosophy. Science and technology has understood most of the aspects of 'how' of the physical processes involved in the formation of an egg, its development that culminates in the birth of a baby, and continues to unravel fascinating details of embryology and physiology. However, questions like 'why a human birth?' and 'what is the final purpose of human birth?' does not appear to be the quest of modern science while this forms the main query in yoga texts.

The birth of a child is generally considered a blessing and a source of great joy. It arouses extremely tender feelings in all those who are close to the child and is accompanied by various rituals and ceremonies in different countries. It is a perfectly natural instinct to have a child .The love between the mother and father helps create a happy family atmosphere and the child forges a closer link between the parents. The mother and father ensure that their sons and daughters receive proper care and they strive hard to create the best conditions for their children's physical, mental, emotional, intellectual and spiritual development. In the present age all these have undergone tremendous changes. The materialistic way of life has diluted the faith in spirituality.

Today, the medical science has advanced in astonishing ways. Our knowledge of science enables us to solve the most complicated and puzzling problems. We have understood many intricate details about nature ranging from astronomical phenomena to atomic motion. Yet, with all available scientific knowledge, many happenings in the world are still beyond our understanding. Birth is one such fascinating phenomenon which has many facets and unanswered questions.

According to our present understating of human embryology, the basic cells that are needed for fertilization are just one ovum and one sperm. The single cell that results from this union quickly becomes an embryo, multiplies by successive divisions and soon transforms into different kinds of cells, like brain cells, bone cells, muscle cells, nerve cells, gland cells, etc, whose systematic arrangement forms a beautiful functional entity, the human embryo. As every cell has a detailed template of all parts of a body embedded within its nucleus as 46 bundles (chromosomes) of information, it is up to the cell to unfold one of those bundles, adopt one of the genes in it, and follow it up, to become a component of one particular part of the body.

The new techniques of assisted reproduction have helped enormously the women who have not been able to conceive in the natural course. Here, the ovum and sperm are fertilized outside the female body (In Vitro) and later implanted into the uterus for further development of the embryo. Techniques like IVF (In Vitro Fertilization), ICSI (Intra Cyto Plasmic Insemination), SIFT (Sperm Intrafallopian Transfer), GIFT (Gamete IntraFallopian Transfer) etc, are giving remarkable results to the infertile couple. The latest in the news is cloning that has produced the first cloned human. This could mark the start of a new era in human reproduction –first time in the history of mankind, a child has not been the product of a genetic mix of ovum and sperm, but it is the identical copy of one parent."

WORK DONE EARLIER IN THIS FIELD

Table: 2.1. Work done as part of the dissertation/thesis by students of S-VYASA

Author & Year	Title	Conclusion
Chetana Deshpande 2008 (MSc)	Pregnancy, its complication & managements.	This study describes the month wise physiological changes during pregnancy as described in Vedic/yoga texts

Malini A. **(**MSc**)** 2011	High risk pregnancy as per Ayurvedic literature.	Ayurveda description of the components of fetus (anatomy), disorders of fetus, treatment of problems of pregnancy and details of Ayurveda prescriptions about diet, life style and other procedures to enhance healthy environment during pregnancy.
Jayashree R.Hegde **(**MSc**)** 2011	A comparative study of the concept of antenatal care and (Garbhini Paricharya) from the point of view of Ayurveda and conventional medicine.	This study explored the concept of antenatal care, the traditional methods of caring pregnant women, and compared the understanding of pregnancy and its care with that of modern times.
Leena Kumari M. **(**MSc**)** 2013	The physiological changes of pregnant women according to Scriptures.	This study has explained relevant Ayurveda principles laid down by texts useful in taking care of pregnant women, who undergo many physiological changes. The study also highlights the usefulness and methods of usage of herbal drugs to prevent problems in pregnancy.
Satyapriya Maharana, (MSc) 2003*	Concept of conception in the text of yoga & spiritual lore.	This is a comprehensive literature survey of the concept of conception according to modern medicine, spiritual texts viz., Vedic age, Upaniṣadbhāṣyam,Bhagavadggītā, Epics, Purāṇas and also according to other religions. Instances of reproduction of human beings that could happen by ***Siddhis and go beyond the common laws of nature i.e., without the well known process of the union of ovum and sperm were quoted.***
Abbas Rakhshani **(**PhD**)** 2013	Effect of Yoga in High risk pregnancy	This Vedic search covered three sections: (i) the description of embryology found in

		Bhāgavata purāṇa (ii) pregnancy related traditional rituals called Saṁskāras, and (iii) overview on the conceptual basis for the integrated yoga therapy for high risk pregnancy as portrayed in the Vedas.

*In my earlier M.Sc. work I had described the concepts of conception as portrayed in spiritual and yoga texts with examples of instances of reproduction of human beings that could happen by Siddhis and go beyond the common laws of nature i.e., without the ovum and sperm coming together. This aspect has been elaborated in the present study with more references.

The major aspect covered in the present work is references on 'why' of human birth that takes us to the **concept of karma theory and rebirth** which is widely accepted in many religions and yoga philosophy. This concept of understanding seems to have a strong impact on human behavior to promote both individual's health and social harmony. The increasing problems of life style, stress and non-communicable diseases can be traced originally to complete loss of faith in this concept of rebirth and karma theory which was accepted and practiced by most religions of the world before science and materialism took over the human psyche in the 20th century that discarded religion. Hence, the present work that compiles the scriptural references from authentic traditional texts of yoga on concept of rebirth and karma theory has relevance to promote stress free attitude which is necessary at the time of conception, during the gestational period, delivery, post partum period and also while bringing up the child.

The present literary search is focused on reviewing the concepts of birth as described in literature of Vedic age including Upaniṣadbhāṣyam, Bhagavadggītā, Epics, Purāṇas and yoga texts such as Yogavāsiṣṭhaḥ, Haṭha Ratnāvalī, Śiva Saṁhitā and Patañjali

yogasūtram. The versus and relevant information related to understanding the concept of birth from the above mentioned sources were systematically compiled, analyzed, and discussed. Available commentaries were explored, screened and reviewed from different ancient classical texts. The work included selection of verses that define the birth concept, verses related to concept of birth in relation to the law of Karma, verses describing the concept of soul and rebirth and those that describe the reincarnation of physical and subtle bodies.

Why human birth

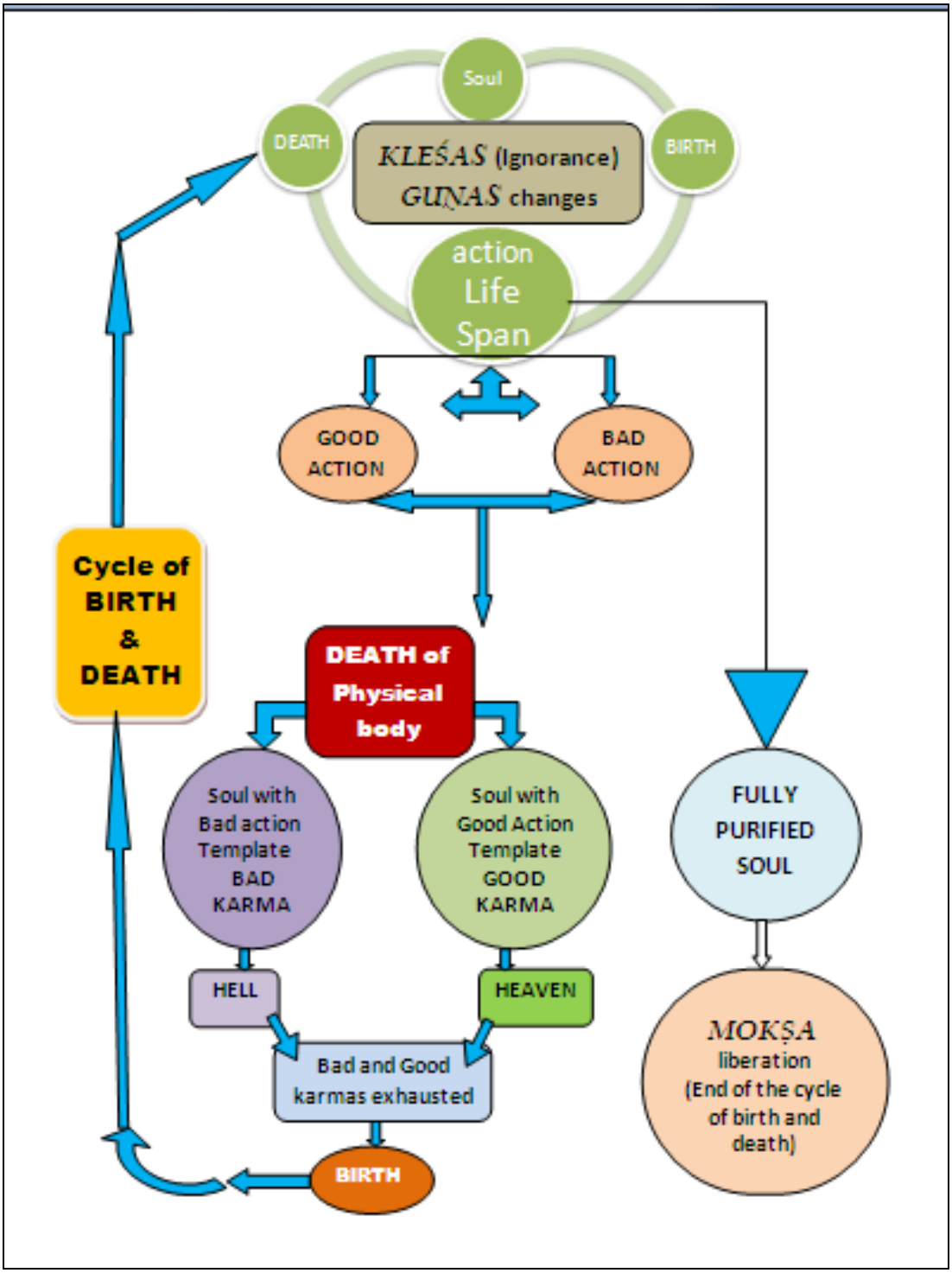
Two important questions which are not addressed by modern Embryology or obstetrics are: 'why a human birth?' and 'what is the final purpose of human birth?' These questions are addressed as important topics in these spiritual/yoga texts with great logical clarity as they are directly relevant to one's life. Rebirth caused by strong imprints produced by one's right or wrong deeds during life (Karma theory) is the greatest contribution of this knowledge base which must have evolved through several years of search. The Vedic /Yoga masters were convinced that birth takes place because of one's past Karma. Many other religions like Buddhism, Jainism, Islam and Catholic theology also believe in these phenomena in nature viz. the law of karma, rebirth and supernatural yogic powers with detailed descriptions of the processes in their scriptures. This theory says that the parentage, the fetal life, the span of life, the quality of life and major events of life are all decided by the law of Karma.

"Man is the maker of his own destiny"

Swami Vivekananda

Based on the traditional texts of yoga & Vedic literature the following model has been developed. Fig.1 describes the concept of cycles of birth & death until we reach Mokṣa. *(Freedom from the bondage of cycles of birth & death).*

FIGURE-1 Concept of Birth, Death & Rebirth cycle, and Mokṣa



After birth we all do our actions. The scriptures say that all action, good or bad, are governed by a basic ignorance (Ajñāna) about the true nature of our existence (i.e. the unchanging universal principle, the Brahman) and the three Guṇas (Sattva, Rajas, Tamas) with which we are made of and also the total absence of insight into the true purpose of life. This is called *Kleśa*, the limited pattern of the functions of mind, as described by the following texts: (Y.V., B.G., and P.Y.S.)

किन्तु ये ब्रह्मणोऽन्यत्वं बुध्यन्ते सात्विकोद्भवाः।

अबोधा ये त्वचिदाख्यं बुद्ध्वा द्वैतमिदं स्वयम्॥ **योगवासिष्ठः** ॥२८॥

Kintu ye brahmaṇo'nyatvaṁ budhyante sātvikodbhavāḥ ।
abodhā ye tvacidākhyaṁ buddhvā dvaitamidaṁ svayam ।। yogavāsiṣṭhaḥ ।।28 ।।

Those persons, who are deluded by their ignorance of the truth, think themselves apart from Brahman, as dull and unintellectual beings, (delusion of the ignorant) that makes him behave as a distinct duality.

(Ravi Prakash Arya, 2000, The Yoga Vasistha of Vālmiki, VOLUME - IV, C.H.-142, Sloka. No. 28, P.G-506)

सत्त्वं रजस्तम इति गुणाः प्रकृतिसम्भवाः।

निबध्नन्ति महाबाहो देहे देहिनमव्ययम्॥ **भगवद्गीता** ॥ १४-५॥

Sattvaṁ rajastama iti guṇāḥ prakṛtisambhavāḥ ।
nibadhnanti mahābāho dehe dehinamavyayam ।। Bhagavadgītā।। 14-5।।

Sattva or goodness, Rajas or activity and Tamas or Inertia; these three Guṇas (or state) of mind (Prakṛti) bind the imperishable soul to the body.

रजो रागात्मकं विद्धि तृष्णासङ्गसमुद्भवम्।

तन्निबध्नाति कौन्तेय कर्मसङ्गेन देहिनम्॥ **भगवद्गीता** ॥ १४-७॥

Rajo rāgātmakaṁ viddhi tṛṣṇāsaṅgasamudbhavam ।
tannibadhnāti kaunteya karmasaṅgena dehinam ।। Bhagavadgītā ।।14-7।।

Know that rajas is charasterized by intense selfish activity and is born of desire & attachment. It binds the Jīva by attachment to the fruit of work.

तमस्त्वज्ञानजं विद्धि मोहनं सर्वदेहिनाम्।

प्रमादालस्यनिद्राभिस्तन्निबध्नाति भारत॥ **भगवद्गीता** ॥ १४-८ ॥

Tamastvajñānajaṁ viddhi mohanaṁ sarvadehinām ।

pramādālasyanidrābhistannibadhnāti bhārata ।। Bhagavadgītā ।।14-8।।

Tamas, the deluder of Jīva , is born of inertia. It bind by ignorance, laziness & excessive sleep.

सत्त्वं सुखे सञ्जयति रजः कर्मणि भारत।

ज्ञानमावृत्य तु तमः प्रमादे सञ्जयत्युत॥ **भगवद्गीता** ॥ १४-९॥

Sattvaṁ sukhe sañjayati rajaḥ karmaṇi bhārata ।

jñānamāvṛtya tu tamaḥ pramāde sañjayatyuta ।। Bhagavadgītā ।।14-9।।

Sattva attaches one to happiness, Rajas to action and tamas to ignorance by covering the knowledge.

षत्त्वात् सन्जायते ज्नानम् रजसो लोभ एव च

प्रमादमोहौ तमसो भवतोज्नानमेव च ॥ **भगवद्गीता** ॥ १४ ॥१७ ॥

Ṣattvāt sanjāyate jnānam rajaso lobha eva ca

pramādamohau tamaso bhavatojnānameva ca ।। Bhagavadgītā ।।14.17।।

From Sattva arises wisdom, and greed from Rajas; miscomprehension, delusion and ignorance arise from Tamas.

कर्मणः सुकृतस्याहुः सात्त्विकं निर्मलं फलम्।

रजसस्तु फलं दुःखमज्ञानं तमसः फलम्॥ १४-१६ ॥

karmaṇaḥ sukṛtasyāhuḥ sāttvikaṁ nirmalaṁ phalam ।

rajasastu phalaṁ duḥkhamajñānaṁ tamasaḥ phalam ।। ।। Bhagavadgītā ।।14.16।।

The fruit of good action, they say, is Sātvika and pure; verily, the fruit of Rajas is pain, and ignorance is the fruit of Tamas. Action with predominance of Tamas will be least efficient. With tamas a person has lot of lazyness, drowsyness and escapist tendency in all action. Therefore tamas has to be removed. The action dominated by rajas is speed, high efficiency, creativity, dynamism and brilliance etc. However the limitation of rajas is that it leads to violence, tension, stress and also fatigue. So the rajas has to be controled and

moderate. In Sātvik action there is always all the good aspects of rajas and there is reduced fatigue and stresses as the strong attachment to selfishness of Rajas is reduced .

(T.N. Sethumadhavan, 2010, Srimad Bhagvad Gita, C.H.-14, Sloka. No. 5, 7, 8, 9,16 & 17)

अविद्याऽस्मिता-राग-द्वेषाभिनिवेशाः पञ्चक्लेशाः ॥ **पतञ्जलियोगसूत्रम्**॥ २॥३॥

Avidyā'smitā-rāga-dveṣābhiniveśāḥ pañcakleśāḥ ।। patañjaliyogasūtram ।।2.3।।

Ignorance, I-feeling, liking, disliking and fear of death are the pain.

क्लेशमूलः कर्माशयो दृष्टादृष्टजन्मवेदनीयः॥ **पतञ्जलियोगसूत्रम्** ॥ २.१२॥

Kleśamūlaḥ karmāśayo dṛṣṭādṛṣṭajanmavedanīyaḥ ।। patañjaliyogasūtram ।। 2.12 ।।

The reservoir of Karmas which are rooted in Kleśas brings all kinds of experiences in the present and future lives.

सति मूले तद्विपाको जात्यायुर्भोगाः॥ **पतञ्जलियोगसूत्रम्** ॥ २.१३॥

Sati mūle tadvipāko jātyāyurbhogāḥ ।। patañjaliyogasūtram ।। 2.13 ।।

As long as the root is there, it must ripen and result in lives of different classes, different lengths and experiences.

ते ह्लादपरितापफलाः पुण्यापुण्यहेतुत्वात्॥ **पतञ्जलियोगसूत्रम्** ॥ २.१४॥

Te hlādaparitāpaphalāḥ puṇyāpuṇyahetutvāt ।। patañjaliyogasūtram ।। 2.14।।

They have joy or sorrow as their fruit according to their cause.

Patañjali talks about Kleśas in Sādhanā Pāda. According to him ignorance is the root cause for ego, strong likes & dislikes, fear & pain. All our actions are governed by these Kleśas and the guṇas described above. These karmas (actions) governed by different kleśas and guṇas are carried on as strong imprints in the subtle layers of our existence that direct our lives and are carried on as templates for future lives after death.

All our actions are guided by these Guṇas (basic material used for creation), Kleśas (the limitations of mind) and ajñāna (ignorance of our true nature). All actions are classified as daily routine actions (Nitya karmas), prescribed actions for healthy life style (Naimittika

karmas), and actions directed by our desires (kāmya karmas). These guṇas guide our behavior that lead to good or bad action which form the template for taking us to heaven or hell after the death of the physical body.

(I.K. Taimini, 2001, Ch.-II, Slokas-3, 12, 13, & 14, Pg-157-160)

त्रिविधो विधिकूटः स्यान्नित्यनैमित्तकाम्यतः।

नित्येऽकृते किल्बिषं स्यात्काम्ये नैमित्तिके फलम्॥ **शिवसंहिता** ॥ २३॥

Trividho vidhikūṭaḥ syānnityanaimittakāmyataḥ।

nitye'kṛte kilbiṣaṁ syātkāmye naimittike phalam।। śivasaṁhitā ।।23।।

Actions are three fold- Nitya (regular), Naimittika (occasional), and kāmya (optional). By the non-performance of Nitya or daily rites there accrues sin; but their performance no merit is gained. On the other hand, the occasional and optional duties, if done or left undone, produce results that merit or demerit.

(Rai Bahadur Srisa Chandra Vasu, 1996, C.H.-1, Sloka no- 23)

These concepts about three types of actions mentioned above (regular, occasional, and optional), described in Śiva saṁhitā is also brought out in Bhagavadgītā as seen in the following verse-

अनिष्टमिष्टं मिश्रं च त्रिविधं कर्मणः फलम्।

भवत्यत्यागिनां प्रेत्य न तु संन्यासिनां क्वचित्॥ **भगवद्गीता** ॥१८॥१२॥

Aniṣṭamiṣṭaṁ miśraṁ ca trividhaṁ karmaṇaḥ phalam ।

Bhavatyatyāgināṁ pretya na tu sannyāsināṁ kvacit ।। Bhagavadgītā ।। 18-12।।

Karma is ever associated three types of actions called desirable, agreeable, and mixed – awaits the non- relinquishes (of fruits) after death but not the relinquished. So we find that a man who goes to heaven as a result of his meritorious deeds may perchance have some evil impression predominant in him on the exhaustion of his merits. Consequently such a person, in coming down from heaven, will have a low birth in the human plane or may

even descend to the subhuman level. Usually those who return from the heaven are reborn on a high level of life. Therefore karma decides the birth of a soul.

(T.N. Sethumadhavan, 2010, Srimad Bhagvad Gita, C.H.-18, Sloka. No. 12)

The result of good & bad actions bring merits (Pūṇya) and sins (Pāpa) that lead us to hell or heaven after death as described in the following verses-

द्विविधं तु फलं ज्ञेयं स्वर्गो नरक एव च।

स्वर्गो नानाविधश्चैव नरकेऽपि तथा भवेत्॥ **शिवसंहिता** ॥ १.२४ ॥

Dvividhaṁ tu phalaṁ jñeyaṁ svargo naraka eva ca ।
svargo nānāvidhaścaiva narake'pi tathā bhavet ।। śivasaṁhitā ।। 1.24 ।।

पुण्यकर्माणि वै स्वर्गो नरकः पापकर्माणि।

कर्मबन्धमयी सृष्टिर्नान्यथा भवति ध्रुवम्॥ **शिवसंहिता** ॥ १.२५ ॥

Puṇyakarmāṇi vai svargo narakaḥ pāpakarmaṇi ।
karmabandhamayī sṛṣṭirnānyathā bhavati dhruvam ।। śivasaṁhitā ।। 1.25 ।।

पापभोगावसाने तु पुनर्जन्म भवेत्खलु। पुण्यभोगावसाने तु नान्यथा भवति ध्रुवम्॥ **शिवसंहिता** ॥ १.२८ ॥

Pāpabhogāvasāne tu punarjanma bhavetkhalu ।
puṇyabhogāvasāne tu nānyathā bhavati dhruvam ।। śivasaṁhitā ।। 1.28 ।।

पितुरन्नमयात्कोशाज्जायते पूर्वकर्मणः। तच्छरीरं विदुर्दुःखं स्वप्राग्भोगाय सुन्दरम्॥ **शिवसंहिता** ॥ १.८९॥

Piturannamayātkośājjāyate pūrvakarmaṇaḥ ।
taccharīraṁ vidurduḥkhaṁ svaprāgbhogāya sundaram ।। śivasaṁhitā ।। 1.89।।

The fruits of action are twofold-heaven or hell. The good actions are verily the heaven, and sinful deeds take the soul to the hell; the creation is the natural outcome of Karmas and nothing else. When the suffering (hell) of the evil actions and enjoyment of good actions (heaven) are exhausted, the Jīva takes rebirth. From the Annamaya Kośa (the physical vehicle) of the father, and in accordance with its past Karmas, the human soul is re-incarnated; therefore, the wise consider this beautiful body as a punishment, for the suffering/enjoying of the effects of past Karma.

(Rai Bahadur Srisa Chandra Vasu, 1996, C.H.-1, Sloka no- 24, 25, 28 & 89)

If however one uses the yoga for purification, one crosses the barrier or bondage of Guṇas and Kleśas.

कर्मजं बुद्धियुक्ता हि फलं त्यक्त्वा मनीषिणः।

जन्मबन्धविनिर्मुक्ताः पदं गच्छन्त्यनामयम्॥ **भगवद्गीता** ॥ २-५१ ॥

Karmajaṁ buddhiyuktā hi phalaṁ tyaktvā manīṣiṇaḥ ।
janmabandhavinirmuktāḥ padaṁ gacchantyanāmayam ।। Bhagavadgītā।। 2-51।।

The wise, possessed of equanimity, having abandoned the fruits of their actions and being freed from the fetters of birth, attains the state that is beyond all evil (reaches the blissful supreme state).

(T.N. Sethumadhavan, 2010, Srimad Bhagvad Gita, C.H.-2, Sloka. No. 51)

इहामुत्रफलद्वेषी सफलं कर्म संत्यजेत्। नित्यनैमित्तिकं संज्ञं त्यक्त्वा योगो प्रवर्तते॥ **शिवसंहिता** ॥ १.३१ ॥

Ihāmutraphaladveṣī saphalaṁ karma santyajet ।
nityanaimittikaṁ sañjñaṁ tyaktvā yogo pravartate ।। śivasaṁhitā ।। 1.31 ।।

Those who are desirous of enjoying the fruits of their actions in this world should renounce all actions which are done with an eye to their fruits. After having discarded the attachment for the daily and the Naimittika acts, one should employ themselves in the practice of Yoga.

(Rai Bahadur Srisa Chandra Vasu, 1996, C.H.-1, Sloka no- 31)

FIGURE. 2 Process of Rebirth.

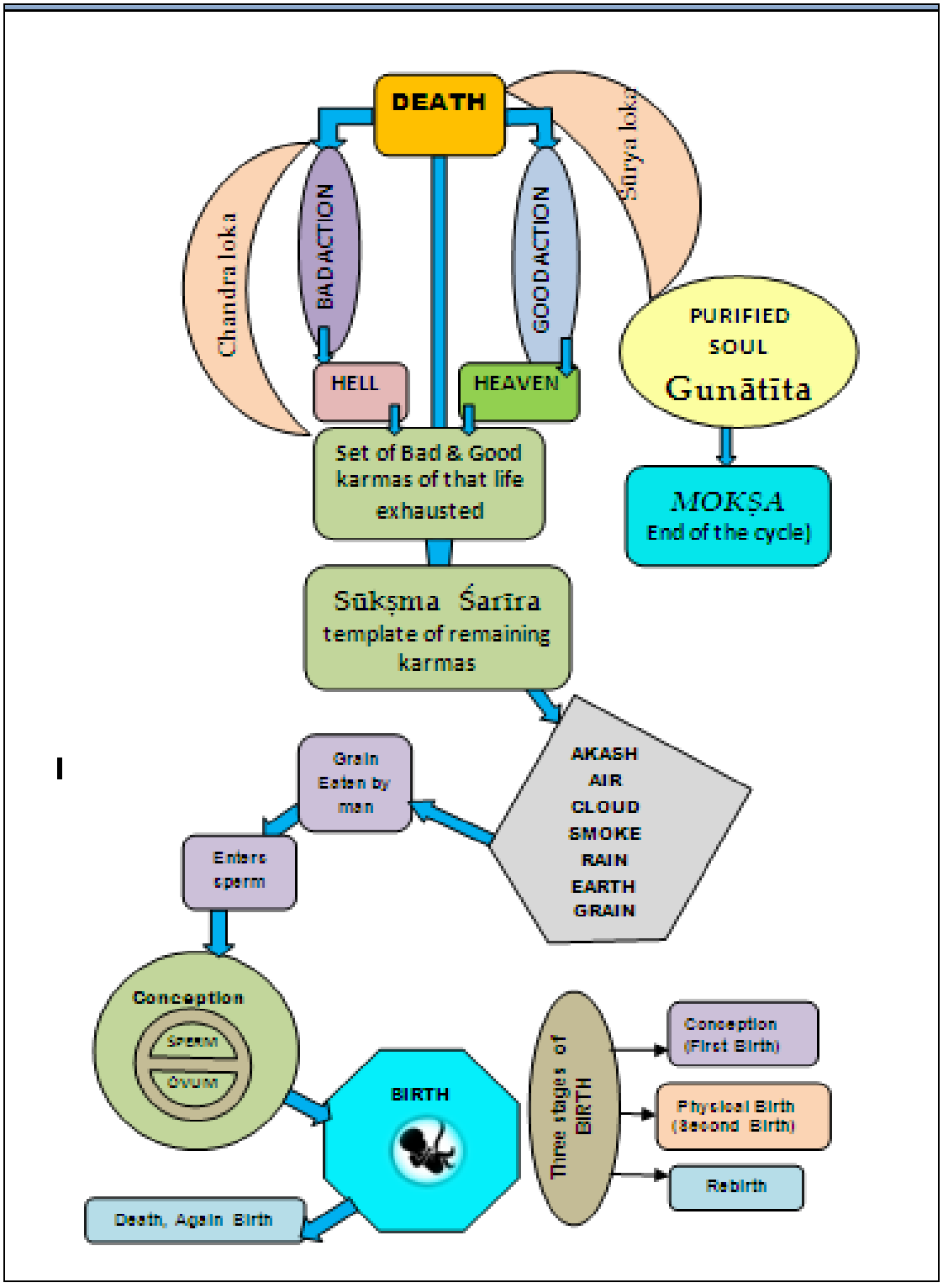


Fig.2 In this model the mechanism of rebirth after death is described.

The Pratiprasava takes place by purified action.

प्रतिप्रसवहेयाः सूक्ष्माः ॥ **पतञ्जलियोगसूत्रम्** - २। १० ॥

Pratiprasavaheyāḥ sūkṣmāḥ ।। patañjaliyogasūtram - 2। 10 ।।

These subtle afflictions can be destroyed by inverse propagation (pratiprasava), involution or reabsorption into their causal origins.

यत्र काले त्वनावृत्तिमावृत्तिं चैव योगिनः।

प्रयाता यान्ति तं कालं वक्ष्यामि भरतर्षभ ॥ **भगवद्गीता** ॥ ८-२३॥

Yatra kāle tvanāvṛttimāvṛttiṁ caiva yoginaḥ ।

prayātā yānti taṁ kālaṁ vakṣyāmi bharatarṣabha ।। Bhagavadgītā ।।8-23।।

अग्निर्ज्योतिरहः शुक्लः षण्मासा उत्तरायणम्।

तत्र प्रयाता गच्छन्ति ब्रह्म ब्रह्मविदो जनाः ॥ **भगवद्गीता** ॥ ८-२४॥

Agnirjyotirahaḥ śuklaḥ ṣaṇmāsā uttarāyaṇam ।

tatra prayātā gacchanti brahma brahmavido janāḥ ।। Bhagavadgītā।। 8-24।।

A person who is a Jīvanmukta moves towards mokṣa or total freedom. And for that he travels through devayāna mārga. While he travels through this märga which is also called arcira mārga, the path is illuminated and become progressively brighter to lead towards brahma loka passing through the sūryaloka. During this process of travel through sūryaloka the sūkṣma śarīra gets burnt to reach the state of total liberation.

(T.N. Sethumadhavan, 2010, Srimad Bhagvad Gita, C.H.-8, Sloka. No. 23 & 24, C.H.- 2, Sloka. No.10)

Similarly if yoga is not used to purify the actions, Soul (Sūkṣma Śarīra) continues to do the action as per our Guṇas and Saṁskāras continue the journey to Candra loka .

धूमो रात्रिस्तथा कृष्णः षण्मासा दक्षिणायनम्।

तत्र चान्द्रमसं ज्योतिर्योगी प्राप्य निवर्तते ॥ **भगवद्गीता** ॥ ८-२५॥

Dhūmo rātristathā kṛṣṇaḥ ṣaṇmāsā dakṣiṇāyanam ।

tatra cāndramasaṁ jyotiryogī prāpya nivartate ।। Bhagavadgītā।। 8-25।।

The path of Gods is the path of illumination that leads to liberation from where there is no return for the departed souls. On the other hand the path of ancestors is the path of darkness which leads to rebirth.

रजसि प्रलयं गत्वा कर्मसङ्गिषु जायते।
तथा प्रलीनस्तमसि मूढयोनिषु जायते॥ **भगवद्गीता** ॥ १४-१५॥
Rajasi pralayaṁ gatvā karmasaṅgiṣu jāyate ।
tathā pralīnastamasi mūḍhayoniṣu jāyate ।। Bhagavadgītā ।।14-15।।

Meeting death in Rajas he is born among those attached to action; so dying in Tamas, he is born in the wombs of the irrational.

यं यं वापि स्मरन्भावं त्यजत्यन्ते कलेवरम्।
तं तमेवैति कौन्तेय सदा तद्भावभावितः॥ **भगवद्गीता** ॥ ८-६॥
Yaṁ yaṁ vāpi smaranbhāvaṁ tyajatyante kalevaram ।
taṁ tamevaiti kaunteya sadā tadbhāvabhāvitaḥ ।। Bhagavadgītā ।।8-6।।

The soul enters the wombs for acquiring human bodies, others into the stationary life (such as plant) in accordance with their deeds and in accordance with their thought. The soul goes to that on which its mind is set during the last moments. What we think we become. Our past thoughts determine our present birth and our present ones will determine the future.

(T.N. Sethumadhavan, 2010, Srimad Bhagvad Gita, C.H.-8, Sloka. No. 6 &25, C.H.-14, Sloka. No. 15)

In Sūkṣma Śarīra, the soul suffers or enjoys the fruits of karma, pāpa (bad actions) in Hell or pūṇya (good actions) in Heaven and clears the Saṁskāras and comes back to the earth to clear the remaining Saṁskāras.

ते तं भुक्त्वा स्वर्गलोकं विशालं क्षीणे पुण्ये मर्त्यलोकं विशन्ति।
एवं त्रयीधर्ममनुप्रपन्ना गतागतं कामकामा लभन्ते॥ ९-२१॥

Te taṁ bhuktvā svargalokaṁ viśālaṁ kṣīṇe puṇye martyalokaṁ viśanti ॥

भगवद्गीता ॥

evaṁ trayīdharmamanuprapannā gatāgataṁ kāmakāmā labhante

|| Bhagavadgītā| 9-21||

They having enjoyed the vast heaven, return to the world of mortals when their merits are exhausted; thus abiding by the injunctions of the three Vedas and desirous of enjoyments, they are subjected to birth and death.

(T.N. Sethumadhavan, 2010, Srimad Bhagvad Gita, C.H.-9, Sloka. No. 21)

As described above, going through Candra loka , and exhausting all the pūṇya and pāpa of the previous life in heaven or hell, the Sūkṣma śarīra with the remaining Karmas (Sañcita Karma), travels through the space (Ākāśa), air (Vāyu), cloud, smoke, rain and earth to get into the food grain. Here it waits until the food is ingested by a man. Then it enters the man's sperm, enters the womb and waits until it is transferred to the ovum during the union for acquiring a human body to clear its Prārabdha karma which is only a part of the sañcita karma that would be exhausted during the present birth.

And thus the soul takes birth again.

ब्रह्मणो मनःशक्तिरभ्युदिता पुरःस्थिताकाशशक्तिमवलम्ब्य

तत्रस्थपवनतानुपातिनी घनसङ्कल्पत्वं गच्छति ॥ **योगवासिष्ठः** ॥ १८ ॥

Brahmaṇo manaḥśaktirabhyuditā puraḥsthitākāśaśaktimavalambya

tatrasthapavanatānupātinī ghanasaṅkalpatvaṁ gacchati || yogavāsiṣṭhaḥ|| 18

||

ततं पुरःप्राप्तभूततन्मात्रपञ्चकतामेत्यान्तःकरणतां नीत्वा सात्वसूक्ष्मा प्रकृतिर्भूत्वा

गगनपवनतेजोरूपतासङ्कल्पात् प्रालेयरूपतामुपेत्य शाल्योषधिं

विशन्ती प्राणिनां गर्भताम् च गच्छति ॥ **योगवासिष्ठः** ॥ १९॥

Tataṁ puraḥprāptabhūtatanmātrapañcakatāmetyāntaḥkaraṇatāṁ

nītvā sātvasūkṣmā prakṛtirbhūtvā gaganapavanatejorūpatāsaṅkalpāt

prāleyarūpatāmupetya śālyoṣadhiṁ

viśantī prāṇināṁ garbhatām ca gacchati || yogavāsiṣṭhaḥ || 19 ||

जायते तस्मात्ततः पुरुषः सम्पद्यते ॥ **योगवासिष्ठः** ॥२० ॥

Jāyate tasmāttataḥ puruṣaḥ sampadyate ।। yogavāsiṣṭhaḥ ।। 20 ।।

तेन पुरुषेण जातमात्रेणैव बाल्यात्प्रभृति। विद्याग्रहणं कर्तव्यं गुरवोऽनुगन्तव्याः॥ **योगवासिष्ठः** ॥२१॥

Tena puruṣeṇa jātamātreṇaiva bālyātprabhṛti ।
vidyāgrahaṇaṁ kartavyaṁ guravo'nugantavyāḥ ।। yogavāsiṣṭhaḥ ।। 21 ।।

These verses describe the process of production of body from the mind that evolves into a human being who accrues more and more knowledge to move towards perfection. It says: the mental power of Brahman, the creative entity of the unmanifest universal consciousness, rests on the wide expanse of vacuum/space (ākāśa), which is spread before it. Being joined with the essence of the individual soul, the sūkṣma śarīra (that carries all imprints of karmas of past lives), becomes solidified in the shape of a strong mental desire. Then, finding the miniature of matter spread out before it, it becomes the quintessence of the quintuple elements (pṛthvī āpa tejas vāyu tattvas); this goes on to assume their outward senses (touch, taste, smell, sound and sight) ; it then becomes a suitable elementary body composed of the finest particles of the five elements. It enters into the grains and vegetables which re-inter the bowel of human being in the form of food. The essence of the food in the form of semen gives birth to the human being. The male child is taken in his boyhood to his tutor for acquisition of knowledge.

(Ravi Prakash Arya, 2000, The Yoga Vasistha of Välmiki, VOLUME-I, C.H.-116, Sloka No-18, 19, 20, 21, P.G-579)

Same concept is described in Bṛhadāraṇyaka upaniṣat & Chāndogya upaniṣat also.

अथ ये यज्ञेन दानेन तपसा लोकाञ्जयन्ति ते धूममभिसम्भवन्ति, धूमाद्रात्रिम् रात्रेरपक्षीयमाणपक्षम् , अपक्षीयमाणपक्षाद्यान्षण्मासान्दक्षिणादित्य एति, मासेभ्यः पितृलोकम, पितृलोकाच्चन्द्रम ते चन्द्रं प्राप्यान्नं भवन्ति तांस्तत्र देवा यथा सोमं राजानमाप्यायस्वापक्षीयस्वेति एवमेनांस्तत्र भक्षयन्ति तेषां यदा तत्पर्यवैत्यथेममेवाकाशमभिनिष्पद्यन्ते आकाशाद्वायुम वायोर्वृष्टिम वृष्टेः पृथिवीम् ते पृथिवीं प्राप्यान्नं भवन्ति ते पुनः पुरुषाग्नौ हुयन्ते ततो योषाग्नौ जायन्ते लोकान्प्रत्युत्थायिनः त एवमेवानुपरिवर्तन्ते अथ य एतौ पन्थानौ न विदुस्ते कीटाः पतङ्गा यदिदं दन्दशूकम्॥ १६॥ इति द्वितीयं ब्राह्मण्म्॥ **बृहदारण्यक उपनिषत्** ॥ ६॥२॥१६॥

Aatha ye yajñena dānena tapasā lokāñjayanti te dhūmamabhisambhavanti
dhūmādrātrima rātrerapakṣīyamāṇapakṣama

apakṣīyamāṇapakṣādyānṣaṇmāsāndakṣiṇāditya eti māsebhyaḥ pitṛlokama pitṛlokāñcandrama te candraṁ prāpyānnaṁ bhavanti tāṁstatra devā yathā somaṁ rājānamāpyāyasvāpakṣīyasveti evamenāṁstatra bhakṣayanti teṣāṁ yadā tatparyavaityathemamevākāśmabhiniṣpadyante ākāśādvāyuma vāyorvṛṣṭima vṛṣṭeḥ pṛthivīm te pṛthivīṁ prāpyānnaṁ bhavanti te punaḥ puruṣāgrau huyante tato yoṣāgrau jāyante lokānpratyutthāyinaḥ ta evamevānuparivartante atha ya etau panthānau na viduste kīṭāḥ pataṅgā yadidaṁ dandaśūkam ।। 16 ।। iti dvitīyaṁ brāhmaṇm ।। bṛhadāraṇyaka upaniṣat ।। 6. 2. 16 ।।

"Racing the earth (while coming down from the celestial sphere) they (the souls of those who perform sacrificial rights and righteous deeds in order to go to higher regions for sense fulfillment) become food (being associated with rice and barley etc); then they become the fire of man, then the fire of women, whence they are born and perform rites with a view to go the other world. Thus do they rotate until they gain the saving knowledge, which saves them from the repeated cycles of birth and rebirth.

(Sri Ramakrishna Math, 1951, Chapter- VI, Section: 6.2.16., Page no-472-473)

योषा वाव गौतमाग्निस्तस्या उपस्थ एव समिद्यदुपमन्त्रयते स धूमो
योनिरर्चिर्यदन्तःकरोति तेऽङ्गारा अभिनन्दा विस्फुलिङ्गाः ॥ छान्दोग्य उपनिषत् ॥ १ ॥
तस्मिन्नेतस्मिन्नग्नौ देवा रेतो जुह्वति तस्या आहुतेर्गर्भः सम्भवति ॥ छान्दोग्य उपनिषत् ॥ २ ॥
तस्मिन्यावत्सम्पातमुषित्वाथैतमेवाध्वानं पुनर्निवर्तन्ते यथेतमाकाशमाकाशाद्वायुं
वायुर्भूत्वा धूमो भवति धूमो भूत्वाभ्रं भवति ॥ **छान्दोग्य उपनिषत्** ॥ ५ ॥
अभ्रं भूत्वा मेघो भवति मेघो भूत्वा प्रवर्षति त इह व्रीहियवा ओषधिवनस्पतयस्तिलमाषा
इति जायन्तेऽतो वै खलु दुर्निष्प्रपतरं यो यो ह्यन्नमत्ति यो रेतः सिञ्चति तद्भूय एव भवति ॥ छान्दोग्य उपनिषत् ॥ ६ ॥

Yoṣā vāva gautamāgnistasyā upastha eva samidyadupamantrayate sa dhūmo yonirarciryadantaḥkaroti te'ṅgārā abhinandā visphuliṅgāḥ ।।C.U. 1 ।।
Tasminnetasminnagau devā reto juhvati tasyā āhutergarbhaḥ sambhavati ।।C.U. 2 ।।

Tasminyāvatsampātamuṣitvāthaitamevādhvānaṁ punarnivartante yathetamākāśamākāśādvāyuṁ vāyurbhūtvā dhūmo bhavati dhūmo bhūtvābhraṁ bhavati ।। C.U.5 ।। Abhraṁ bhūtvā medho bhavati medho bhūtvā pravarṣati ta iha vrīhiyavā oṣadhivanaspatayastilamāṣā iti jāyante'to vai khalu durniṣprapataraṁ yo yo hmannamatti yo retaḥ siñcati tadbhūya eva bhavati ।।chāndogya upaniṣat ।। 6 ।।

Woman indeed is the fire, O Gautama. Into this fire the deities offer the oblation of the seed. Out of the oblation the fetus arises. Residing in that (region of the moon) till they have exhausted (the results of action), they then return, again, the same way as they came (by the path being mentioned), they come to Akaśa, and from Akaśa to air. Having become air, they become smoke. Having become smoke they become the white cloud. Having become the white cloud, they become the (rain bearing) cloud. Having become the cloud it falls with rain. Then they are born in this world as rice and barley, herbs and trees, sesamum plants and beans, but the release from these is more difficult, for whoever eats the food and sows the seed, they become like him only.

(Swami Swahananda.1984, Ch-V, Sloka. 5.8.1-2., page no-365, 5.8.6-7-8., Page no-373-375.)

योनिमन्ये प्रपद्यन्ते शरीरत्वाय देहिनः। स्थाणुमन्येऽनुसंयन्ति यथाकर्म यथाश्रुतम्॥ **कठ उपनिषत् ॥ २॥२॥७ ॥**

Yonimanye prapadyante śarīratvāya dehinaḥ. sthāṇumanye'nusaṁyanti yathākarma yathāśrutam. ॥7॥ kaṭha upaniṣat ।।2. 2. 7।।

Some souls enter the womb for acquiring bodies and other follow the motionless, in accordance to their work and in conformity with their knowledge. Then the Sūkṣma Śarīra enters into the womb to acquire the physical body as described in Kaṭha Upaniṣad.

(Swami Gambhirananda, 2008, Part-II, Canto-II, Sloka-7, Page no-107)

Birth: Three stages of Birth: Further, the soul goes through three stages of birth as described in Aitareya Upaniṣat, in following slokas:

ॐ पुरुषे ह वा अयमादितो गर्भो भवति यदेतद्रेतः। तदेतत्सर्वेभ्योऽङ्गेभ्यस्तेजः संभूतमात्मन्येवाऽऽत्मानं बिभर्ति तद्यदा स्त्रियां सिञ्चत्यथैनज्जनयति तदस्य प्रथमं जन्म॥ **ऐतरेय उपनिषत्** ॥ २॥१॥१ ॥

Om puruṣe ha vā ayamādito garbho bhavati yadetadretaḥ. tadetatsarvebhyo'ṅgebhyastejaḥ sambhūtamātmanyevā''tmānaṁ bibharti tadyadā striyāṁ siñcatyathainajjanayati tadasya prathamaṁ janma. ।aitareya upaniṣat ।2.1.1।।

तत्स्त्रिया आत्मभूयं गच्छति यथा स्वमङ्गं तथा। तस्मादेनां न हिनस्ति।
साऽस्यैतमात्मानमत्र गतं भावयति ॥ **ऐतरेय उपनिषत्** ॥ २॥१॥२ ॥

Tatsriyā ātmabhūyaṁ gacchati yathā svamaṅgaṁ tathā. tasmādenāṁ na hinasti. sā'syaitamātmānamatra gataṁ bhāvayati. ॥ aitareya upaniṣat ।। 2.1.2 ।।

सा भावयित्री भावयितव्या भवति। तं स्त्री गर्भं बिभर्ति। सोऽग्र एव कुमारं जन्मनोऽग्रेऽधिभावयति।
स यत्कुमारं जन्मनोऽग्रेऽधिभावयत्यात्मानमेव तद्भावयत्येषां लोकानां सन्तत्या।
एवं सन्तता हीमे लोकास्तदस्य द्वितीयं जन्म ॥ **ऐतरेय उपनिषत्** ॥२॥१॥३ ॥

Sā bhāvayitrī bhāvayitavyā bhavati. taṁ strī garbhaṁ bibharti. so'gra eva kumāraṁ janmano'gre'dhibhāvayati. sa yatkumāraṁ janmano'gre'dhibhāvayatyātmānameva tadbhāvayatyeṣāṁ lokānāṁ santatyā. evaṁ santatā hīme lokāstadasya dvitīyaṁ janma. ॥ aitareya upaniṣat ।। 2.1.3 ।।

सोस्यायमात्मा पुण्येभ्यः कर्मभ्यः प्रतिधीयते। अथास्यायमितर आत्मा कृतकृत्यो वयोगतः प्रैति।
स इतः प्रसन्नेव पुनर्जायते तदस्य तृतीयं जन्म॥ **ऐतरेय उपनिषत्** ॥ २॥ १॥ ४॥

Sosyāyamātmā puṇyebhyaḥ karmabhyaḥ pratidhīyate ।
athāsyāyamitara ātmā kṛtakṛtyo vayogataḥ praiti ।
sa itaḥ prasanneva punarjāyate tadasya tṛtīyaṁ janma ।। aitareya upaniṣat ।। 2।। 1।। 4 ।।

In man indeed is the soul first conceived? That which is the semen is extracted from all the limbs as their vigour. He holds that self of his in his own self. When he shed it into his wife, then he procreates it. That is its first birth. That becomes non-different from the wife,

just as much as her own limb is. Therefore (the fetus) does not hurt her. She nourishes this self of his that has entered here (in her womb). She, the nourisher, becomes fit to be nourished. The wife bears that embryo. He (the father) protects the son at the very start, soon after his birth. That he protects the son very beginning, just after birth, thereby he protects his own self for the sake of continuance of these worlds. For thus, is the continuance of this world ensured. That is his second birth. This self of his (viz the son) is deputed (by the father) for the performance of virtuous deeds. Then this other got self as his (that is the father of the son), having of his duties fulfilled and having advanced in age departs. As soon as he departs, he takes birth again. That is his third birth.

(Swami Gambhirananda. 2006, Part-II, Chapter- 1, Sloka- 1,2,3,4. Page no- 53-57).

SUMMARY

In the first model, we have described the concept of birth, death & rebirth or Mokṣa. If the Saṁskāras and Vāsanās were not exhausted then one takes birth again and continue in the cycle of birth and death. On the other hand if the Vāsanās and Saṁskāras are exhausted and all the Kleśas were purified then this subtle body goes beyond the bondage of the cycles of birth and death, and gets liberated (Mokṣa). In the second model we have presented the mechanism by which we take birth after death. The Sūkṣma śarīra after experiencing and exhausting the Pūṇyas (result of good actions) in the heaven or the pāpas (result of bad actions) in the hell, will descend downwards towards grosser states through Ākāśa, Vāyu, cloud, smoke, rain and the earth to get into the food grain. This path is called as Candrāyaṇa mārga. Here it waits until the food is ingested by a man. Then it enters the man's sperm, enters the womb and waits until it is transferred to the ovum

during the union for acquiring a human body to clear its Prārabdha karma which is only a part of the Sañcita karma that would be exhausted during the present birth. Three stages of birth for the Soul are described. When the soul is conceived and procreated it is its first birth; In the womb, the mother protects him or her. When it comes out of the womb for the sake of the continuance of this world it is the second birth. After birth, the soul departs and takes birth again which is called its third birth. The birth is considered high or low, according to the nature of residual (Sañcita) karma.

CONCLUSION

Every thought that we think, every deed that we do, after a certain time becomes an imprint in our subconscious mind, goes into a seed form, so to speak, lives in the subtle body in a potential form. After a time it bears its results to form a full template to create the necessary conditions for the next life. Thus he moulds his own life. Man is not bound by any other laws excepting those which he makes for himself. Our thoughts, our deeds, our words are the thread of the net which we throw round ourselves, for good or for evil. Once we set in motion a certain power, we have to take the full consequence of it. This is called law of karma. Thus, the soul is bound to go through the law of karma, which leads him in to the cycle of birth and death. Thus the law of karma states that soul returns to the mundane life on the exhaustion of the impressions of either the bad or meritorious deeds and gains a new suitable body by selecting the most appropriate family and the womb to exhaust the next set of karmas (Prārabdha karma). Hence, birth is considered high or low, according to the nature of the residual karma.

CHAPTER 3

LITERATURE SURVEY OF SCIENTIFIC INVESTIGATIONS

3.1. PREGNANCY& PRENETAL STRESS

3.1.1. Pregnancy, a positive experience

Pregnancy is an event that changes many perspectives of a woman's life. It has been regarded as a time of psychological and biological crisis and of emotional upheaval, and as a life event for a primigravida which initiates a new social role (Thorpe et al., 1992). A more optimistic standpoint views pregnancy as a period that brings marvelous feelings of well-being and psychological strength, while others view it as a relatively normal and largely positive developmental experience (Brown et al., 1979). Although the individual experience may vary between these extremes, pregnancy has potentially important short- and long-term implications for women's health, well-being and social roles (Striegel et al., 1996). Pregnancy is an important period during which the mother and the fetus are potentially exposed to the negative impact of stress (Cameron et al., 1996). Giving birth is one of the most important events in life, which is a highly individual experience. The experience of childbirth plays a major role in how first-time mothers will develop good self-esteem (Oweis et al., 2004), positive feelings for the baby, and an easier adjustment to motherhood role (Ekstrom et al., 2006). Berg et al. also stress women's unique needs of support during birth, such as to be seen as an individual and to have a trusting relationship (Berg et al., 1996). It has also been observed that women want a sense of security and to feel involved in decisions affecting them, during the childbirth period (Berg et al., 1996 & Wahn et al., 2005). They want to feel confident in their first childbirth and want to be seen as unique individuals by the professionals and their partner. If professionals responded to the individual woman's needs of support, the woman more often had a positive birth experience, even if the birth was protracted or with medical complications (Nilsson et al.,

2013).Literature review of work done on mind body interactions during pregnancy is presented under several headings in this chapter.

3.1.2 Prenatal Stress

Definition of prenatal stress

Stress is presumably most accurately described through a multidimensional concept, with the model of Lazarus & Folkman (Lazarus et al., 1984) as a useful theoretical starting point. In this model a differentiation is made between stress-provoking factors (e.g., life events, daily hassles), stress-mediating or -moderating factors (e.g., coping, social support) and stress-resulting factors (e.g., perceived distress). Recent studies have integrated various stress definitions into a comprehensive and multidimensional definition of prenatal stress. Prenatal distress was best predicted by combining life events distress, perceived chronic distress, and state anxiety, emotion, socio-economic stressors, family stressors, environmental and personality factors (Sheehan et al., 1998; Sheehan et al., 1996 & Lobel et al., 1990).During exposure to a stress, the whole system of stress regulation, i.e. the hypothalamus-pituitary-adrenal cortex system (HPA axis) and the sympathetic nervous system-adrenal medulla system (SAS), is activated. Various hormones, including corticotrophin-releasing hormone (CHR), adrenocorticotropin-releasing hormone (ACTH), cortisol and noradrenalin are released in large quantities to the blood (Mulder et al., 2002**).**

Why pregnancy is stressful?

An observational cross sectional study in Northern Ireland among 263 healthy low-risk mothers found that high degree of pregnancy-related stress is related to maternal characteristics of nulliparous status (Lynn et al., 2011). Stresses of pregnancy, often associated with rapid mood changes, intense fear of child integrity or fear of pain during delivery, seem to be due to the rapid changes in their physical characteristics and the

hormonal changes (Huizink et al., 2000 & Vanden et al., 1992). Every pregnant woman may respond differently to an identical stressful stimulus. The degree of stress response depends on many factors such as personality characteristics, previous experience, support from the social environmentand genetic factors. Stress affects constitutional changes and in turn the stress and constitutional changes affect the incidence of discomfort (Wang et al., 2012).Maternal stress during pregnancy can have both immediate and long term negative impact on the progress of pregnancy and the health of the offspring. Maternal stress in pregnancy is associated with adverse obstetric outcomes. This is reflected in increased risk for premature delivery, low birth weight for gestational age and smaller head circumference (Pagelet al., 1990; Hedegaard et al., 1993; Copper et al., 1996; Lou et al., 1994; Dunkel-Schetter et al., 1998 & Wadwha et al., 1993). These studies did not only include the effect of psychological stress during pregnancy, but also the effect of physical stresses such as chronic exposure to loud noise in the vicinity of an international airport (Schell et al., 1981) or fatigue associated with occupational working conditions during pregnancy (Landbergis et al., 1996& Mamelle et al., 1987). Many pregnant women report distress during pregnancy that was traceable to worries over physical changes, medical problems, and parenting competence (Lederman et al., 1984; Lobel et al., 1998 & Arizmendi et al., 1987). Physiological stress reactivity appears to be intense during pregnancy. The physiological responses to laboratory challenges are clearly present and display enough inter-individual variability to enable the study of links between responsively patterns, psychosocial variables, fetal behavior, pregnancy outcome and offspring development (de Weerth et al., 2005).

3.1.3. Prenatal Stress and Complications of Pregnancy

Recent well-controlled studies in humans suggest a direct relationship between prenatal maternal stress and a number of pregnancy complications.

i. ***Spontaneous abortion:***An increased risk of spontaneous abortion has been found for a recent life event (death of a relative or being victim of criminality) (Neugebauer et al., 1996), and for stress in the work place (Fenster et al., 1995).

ii. ***Structural malformations:***A strong relationship has been found between the (unexpected) death of an older child during early pregnancy and the occurrence of craniofacial malformations and heart defects (Hansen et al., 2000). A number of studies have shown that structural malformations can also emerge in the context of increased psychosocial problems, especially for quarrels with the partner or members of the family (Nimby et al., 1999). An effect on intrauterine growth restriction (IUGR); (Wadhwa et al., 2004), probably driven by higher levels of placental CRH resulting in decreased uteroplacental flow and hypoxemia, which are known risk factors for IUGR (Giles et al., 1996& Goland et al., 1993).

iii. ***Preeclampsia:***Depression and anxiety (Kurki et al., 2000) and also some forms of work stress (Landbergis et al., 1996) that are experienced during the first trimester seem to be associated with an increased risk for developing preeclampsia in a later phase of pregnancy. Patients who eventually develop preeclampsia often have increased serum concentrations of placental CRH (pCRH) from 18 to 20 weeks of gestation onwards (Hobel et al., 1999 & Perkins et al., 1995).

iv. ***Preterm delivery:***The relationship between stressful experiences during pregnancy and an increased risk of preterm delivery has been a consistent finding of independent studies for several decades (Lou et al., 1994 & Paarlberg et al., 1995). It has been suggested that preterm uterine activity and shortened length of pregnancy result from stress during the third trimester. Remarkably, serum concentrations of placental CRH are already raised at 15–20 weeks of pregnancy in women who deliver preterm (Hobel et al., 1999& Leung et al., 1999). Maternal stress has been implicated in the production, in both the mother and

the fetus, of corticotrophin-releasing hormone (CRH), adrenocorticotrophic hormone (ACTH), and cortisol, which are in turn related to premature delivery (Glynn et al., 2001; Hobel et al., 2004 & Lockwood et al., 1999). Stress-induced CRH alters the physiology of parturition, producing uterine contractions that result in early delivery (Majzoub et al., 1999; Mancuso et al., 2004 & Wadhwa et al., 1998). Early maternal stress initiates a chain of events leading to preterm labor by triggering CRH gene expression in the placenta, which sets a biological clock for early delivery month's later (Hobel et al., 2004; Hobel et al., 1999; McLean et al., 1995 & Sandman et al., 2006).

v. ***Birth weight:*** Recent well-controlled research has documented that high level of anxiety and depression result in reduced birth weight and smaller head size (a measure of brain development). This effect of prenatal stress is of the same magnitude as the effect of smoking (Lou et al., 1994). The chance of delivering a low birth weight baby is higher if exposure to stress, daily hassles in particular, occurs during the first 3 months of pregnancy (Paarlberg et al., 1999). This may explain why others found a normal birth weight in infants of women whose husband died after the fourth month of pregnancy (Cepicky et al., 1989). Maternal stress affects birth weight by shortening gestational age (Copper et al., 1996& Nordentoft et al., 1996).

3.1.4 Prenatal Depression and Complications of Pregnancy

Depression may be an important mechanism whereby the effects of exposure to chronic stress and racism influence fetal growth and birth weight, likely via downstream physiological and behavioral mechanisms (Dunkel-Schetter et al., 2011). The recent meta-analysis on depression in pregnancy, cited earlier, evaluated 20 studies and found that high depressive symptoms were associated with 1.4 to 2.9 times higher risk of LBW in undeveloped countries, and 1.2 times higher risk on average in the USA (Grote et al., 2010). Evidence appears to be stronger for contributions of depressive symptoms or

disorder to slower growth of the fetus and LBW than to the timing of delivery or PTB, and these effects are pronounced for disadvantaged women (Alder et al., 2007).

Depression during pregnancy is also associated with adverse child outcomes (Alder et al., 2007& O'Connor et al., 2007) including premature births, low birth weight, and poor infant growth (Field et al., 2004; Rondo et al., 2003 & Rahman et al., 2004). Depression especially during the second and third trimesters of pregnancy has been reported substantially (Bennett et al., 2004). Among South Indian women, the prevalence of depression during the last trimester was found to be around 16% (Chandran et al., 2002). Adverse pregnancy outcomes like higher rates of mortality in the offspring and preterm birth are associated with depression during pregnancy (Rahman et al., 2004; Halligan et al., 2007; Weissman et al., 2006 & Wisner et al., 2009).

3.1.5 Prenatal Anxiety and Complications of Pregnancy

Pregnancy specific anxiety (PSA) defined as worries, concerns and fears about pregnancy, childbirth, and the health of infant and future parenting (Huizink et al., 2004). Pregnancy Anxiety Scale suggested a three-dimensional model of pregnancy anxiety: 'anxiety about being pregnant', 'anxiety about childbirth', and 'anxiety about hospitalization' (Levin et al., 1991).anxiety and depression in pregnancy can increase complications of pregnancy, such as preterm birth and low-birth weight babies (Weisberg et al., 2002; Rondo et al., 2003).

A large body of research is now available regarding stress and affective states during pregnancy as predictors of specific pregnancy conditions, preterm delivery and other birth outcomes (Rondo et al., 2003; Huizink et al., 2004; Behrman et al., 2006; Beydoun et al., 2008 & Lobel et al., 2008). State anxiety during pregnancy significantly predicted gestational age and/or PTB in seven of 11 studies recently reviewed (Dunkel Schetter et al., 2011 & Glynn et al., 2008). Pregnancy anxiety appears to be a distinct and definable

syndrome reflecting fears about the health and well being of one's baby, of hospital and health-care experiences (including one's own health and survival in pregnancy), of impending childbirth and its aftermath, and of parenting or the maternal role (Dunkel-Schetter et al., 2010 & Dunkel-Schetter et al., 2009). It represents a particular emotional state that is closely associated with state anxiety but more contextually based, that is, tied specifically to concerns about a current pregnancy. Assessment of pregnancy anxiety has entailed ratings of four adjectives combined into an index ('feeling anxious, concerned, afraid, or panicky about the pregnancy (Roesch et al., 2004). the effects of stress on infant birth weight and/or LBW, reviewed recently by Dunkel-Schetter (Dunkel-Schetter et al., 2011).

3.1.6. Fear of childbirth

Women may experience a variety of fears in association with pregnancy and childbirth. About 20% of low-risk pregnancies in western countries reported intense childbirth fear and 6 to 10 % are seriously incapacitated by childbirth fear (Eriksson et al., 2006).Women's fears that are associated with pregnancy and childbirth can be explained by different factors. Fears were manifested as symptoms of stress, effects on everyday life, and a wish to have a cesarean section or to avoid pregnancy and childbirth; employment situation and elective cesarean section were the most important factors related to manifestation of fears. In multiparae, negative experiences of previous pregnancy, childbirth, and baby's health and care; causes were significantly related to occupation (Melender et al., 2002). Melender reported the following factors which women are afraid of during pregnancy and childbirth: fear of labor pain, caesarean section, health of the infant, health care professionals' actions, and subsequent family life (Melender et al., 2002). Fear appeared in the form of stress and effects on daily life as to avoid pregnancy and a desire to have a caesarean (Melender et al., 2002). Among 160 third trimester

pregnant women, there was a significant relationship between state and trait anxiety and fear of childbirth, and the nulliparous women had higher levels of anxiety in 28th to 38th weeks of gestation (Alipour et al., 2012). Similar observations of a strong relationship between fear of childbirth with general anxiety were reported in 660 low risk Turkish women between 28 to 40 weeks of gestation with higher scores of fear of childbirth in nulliparous women than parous women (Korukcu et al., 2010). A survey among 650 low risk third trimester nulliparous and multiparous women of 17-46 years of age reported a 25% prevalence of childbirth fear (Hall et al., 2009). An investigation on childbirth anxiety among 77 nulliparous and 85 parous women at 32 weeks, at 2 hours and 5 hours postnatally highlighted that nulliparous women had higher level of childbirth fear during pregnancy than parous women (Zar et al., 2001). A qualitative study among 19 nulliparous women with childbirth fear in Turkey, found that women's fears were related to labor pain, birth-related problems and procedures, attitudes of health-care personnel and sexuality (Sercekus et al., 2009). A Swedish study among 1635 pregnant women reported 15.8% prevalence of intense fear of childbirth and 5.7% very intense fear. Nulliparous women had a higher mean score than parous women. Preference for caesarean section was associated with fear of childbirth (Nieminen et al., 2009). Association of severe fear of vaginal childbirth with emergency caesareans and prolonged labour with vacuum extraction has been reported in a study on 100 primiparous women (Glynn et al., 2008). Women with a high fear of childbirth had high general anxiety too (Hall et al., 2009 & Zar et al., 2001). Many other studies also have reported a high degree of childbirth fear in pregnant women (Fenwick et al., 2009 & Hall et al., 2009).

Effect of maternal stress on pregnancy outcome - how?

Evidence for effects of maternal stress, depression, and anxiety in pregnancy on adverse neurodevelopment outcomes for the child is substantial (O'Donnell et al., 2009)

through a process of altered'fetal programming' (Beydoun et al., 2008 & DiPietro et al., 2004). Evidences suggest that stress effects the development of the fetal nervous system through alterations in functioning of the maternal and fetal hypothalamic pituitary adrenal (HPA) axes (Schneider et al., 2000; Coe et al., 2008 & O'Connor et al., 2005). Maternal mood disorders have also been shown to activate the maternal HPA axis and reprogram the HPA axis and physiology of the fetus (Charil et al., 2010, & Glover et al., 2009). In short, a mother's stress exposure and her affective states in pregnancy may have significant consequences for her child's subsequent development and health (Beydoun et al., 2008; De Weerth et al., 2005; Van den Bergh et al., 2005; Kinsella et al., 2009 & Weinstock et al., 2005).

The possible mechanisms involve: (a) reduction in blood flow to the uterus and fetus at increased levels of maternal stress; (b) transplacental transport of maternal stress hormones; (c) stress-induced release of placental CRH to the intrauterine environment.

(a) ***Reduced uteroplacental blood flow:*** Activation of the sympathetic nervous system by stress may lead to reduced blood flow to the uterus and fetus, and may contribute to fetal growth restriction. Indeed, Doppler blood flow studies have shown increased resistance of the uterine artery in women with high anxiety scores at about 32 weeks of gestation (Teixeira et al., 1999).

(b) ***Transplacental transport of maternal stress hormones*****:** maternal cortisol levels have been found to be linearly related with the fetal cortisol levels (although much lower levels) at antenatal umbilical cord blood sampling through cordocentesis. A small increase in maternal cortisol may cause a substantial increase in fetal cortisol (Gitau et al., 1998).

(c) ***Increased placental CRH levels:***Diminished supply of nutrients and oxygen (hypoxaemia) due to decreased blood flow may cause a stress response in the fetus which results in increased secretion of pCRH ; this in turn, contributes to the feed-forward

mechanisms at either side of the placenta (Challis et al.,1995). Increased pCRHlevel leads toincreasedFetal cortisol which in turn enters the placental circulation via the umbilical arteries and stimulates further production of pCRH; this result in a large increase in fetal cortisol levels by which maturation of the fetal organs is enhanced. pCRH also initiates and increases uterine activity that eventually leads to premature delivery (Challis et al., 1995 & Majzoub et al., 1999). Studies have shown an association between prematurely raised blood pCRH levels in pregnant women who had preterm delivery (Hobel et al., 1999 & Leung et al., 1999) or preeclampsia that occurred in later stages of pregnancy (Perkins et al., 1995).

3.1.7Cognitive impairment and Pregnancy

A number of studies have looked at the cognitive changes during pregnancy. Memory performance was poorer and general speed of information processing wasslower during pregnancy and early motherhood (de Groot et al., 2006).There was also significant impairment of memory as tested by recall or by priming, but not by recognition. (Sharp et al., 1993). Implicit memory was significantly impaired in primigravidae (Brindle et al., 1991). The gravid and postpartum groups reported significantly more everyday forgetting than the non-pregnant groups (Casey et al., 1999); primigravid and primiparous groups scored significantly lower on a test of working memory(Janes et al., 1999); women in second trimester showed more impairment of cognitive abilities than before and as compared with the non-pregnant women. Further, women in their third trimester reported mild impairments in focused and divided attention and also in their ability to remember. (Crawley et al., 2003); pregnancy was associated with increased difficulty in implementing delayed intentions in everyday life (Rendell et al., 2008). A significant decrease in functional memory was observed in healthy, pregnant women compared to non-pregnant women. Decreased plasma neurotransmitter levels observed in the second trimester of

healthy pregnancy seem to be responsible for loss of functional memory in pregnant women (Shetty et al., 2002). A meta-analysis of 14 studies over the past 17 years comparing pregnant and/or postpartum women with healthy matched controls on behavioral measures of memory indicated that pregnant women are significantly impaired on some, but not all, measures of memory; more specifically, memory measures that place relatively high demands on executive cognitive control may be selectively disrupted (Julie et al., 2007).

3.1.8. Positive Birth Experience

A positive childbirth experience is an important goal of obstetric care where childbirth is defined as a normal life event, with outcomes defined as "A live, healthy mother and baby and satisfaction of individual needs" (Goodman et al., 2004 & Bryar et al., 2011). Waldensrtrom et al. observed that primigravidea often had a positive birth experience when they felt involved in decisions, which led to the confidence that they can handle the situation better than they expected before giving birth (Waldenstrom et al., 1996). It is of importance to empower women to become more involved in maternal and child healthcare which means that the mothers are provided with the information, expertise, support, and skills they need through interactive participation. (Labonte et al., 1994 & Hermansson et al., 2001). In their study, Hermansson et al showed that if the women felt empowered it affected their experience positively, with or without any unplanned medical intervention .The mothers described that the body's strength was affected by how they could manage and deal with the pain; a feeling of 'losing control' was worse than pain itself; but pain relief could affect the feeling of control in a positive way (Hermansson et al., 2001).

3.2. COMPLEMENTARY & ALTERNATIVE THERAPIES

We now move on to review the results of several studies that have used complimentary interventions during pregnancy with beneficial and or in conclusive evidences. There

seems to be a common factor that contributes to the benefits found in all these CAM therapies which is incorporated in IAYT. Allaying the fears and anxieties through the caring psychological support by the CAM therapist for taking responsibility with self confidence seems to be an important common factor in most of these modalities. Add-on techniques practiced regularly would strengthen these positive thoughts. Looking at the benefits of all these therapies it appears that it is less important which specific modality is used but it is the overall stress reducing effect that seems to work. We have reviewed all these related CAM therapies as yoga seems to incorporate all these components of life style change offered by different systems of therapies. These could be: (i) stamina building effect of physical postures of yoga similar to different forms of exercises. (ii) cleansing the internal toxins through kriyas as done in herbal medicines,(iii) balancing/correcting the imbalances in the flow of vital energy (prana or chi) through pranayama as done in Chinese acupuncture/acupressure, and craniosacral therapies,(iv) deep rest to all parts of the body (shavasana) as done in different relaxation therapies and (v) change the pattern of stress responses through introspective analysis (jnana yoga), meditation (raja yoga) and conceptual corrections using inputs from karma yoga and bhakti yoga in every walk of life, as observed in CBT and other psychotherapies. The tables below are compilations of studies on exercise and different CAM therapies used during pregnancies.

3.2. COMPLEMENTARY & ALTERNATIVE THERAPIES

Complementary and alternative medicine is a broad set of health care practices in the world that includes modalities of treatment practices traditionally practiced in different parts of the globe. The findings for these fourteen research studies are complied in

TABLE3.2.1COMPLEMENTARY & ALTERNATIVE THERAPIES

Table 3.2.1. Summary of published work on CAM therapies during pregnancy.

Sl. No	Author & Year	Sample	G.A	Intervention	Parameter	Design	Result	Conclusion
01	Huntley, 2004	12 trials	Labor	a. Acupuncture (2), b.Biofeedback (1), c.Hypnosis (2), d.Intracutaneous sterile water e.Injections (4), f.Massage (2), & g.Respiratory h.Autogenic training (1)	Labor pain	Review	Evidence for the efficacy of any of CAM therapies is insufficient for labor pain, except for intracutaneous sterile water injection therapy	Evidence insufficient.
02	Gaffney, 2004	50% of mid wives	During Pregnancy	a.Massage, b.Acupuncture, c.Vitamins, d.Yoga, e.Meditation & f.Hypnosis	Pregnancy outcome	Review	Over 70% of obstetricians and midwives considered massage, acupuncture, vitamins, yoga, meditation and hypnosis to be useful and safe to use during pregnancy	Majority of clinician's considered CAM therapies to be useful and safe during Pregnancy.
03	Wang, 2005	Survey	During pregnancy	a.Massage b.Acupuncture c.Relaxation d.Yoga, &c.Chiropractic	Low-back pain during pregnancy	Two-part anonymous survey	Massage (61.4%), acupuncture (44.6%), relaxation (42.6%), Yoga (40.6%), & Chiropractic (36.6%)	Majority of pregnant women were accepting complementary and alternative medicine (CAM)

								therapy as treatment for LBP during pregnancy.
04	Field, 2008	Review	During pregnancy & labor	a. Massage therapy, b.Acupuncture, c. Relaxation, d. Yoga, & e. Exercise.	1. Pregnancy-related back and leg pain, 2. Nausea 3.Depression 4. Cortisol levels 5. Prematurity	Review	↓ Reducing pregnancy-related back, ↓ Leg pain, ↓ Nausea, ↓ Depression, ↓ Cortisol levels & ↓ Prematurity rate.	Alternative therapies reduce pain, other symptoms during pregnancy.
05	Munstedt ,2009	366 Mid-wifes	During child birth.	a. Acupuncture b. Homeopathy c. Aromatherapy	Practice during childbirth.	Survey	Commonly used of CAM therapy was: Acupuncture 97.3% Homeopathy 93.4% Aromatherapy 76.6%	CAM methods are widely used in the departments of obstetrics despite lacking evidence of effectiveness in German.
06	Samuels , 2010	238 subjects	During pregnancy	a. Massage, b. Herbal Medicine, c. Meditation, d. Touch therapies & e. Prayer.	CAM Health Belief Questionnaire.	Cross-sectional study	Using of CAM: Massage 67.1%, Herbal medicine 48.6%, Meditation 42.2%, Touch therapies 40.5%, & Prayer 39.9%.	Health care providers could benefit from efficacy and safety of CAM modalities during pregnancy and childbirth
07	Bishop, 2011	14,115 women pregnant	8, 12, 18 and 32 weeks' gestation	a. Herbal b. Homeopathic Medicine. c. Herbal Medicine. d. Osteopathy, e. Aroma therapy, f. Acupuncture,	Self-completion questionnaires.	Observational, cohort study	CAM at any time in in pregnancy (17.7%) followed by Homeopathic Medicine (14.4%), Herbal medicine (5.8%). 6% in the 1st trimester	The use of frequency of Complementary and Alternative Medicine affected by a number of

			CAM at least once in preg nancy,	g. Acupressure, h. Chinese medicine, i. Chiro practice, j. Cranial sacral therapy, k.Hypnosis.			12.4% in the 2nd & 26.3% in the 3rd trimester.	factors.
08	Kalder, 2011	104 Pregnant women	During preg nancy and birth	a. Homoeopathy, b. Acupuncture & c. Phytotherapy.	Self-report questionnaire	Pros-pective study	The most important predictors of CAM use are 1. CAM use prior to pregnancy, 2. Greaterincome & 3. Nationality.	Most important methods used in the field of Obstetrics.
09	Koc, 2012	129 mid wives	During preg nancy	a. Herbal treatment b. Diets, c. Exercises, d. Acupuncture, e. Relaxation techniques & f. Fast walking.	1.Nausea, vomiting 3. Anemia, 4.Gastric complaints, 5.Constipation, 6.sore throat, 7.Insomnia, 8.Hyper tension 9.Sinusitis, 10. Cough, cold, 11. Stress, 12. Fatigue	Survey study	CAM suggested by the midwives: 1.Herbal treatment 32.6%, 2.Diets 27.9%, 3.Exercises 28.7%, 4.Acupuncture1.6%, 5.Relaxation techniques 6.2%	Herbal therapy was most commonly suggested during pregnancy by midwives.
10	Munoz-Selles, 2013	Mid wives working at 28 hospitals	During preg nancy	a. Relaxation techniques, b.Hydrotherapy, & c. Application of compresses to the perineum.	1.pain relief during labor and delivery 2. Care for natural childbirth.	Descri ptive, cross-sectional, Study.	CAM suggested by Midwives: Relaxation techniques (64.3%), Hydrotherapy (84.8%) & the application of compresses to the perineum (75.9%).	It is important to increase the number of trained midwives in CAM for pain relief during childbirth.

11	Pallivalappila, 2013	Twenty-two Studies	During pregnancy	a. Homeopathic. b. Herbal medicines, c. Vitamins d. Minerals, e. Homeopathy, & f. Special diets	Generalisability of CAM practice in pregnancy	Systematic review	CAM : Total 22 studies 9 studies: During all the trimester in pregnancy. 5 studies : During the later stages of pregnancy, 3 studies: During the first trimester.	There is an urgent need to expand the CAMs use during pregnancy.
12	Strouss, 2014	153 post-partum women	post-partum women	a. Routine patient assessments	Prevalence and types of CAM use during pregnancy	Cross-sectional survey	CAM use response: 74.3%, 72 % & 68.5%. CAM associated with ↑increased maternal age, ↑primagravida, and having a college education ($p \leq 0.05$).	Health-care providers routinely ask about CAM use during pregnancy.
13	Hall, 2014	315 post natal women	During pregnancy	a. Vitamins , b. Massage therapy, c. Yoga & d. Relaxation	Routine health-care during pregnancy	Survey	Vitamins (34.9%), Massage therapy (14.0%), Yoga (11.1%) & Relaxation (10.2%).	Health-care providers routinely ask about CAM use during pregnancy.
14	Stewart, 2014	135 health Care professionals.	During pregnancy	a. Vitamins, b. Minerals, c. Massage, d. Homeopathy e. Acupuncture, f. Yoga, g. Reflexology, h. Aroma, therapy i. Herbal medicine	Pregnancy care	Review	Most frequently CAMs modalities were: Vitamins & minerals (55%), Massage (53%), homeopathy (50%), acupuncture (32%), Yoga (32%), Reflexology (26%), aromatherapy (24%), Herbal medicine (21%). ($P < 0.001$).	A wide variety of CAM therapies are recommended to pregnant women by midwives.

3.3. EXERCISE & PREGNANCY

3.3.1. Physical exercise & pregnancy outcome

Exercises during pregnancy was associated with higher cardio respiratory fitness, reduced symptoms of depression, gestational weight gain control, prevention of urinary incontinence and low back pain, and reduced number of women who required insulin in cases of gestational diabetes. (Table no. 3.3.1.1.)

3.3.2. Exercise therapy &C sections

Five studies (Table no.3.3.1.1.) point to the possibility of avoiding Caesarean section as a result of exercise therapy.

3.3.3. Swimming during Pregnancy

Improved well being with reduction in their anxiety level and Discomfort index, has been reported in pregnant women who participated in swimming program (Table no.3.3.1.1.).

3.3.4. Aerobics during Pregnancy

Five studies add evidence to the benefits of regular Aerobic exercise on endothelium function, and VO2max (Table no.3.3.1.1.)

3.3.5. Pelvic Floor Muscle Exercise during Pregnancy

Pelvic Floor Muscle Exercise during pregnancy & delivery is recommended in clinical practice. The findings of about six studies (Table no.3.3.1.1.) have been quoted here. It has been observed that Pelvic Floor Muscle Exercise is easily adopted during pregnancy and management of labor. The advantages include reduction of pain during labor and feeling of better management of pregnancy by these women.

TABLE 3.3.1.1. EXERCISE & PREGNANCY

TABLE 3.3.1.1. Summary of published work on exercise & pregnancy.								
Sl No	**Author and Year**	**Sample / Age**	**Gestational age**	**Intervention**	**Parameter**	**Design**	**Result**	**Conclusion**
3.3.1. Physical exercise & pregnancy								
01	Nasimento, 2012	Review study	During pregnancy	a. Exercise	1. Effects on mother and fetus 2.Types, frequency, intensity, duration and rate of progression of exercise	Review Study	↑Higher cardio-respiratory fitness, prevention of urinary incontinence and low back pain, ↓reduced symptoms of depression, gestational weight gain control, ↓ Insulin requirement for gestational diabetes.	Physical exercise is beneficial for women during pregnancy and postpartum period.
02	Amezcua-Prieto, 2013	1175 Pregnant women	20-22 weeks	a. Leisure time physical activity (LTPA)	The Paffenbarger Physical Activity Questionnaire	A Prospective study	20.0% of the women did not engage in any LTPA. 68.0% did not achieve the recommendations for exercise, either before or during pregnancy	Healthy lifestyle choices during Pregnancy promotes other healthy habits.
3.3.2. Exercise therapy & pregnancy								
03	Ji, 2010	70 healthy pregnant women	more than 18 weeks	a. Qi exercise/ (90 minutes), twice a week/ 12 weeks	1.Intrapersonal Communication Questionnaire, 2.Zung's Self-rating 3.Depression Scale (ZSDS), 4.the State Trait Anxiety Inventory (STAI), 5. Pregnancy Mild Discomfort Index.	A prospective, two-group, quasi-experimental, pre/post design	Qi exercise group had ↑ maternal/fetal interaction ↓ maternal depressive symptoms & ↓physical discomfort scores than the control group.	Qi exercise may positively influence maternal/fetal interaction and mother's health.

04	Barakat, 2011	80 healthy women E=40 C=40	1st , 2nd& 3rd trimester	a. moderate physical activity	1. Maternal perception of health status. 2.pregnancy Outcomes.	A randomized controlled study	↑ better health status EG: (54.5%), CG: (27.3%). ↓ weight EG: (11,885 ± 3146 g) CG: (13,903 ± 2113). (P = .03)	A moderate physical activity improves the maternal perception of health status.
05	Barakat, 2012	83 pregnant women (E=40) (C=43)	During entire pregnancy	a. physical activity b. aquatic activities.	1.maternal glucose tolerance maternal, 2.weight gain & 3.several pregnancy outcomes	A randomized controlled trial.	Experimental Group (103.8 ± 20.4 mg/dl) Control Group (126.9 ± 29.5 mg/dl), p=0.001.	A moderate Physical activity performed during pregnancy Improves levels of maternal glucose tolerance.
06	Barakat, 2012	290 healthy pregnant women exercise (n = 138) control (n = 152)	Entire length of pregnancy	a. Structured, moderate-intensity exercise program	Types of delivery	A randomized controlled trial	↓percentage of cesarean & instrumental deliveries. 15.9% (E) vs 11.6%(C) 23% (E)vs (C) 9.1%) (p = 0.03).	A supervised moderate-intensity exercise performed during pregnancy was associated with a reduction in the rate of cesarean.
07	Barakat, 2013	510 healthy pregnant women	second-third trimesters	a. Moderate-intensity resistance &b. Aerobic exercises. (three times/ week, 50-55 min/session)	1. GDM 2. Birth weight 3. gestational age, 4. risk of caesarean delivery and 5. Maternal weight gain.	A randomized controlled trial	↓ reduced by 58% the GDM-related maternal weight gain was lower in the exercise group than the control group.	Regular moderate-intensity exercise reduces the GDM-related adverse outcomes.

3.3.3. Swimming & pregnancy								
08	Lynch, 2003	23 Pregnant women	16 to 28 weeks	a. Monitored swimming Program.	1.Resting maternal heart rate 2. resting systolic 3. diastolic blood pressures 4. fetal heart rates 5.Non-stress tests 6.Umbilical artery systolic/diastolic ratios	Prospe ctive obser vational study	↓Resting maternal heart rate (p = 0.041), ↓Resting systolic (p = 0.092) & ↓Diastolic (p = 0.971) ↓fetal heart rates with advancing gestational age (p = 0.001). blood pressures remained unchanged.	A structured swimming program in sedentary pregnant women increases maternal fitness without any alteration in maternal and fetal well-being.
3.3.4. Aerobics & pregnancy								
09	Granath, 2006	390 healthy pregnant women	During preg nancy	a. Physical exercise program& b. water aerobics (once a week)	Pregnancy-related low back pain.	Rando mized controlled clinical trial.	↓pregnancy-related low back pain (p=.04), ↓sick leave due to pregnancy-related low back pain (p=.03).	Water aerobics can reduced low back pain during Pregnancy.
10	Santos, 2005	92 over weight Pregnant women.	20 weeks	a. aerobic Exercise (one-hour /week) b. Relaxation & group discussions.	Oxygen uptake during cardio pulmonary treadmill testing	A rando mized clinical trial	↑Oxygen uptake 18% in the exercise group but ↓decreased 16% in the control group.	Aerobic training in overweight pregnant women increases submaximal exercise capacity.
11	Ramírez-Vélez, 2011	64 healthy primi gravid women	16 and 20 weeks Preg nancy	a. regular aerobic exercise (three times/ a week/16 weeks) b. physical activity	endothelial function and cardio respiratory fitness	A rando mized, double-blinded, controlled clinical trial	Exercise group showed higher cardio-respiratory fitness (P=0.014) & control group showed (P=0.02)	Aerobic exercise improves endothelium-dependent vasodilatation (higher cardio vascular fitness)in pregnancy.

12	Ruiz, 2013	962 healthy pregnant women	9^{th} week of Preg nancy	a.Supervised light- to moderate-intensity exercise 3 days a week (50-55 minutes per session).	Excessive gestational weight gain	A randomized clinical trial	Normal weight women in the intervention group gained less weight (P<.001)	Supervised exercise of moderate intensity is used to prevent excessive gestational weight gain.
13	Lamina S, 2013	1177 pregnant women (11 studies)	During preg-nancy	Aerobic training	Maternal weight in pregnancy	A Meta-analysis	Significant effect of aerobic training on maternal weight (p< 0.001).	Aerobic training is an effective tool in maternal weight gain control in pregnancy.
3.3.5. Pelvic floor muscle exercise & pregnancy								
14	Samps elle, 1998	81 pregnant women	a.20^{th}& 35^{th} weeks' gestation, b.6^{th}weeks, c.6^{th} months &d.12^{th} months of post-Partum.	a.Pelvic muscle exercise	Pelvic muscle strength Stress urinary incontinence	A prospe ctive trial rando mized	Treatment effect on Stress urinary continence on35 weeks' gestation (P=0.043), 6 weeks Postpartum(P = .032) & 6 months postpartum (P = .044). Pelvic muscle strength (P = .014). 46 women with vaginal 37 women with vaginal birth from a sub group.	Practice of pelvic muscle exercise by primiparas results in fewer urinary incontinence symptoms during late pregnancy and postpartum.
15	Mørkv ed, 2003	Three hundred one healthy nulliparou s women	During Preg nancy	a. Pelvic floor muscle intensive training program (12-week).	1.Pelvic floor muscle strength 2. Urinary incontinence	A single-blind RCT	↓ Urinary incontinence at 36 wks pregnancy (P =0.007) & 3 months after delivery (P =.018). ↑Pelvic floor muscle strength (P =.008) & (P =.048).	Pelvic floor muscle strength improved significantly after intensive pelvic floor muscle training.

16	Salvesen, 2004	301 healthy Nulli parous women T G: (148) C G: (153)	between 20^{th} – 36^{th} week of pregnancy	a. Pelvic floor muscles training	1. 2^{nd} stage labor Duration 2. Spontaneous labor after 37 weeks of Pregnancy.	A randomized controlled trial	The duration of the second stage was not significantly shorter (40 minutes v 45 minutes, (P = 0. 06).	A structured pelvic floor muscles exercise is associated with fewer cases of active pushing in the second stage of labor lasting longer than 60 minutes.
17	Lee, 2006	49 pregnant women.	Normal delivery.	a. Pelvic floor muscle exercise+ Biofeedback + Electrical stimulation (50-60 repetition per session), (3/day) for 6 wks.	1.MPPFMC, 2.APPFMC, 3.DTPFMC, 4. Subjective lower urinary symptoms & 5.Bristol Female Urinary Symptom Questionnaire.	Experimental control group.	↑MPPFMC, ↑APPFMC, ↑DTPFMC ↓ subjective lower urinary symptoms in the experimental group than in the control group.	The pelvic floor muscle exercise using biofeedback and electrical stimulation is effective for reinforcing pelvic floor muscle after normal delivery.
18	Mørk-ved, 2007	301 Healthy Nulli parous women Training group:148 control group: 53	20 weeks of pregnancy	a.Daily pelvic floor muscle training + Home + weekly group Training/12weeks . b. Aerobic exercises + pelvic floor muscle.	1. self-reported symptoms of lumbo pelvic pain (once per week or more), 2.sick leave, & 3. functional status	A randomized controlled trial	↓lumbopelvic pain (p=0.03) at 36 weeks of gestation. ↓lumbopelvic pain (p=0.06) at Three months after delivery ↑ Functional status (p=0.01) in the training group compared to control.	A 12-week specially designed training program during pregnancy was effective in preventing lumbopelvic pain in pregnancy.
19	de Oliveira, 2007	46 nulli parous pregnant women	During delivery	a.Pelvic floor muscle training	1. The pelvic floor muscle (perineometry) & 2.Digital assessment in the strength of pelvic floor muscles	Experimental two group study	↑in pelvic floor muscle strength (P < .001) in both groups during pregnancy. ↑in pelvic floor muscle pressure and strength during pregnancy.	A significant positive correlation between functional evaluation of the pelvic floor muscle was observed during pregnancy.

3.4 OTHER CAM MODALITIES & PREGNANCY

3.4.1. Acupuncture & Pregnancy

Seven studies that point out that acupuncture could be an alternative option for pain relief during labor is tabulated in this literature review (Table no. 3.4.1.1.). The findings following the acupuncture treatment were: reduction of pain experience during labor, shorting of delivery time and reduction of somatic symptoms related to pregnancy.

3.4.2. Acupressure & Pregnancy

Another form of Chinese medicine namely acupressure was used in the form of an intervention, and the research findings of about ten studies are cited in table no (Table no. 3.4.1.1.). Following the intervention of acupressure, it was observed that there was reduced frequency and severity of vomiting episodes in participants who had nausea; the other findings were reduction in the labor pain during active phase of the first stage of labor, perception of anxiety and pain.

3.4.3. Squatting position & Pregnancy

Squatting position during delivery is recommended in clinical practice. It has been observed that traditional birth posture of squatting is easily adopted for modern labor managements and has many advantages of women for the managing the pain during labor in ten studies. (Table no. 3.4.1.1.).

3.4.1.1. PREGNANCY & OTHER CAM MODALITIES

TABLE 3.4.1.1. Summary of published work on pregnancy& other cam modalities.								
Sl No	**Author and Year**	**Sample**	**Gestational age**	**Intervention**	**Parameter**	**Design**	**Result**	**Conclusion**
3.4.1.Pregnancy &Acupuncture								
01	Thomas, 2000	Pregnant women	27 wks gestation	a. Acupuncture & b. Acupressure	Chronic pelvic pain	A singles case study	↓ Pain resolved immediately following delivery.	Use of acupuncture was limited in this gravida by maintaining normal activity.
02	Skilnand, 2002	210 healthy pregnant women	Active labor	a. Analgesic medication	Visual analog scale	A controlled, single blind study	↓ time in active labor & ↓augmentation & ↓ lower mean pain scores & ↓need for pharmacological analgesia.	Acupuncture may be useful for parturients who wish a non-pharmacological analgesia without Side-effects.
03	Habek, 2004	36 Pregnant women (group 1: n = 10), (group 2: n = 11), (group 3: n = 8) (group 4: n = 7).	7 Wks 8 Wks Gestation	a. Bilateral manual AP of the Pc 6 (Neiguan) acupoint (G:1), b. Bilateral AP of the Pc 6 acupoint (G:2) c. Superficial intracutaneous placebo AP (G:3) & d. Placebo AP (G: 7).	Occurrence of HG symptoms.	A prospective, placebo-controlled trial.	Anxio-depressive symptoms occurred ($p < 0.001$). HG treatment with AP of the point Pc 6 was 90%, i.with APr of the Pc 6 63.6%, ii.with placebo AP 12.5%, &iii.with placebo APr 0%.	Acupuncture & acupressure are Effective non-pharmacologic methods for the treatment of HG.

04	Neri, 2005	88 Pregnant women	During pregnancy	a.Acupuncture + Acupressure + metoclopramide /vitamin. (12 AP sessions: twice/ week for 2 weeks, 6-8 h/day acupressure).	Somatic symptoms and the ability to achieve the daily routine activity. (functioning)	A randomized study	↓ reduced vomiting episodes and then nausea.	Acupuncture was significantly more effective than drugs in improving functioning.
05	Hantoushzadeh .2007	144 Healthy nullip arous women	Active phase of labor	a. Acupuncture	1. Pain, 2. Labor duration & 3. Maternal acceptability	A randamized study	↓Visual analogue Scale pain score. ↓Active phase duration & oxytocin units administration.	Acupuncture could reduce pain experience, active phase duration and oxytocin units.
06	Chao, 2007	100 women TENS Group: (n=52). TENS placebo: (n=53).	first stage of labor	a. TENS on Acupuncture points (Li 4)& (Sp 6).	1.Visual analogue scale (VAS) 2. Mode of delivery & 3. Neonatal effect	Double-blind, placebo-controlled trial	↓ VAS scorein TENS group. (62% vs 14%, P<0.001). Willingness of using for future childbirth was also significantly different (TENS: 96% vs TENS placebo: 66%, P<0.001). ↑Operative delivery in TENS group (24% vs 8%, P=0.05).	The application of TENS on specific acupuncture points could be a non-invasive adjunct for pain relief in the first stage of labor.
07	Borup, 2009	607 healthy women	labor	a. level of pain	1.VAS scale, 2. birth experience, 3. delivery satisfaction, 4. Use of oxytocin, 5. labor Duration 6. mode of delivery,	A randomized controlled trial	↓ Invasive methods in the acupuncture group (p < 0.001; vs p=0.031). ↑Mean Apgar score at 5 minutes and ↑Umbilical cord pH value higher among infants in	Acupuncture reduced need of pharmacological and invasive methods during delivery.

					7. postpartum hemorrhage, 8. Apgar score, & 9.umbilical cord pH value.		the acupuncture group compared with infants in the other groups.	
3.4.2. Pregnancy & acupressure								
08	Wernt oft, 2001	60 women	During preg nancy	a. Acupressure at the Neiguan point (P6)	1.Nausea & 2. Vomiting during pregnancy (NVP)	A rando mized, placebo-controlled, pilot study	↓NVP significantly with acupressure at P6 ↓ Nausea in The P6 group, after 14 days as compared to the other two groups.	Acupressure can reduce NVP significantly at P6 as compared to acupressure at a placebo point and to no treatment.
09	Steele, 2001	Preg nancy	1st tri mester Preg nancy	a.Acupressure at P6with Sea Bands to both wrists for 4 days Placebo group b.Applied the Sea-Bands without acupressure buttons to both wrists on the same time schedule.	1.Frequency and severity of nausea and vomiting of pregnancy during the 1st trimester	A two-group, quasi-experi mental	↓ Frequency and severity of nausea and vomiting of pregnancy while wearing the Sea Bands than when not wearing the Sea-Bands.	Acupressure buttons are a noninvasive, inexpensive, safe, and effective treatment for the nausea and vomiting of pregnancy.
10	Chung , 2003	127 preg nant women	Active phase of the 1st stage of labor	a. Acupressure LI4 & BL67	1.Labor pain &2.Uterine contractions during the first stage of labor	An experi mental study	↓labor pain during the active phase of the first stage of labor among the three groups. no significant difference in uterine contractions during the first stage of labor.	Acupressure is effective in lessening labor pain during the active phase of the first stage of labor.
11	Habek ,2004	36 preg nant	7 weeks -	a. Bilateral manual b.AP of the Pc 6 (Neiguan)	1.Hyperemesis gravidarum	A prospe ctive, placebo-	Effect of the HG treatment with AP point Pc 6 : 90%,	Acupressure was effective, nonpharmacologic

		women with HG (G1= 10) (G2 = 11) (G3= 8) & (G4 = 7).	8 weeks	c. placebo AP d.placebo APr		controlled trial	APr of the Pc 6 63.6%, placebo AP 12.5%, & placebo APr 0%. Acupuncture ($p < 0.0001$) & acupressure ($p < 0.1$)& Anxiodepressive symptoms ($p < 0.001$).	methods for the treatment of HG.
12	Chen, 2005	104 preg nant women	Before CS and within the first 24 hours after CS.	a.1st acupressure treatment was performed the night before CS, b. 2nd was 2-4 hours after CS, & c. 3rd was 8-10 hours after CS.	Post-cesarean symptoms, 1. Rhodes Index of Nausea and Vomiting, 2.Visual Analog Scale 3.Anxiety, State-Trait Anxiety Inventory.	Experi mental study	↓nausea, vomiting or retching from 69.3% to 53.9%, ($p=0.040$) 2-4 hours after CS & ↓ from 36.2% to 15.4% ($p = 0.024$) 8-10 hours after CS. ↓anxiety and pain perception of cesarean experiences.	Acupressure treatment promotes the comfort of women during cesarean delivery.
13	Helmr eich, 2006	six cross over controlled trials (N = 1655)	During preg nancy	a. Acu-stimulation (AS)	1.Nausea &2.vomiting	A meta-analysis	↓Nausea ($P < .0001$)& vomiting ($P < .0001$). placebo effect: ↓ nausea ($P = .0479$) & vomiting ($P = .0084$).	Acupressure had greater impact than the acupuncture methods in the treatment of NVP.
14	Shin,2 007	66 women	During Preg nancy	a. acupressure	Nausea, vomiting and ketonuria levels	A randomized control	↓Degree of nausea and vomiting ↓Ketonuria levels ↓levels in the placebo groups ($P <$o.05).	Nei-Guan point acupressure is a useful treatment for relieving symptoms experiencing women with HG.
15	Can Gur kan 2008	75 Preg nant women	Nausea, vomit ing	a. Acupressure 9-day period treatment group applied	Pregnant women suffering from nausea, with or	Interv entional control study	↓ Symptoms of Nausea and vomiting.	Acupressure would be effective in reducing nausea and vomiting during pregnancy.

		TG: 26 CG: 25 Placebo: 24		acupressure bands to P(6) acupressure point on days 4-6 of the study.	without associated vomiting.			
16	Hjelmstedt , 2010	Seventy-one women AG:71 CG:70	active phase of labor	a.Acupressure at acupuncture point spleen 6 (SP6) on both legs during contractions over a 30-minute period & 70 women to receive standard care (standard care group)	1.Visual analog scale 2.Labor pain intensity	A Randomized controlled trial	↓ Labor pain in the acupressure group and was most noticeable immediately after treatment (< 0.001; vs. p < 0.001).	Acupressure reduces pain during the active phase of labor in nulliparous women.
17	Naeimi Rad, 2012	80 women	1st trimester of pregnancy	a. Acupressure (on KID21 point) in the first trimester of pregnancy b. Pressure on sham acupressure for 20 minutes per day in four consecutive days.	1. frequency of Nausea and vomiting 2. Visual Analogue scale (VAS) evaluated by counting during these four days.	Single blind clinical trial study.	The intensity of nausea and vomiting between two groups on the fourth day was shown differences (P<0.001).	Acupressure on KID21 point is more effective than sham acupressure in reduction of nausea and vomiting in pregnancy.
3.4.6.Squatting Position								
18	Gardosi , 1989	151 primi gravidae 18 mid Wives.	second-stage labor	Upright positions a.squatting, b.kneeling, c.sitting or d.standing.	1. Blood loss 2. Apgar score 3. Umbilical artery pH.	A controlled clinical trial	Adoption of upright positions resulted in a ↑ rate of intact perineum, ↓ forceps deliveries, beneficial in slow progress labor.	Squatting position appear to be safe, acceptable to most parturient and their midwives.
19	Gardosi ,1993	427 primi parae	During labor	a. SG: Squatting Position	1. forceps deliveries	A prospective,	Significantly fewer forceps deliveries (9% vs 16%).	Squatting group reported great

		squatting Group: (218) Control group: (209)		b. CG: Semire cumbent position	2.Labor duration 3.perineal tears 4.Apgar scores, 5.blood loss, & 6. post-partum vulvar oedema	controlled trial	Significantly shorter second stages (31 vs 45 min) Fewer perineal tears, but More labial tears, in the squatting group.	satisfaction with the supported squatting Position.
20	Golay, 1993	300 pregnant women.	Second stage of labor	Squatting position a.Squatting births: 200 b.Semire cumbent births: 100	1. Progress of labor, 2.Maternal and fetal well-being	A cohort study	↓ Length of labor during2nd stage(23 minutes in primiparas &13 minutes in multiparas). ↓Requirement of oxytocin (P = 0.0016), ↓ Less severe perineal lacerations occurred, & ↓ Episiotomies were performed (P=0.0001) in the squatting group.	Changes in labor duration,oxytocin requirement, assisted deliveries,perineal lacerations & episiotomies were found in the squatting group in primiparas & multiparas.
21	Allahba dia, 1993	200 normal pregnant women 42 primi& and 58 multi gravidae.	labor & delivery	a. Squatting position b. Supine position	1. Labor duration. 2. Mode of delivery 3. foetal complications. 4. maternal injuries	A Randa mized study.	1st stage of labor:shortened by 3 hour in primigravidae and 2 hours in multigravidae. 2nd stage of labor: 20 minutes in primigravidae &13.5 minutes in multigravidae. Squatting group: 79 normal vaginal delivery, 16 forceps delivery and 5 caesarean sectionscontrol group: were 80, 18 and 2 cases respectively. Maternalinjuries:(14) in control&(38) cases in squatting group.	Without proper birthing chairs which can give good perineal support, the usual supine position is preferable.
22	Bomfi m-hypp	127 Sitting	Duration of the	a.Horizontal position	1.Duration of the second stage	Clinical trial rando	Perineal trauma: (44.1% for vertical position&	Mothers should be given the choice of

	Olito, 1998	position 121 for the horizontal position	second stage and of expulsion of the placenta	sitting position	2. Expulsion of the placenta, 3.Vulvo vaginal and perineal lacerations, 4.Blood lost and 5.Apgar score.	mised	47% for horizontal position in the whole group and of 47.8% and 71.2% in the group with history of episiotomy.	the posture to be assumed during parturition.
23	Racinet , 1999	240 Pregnant women	During labor	a.Squatting position vs b.Lithotomy position	1. expulsion, duration 2.Neonatal status, 3.Delivery mode, 4.Frequency of hemorrhagia, 5.Perineum status , 6.Patient comfort	A Randomized, unicentric, comparative, open, prospective study.	↓ the length of the expulsion phase and ↓ the use of forceps in the squat position.	Squatting position had shown a tendency to shorten the length of the expulsion phase and a reduced use of forceps in the squat position.
24	Bodner-Adler, 2003	307 Pregnant women	During delivery	a.Upright position (free squatting) compared with b. Supine position	Maternal, perineal and neonatal outcomes	Case-control study.	↓ the use of medical analgesia ($p = 0.0001$), oxytocin ↓ ($p = 0.001$).Length of the first and second stages of labor ($p > 0.05$). ↓Rate of episiotomy ($p = 0.0001$), ↓ perineal tears($p>0.05$), ↓ Maternal blood loss ($p>0.05$)& ↑ APGAR score ($p > 0.05$).	Laboring and delivering in an upright position is associated with lower rate of episiotomy, reduced use of medical analgesia & oxytocin.
25	Gupta, 2004	19 trials 5764 Pregnant women	During delivery	a. Upright or lateral position, b.Supine or lithotomy positions	1.duration of second stage of labor 2.Assisted deliveries 3.Episiotomies 4.Perineal tears	Review study	↓ Labor duration in second stage. (mean 4.29 minutes) , ↓ Assisted deliveries (relative risk (RR: 0.84),↓Episiotomies (RR 0.84),↑ Second degree perineal tears (RR 1.23), ↑ increased estimated blood loss	Women should be allowed to make informed choices about the birth positions in which they might wish to assume for delivery

					5. blood loss 6. labor pain 7. fetal heart rate		(RR 1.68), ↓ Severe pain during second stage of labor (RR :0.73)&Fewer abnormal fetal heart rate patterns (1 trial: RR 0.31).	of their babies.
26	Nasir, 2007	200 pregnant women (37^{th} week gestation) ante partum, intra partum	During labor	a. Squatting position b.Supine position (lithotomy position)	1.Episiotomies 2.extension of the episiotomy 3.Para urethral tears 4.perineal tears 5.Forceps application 6.shoulder dystocia	Rando mized study	Extension of the episiotomy 7% (P<0.05). Para urethral tears 5% , squatting group, perineal tears 9% in the non-squatting Group. (P < 0.05) in the squatting group. Forceps application: 11% (A) vs 24 %(B) (P < 0.05).4% cases of retained placenta and 1% case of postpartum haemorrhage.	Squatting position may result in less instrumental deliveries, extension of episiotomies and perineal tears.
27	Payman , 2014	95 preg nant women	During labor	a. Birthing belt	1.Labor duration 2.Rate of cesarean 3.Shoulder systocia 4.Rate of episiotomy	Experi mental study.	↓Decrease the time in the second stage of labor. ↓Tthe rate of cesarean delivery. ↓ Occurrence of shoulder dystocia, rate of episiotomy, & fistula and anal incontinence are decreased.	Birth belt is the third generation in the movement for active participation in labor and delivery after Drs Reeds and Lamaze.

3.5. MIND BODY INTERVENTION & PREGNANCY

Two review studies demonstrated the benefits of Mind-body interventions in pregnancy (Table no 3.5.1.1.)

3.5.1. Relaxation therapy & Pregnancy.

The effect of relaxation methods was studied in pregnant women for the pain managements during labor. There were two studies speaks about the effective handling of pain during pain, increasing satisfaction etc (Table. 3.5.1.1.).

3.5.2. Guided relaxation therapy & Pregnancy

The effectiveness of guided relaxation techniques were examined in two studies. It was observed that reduction in the anxiety and depression, greater self-esteem, decline in the endocrine measures (Table. 3.5.1.1.)

3.5.3. Progressive relaxation therapy & Pregnancy

Four studies on Progressive relaxation technique is quoted. Preterm labor, blood pressure, heart rate, angerwere significantly reduced with improved quality of life and lung functions following this intervention (Table. 3.5.1.1.).

3.5.4. Behavioral Therapy & Pregnancy

The effect of behavioral intervention was studied for pregnant women. There were three studies which have observed that reduction in the anxiety, depression, gestational weight gain & postpartum weight retention (Table no. 3.5.1.1.).

3.5.5. Hypnotherapy & Pregnancy

The effect of hypnotherapy was studied in five experiments (Table no. 3.4.1.1.). Hypnotherapy helped in reducing self-reported pain, fear of childbirth experience and the need for epidural analgesics.

3.5.6. Music therapy & Pregnancy

Music therapy was also used as an important intervention in many experiments. There were about nine studies (Table no. 3.4.1.1.). Music listening at home resulted in successful child birth experience, reduction of pain during birth, reduction of postoperative pain and anxiety, decrease in level of cortisol and significantly better autonomic stability seen as increased high frequency and decreased low frequency bands of heart rate variability spectrum.

3.5.7. Guided Imagery technique & Pregnancy

The level of anxiety, depression were significantly lower and the self-esteem was higher after Guided Imagery explained in three studies (Table no. 3.4.1.1.).

TABLE 3.5.1.1. MIND BODY INTERVENTION & PREGNANCY

TABLE. 3.5.1.1. Summary of published work on Mind body interventions.								
Sl No	**Author and Year**	**Sample**	**Gestational age**	**Intervention**	**Parameter**	**Design**	**Result**	**Conclusion**
01	Marc, 2011	(eight trials) 556 Pregnant women 1.Mind body intervention Group. 2.Control group	During pregnancy	a.Autogenic training, b.Biofeedback c.Hypnotherapy, d.Imagery, e.Meditation, f.Prayer, g.Auto-suggestion, h.Tai-chi & yoga. i. standard care, j.Non-pharmacological interventions, k. No treatment.	1.Anxiety anxiety at the early and middle stages of labor.	A review study	↓ decreasing anxiety at the early and middle stages of labor ↓ anxiety and depression in the immediate postpartum period after imagery techniques.	Mind-body interventions might benefit women's anxiety during Pregnancy.
02	Beddoe ,2008	12 out of 64 published studies (1980-2007) pregnant women	during pregnancy	a.Mind-body interventions (Progressive muscle relaxation)	1.birth weight, 2.length of labor, fewer 3.instrument-assisted births, & 4.perceived stress and anxiety	A review study	↑ higher birth weight, ↓shorter length of labor, fewer instrument-assisted births, & ↓perceived stress and anxiety	Pregnant women have health benefits from mind-body therapies used in conjunction with conventional prenatal care.
3.5.1. Relaxation therapy & pregnancy								
03	Smith, 2011	11 studies (1374	During Labor	a. Relaxation methods. b.Standard care	1.Pain management in labor on maternal	Review study	Relaxation associated with ↓ in pain intensity during the latent phase (MD-1.25),	Relaxation may have a role with

		women) in the review			and perinatal morbidity		Active phase of labor (MD -2.48), ↑increased satisfaction with pain relief (risk ratio (RR- 8.00), ↓ lower assisted vaginal delivery (RR 0.07). Yoga was associated with ↓ pain (MD) : 6.12), ↑increased satisfaction with pain relief (MD 7.88),↑satisfaction with the childbirth experience (MD) 6.34), & ↓ length of labor.	reducing pain, increasing satisfaction with pain relief and reducing the rate of assisted vaginal delivery.
04	Khian man, 2012	833 women	During Preg nancy (26 to 29 weeks gestation al age)	a. Relaxation therapies.	1.PTL & preventing PTB	A review study Eleven randomized controlled trials	↓ Maternal Anxiety Stress Scale (MD -7.04).↑baby birth weight (MD- 285.00 g)↑vaginal delivery (RR 1.52),↓ Cesarean section (RR 0.38), ↓ Maternal anxiety (MD-15.79) &↓ stress (MD -13.08)Compared to standard treatment.	Relaxation during pregnancy red uces stress and anxiety.
3.5.2. Guided relaxation techniques								
05	Rees, 1993	New mothers	4 weeks post partum	a. Relaxation with guided imagery (4-week)	1.Anxiety, depression & 2. Self-esteem.	An exploratory study	↓ anxiety and depression & ↑self-esteem	Reduced anxiety & increase self-esteem was greater in the experimental group.
06	Rees, 1995	60 pregnant women	4 wks of post partum period.	a. Relaxation with guided Imagery.	1.anxiety, 2.depression, &3.self-esteem	A pretest-posttest experi mental design	↓ anxiety depression ↑ greater self-esteem ($p<0.05$) in (Experimental group).	Less anxiety, depression andgreater self-esteem was found with guided relaxation tech.
07	Jallo, 2009	59 women	second trimester	a. Relaxation-guided	1.Stress Scale (PSS), 2.State-Trait Anxiety Inventory, &	A controlled randomized experi	↓ NRSS scores ↓ State anxiety	R-GI is effective as a primary prevention intervention to

				imagery 12 weeks	3. plasma CRH levels 4. Numeric Rating Scale of Stress (NRSS).	mental design pilot study.		reduce preterm birth.
08	Urech , 2010)	39 healthy pregnant women	During Com plete Preg nancy	a.Progressive muscle relaxation (PMR) b.Guided Imagery (GI), (10 minutes).	1.VAS 2. STAI-S 3. HPA axis 4. cortisol, 5. ACTH & 6.sympathetic-adrenal-medullary (SAM) system activity. 7. heart rate, 8. blood pressure	A randomized controlled trial	↓ decrease in heart rate ↓ decline in endocrine measures except epinephrine	Guided Imagery was especially effective in inducing self-reported relaxation in pregnant women while at the same time reducing cardiovascular activity.
09	Fink, 2011	33 fetuses	During preg nancy	a. Progressive muscle relaxation, & b. Guided Imagery.	1.fetal behavior (fetal heart rate), 2.FHR variation, 3.FHR acceleration, 4.body movements,5.Uterine activity6.Maternal heartrate, 7.blood pressure, cortisol, & orepinephrine	Inter vention study	Changes in fetal behaviorCG. Fetuses had more FHR acceleration. ↑Uterine activity.	The fetus might participate in maternal Relaxation.
10	Gedde -Dahl, 2012	Pregnant women	3rd Semester	a.Self-administered practice of relaxation techniques, b.Positive affirmation 3.Guided imagery	1. ESAS (0-10) Edmonton Scale (Post-delivery Wellbeing) 2.pain, 3.anxiety, 4.Apgar score 5. duration of birth, 6.complications and 7.anesthesia /analgesic	A randomized controlled trial	↑ total Wellbeing	Guided relaxtation Technique group had a significantly better score on total Wellbeing, as measured by the ESAS.

3.5.3. Progressive relaxation techniques								
11	Janke, 1999	107 Pregant women Experi Mental: 44), control: 40), and non adherent :23 participants	preterm labor	a.Pro gressive relaxation exercise	1.Gesta tional age at birth, 2.Rate of pregnancy prolong ation, & 3.Birth weight	A Quasi-experimental	Significantly longer gestations and larger newborns compared to the control &relaxation therapy made a difference in preterm labor outcome.	Women who practiced relaxationhad larger newborns, longer gestations, and higher rates of pregnancy prolongation.
12	Nickel, 2006	64 pregnant women Thirty-two were selected for PMR, and 32 received a placebo intervention	During preg nancy	a.Pro gressive muscle relaxation (8-week)	1.Blood pressure, 2.Lung parameters, 3.Heart rate, 4.Anger &5.Health-related quality of life	A randomized, prospective, controlled trial	↓systolic blood pressure, ↑both forced expiratory volume in peak expiratory flow, ↑Heart rate, ↓ State-Trait Anger Expression Inventory scales, & ↑seven of eight SF-36 scales.	PMR appears to be an effective method to improve blood pressure, lung parameters, heart rate, to decrease anger levels &enhancing health-related quality of life in pregnant women.
13	Pan, 2012	90 pregnant women relaxation group (n = 45) or a control group (n = 45	During Preg nancy	a.Progressive muscle relax ation training b.Standard single-dose methotrexate treatment	1.State-Trait Anxiety Inventory and SF-36 shortly	A randomized, trial	improve the anxiety and health-related quality of life of patients with ectopic pregnancy	muscle relaxation tra ining can effectively improve the anxiety and health-related quality of life of patients with ectopic pregnancy.
14	Tragea, 2014	60 pregnant women. E: (N=31) C: (N=29).	Second trimester	a.Relaxation breathing&b. Progressive muscle relax ation, Twice/ a day)	1. Anxiety& 2.Stress.	A randomized control trial with a prospective pretest-	↓perceived stress (mean change -3.23) & ↑the sense of control (mean change 1.99).	proposed relaxation techniques may constitute an ideal, non-pharmaceutical, intervention that can

				c.Applied relaxation. (6-week stress management programme).		posttest experimental design		promote well-being, at least during Pregnancy.
3.5.4. Behavioral therapy								
15	Bogarts, 2013	235 obese pregnant women	the 1st , 2nd& 3rd of preg nancy	a.Targeted antenatal lifestyle intervention programme	1.Anxiety (State and Trait Anxiety Inventory) 2.Depression (Edinburgh Depression Scale)	A rando mized controlled	↓anxiety (P=0.02) ↑GWG (P=0.01); ↓ gestational diabetes mellitus (GDM) (P=0.03) & (P=0.04) showed significant higher levels of state anxiety. ↓ reduction of GWG and lifestyle intervention (10.6 kg) group compared with normal care group (13.5 kg) (P=0.007).	A targeted lifestyle intervention programme based on the principles of motivational interviewing reduces GWG and levels of anxiety in obese pregnant women.
16	Phelan, 2011	normal-weight ; n = 201) and obese (OW/OB; n = 200) women	13.5 wk gesta tion	a.A low-intensity behavioral intervention (telephone-based feedback).	1.Gestational weight gains	A rando mized assessor-blind, controlled trial	↓the percentage of NW women. (40.2% compared with 52.1%; P = 0.003) ↑the percentages of NW and OW/OB women who returned to their pregravid weights 6 month postpartum (30.7% compared with 18.7%; P = 0.005).	A low-intensity behavioral intervention during pregnancy re duced excessive gestational weight gains and postpartum weight retention.
17	Polley, 2002	Women (n=120	20 weeks gesta tion	a. A stepped-care behavioral intervention. b. Education	weight gain during pregn ancy	A Rando mized controlled trial	↓ percentage of normal-weight (33 vs 58%, P<0.05).	The intervention reduced excessive weight gain during pregnancy a

				about weight gain, healthy eating, and exercise weight gain.				mong normal weight women.
3.5.5. Pregnancy & hypnotherapy								
18	Jenkins, 1993	300 pregnant women	1st& 2nd stages of labor	a.Hypnotherapy	1.Analgesic requirements, 2.duration of first and second stages of labor	Semi-prospective case control study	lengths of the first stage of labor in the primigravid women was 6.4 h after hypnosis and 9.3 h in control group (P<0.0001); Second stages were 37 min & 50 min, (P < 0.001). In the parous women: Hypnosis: 5.3 h: 24 mins & Control: 6.2 h:22 min (P < 0.01); ↓analgesic agents (P < 0.001).	Hypnotherapy is benefit to look insight into the relative proportions of mechanical and psychological components involved in the longer Duration of labor in primigravid women.
19	Hao, 1997	120 healthy, primi pregnancy.	final modes of delivery	a.Psychological suggestion therapy	Birth process	A specially designed, prospective study	↓ time of the first and second stages of labor in the study group than that in the control group (P < 0.01)	Conversation between the mother-to-be and nurse should be controlled carefully for the purpose of advancing of birth process.
20	Werner, 2013	1222 healthy nulli parous women. G:1 G:2 G:3	During child birth.	Hypnosis Three groups. a.G: 1: 1-hrs/ self-hypnosis + audio recordings to ease childbirth. b.G:2: Relaxation group/1-hour various	Use of epidural analgesia and self-reported pain during delivery.	A Randomised, controlled, single-blinded trial.	Required epidural analgesia: 31.2% in the hypnosis group, 29.8% in the relaxation group & 30.0% in the control group. No significant differences in the self-reported pain measures.	A short antenatal training course in self-hypnosis effective for ease childbirth.

				relaxation tech+ mindful ness + audio recordings. c.G: 3: Antenatal care.				
21	Werner, 2013	1,222 healthy nulli parous women Three groups	During preg nancy	Hypnosis Three groups: a.G:1: 1-hr sessions self-hypnosis, b.G:2: Relaxation group: 1-hr lessons+ relaxation tech + Mindfulness c. Control group; antenatal care.	Wijmas Delivery Expectancy/ Experience Questionnair e (W-DEQ) was used to measure the childbirth experience 6 weeks postpartum.	Rando mized, controlle d, single-blinded trial	Hypnosis group experienced their childbirth as better compared with the other two groups (mean W-DEQ score of 42.9 in the Hypnosis group, 47.2 in the Relaxation group, and 47.5 in the Care as usual group ($p = 0.01$)).	A brief course in self-hypnosis improved the women's childbirth experience.
22	Clark, 1981	50 women	Third trimester of Preg nancy.	a. Experimental group: Music throughout labor and delivery, b. Control Group: Labor and delivery- routines antenatal care.	Childbirth outcome.	Experi mental study.	Experimental subjects achieved significantly higher "success" scores on Subjective perceptions. Labor/delivery experience Frequency and duration of home practice($p < 0.05$).	Music home practice is a significant predictor of success in the childbirth experience.
23	Brownin g, 2000	Eleven women	During preg nancy	a.Music therapy.	Coping strategy during labor	Experi nemtal study	Women selected : music + labor support (coping strategy) during labor.	All women used the music during labor to help distract them from the pain or

								their current situation.
24	Phumdoung, 2003	Music group (n = 55) or a control group (n = 55).	active phase of labor	a. Soft music without lyrics for 3 hours starting early in the active phase of labor	1.Sensation and distress of pain 2. Dual visual analog scales.	Randomized controlled trial	↓ Less sensation and distress of pain. Music group: (p <.001) control group: (<.001). ↑Sensation and distress across the 3 hours in both groups (p <.001). ↓Distress than sensation in both Groups (p <.05).	Soft music to laboring women for greater pain relief during the active phase.
25	Chang, 2008	236 pregnant women M.G:16 C.G:12	During Pregnancy	a. Music Group: therapy for two weeks. b.control group: prenatal care.	1.PSS, 2. S-STAI and Edinburgh Postnatal Depression Scale (EPDS).	A randomized experimental study design	↓PSS, ↓ S-STAI and ↓ EPDS after two weeks. (Experimental group).	Two-week music therapy during pregnancy Provides psychological benefits.
26	Sen, 2010	70 Pregnant women. patients	During Delivery	a. Group 1 listened to music through a headphone for one hour after surgery, b. Group 2: No music.	1.Post operative analgesia. 2.Patient Controlled Analgesia (PCA) 3.visual analog scale (VAS)	Randamized control study (4th hour postoperatively)	↓ PCA delivery frequency at the ($p<0.05$). ↓ Postoperative tramadol Consumption ($p<0.05$), ↓The total amount of tramadol consumption in postoperative 24 hours in ($p<0.05$). ↓All VAS values ($p<0.05$). in Group 1 compared to group2.	Music therapy prescribed after surgery to decreases postoperative pain in the first 24 hours and the analgesic consumption during the first four hours.
27	Ventura, 2012	Pregnant women n=154	During pregnancy	a. (G 1) listening to relaxing music, b.(G 2) sitting	1.Spielberger's State and Trait anxiety inventory &	Randamized study	↓cortisol level in the music group (-61.8 nmol/L, ANOVA: p=0.01). ↓in state anxiety ($p<0.001$).	Pregnant women benefited from the routine practice of relaxation in the

		(30 min) music		and reading magazines, & c.(G 3) sitting in the waiting-room	2. Cortisol& Anxiety level.		↓ Plasma cortisol and self-reported state anxiety score after relaxation.	imminence of clinical stressful events.
28	Li, 2012	Sixty women	During Delivery	a. Music study group listened to music for 30 minutes before surgery	1. Heart rate variability 2.Anxiety & 3.Self-Rating Anxiety Scale & 4. Visual analog pain scale.	Rando mized	↓ in Holter assessment ↑the mean HF value. ↓ Anxiety score after music intervention. ↓ pain score obtained 6 hours after surgery was significantly lower in the study than in the control group.	A preoperative music intervention can reduce anxiety and pain in women undergoing cesarean delivery.
29	Hosseini , 2013	30 women	during labor	a.Relaxing music for 30 minutes in each hour for a two-hour period. b. Control group: no music during this period.	1. Labor pain & 2.progress in parturient primipara.	Pre-test and post-test design experim ental	After intervention ↓ visual and numeric pain ($p < 0.0001$) & ↓ Verbal pain. ($p < 0.0001$).	Music- therapy during labor increases pain tolerance, decreasing Anxiety & shorten the labor duration.
30	Simavli, 2014	161 primipa rous women (M: n=80) (C: n=81).	During labor	a. Music group listened to self-selected music during labor	1.Visual analog scale (VAS), Edinburg Postpartum 2.Depression Scale (EPDS) at postpartum day one and day eight	Rando mized	↓postpartum pain & anxiety in music group. it was significant improved at all time intervals (1, 4, 8, 16 and 24h, $p<0.001$). ↑satisfaction rate ($p<0.001$) & ↓ postpartum depression rate at postpartum day one & day eight ($p<0.05$).	Music therapy can be as an safe, easy, alternative & enjoyable nonpharma cological. method for postpartum Well-being.

3.5.7.Guided imagery techniques								
31	Rees, 1995	60 subjects	first 4 weeks of the postpartum period	a. relaxation with guided imagery	1.Anxiety, 2.depression, & 3.self-esteem in primiparas	Pretest-posttest experimental design	↓ anxiety and depression ↑ Self-esteem in Experimental group than the control. All findings were significant at the .05 level.	Experimental group had less anxiety and depression and greater self-esteem than the control group at the end of the period.
32	Jallo, 2009	59 women	Second trimester	a. Relaxation-guided imagery (R-GI) 12 weeks	1.Perceived stress, 2. Anxiety, and 3.Corticotropin-releasing hormone (CRH) levels 4.Numeric Rating Scale of Stress (NRSS)	Prospective, longitudinal study	↓State anxiety in R-GI group, ↓Weekly Numeric Rating Scale of Stress NRSS scores. No significant differences in CRH levels between groups.	Relaxation-guided imagery recommended as a primary prevention to reduce preterm birth.
33	Jallo, 2013	19 pregnant women	During pregnancy	a. Guided imagery	1.Guided imagery	A randomized clinical trial	↓ Mean stress ↓systolic blood pressure	Guided imagery intervention reduces Maternal stress.

3.6. YOGA & PREGNANCY

3.6.1. Conceptual basis of integrated yoga during pregnancy

The Word yoga comes from a Sanskrit root ‘yuj that means ‘to yoga, ‘to join’, to unite the mind, body and the spirit and it is a process of calming down the restless mind (Nagarathna et al., 2008). It is also referred as union between the Jīvātmā (living soul) and Paramātmā (higher soul) i.e. merging of one’s individual consciousness with the Universal consciousness (Udupa et al., 1976). Therefore Yoga is referred as a state of consciousness as well as a method that helps one reach that goal or state of union with the divine (Nagarathna et al., 2001).

Five aspects of human existence (Pancha Kosha).

Yoga is guided by five sheaths/ aspects of existence referred to as kośa (bodies), namely the physical body (*annamaya kośa*), energy body (*prāṇamaya kośa*), mind body (*manomaya kośa*), higher intellect body (*vijñānamaya kośa*) and the bliss body (*ānandamaya kośa*). (LePage et al**.,** 2002). The five sheaths of existence interact with each other, thus, something that affects the mind can spread to the body and vice versa. Imbalance in of the harmonious existence of these five aspects is illness (*vyadhi*). To attain harmony or balance or homeostasis within, one utilizes several inbuilt self corrective techniques with deep internal awareness or mindful awareness as the base.

The first component of yoga practice, yoga äsana, is designed as a sequence of set postures, which work at the physical body (*Annamaya kośa)*, level. Each posture creates awareness of the body and its functions when maintained with effortless awareness as suggested by sage patanjali (*sthira sukham asanam*). During the period while maintaining in the final posture and

immediately after that (between each pose), the mind becomes stabilized (*sthira*) and develops the sensitivity to perceive distinctive awareness of the state of the tissues in the stretched part. This helps the practitioner to become aware of the body parts during stress and relaxation. This ability to identify areas of tension and imbalances offers a feedback to be relaxed more and more and increase suppleness, flexibility and thus reduce the discomfort of pregnancy and delivery. Deep internal relaxation achieved during śavāsanamPosture is the most important component of IAYT. It helps to calm the body and focus the mind in preparation for the postures to follow. This posture allows energy that has been created and released, during the various yoga postures, to flow freely through the body for the purpose of healing and nourishment. It also releases stress and tension from the body, allowing the body and mind to become still and peaceful (Coulter et al., 2001). Thus, the practice of asanas during antenatal period can improve physical strength, maintain the stamina throughout, enhance flexibility and increase endurance that goes a long way in restoring autonomic and endocrine homeostasis.

The second component of yoga practice is breathing awareness (*pranayama*) that works at the *prana* (bioenergy) body (*Prāṇamaya kośa*). For a woman, the labor experience may depend on how well her physical, psychological and spiritual energies are balanced and harmonized. By cultivating right type of breathing pattern during pregnancy and labor the stress responses to pain may be handled with much less discomfort. Simple breathing patterns, using slow and deep breaths during the early phase of uterine contractions and panting breathes through the mouth in transitional phase of labor, can assist pregnant women to stay calm and relaxed. A relaxed mind relaxes the body. The relaxed tissues and blood vessels may help in maintaining fetal blood flow and prevent fetal distress, promote well-being and facilitate easier delivery. Breathing awareness not only enables women to remain calm and centered during labor, but also allows them to

welcome the rhythm of contractions, instead of resisting them, so as to avoid negatively affecting their perception of pain and discomfort.

The third component of yoga practice is operation on mental body level, (*Manomaya-Kosha*). A direct operation on the mind level is made possible by the last three limbs of *Astanga Yoga* of *Patanjali* named *Dhárañá, Dhyáña* and *Samadhi*. The culturing of mind is accomplished by focusing of the mind (*Dhárañá*) initially, followed by relaxed dwelling of the mind in a single thought (*Dhyána*) for longer and longer durations leading ultimately to super consciousness (*Samádhi*). A progressive habituation allows the mind to remain relaxed during the period of meditation (*Dhyána*). The benefits of 'OM' Meditation, a simple technique, are numerous and noteworthy. Chanting om, involves the pronunciation of the sound series, ‘‘aaa, uuu, mmm and ommm’’ which are essential for creating vibrating and pulsing energy that activate the prana chakras in the abdomen, throat and head, respectively. This practice has effects on the autonomic nervous system (Telles et al., 1995) and can result in tension and emotions being eased (*sukha*) or released from the body (Taylor et al., 2003).

A randomized controlled pilot trial tested a six-week mindfulness-based meditation intervention in a sample of pregnant women experiencing high levels of perceived stress and pregnancy anxiety (Guardino et al., 2014). Forty-seven women enrolled between 10 and 25 weeks gestation were randomly assigned to either a series of weekly Mindful Awareness Practices classes (n = 24) with home practice or to a reading control condition (n = 23). Hierarchical linear models of between-group differences in change over time demonstrated that participants in the mindfulness intervention experienced larger decreases from pre-to post-intervention in pregnancy-specific anxiety and pregnancy-related anxiety (PRA) than participants in the reading control condition.

This study is one of the first randomized controlled pilot trials of a mindfulness meditation intervention during pregnancy and provides some evidence that mindfulness training during pregnancy may effectively reduce PRA and worry.

The fourth component of yoga practice is to provide inputs at intellectual level (*Vijñānamaya kośa*), during lectures and individual counseling sessions using concepts of one's true nature, happiness analysis etc. The inner peace, harmony and inner blissful silence that ensue are extremely useful to overcome emotional and notional conflicts which are the most common difficulties of highly sensitive and anxious women. It is these surges of highly excited states, repeated several times in a day that causes insurmountable stresses. Yoga helps one develop "samatvaṁ", the equanimity of mind i.e. the ability to maintain cool headedness under provoking situations. It is this equanimity of mind that goes a long way to strengthen the personality. A stable mind always is considered a wiser than an emotionally disturbed woman. Once this emotional stability comes as a result of the practice of the inner peace and quatitude, one can work more efficiently and handle one's own problems better without having to suppress them. (Nagarathna et al., 2008).

The fifth component of yoga practice is to work at bliss body (*Ānandamaya kośa*) level. This is the most powerful conceptual correction that happens in IAYT which makes one recognize and establish in a state of inner peace all day, under all circumstances, even in the midst of intense activity which may be stressfully demanding. Dwelling in a blissfully positive mood all day while at work (official or personal) is the state whereby the mind becomes concentrated and focused with a deep sense of relaxation. This practice, either by itself or in conjunction with *asanas* and *pranayama*, reduces excessive thinking and phases out extraneous sensory stimuli,

and trains one to be not disturbed by the distractions. By doing so a heightened sense of spirituality may be achieved.

In summary, the integrated sets of yoga therapy practices improve the physical strength, flexibility, relaxation, and self-awareness. They also promote harmonious flow of bioenergy through the *prana* channels and lead to a balance of the five sheaths of human existence.

3.6.2. Complementary role of antenatal yoga

Yoga, an intervention based on mind and body interconnectedness, is a non-pharmacological intervention that has been studied widely for its complimentary effects in a variety of immunological, neuromuscular, psychological, and pain conditions.

3.6.2.1. Reviews on yoga in pregnancy

A review on the effects of yoga poses reported the beneficial effects on psychological conditions including anxiety and depression, on pain syndromes, cardiovascular, autoimmune and immune conditions and on pregnancy. The physiological effects of yoga postures during pregnancy including decreased heart rate, blood pressure and the physical effects such as weight loss and increased muscle strength were also reported in this review of existing literature by Field et al (2011). Based on these results, they proposed the potential underlying mechanism as follows: the stimulation of pressure receptors while maintaining in the final yoga postures associate with relaxation response would have led to enhanced vagal activity and reduced cortisol. The reduction in cortisol, in turn, may contribute to positive effects such as enhanced immune function and lower prematurity rate (Field et al., 2011).

A review in 2012 of yoga for pregnancy searched 6 databases using the terms "yoga and pregnancy", and "yoga and [post-natal or post-partum". Trials were considered if they were controlled and evaluated a yoga intervention. Six trials were identified: three were

randomized controlled trials (RCTs) and 3 were controlled trials (CTs). The methodological quality and reporting ranged from 0-5 on the Jadad scale and from 3-6 on the Delphi List. Findings indicated that yoga may produce improvements in stress levels, quality of life, aspects of interpersonal relationship, autonomic nervous system functioning, and labor parameters such as comfort, pain, and duration (Curtis et al., 2012).

Another review of 64 published mind body intervention studies between 1980 and 2007 on healthy adult pregnant women noted that progressive muscle relaxation was the most common intervention used among others which included multimodal psycho-education, yoga and meditation (Beddoe et al., 2008)**.**

3.6.2.2. Integrated yoga in normal pregnancy

Several studies on integrated approach of yoga therapy **(IAYT**- including physical postures, breathing, and meditation for one hour daily) specifically designed to suit the needs in different trimesters for normal and high risk pregnancy were planned in this institution (VYASA, Bengaluru, India). In 2005, Narendran et al published the results of a prospective, matched, control study on a large sample (169 in yoga and 166 women in the control group) of pregnant women enrolled between 18 and 20 weeks in a tertiary obstetric hospital (Narendran et al., 2005). Women were matched for age, parity, body weight, and Doppler velocimetry scores of umbilical and uterine arteries. Yoga practices were practiced by the yoga group one hour daily, from the date of entry into the study until delivery. The control group walked 30 minutes twice a day (standard obstetric advice) during the study period. The number of babies with birth weight ≥ 2500 grams was significantly higher in the yoga group. Preterm labor was significantly lower in the yoga group. Complications such as isolated intrauterine growth retardation (IUGR) and pregnancy-induced hypertension (PIH) with associated IUGR were also significantly lower

in the yoga group. There were no significant adverse effects noted in the yoga group (Narendran et al., 2005).

In a randomized trial in 2008, Chuntharapat et al recruited 74-primigravid Thai women who were equally divided into two groups (experimental and control). The yoga program involved six, 1hour sessions at prescribed weeks of gestation. The experimental group was found to have shorter duration of the first stage of labor, as well as the total time of labor ; they also reported higher levels of maternal comfort during labor and 2hour post-labor, and experienced less 'subject evaluated labor pain' than the control group. No differences were found, between the groups, regarding analgesic usage, labor augmentation or newborn Apgar scores at 1 and 5 min (Chuntharapat et al., 2008).

In a study on tai chi/yoga, 92 prenatally depressed pregnant women at an average of 22 weeks gestation were randomly assigned to experimental or a waitlist control group .The tai chi/yoga group participated in a 20-min group session per week for 12 weeks. At the end of the treatment period the tai chi/yoga group had lower summary depression scores, as well as lower negative affect and somatic/vegetative symptoms subscale scores , lower anxiety and lower sleep disturbances scores (Field et al., 2013).

The effects of prenatal haṭhayoga on cortisol, affect and depressive symptoms were investigated in 51 women. Twice during pregnancy, yoga group participants reported on affect and provided a saliva sample before and after a 90-min prenatal haṭhayogasession. Depressive symptoms were assessed in pregnancy and post partum. Cortisol was lower and positive affect higher on yoga compared to usual activity days. Negative affect and contentment improved more in response to the yoga session. Yoga group participants showed fewer postpartum ($p < .05$) but not antepartum depressive symptoms than control group participants. Findings indicate that prenatal haṭhayoga

may improve current mood and may be effective in reducing postpartum depressive symptoms (Bershadsky et al., 2014).

An interesting observation of a recent RCT on 59 low-risk primiparous pregnant women was that a single session of **yoga** reduced both subjective and physiological measures of state anxiety (STAI-S and cortisol), and this class-induced reduction in anxiety remained at the final session of the intervention; in addition, practice of antenatal yoga for 8 weeks reduced the anxiety towards childbirth and prevented increases in depressive symptomatology (Newham et al., 2014).

3.6.2.3. Integrated yoga in high risk pregnancy

While previous studies have shown the potential effects of yoga in normal pregnancies, this randomized controlled trial investigated the effects of integrated yoga relaxation in prevention of pregnancy complications in high-risk pregnancies for the first time (Rakhshani et al., 2012). 68 high-risk pregnant women were recruited from two maternity hospitals in Bengaluru, India and were randomized into yoga and control groups. The yoga group (n=30) received standard care plus one-hour yoga sessions, three times a week, from the 12th to the 28th week of gestation. The control group (n=38) received standard care plus conventional antenatal exercises (walking) during the same period. Significantly fewer cases of pregnancy induced hypertension (PIH), preeclampsia, gestational diabetes (GDM) and intrauterine growth restriction (IUGR) were observed in the yoga group. Significantly fewer Small for Gestational Age (SGA) babies and newborns with low APGAR scores were born in the yoga group. This study also showed decrease in perceived stress levels (Deshpande et al., 2013) and healthier adaptation to pregnancy through better physiological hemodilution in the yoga group as seen by observations on Platelet Count and Uric acid (Jayashree et al., 2013).This first randomized study of yoga in

high-risk pregnancy was a good evidence for the safety and potential efficacy of integrated relaxing type of yoga in reducing hypertensive related complications of pregnancy and improving fetal outcomes.

3.6.2.4. Mindfulness meditative yoga in pregnancy

The feasibility and level of acceptability of a mindful yoga intervention provided during pregnancy was examined by (Beddoe et al., 2009). The 7 weeks mindfulness-based yoga group intervention combined elements of Iyengar yoga and mindfulness-based stress reduction program. This pilot study recruited 16 healthy pregnant nulliparous women with singleton pregnancies between 12 and 32 weeks gestation at the time of enrollment. Outcomes were evaluated from pre- to post intervention and between second and third trimesters with repeated measures analysis of variance and post hoc nonparametric tests. Women practicing mindful yoga in their second trimester reported significant reductions in physical pain from baseline to post intervention compared with women in the third trimester whose pain increased. Women in their third trimester showed greater reductions in perceived stress and trait anxiety; this study offered preliminary evidence to yoga's efficacy during pregnancy particularly if started early in the pregnancy. The purpose of another experimental pilot study was to measure the effects of a mindfulness-based yoga intervention on sleep in pregnant women (Beddoe et al., 2010).

Further, in an RCT on mindfulness meditation study, 57 women enrolled between 10 and 25 weeks gestation were randomly assigned to either a series of weekly Mindful Awareness Practices classes (n = 24) with home practice or to a reading control condition (n = 23). Hierarchical linear models of between-group differences in change over time demonstrated that participants in the mindfulness intervention experienced larger decreases from pre-to post-intervention in pregnancy-specific anxiety and pregnancy-related anxiety (PRA) than

participants in the reading control condition. However, these effects were not sustained through follow-up at six weeks post-intervention. Participants in both groups experienced increased mindfulness, as well as decreased perceived stress and state anxiety over the course of the intervention and follow-up periods. This study is one of the first randomized controlled pilot trials of a mindfulness meditation intervention during pregnancy and provides some evidence that mindfulness training during pregnancy may effectively reduce PRA and worry (Guardino et al., 2014).

Fifteen healthy, nulliparous women in their second or third trimesters with singleton pregnancies attended weekly mindfulness meditation and prenatal haṭhayogaclasses in the community for 7 weeks. Sleep variables, as estimated by 72 hr of continuous wrist actigraphy and the General Sleep Disturbance Scale (GSDS), were recorded at baseline (Time 1) and post intervention (Time 2). Control data were obtained by evaluating sleep in the third-trimester group at Time 1. Women who began the intervention in the second trimester had significantly fewer awakenings, less wake time during the night, and less perceived sleep disturbance at Time 2 than at baseline. Those who began during the third trimester had poorer sleep over time in spite of the intervention. The authors concluded Mindful yoga offers promise for women in their second trimester of pregnancy to diminish total number of awakenings at night and improve sleep efficiency (Beddoe et al., 2010). Further, a recent study showed reduction in perceived stress ,state anxiety, prenatal and postpartum depression with improved interpersonal relationships after Mindfulness meditation Practices (Guardino et al., 2014).

3.6. YOGA & PREGNANCY

Sl No	Author and Year	Sample	Gestational age	Intervention	Parameter	Design	Result	Conclusion
TABLE 3.6.2. Summary of published work on Yoga & pregnancy								
3.6.2.1Reviews on yoga in pregnancy								
01	Field, 2011	Pregnant Women	During pregnancy	a. Yoga	1.Anxiety, 2.depression, 3.Pain syndromes, 4.cardiovascular, 5.autoimmune 6.immune conditions.	Review study	↓ Heart rate ↓ BP ↑ Vagal activity ↓ Cortisol. ↓ Prematurity rate.	Yoga may contribute to positive effects such as enhanced immune function and a lower prematurity rate.
02	Curtis, 2012	Pregnant women Six trials	During Pregnancy	a. Yoga	1.stress levels, 2.quality of life, 3.aspects of interpersonal relating, 4.autonomic nervous system functioning, 5. labor comfort, 6. Labor pain, 7. Labor Duration.	Review study	↑stress levels, ↑quality of life, ↑aspects of interpersonal relating, changes in autonomic nervous system functioning, and labor parameters such as comfort, pain, and duration.	Yoga is well indicated for pregnant women and leads to improvements on a variety of pregnancy, labor, and birth outcomes.
03	Beddoe, 2008	12 out of 64 published intervention studies (1980- 2007) Healthy pregnant women	During pregnancy	a.Mind-body interventions (Progressive muscle relaxation)	1.higher birth weight, 2.shorter length of labor, 3.Instrument-assisted births, & 4.perceived stress & 5. Anxiety.	Review study	pregnant women have health benefits from mind-body therapies used in conjunction with conventional prenatal care	Mind-body practices were effectiveness for perinatal Outcomes.

3.6.2.2. Integrated yoga in normal pregnancy								
04	Naren dran, 2005	335 Pregnant women (Y)169 women (C)166 women	18 and 20 weeks	a.Yoga practices b.Walking (30 minutes twice a day)+ (standard obstetric advice	1.Birth weight 2.Preterm labor 3.Pregnancy complications	A prospe ctive, matched, observatio nal study	↑ Birth weight ($p < 0.01$) , ↓Preterm labor ($p < 0.0006$) ↓ Complications (IUGR: $p < 0.003$), PIH with associated IUGR: ($p < 0.025$) in the yoga group compared to Control group.	Integrated approach to yoga during pregnancy improves birth weight, decreases preterm labor, and decreases IUGR either in isolation or associated with PIH, with no increased complications.
05	Narendr an, 2005	121 women	18-20 weeks of preg nancy Y: 68 women & C: 53 women	a.Yoga practices, b.Walking (30 minutes twice a day)+ (standard obstetric advice	1.Doppler velocimetry scores	A prospe ctive, matched, obser vational study	↑ Birth-weight ($P < 0.018$) ↓Pregnancy complications.	Occurrence of pregnancy Complications show lower trends in yoga group.
06	Chuntha rapat, 2008	74-primi gravid Thai women	During pregnancy	a. Yoga Six, (1-h sessions)	1.Maternal comfort, 2.Labor pain, & 3.Birth outcomes	A rando mized trial	↑higher levels of maternal comfort during labor and 2h post-labor, ↓labor pain than the control group.	Yoga found to have a shorter duration of the first stage of labor, as well as the total time of labor.
07	Field, 2013	Prenatal depressed pregnant women N=92	22 weeks gestation	a.Tai chi/yoga (20-min group session/ per week/ 12 weeks)	1.(CES-D) scores 2.(STAI) scores 3.sleep Scale	Rando mized study	↓Depression (CES-D) scores, ↓ Negative affect and somatic/vegetative symptoms. subscale scores on the CES-D, ↓anxiety	Yoga reduced depression, Somatic symptoms, anxiety & improved in sleep scale.

							(STAI) scores and ↓ sleep disturbances scores.	
08	Bershadsky, 2014	Pregnant women N=51	During pregnancy	a. Hatha yoga b.Usual activity	1.Cortisolaffect 2. Depressive symptoms.	Inter ventional control study	↓Depressive symptoms ↓ Cortisol level ($p < .01$) ↑ positive affect higher ($p < .001$) ↓ Negative affect and ↑ Contentment ($p < .05$) ↓Fewer postpartum ($p < .05$).	Hatha yoga may improve current mood and may be effective in reducing postpartum depressive symptoms.
09	Newham, 2014	Fifty-nine primiparous, low-risk pregnant women treatment-as-usual	During pregnancy	a. Yoga course (8-week)	1.State Trait Anxiety Inventory; STAI-State) & (STAI-Trait) 2.Pregnancy-specific anxiety (Wijma Delivery Expectancy Questionnaire; WDEQ) & 3. Depression (Edinburgh Postnatal Depression Scale; EPDS) 4.cortisol	Inter vention study	yoga group has ↓WDEQ scores ($P = .014$), & Treatment as usual group had ↑ in EPDS scores ($P = .042$).	Antenatal yoga seems to be useful for reducing women's anxieties and decrease depressive symptomatology.
3.6.2.3.Integrated yoga in high risk pregnancy								
10	Rakhshani, 2012	68 high-risk pregnant women yoga group (n=30)	12th to 28th week of gestation standard care plus	a. Yoga group (one-hour yoga sessions, three times a week, from the 12th to the 28th week	1.hypertension (PIH), 2.Preeclampsia, gestational 3.Diabetes (GDM)	A randomized control study	↓pregnancy induced hypertension (PIH), preeclampsia, gestational diabetes (GDM) and intrauterine growth restriction (IUGR) cases	Yoga can potentially be an effective therapy in reducing hypertensive related

			one-our yoga sessions standard care plus conventional antenatal exercises (walking)	of gestation) b.Standard care	4.Intrauterine growth restriction (IUGR) 5.Gestational Age (SGA) babies 6. APGAR scores.		were observed in the yoga group (p=0.018, 0.042, 0.049, 0.05 respectively). ↓ Fewer Small for Gestational Age (SGA) babies and newborns with low APGAR scores (p=0.006) were born in the yoga group (p=0.033).	complications of pregnancy and improving fetal outcomes.
11	Deshpande, 2013	68 high-risk pregnant women C: 38 YT: 30)	12(th), 20(th), & 28(th) weeks of pregnancy	a. Yoga: Yoga Therapy b.Standard antenatal care	1.Stress level in high risk pregnancy Perceived stress scale	A single-blind randomized controlled clinical trial	↓PSS level of the YT group at the second follow-up (28(th) week of pregnancy) compared to the control group (P = 0.02). Women who took part in the YT module reported ↓fewer Pregnancy discomforts decrease in PSS (P = .02).	Practicing YT during high-risk pregnancy is not only a cost-effective option but also a feasible and safe option.
12	Jayashree, 2013)	68 high-risk pregnant women C: 38 YT: 30)	12^{th} week of pregnancy	a. Meditativeyoga (three days / week for three months).	1.platelet counts 2.Serum Ua in high-risk pregnancy	Stratified randomized controlled trial	Healthy↓ in platelet count (twelfth to twentieth week) occurred in a higher (P < 0.001) in yoga group than the control group. A similar trend was found in uric acid. Significantly ↓ number of women in the yoga group (n = 3) developed pregnancy-induced hypertension (PIH) / pre-eclampsia	Antenatal integrated yoga from the twelfth week is safe and effective in promoting a healthy progression of platelets and uric acid in women with high-risk pregnancy.

							(PE) than those in the control group (n = 12), with absolute risk reduction (ARR) by 21%.	
3.6.2.4.Mindfulness meditative yoga in pregnancy								
13	Vieten, 2008	31 pregnant women	During pregnancy	a.Eight-week mindfulness-based intervention	1.perceived stress, 2.positive & negative affect, 3. depressed, 4. Anxious mood & affect	RCT	↓ Anxiety ($p<0.05$) & ↓ Negative affect ($p<0.05$) during the third trimester.	A non pharmaceutical intervention useful during Pregnancy.
14	Beddoe, 2009	Healthy pregnant nulliparous women. N=16	between 12 and 32 weeks gestation	a.7 weeks mindfulness-based yoga + elements of Iyengar yoga + mindfulness-based stress reduction.	1.State and trait anxiety, 2.Perceived stress, 3.Pain, & 4.Morning salivary cortisol	Intervention study	↓Physical pain in second trimester ↓in perceived stress and trait anxiety third trimester in pregnancy.	Women in their third trimester showed greater reductions in perceived stress and trait anxiety after yoga.
15	Beddoe, 2010	Healthy nulliparous women-n=15	Second & third trimester	a. Mindfulness-based yoga	1.General Sleep Disturbance Scale (GSDS),	Experimental pilot study	1.less wake time during the night, and 2. less perceived sleep Disturbance. 3. Less awake time.	Mindful yoga shows promise for women in their second trimester of pregnancy to diminish total number of awakenings at night and improve sleep efficiency.
16	Guardino, 2014	Forty-seven women (n = 24) (n = 23).	10 and 25 weeks gestation	a. Six-week mindfulness-awareness practices.	1.Perceived stress 2.Pregnancy anxiety	RCT pilot trial	both groups experienced ↑ mindfulness, ↓perceived stress & state anxiety	Mindfulness training during pregnancy may effectively reduce PRA and worry during Pregnancy.

CHAPTER 4

AIMS AND OBJECTIVES

4.1 AIM

This prospective randomized active control study was aimed at assessing the effect of integrated yoga on pregnancy outcome with special emphasis on labor outcome, cognitive functions, autonomic responses and quality of life apart from other maternal and fetal outcomes, in normal pregnancy.

4.2 OBJECTIVES

PRIMARY OBJECTIVES

1. To assess the effect of practicing integrated yoga from second trimester on duration of all three stages of labor in normal pregnancy.
2. To assess the effect of practicing integrated yoga from second trimester on maternal cognitive functions including response inhibition based on fluency test and Stroop effect, and executive memory based on visual working memory and verbal working memory.
3. To measure the effect of practicing integrated yoga from second trimester on autonomic responses using Heart Rate Variability.
4. To assess the effect of practicing integrated yoga from second trimester on quality of life.

SECONDARY OBJECTIVES

1. To study the effect of practicing integrated yoga from second trimester on Mode of delivery, Pregnancy complications, Epidural analgesia, Birth weight and Apgar scores.
2. To assess the effect of practicing integrated yoga from second trimester on perceived stress, anxiety and depression.

3. To assess the effect of practicing integrated yoga from second trimester on pregnancy experience and interpersonal relationship.

4.3 RATIONALE AND RESEARCH QUESTIONS

RATIONALE:

Previous studies on yoga in normal pregnancy have been found to be useful in improving Birth weight of babies, decreased preterm labor and decreased intrauterine growth restriction apart from reduction in occurrence of complications of pregnancy such as pregnancy induced hypertension with associated IUGR. (Narendren et al., 2005).A randomized control trial reported reduction in duration of labor after antenatal yoga (Chuntharapat et al., 2008). It has been well established that yoga practices can reduce anxiety, perceived stress and cortisol levels (Gupta et al 2006). Studies by an earlier doctoral candidates at this university have looked at the effect of integrated yoga in normal pregnancy on a large sample size through non randomized control design (Narendran et al., 2005) and the effect of relaxation yoga on high risk pregnancy (Rakhshani et al., 2014). To the best of our knowledge, there are no published randomized controlled studies that have compared the effect of regular supervised practice of integrated yoga with standard antenatal exercises on all three stages of labor, autonomic changes, stress, cognitive functions and quality of life. Hence this study was planned on this rationale of looking at these outcome parameters.

RESEARCH QUESTIONS:

1. What is the effect of practicing integrated yoga from second trimester on duration of all three stages of labor in normal pregnancy?
2. What is the effect of practicing integrated yoga from second trimester on maternal cognitive functions such as response inhibition based on fluency test and Stroop effect?

3. What is the effect of practicing integrated yoga from second trimester on maternal cognitive functions such as executive memory based on visual working memory and verbal working memory?
4. What is the effect of integrated yoga on quality of life and interpersonal relationship?
5. What is the effect of integrated yoga on Mode of delivery, Pregnancy complications, Epidural analgesia, Birth weight and Apgar scores?
6. What is the effect of integrated yoga on perceived stress?
7. What is the effect of integrated yoga on autonomic responses as measured by Heart Rate Variability spectral analysis?
8. What is the effect of integrated yoga on pregnancy specific anxiety and depression?
9. What is the effect of integrated yoga on pregnancy experience and interpersonal relationship?

4.4 HYPOTHESIS

Yoga practices can produce significant improvement in labor outcome, cognitive functions, and autonomic response during normal pregnancy and improve quality of life apart from improvement in other pregnancy outcomes.

4.5 NULL HYPOTHESIS

Antenatal yoga is not better than antenatal exercises in changing these outcome measures.

CHAPTER 5

MATERIALS & METHODS

5.1 SUBJECTS

5.1.1 ***Sample size:*** A sample size of 47 per group was derived by using G power software for an effect size of 0.59 at an alpha of 0.05 powered at 0.8. A previous study (Chuntharapat et al, 2008) reported an effect size of 0.59 on labor duration between the two cohorts which was used to extrapolate the optimum sample size for this study. A total of 105 were recruited into the study and there were 9 dropouts subsequently. Data available for the final analyses were for 51 and 45 in yoga and control groups respectively.

5.1.2 Inclusion criteria: Inclusion criteria were**:** (a) normal pregnancies registered for antenatal check up between 18- 20 weeks of gestation.

(b) Either primi gravida or multi gravidae with at least one live child through a normal previous delivery. This was used as the criterion to ensure that the baseline stress levels may be fairly uniform as the anxiety and stress levels would be very high in multigravidae without a live child.

5.1.3 Exclusion criteria: Exclusion criteria were*:* (a) those with associated medical problems such as diabetes, hypertension, psychiatric illness etc., (b) multiple pregnancies, (c) IVF *(In vitro fertilization)* pregnancy, (d) maternal physical abnormalities, (e) fetal abnormality, and (f) previous exposure to Yoga or vigorous physical exercises.

5.1.4 Source: Subjects were recruited from ante-natal clinics of three hospitals in south Bengaluru, India. All these four hospitals followed the same antenatal and labor protocols under the guidance of a senior obstetrician (Dr Latha Venkatram). The obstetric units of these hospitals conducted about 1200-1500 deliveries per year. One hundred and five pregnant women registered in these hospitals, (2008 to 2010) who satisfied the selection criteria and consented to participate in the study were selected for the study.

5.1.5 Informed consent

The study was cleared by the Institutional ethical committee of the University (S-VYASA) and written permission was obtained from individual sites of recruitment. Signed informed consent was sought from all 105 participants before randomization into the Yoga intervention group and antenatal exercise controls.
The study was registered under CTRI; with the registration number CTRI/2009/091/000132.

5.2 DESIGN

This was a prospective randomized active control design. Women consenting to participate, who satisfied the study criteria as assessed by the obstetrician were allotted to two groups, by the researcher who was not involved in assessment or administering the intervention. A computer generated random number table (www.Randomizer.org) was used. Paper slips with the group names were inserted in 105 serially numbered envelopes, sealed and kept confidentially by the researcher. Each envelope was opened only after writing the name of the next recruited participant against her serial number. Certified instructors taught both groups in batches of one to ten women per group. After initial training of two hours daily for one month, one hour of home practice using a pre-recorded audio-CD was advised for the rest of the term in both groups. Two hour refresher classes were provided during routine antenatal obstetric visits. (Once in four weeks till the 28^{th} week, once a fort night till the 36^{th} weeks, and weekly thereafter till delivery). Compliance was documented by signed attendance at initial training and monitoring by phone and activity diaries thereafter. All deliveries were conducted in the hospitals. Safe labor ward facilities, a neonatologist/pediatrician and 24 hours senior nurses were available in all these centers for conducting the delivery. Certified staff nurses trained specially in midwifery by the consultant obstetricians were looking after one to two women in labor. Feto-maternal

surveillance by cardiotochograph was done by the nursing staff with supervision of Doctors. The labor was conducted in semi-lithotomy position with the head end raised to 30 to 45 degrees from horizontal, in the presence of an Obstetrician. Labor outcome measures were noted during and immediately after delivery. The attendance for the supervised training classes was 95%. The compliance in home practice was also 90%. There were no drop outs due to lack in compliance although the study had planned to exclude participants with lower than 60% regularity. Both groups were given pre recorded audio CD for home practice that had instructions for one hour of the practice for the complete module taught to them.

Blinding and masking: Yoga being an active intervention, it cannot be studied using a double blinded study design. Attempts were made to mask personal identifiers wherever possible. The statistician, who did the randomization and the final analysis, and also the staff making the outcome assessments of the women were blinded to the grouping of subjects. The medical professionals involved in clinical care of the subject as well as the therapist administering the interventions were not blinded. The two groups had different class venues and timings to avoid participant contact.

5.3 INTERVENTION

Details of the conceptual basis of yoga are described in chapter three under literature review.

The yoga group practiced modules of yoga techniques specific to second and third trimesters of pregnancy .The control group practiced standard antenatal exercises. Initially, each group received essential additional pregnancy information covering all concepts and techniques required for successful holistic health management.

The antenatal classes for both groups were aimed at educating the women (a) about the physical and psychological changes expected during pregnancy, (b) to incorporate the

necessary changes in life style, including diet, exercise and occupation, (c) avoid excess weight gain and stress to ensure better general health and physical stamina, (d) improve emotional stability for a positive quality of life and (e) prepare them for labor.

The specific yoga module used for the experimental group called 'Integrated approach of yoga during pregnancy' is based on the knowledge culled out from yoga scriptures (*Patanjali yoga sutras, and Mandukya karika*). This module that incorporated the concepts and techniques for a holistic health management at physical, mental, emotional and intellectual levels was also used in our earlier study on yoga in pregnancy by (Narendran et al., 2005). The physical postures (*asanas*) and breathing techniques (*pranayama*) improve flexibility and vitality. The number of asanas (physical postures) performed in standing, sitting or lying prone or supine postures went on reducing with increasing gestational age. These asanas done with internal awareness (eyes closed) promotes full range of motion of the body part by graded gradually increasing stretches followed by relaxation, that results in flexibility of the joints and strengthening of the muscles.

The breathing techniques (*Pranayama*) focus on conscious prolongation of all three components of breathing cycle (inhalation, effortless, retention, and exhalation) that results in better vital capacity and balance of vital energy (*prana*). Meditation included techniques such as listening to one's own breath or repeating a mantra to bring about a state of self awareness and inner calm (Narendran et al., 2005). Meditation and relaxation techniques, such as the isomeric relaxation technique, the quick relaxation technique, and the guided deep relaxation technique, enhance physiological rest (Nagendra et al, 1988).

The DRT used to observe the immediate effect on HRV of practicing with the integrated yoga–Deep relaxation modules lasted for 10 minutes, and comprised 5 phases. (Chinmayananda S, 1984). This guided deep relaxation technique was used to observe the

immediate effect on HRV of practicing with the integrated yoga at 20th and 36th weeks of pregnancy.

Other components of the yoga module included daily 15-minute lectures and yogic counseling sessions meant to bring about a perceivable lifestyle change, with the proper understanding of oneself. The yogic texts trace all yoga benefits to the development of "mastery over modifications of the mind" (chitta vritti nirodhah; Sage Patanjali) through "slowing down of the flow of thoughts in the mind" (manah prashamana upayah yogah; Sage Vasishta).

Control group practiced the standard antenatal practices, which included simple stretching exercises approved by the Executive Council of the society of Obstetrician and Gynecologists of Canada, and by the board of directors of the Canadian society for exercise physiology (Geogory et al., 2003).

Compliance: Attendance at initial training was recorded; thereafter, the monitoring was by phone and activity diaries.

5.4 ASSESSMENTS

Assessments were done at the time of recruitment (18- 20th week), at the time of each follow up visit and at 36th week. Post assessments of clinical variables were done on 36th week, but the final outcome variables were recorded on the next day after completion of labor. As duration of labor is an important measure of healthy progression of labor we considered this as the primary outcome measure; related variables, mode of delivery and requirement of analgesia were also included under primary outcome measures. Complications of pregnancy gestational age at delivery, birth weight and APGAR scores were secondary measures.

TABLE.5.4.1. THE OUTCOME MEASURES: SCHEDULE OF ASSESSMENT

S.N	Prim/sec	PARAMETERS	20th week	36th week	Delivery
PREGNANCY OUTCOME					
1	**Primary**	Labor Duration			X
2	Secondary	Mode of delivery			X
3	Secondary	Requirement of analgesia			X
4	Secondary	Birth weight			X
5	Secondary	APGAR scores			X
6	Secondary	Complications of pregnancy			X
7	Secondary	Gestational age at delivery			X
PSYOCHOLOGICAL / AUTONOMIC MEASURES					
8	**Primary**	Quality of life	X	X	
9	**Primary**	HRV(Heart rate variability)	X	X	
10	Secondary	PSS : perceived stress scale	X	X	
11	Secondary	PEQ: Pregnancy Experience Questionnaire	X	X	
12	Secondary	STAI: State & Trait Anxiety Inventory	X	X	
13	Secondary	HADS: Hospital anxiety & depression scale	X	X	
14	Secondary	PRAQ: Pregnancy Related Anxiety Questionnaire	X	X	
15	Secondary	FIRO-B: Fundamental Interpersonal Relations Orientation.	X	X	
COGNITIVE FUNCTIONS					
16	**Primary**	Phonemic Fluency	X	X	
17	**Primary**	Category Fluency	X	X	
18	**Primary**	Design Fluency Test	X	X	
19	**Primary**	Stroop Test	X	X	
20	**Primary**	Verbal Working Memory	X	X	
21	**Primary**	Visual working memory	X	X	

CHAPTER 6

DATA EXTRACTION AND ANALYSIS

6.1 DATA COLLECTION & SCORING

6.1.1. Labor duration: Labor Outcome was noted during and immediately after the delivery. The three stages of labor were defined as follows (Albers et al., 1996):

Stage I: from time of 3 cms cervical dilatation (or admission time) up to full dilatation;

Stage II: full dilatation to completion of baby's delivery;

Stage III: completion of placental delivery.

6.1.2. Mode of delivery: normal, instrumental (forceps or vacuum), or cesarean section.

6.1.3. Epidural analgesia: The number of subjects who required epidural analgesia.

6.1.4. Birth weight

6.1.5. Apgar scores: First and fifth minute APGAR scores after the birth of the baby.

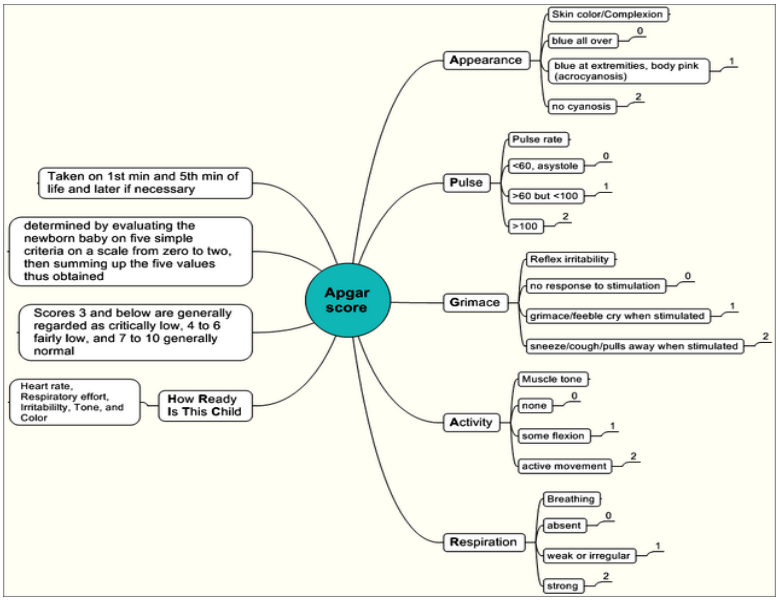
Scoring: The Apgar scale is determined by evaluating the newborn baby on five simple criteria on a scale from zero to two, then summing up the five values thus obtained. The resulting Apgar score ranges from zero to 10. The five criteria were summarized using words chosen to form a acronym (Appearance, Pulse, Grimace, Activity, Respiration). From each column in the table below, the infant is given a score of 0, 1 or 2. The scores are added up and the total sum is their Apgar score (The Apgar score, 2006).

Figure. 3. The five criteria of the Apgar score:

Component of Acronym	Score of 2	Score of 1	Score of 0	
Appearance	no cyanosis body and extremities pink	blue at extremities body pink (acrocyanosis)	blue or pale all over	Appearance /Complexion
Pulse	>100	<100	absent	Pulse rate
Grimace	cry or pull away when stimulated	grimace/feeble cry when stimulated	no response to stimulation	Reflex irritability
Activity	flexed arms and legs that resist extension	some flexion	none	Activity
Respiration	strong, lusty cry	weak, irregular, gasping	absent	Respiratory Effort

(http://en.wikipedia.org/wiki/Apgar_score)

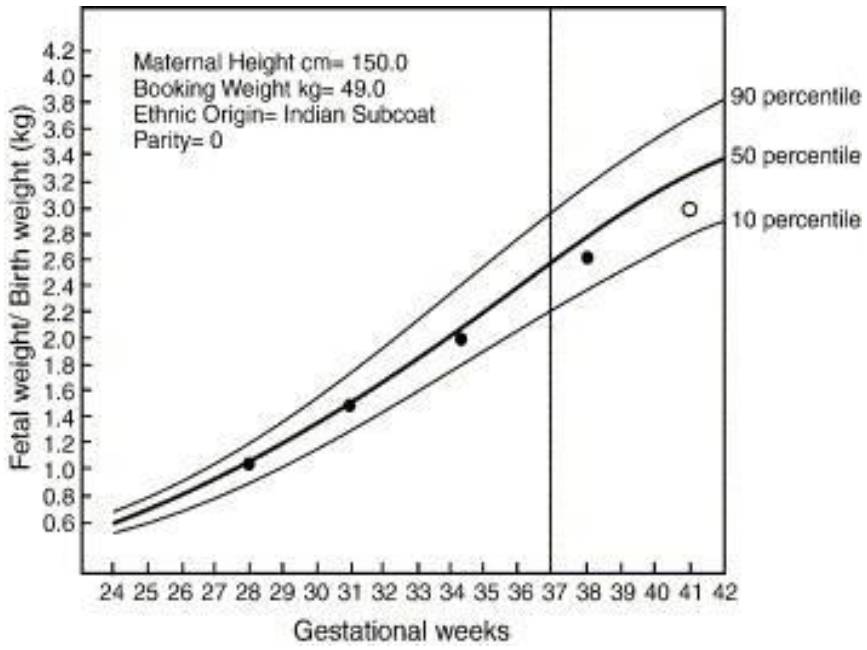
Figure. 4. Apgar Score



(http://en.wikipedia.org/wiki/Apgar_score)

6.1.6. Pregnancy Complications included: (a) Pregnancy Induced Hypertension (PIH), defined as resting SBP >140 mmHg and/or DBP > 90 mmHg recorded in sitting position on two occasions 24 hours apart; (b) gestational diabetes defined as fasting blood glucose > 90 mg percent or 2 hrs post-prandial blood glucose > 140 mg percent; and (c) Intra uterine growth retardation (IUGR), defined as fetal growth < 10^{th} centile of Indian normative curve (Sanderson, 1994).

Figure. 5 IUGR CURVE



(Haram, 2006)

6.1.7. Gestational age at delivery. The week of gestation at delivery was documented.

6.1.8. Heart rate variability: (HRV)

Heart rate variability: Heart rate variability analysis was derived from continuous heart rate recording, at a sampling rate of 1024 Hz, using an ambulatory ECG system (Niviqure, Bangalore, India). R-R intervals were computed and the HRV power spectrum was obtained via a fast Fourier transformation algorithm using an appropriate software program

(HRV Analysis for Windows, version 1.1; Biosignal Imaging Group and Analysis, the University of Kuopio, Kuopio, Finland. Free download at: http:// bsamig.uku.fi/winhrv.shtml) (Niskanen et al., 2004). The energy in the specific frequency bands of HRV were expressed as normalized units for the low frequency (range, 0.05–0.15 Hz), and high frequency bands (range, 0.15–0.50 Hz), as recommended by the Task Force for Pacing and Electrophysiology (HRV, standard measurement, 1996). The low frequency of the LF band is mainly related to sympathetic modulation; the efferent vagal activity is a major contributor to the high frequency HF band; and the LF/HF ratio is a measure of sympathovagal balance (Malliani et al., 1991).

6.1.9. Perceived stress scale: (PSS)

Perceived stress scale is a widely used psychological instrument for measuring perception of stress (Hewitt et al., 1993 & Chattha et al., 2008). PSS is valid for use in the Indian population, with a Cronbach α for reliability of 0.84. This questionnaire consists of 10 questions about experiencing stress during the previous month and coping with the stress (Cohen et al., 1983) and has a 5-point scoring system, from 0 to 4, with reverse scoring for 4 positive items (the 4th, 5th, 7th, and 8th questions). The final score is a sum of the scores for all 10 items. The PSS questionnaire was administered before the first class, and again before the final class.

6.1.10. Pregnancy experiences Questionnaire: (PEQ)

The Pregnancy experiences Questionnaire addresses Pregnancy specific stressors and concerns experienced during pregnancy (Da Costa et al., 1992) PEQ has 41 questions related to somatic symptoms, Pregnancy, fetus/infant and parenting concerns, baby-image, and attitudes to sex. Women are asked to rate how severe each item has been for them in the past month on a three-point scale (1-3) with the total scores ranging from 41 to 123

with higher scores indicating higher stress levels. PEQ has good internal consistency (a ¼ 0.87-0.91) (Da Costa et al, 1999) with Test-retest reliability coefficients varying from 0.64-0.84 depending on the time period sampled (one to six months).

6.1.11. State Trait Anxiety Inventory: (STAI)

The state trait anxiety inventory (Spielberger et al., 1970) comprises two-self report scales for measuring two distinct anxiety concepts, the State-anxiety and trait anxiety. Both scales contain 20 statements that ask the respondent to describe how she feels at a particular moment (state-anxiety) or how she generally feels (trait anxiety). State anxiety is conceptualized as a transitory emotional state, where as trait anxiety refers to relatively stable individual differences in proneness to anxiety. The respondents were required to rate themselves on a four point Lickhert scale 'not at all' to very much so on various anxiety related symptoms which they experience in the past weeks for the state scale or how they generally feel for the trait scale (Spielberger et al., 1970). STAI is widely used and has been shown to have high reliability and validity (Spielberger, 1970 with a Cronbach's alpha of 0.88 and 0.83 for state (STAI-I) and trait anxiety (STAI-II) respectively (Huizink et al., 2004).

6.1.12. Hospital anxiety depression scale: (HADS)

Hospital anxiety depression scale is a self-assessment scale developed by Zigmond and Snaith (Zigmond et al., 1983). It is a widely used self-report instrument designed to assess the dimensions of anxiety and depression in non-psychiatric population (Herrmann et al., 1997 & Bjelland et al., 2002). It has 14 items that consist of two subscales of seven items each, to measure the levels of anxiety and depression. Each item is rated on a scale from 0 (not at all) to 3 (very much). This is a widely used reliable scale with Cronbach's alpha of 0.89 (Rodgers et al., 2005).

6.1.13. Pregnancy Related Anxiety Questionnaire (PRAQ)

Pregnancy related anxieties questionnaire-Revised version (Huizink et al., 2000) is an abbreviated version of anxiety scale developed originally by Van den Bergh, in 1990. It is used in obstetrics practice or in research as a short measure of the pregnant women's emotional state (Huizink et al., 2004) that refers to her specific fears and worries related to pregnancy and can be used for repeated measurements. This scale consists of ten items that fits into a three-factor model i.e. Fear of giving birth (3 items), fear of bearing a physically or mentally handicapped child (4 items) and concern about one's appearance (3 items). Women were asked to underline one of the five possible responses closest to their feeling related to her pregnancy (Huizink et al., 2004).

Scoring

PRAQ has a 5-point scale, ranging from 'never' to 'very often'. Cronbach's alpha of the subscales in different stages of pregnancy were all more than 0.76 (Huizink et al., 2003).

Fluency Test

Fluency refers to mental flexibility and it is measured in both verbal and visual modalities. Spontaneous flexibility requires a ready flow of ideas and answers, often in response to a single question (Eslinger et al., 1993). It is a measure of the intrinsic capacity to generate alternatives in a regulated manner (Spreen et al., 1998).

Verbal fluency refers to the capacity to generate new words in a regulated manner. Asking the subject to generate words beginning with a consonant is called Phonemic fluency whereas to generate words belonging to a category imposes the regulation is Category fluency.

6.1.14. Phonemic Fluency

Controlled Oral Word Association Test (Benton et al., 1989) is a measure of phonemic fluency. The subject generates words based on the phonetic similarity of words. The subject generates words beginning with the letters F, A, S. Proper nouns and names of numbers should be excluded. The same word should not be repeated with a different suffix. In our adaptation, the subjects who do not know the English language were asked to generate words in their mother tongue, commencing with the consonants "Ka", "Pa", "Ma". These consonants were chosen as they were effective in eliciting words in an earlier study carried out in our center (John et al., 1998).

Procedure

The subject is seated and told that he /she has to generate words beginning with a consonant that will be provided by the tester. A practice trial is given with the consonant other than the ones used in the test. The subject is asked to generate words for one minute for each consonant; for e.g. a word starting with the consonant `F' and ending with `S' or starting with 'Ka' and ending with `Ma'. After the subject has understood the task, the test is administered. After each one-minute trial, the subject is given a short rest pause before commencing the next trial.

Scoring

The total number of acceptable new words produced in one minute is noted for each trial. The average new words generated over 3 trials forms the score. Duration of the test was approximately 5 minutes.

6.1.15. Category Fluency

Category fluency measured by '**Animal Names Test'** is another form of verbal fluency. In category fluency, unlike in phonemic fluency, it is the content of the words, rather than the

phonetic similarity of the words, that is regulated. In a test, which measures category fluency, the subject generates words, which belong to a particular semantic category. The Animal names test (Lezak et al., 1995) requires the subjects to generate names of animals for one minute.

Procedure

The subjects are asked to generate the names of as many animals as possible in one minute. They are asked to exclude the names of fish, birds and snakes. The number of names generated formed the score.

Score

The total number of new words generated formed the score. Approximately the duration of this test was three minutes.

6.1.16. Design Fluency Test

The Design Fluency Test (Jones-Gotman et al., 1977) measures the ability to produce novel designs. It is a means of testing the visual fluency. Visual fluency is the capacity to generate new visual forms and it measures the regulation of thinking with visual imagery and visual forms. The designs should not represent actual objects or nameable abstract forms such as geometric designs. Therefore the subject is asked to produce new forms and not reproduce these forms from memory.

Procedure

The subjects were asked to draw as many new forms as possible in a given period of time. There are two conditions to this test: Free and Fixed conditions. In the Free condition, the subject is given 5 minutes to draw new designs. In the Fixed condition, the subject draws novel designs with the restriction that only four straight or curved lines may be used per design within four minutes. In both tests, the instructions include: the drawings should not

be geometric forms or similar to the previous designs or elaborations of a previous design, and should not be meaningful or capable of being named; scribbles are not permitted. Only one warning by the supervised is permitted if the subject commits any of the above mistakes. The score in each condition is the number of novel designs produced.

Scoring

The number of novel designs drawn in each condition formed the score for that condition. The novel design score is the total output minus the sum of [preservative responses + nameable drawings + drawings with the wrong number of lines (only for the fixed condition) + preservative responses including rotations or mirror-image versions of previous drawings + variations on a theme + complicated drawings that differ from previous ones by small details and scribbles]. There were two components in this test; Digit fluency 1: the novel design score for the free condition and Digit fluency 2: novel design score for the fixed condition. Duration of this test was approximately 12 minutes.

Response Inhibition

Response inhibition is a measure of executive control. The concept refers to the suppression of actions that are not required any more or that are inappropriate, which supports flexible and goal-directed behavior in ever-changing environments. This contributes to a better understanding of the processes involved in inhibiting a response and monitoring stopping performance, and more generally, discovering how behavior is controlled (Frederick et al., 2008).

6.1.17. Stroop Test

The color names "Blue", "Green", "Red" and "Yellow" were printed in capital letters on a paper. The color of the print occasionally corresponds with the color designated by the word. The words are printed in 16 rows and 11 columns.

Data Extraction

The stimulus sheet was placed in front of the subject. The subjects were asked to read the stimuli column-wise as fast as possible. The time taken to read all the 11 columns was noted down. Next, the subjects were asked to name the color in which the words were printed. This time also the subject proceeds column wise. The time taken to name all the colors were noted down. The words were presented in the mother tongue of the subjects.

Scoring

The reading time and the naming time were converted into seconds. The reading time was subtracted from the-naming time to get the Stroop effect score. Uncorrected errors were noted down separately for both the phases. '

Stroop effect score=Time taken to name- Time taken to read the words. (The time taken to complete this test was 20 minutes)

Working Memory

Working memory, a concept put forth by Baddeley refers to the capacity to hold and manipulate information for ongoing processes (Baddeley et al., 1986). This capacity is required to integrate the information with long-term memory and with other information being processed either serially or in parallel. Working memory is utilized when stimuli whose order of recall is predetermined are presented to the subject in quick succession. Although the stimulus organization and the strategy for task performance is provided to the subject, the subject has to remember the given, sequence of stimuli in order to perform the task.

6.1.18. Verbal Working Memory (N Back Test)

The verbal working memory system involves a phonological loop, consisting of a limited duration passive store for phonological codes (the phonological buffer) and an articulatory

rehearsal process that refreshes the buffer. The visuo-spatial sketchpad is a buffer responsible for the initial registration of non-verbal material. The sketchpad contains an imagistic mechanism through which the spatial information is rehearsed.

The 1 back and 2 back versions of the N back test (Smith et al., 1999) were used. The 1 back version requires verbal storage and rehearsal, while the 2 back version requires, in addition to the above, manipulation of information. Therefore the 1 back version would involve the Articulatory loop in the verbal modality and the visuospatial sketchpad in the visual modality. The 2 back version would involve the Central Executive in both modalities.

Data Extraction: -

Thirty randomly ordered Consonants common to multiple Indian languages are presented auditory at the rate of one per second. Nine of the 30 consonants are repeated. The consonants which are repeated are randomly chosen. In the 1 back test the subject responds whenever a consonant is repeated consecutively. In the 2 back test the subject responds whenever a consonant is repeated after an intervening consonant. The consonants used in the 1 back and the 2 back versions are given in the appendix.

Scoring: The number of hits and errors forms the score in each test. The total number of omissions and commissions form the errors. Omissions are defined as the number of repetitions, which are missed. Commissions are the number of non-repetitions wrongly identified as repetitions. Duration of the test is approximately 12 minutes.

6.1.19. Visual Working Memory (N Back Test)

Visual working memory was tested using N back tast with 1 back and 2 back version. It consisted of 36 cards each of which had one black dot placed randomly along a circle imagined to be on the card. The dimension and location of the imaginary circle on each

card remained constant in all cards. Each card was individuality presented to the subject. The subject was told to respond whenever the location of the dot repeated itself. In the 1 back test, she/he was told to respond when the location of the dots was consecutively repeated, and in the 2 back test he/she was told to respond whenever the location of the dot was repeated after one intervening card. The number of hits and errors in each test formed the score. The cards used in the test are given in the order of their presentation in the appendix.

Data Extraction:

1 Back Test: The subject is seated comfortably and the cards are successively presented to the subjects in pre determined order. Each card is exposed for one second and then placed down on the table. The subject is asked to say, "Yes" whenever the location of the dot on the cord is repeated in the successive card.

2 Back Test: The procedure is similar to the 1 back test except the following. The subject is asked to say "yes" if the location of the dot is repeated after one intervening card.

Scoring: In each condition of the N Back Test there are two scores. These are the correct responses coded as hits and some of the omissions commissions coded as error. Omissions are defined as the numbers of repetitions, which are missing. Commissions are the number of non-repetitions wrongly identified as repetitions. Duration of the test is approximately 10 minutes.

Data Extraction: - Thirty randomly ordered Consonants common to multiple Indian languages are presented auditory at the rate of one per second. Nine of the 30 consonants are repeated. The consonants which are repeated are randomly chosen. In the 1 back test the subject responds whenever a consonant is repeated consecutively. In the 2 back test the subject responds whenever a consonant is repeated after an intervening consonant. The

consonants used in the 1 back and the 2 back versions are given in the appendix.

Scoring: The number of hits and errors forms the score in each test. The total number of omissions and commissions form the errors. Omissions are defined as the number of repetitions, which are missed. Commissions are the number of non-repetitions wrongly identified as repetitions.

6.1.20. Quality of Life: WHOQOL-100

World Health Organization Quality of Life assessment instrument (WHOQOL-100) is a generic, client-completed measure of health-related quality of life that was simultaneously developed in 15 sites worldwide (WHOQOL-100, 1995). It is focused around the definition of quality of life advocated by the World Health Organization which includes the culture and context which influence an individual's perception of health (WHOQOL-100). It consists of six domains (physical health, psychological health, level of independence, social relationships, environment, spirituality/religion/personal beliefs) and 24 facets, each consisting of four 4 items, distributed across domains plus a general facet (overall quality of life and general health) (De Vire et al., 1997). The WHOQOL-100 instrument is widely used to compare the QOL of different populations. Its growing popularity is in part due to the substantial evidence that the questionnaire is sensitive and responsive to important changes in the physical and emotional domains of QOL (Bonomi et al., 2000).

Scoring: Items are scaled on 5-point Likhert scale and scoring is available for domain, facet, and overall - with higher scores indicating higher quality of life (De Vire et al., 1997).

6.1.21. Interpersonal relationship: FIRO-B

Fundamental Interpersonal Relations Orientation (FIRO) is a theory of interpersonal relations, introduced by William Schutz in 1958 (Schutz et al., 1958). The FIRO-B instrument measures behaviors driven by interpersonal needs in three areas - Inclusion, Control, and Affection; it addresses how such behaviors can affect one's interactions with others (Hammer et al., 2000). The 'need for Inclusion' refers to the extent to which individuals need to have social interactions and associations with others. The 'need for Control' refers to the extent to which individuals want to lead and influence others as well as the extent to which they prefer to be led and influenced (Hammer et al., 2000). The 'need for Affection' refers to the emotional connections between people and the extent to which individuals seek to establish relationships with others, particularly one-on-one relationships (Waterman et al., 1996). The FIRO-B instrument measures the extent to which each of these interpersonal needs is expressed or wanted (Schnell et al., 1993). 'Expressed needs' refer to behaviors the individuals demonstrate toward others, whereas 'wanted needs' refers to the behaviors individuals prefer to have exhibited toward them by others (Schutz et al., 1958). The FIRO-B instrument also measures overall needs (e.g., Total Inclusion) and overall behaviors (e.g., Total Expressed), and provides an overall Interpersonal Need Score. The standard FIRO-B questionnaire consists of six different spheres: Expressed Inclusion (EI), Wanted Inclusion (WI), Expressed Control (EC), Wanted Control (WC), Expressed Affection (EA), and Wanted Affection (WA) (Schutz et al., 1958).

Reliability and Validity: Respondents receive a numerical score as well as a categorical score (low, medium, or high) for each measure. The current norm sample for the FIRO-B instrument includes a U.S. national sample of 3,091 individuals who took the assessment in

1997 (Hammer et al., 2000). In examining the internal consistency reliability of each measure for the national sample, results indicate that reliability coefficients for all measures are satisfactory, ranging from .85 to .96. Test-retest reliability coefficients also demonstrate good reliability - ranging from .71 to .85 for three different samples reported in the FIRO-B® Technical Guide (Hammer et al., 2000). FIRO (Fundamental Interpersonal Relations Orientation).

Scoring:

To derive interpersonal orientation scores, there are six columns, each with items and keys. Each column refers to an interpersonal need listed in the chart at the bottom of the page. Items in the column refer to question numbers on the questionnaire; Keys refer to answers on each of those items. If the answered an item using any of the alternatives in the corresponding key column, circle the item number on this sheet. When all of the items for a single column, count up the number of circled items and placing the number in the corresponding box in the chart. These numbers will give the strength of interpersonal need in each of the six areas. The highest possible score is 9. The lowest score is 0 (Ryan et al., 1977).

6.2. DATA ANALYSIS

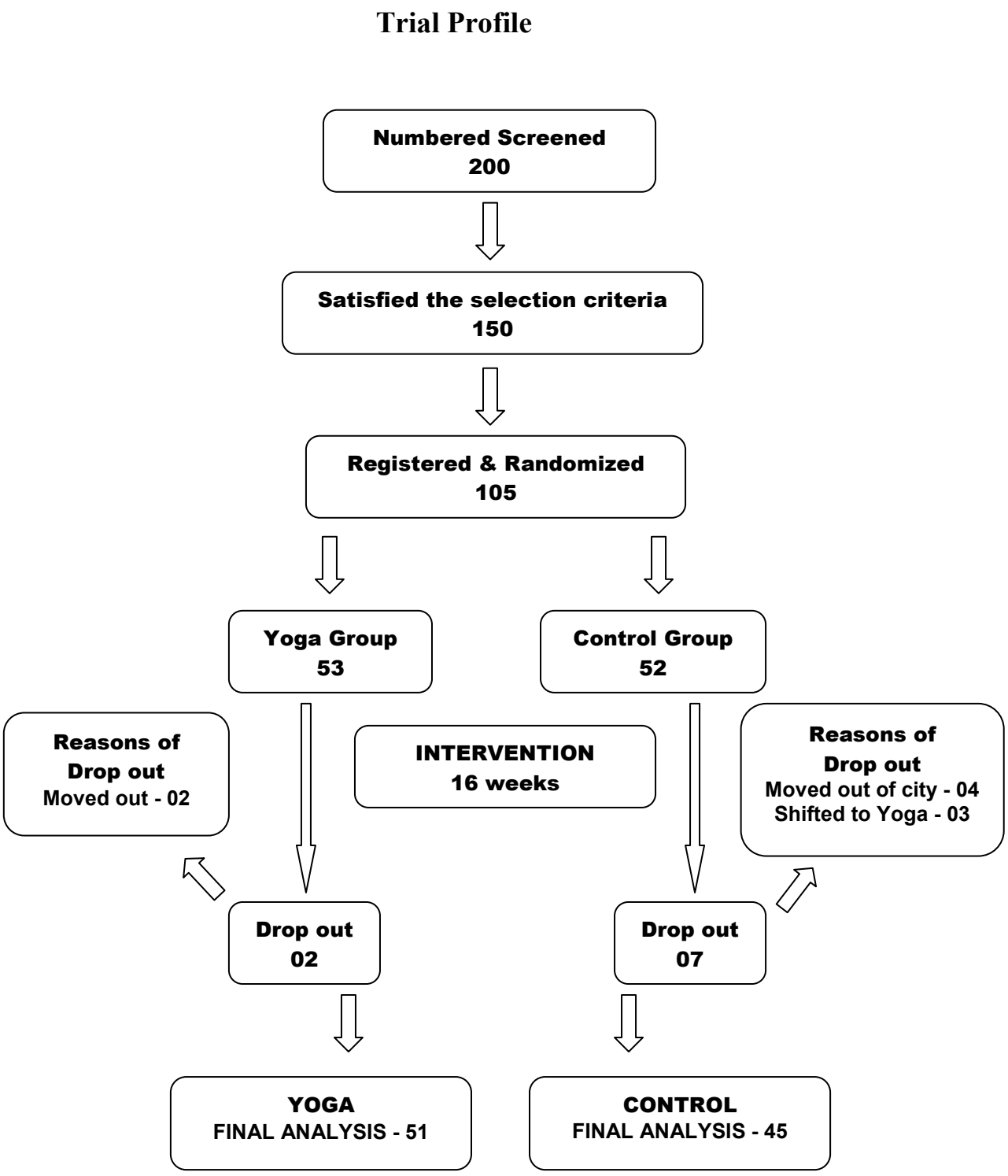
Statistical analysis was done using SPSS, version 10.0 (SPSS, Chicago, IL, USA). Chi squared and 'Independent Samples' tests were used for baseline comparisons. The values were checked for normal distribution by the Shapiro-Wilk's test. Mann-Whitney and Wilcoxon's Signed Ranks test were used to compare means for the data that were not normally distributed for between and within groups' comparisons respectively. Pre-post differences within groups and between groups were checked using repeated measures analysis of variance for the data that were normally distributed.

CHAPTER 7

RESULTS

Figure 6 shows the trial profile. Out of 200 women who were screened, 150 women satisfied the selection criteria. Of these, 105 who agreed to participate in the study were randomized into yoga and control groups, and 96 women (51 yoga and 45 controls) completed the study. The reasons for dropouts (9 women) were: 3 women from control group shifted to yoga because of increasing popularity of yoga in society. Six of them (2 from yoga and 4 from control group) moved out of Bengaluru in third trimester to their mother's house as a part of the cultural practice in south India, (the daughter has to be with her parents for the first delivery), although they had signed the informed consent form before recruitment and registered for that their delivery in this hospital.

Figure. 6 - Trial profile. Of the 200 women screened, 96 completed the study.



7.1 DEMOGRAPHY

Table shows the maternal characteristics. The baseline values of the two groups were matched on all variables ($p > .05$; independent samples *t* test and Chi- squared test).

TABLE 7.1.1. DEMOGRAPHIC DATA (Participant Characteristics)

Variables		Yoga (N=51)	Control (N=45)
		Mean ± S.D	Mean ± S.D
Age in years		26.41±3.01	24.96±2.58
Height (Inches)		63.67±1.81	62.84±1.98
Gravida *	Primi	45 (88%)	39 (87%)
	Secunda	6 (12%)	6 (13%)
Occupation*	Working	33 (65%)	22 (49%)
	Housewives	18 (35%)	23 (51%)
Weight (kgs)^	Pre[1]	63.69±9.67	61.56±8.56
	Post[2]	71.82±9.90	69.91±8.84
BMI^	Pre[1]	24.97±3.52	25.05±3.80
	Post[2]	28.54±3.60	28.55±3.86
BP(mm of Hg) ^ (Systolic)	Pre[1]	114.71±14.74	115.07±8.13
	Post[2]	117.25±9.61	118.00±8.15
BP^ (Diastolic)	Pre[1]	73.12±5.43	72.40±6.56
	Post[2]	75.06±5.33	75.84±6.24

*Chi square test; ^independent samples' test. [1]: 20th week, [2]: 36th week.

Abbreviations: BMI- Body mass index, BP- Blood pressure.

Note: Non- significant (p>0.05) difference between groups in all variables.

OUTCOME MEASURES

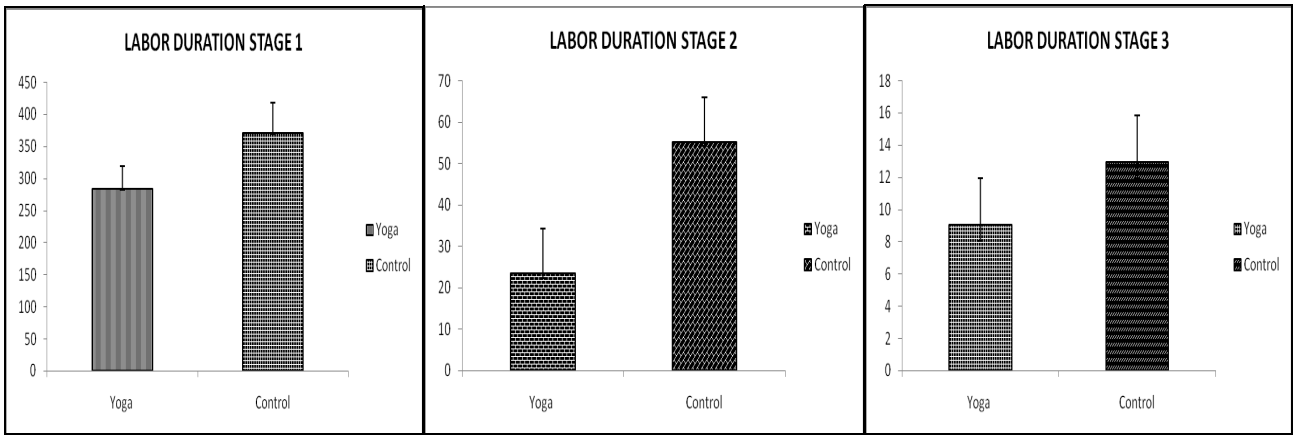
7.2 EFFECT OF YOGA ON BIRTH OUTCOMES

7.2.1. Duration of labor: The duration of all three stages of labor was significantly lower in the yoga group as compared to the control group at $p<0.001$ (independent *t* test). The first stage of labor was 371.11 ± 47.17 minutes in the control group and 283.63 ± 35.11 minutes in the yoga group, with a difference of 23.57%. The second stage was 55.19 ± 10.87 minutes in control group and 23.41 ± 7.68 minutes in the yoga group, with a difference of 57.60%. The duration of the third stage was 12.96 ± 2.86 and 9.07 ± 2.35 minutes in the control and yoga groups, respectively, with a difference of 30.00%.

TABLE.7.2.1.1. LABOR DURATION: Results of parturition data in both groups.

Variables	Yoga			Control			Effect size	% changes	Between groups Sig. P***
	Mean ±S.D	95% CI		Mean ±S.D	95%CI				
		Lower	Upper		Lower	Upper			
L.D., Stage 1 (mins)	283.63*** ±35.11	272.96	294.31	371.11 ±47.17	352.44	389.77	2.10	23.57	0.001
L.D., Stage 2 (mins)	23.41*** ±7.68	21.07	25.75	55.19 ±10.87	50.88	59.49	3.37	57.6	0.001
L.D., Stage 3 (mins)	9.07*** ±2.35	8.35	9.78	12.96 ±2.86	11.83	14.10	1.48	30	0.001
***Independent sample t test, CI-Confidence Interval, L.D.: Labor Duration, mins: minutes Note: Yoga group showed significantly lesser Duration of Labor in all three stages.									

GRAPH: 7.2.1.1. LABOR DURATION



7.2.2. Mode of Delivery

TABLE 7.2.2.1. Duration of Labor in Three Stages: Frequency Distribution.

Yoga (n 44), control (n 27). χ^2 test for significance.

Stage 1[1]			Stage 2[2]			Stage 3[3]		
Duration in minutes	Frequency		Duration	Frequency		Duration	Frequency	
	Yoga	Control	Minutes	Yoga	Control	Minutes	Yoga	Control
<300	15	1	15-19	2	0	3-6	8	1
300-310	26	2	20-29	30	1	7	1	0
311- 360	3	16	30-39	10	1	8	4	0
361-420	0	7	40-49	1	3	9-10	29	9
>420	0	1	50-60	1	22	11-15	2	17

Stage1-cervical dilatation 3cms to full dilatation; [2] stage 2-completion of baby's delivery; [3]stage 3-completion of delivery of placenta.

41/44 in yoga and 3/27 on control completed stage 1 within 310 minutes.

42/44 in yoga and 2/27 on control completed stage 2 within 30 minutes.

42/44 in yoga and 10/27 on control completed stage 1 within 10 minutes

The number of normal vaginal deliveries was higher and the cesarean sections was fewer ($p < 0.004$) in the yoga group (14%) than in the control group (40%) with an odds ratio of 0.23 between vaginal delivery versus cesarean section and a confidence interval of 0.64 - 0.08. The reasons for cesareans in the two groups are presented in another table.

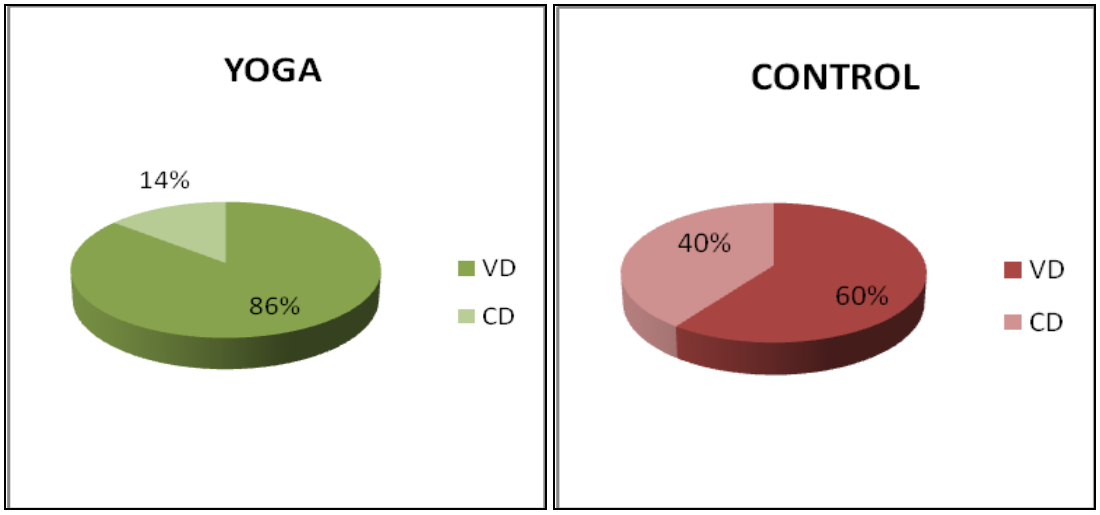
MODE OF DELIVERY

TABLE. 7.2.2.2. Parturition data: Mode of delivery

Variables Mode of Delivery	Yoga (n=51)		Control (n=45)		Difference between gps			
					95% CI		χ^2	Odd's
	N	%	N	%	Upper	Lower	Sig P	Ratio
Vaginal delivery	44	86	27	60	0.64	0.08	0.004	0.23
Cesarean section	7	14	18	40				
Abbreviations: CI- confidence interval								
Notes: Yoga group shows significantly fewer numbers of Cesarean sections compared to c								

GRAPH: **7.2.2.2.** MODE OF DELIVERY

(CD –Caesarean delivery; VD –Vaginal delivery)



MODE OF DELIVERY**:**

The reasons for cesareans in the two groups were as follows (Table 5): (a) maternal–medical conditions: yoga 14% (1/7) and control 17% (3/18); (b) malpresentation: yoga 29% (2/7) and control 11% (2/18); (c) fetal distress: yoga 14% (1/7) and control 17% (3/18); (d) fetal condition: yoga 0% (0/0) and control 6% (1/18); (e) failed induction: yoga 14% (1/7) and control 6% (1/18); and (f) failure to progress: yoga 29% (2/7) and control 44% (8/18). There was non significant between yoga and control groups except in "failure to progress." Among those who had vaginal deliveries, the following Subgroups were noted: (a) induced labor: yoga 5% (2/44) and control 11% (3/27); (b) spontaneous delivery: yoga 95% (42/44); and control 89% (24/27). The number of women who had spontaneous labor was significantly higher in yoga than the control group.

TABLE: 7.2.2.3. Changes in mode of delivery after the intervention in both groups.

Variables			Yoga		Control	
			N	%	N	%
MD	VD	Total	44 /51	86	27 /45	60
		IL	2 /44	5	3 /27	11
		SL	42 /44	95	24 /27	89
		NL	33 /42	79	17 /24	71
		ID	9 /42	21	7 /24	29
	CS	Total	7 /51	14	18 /45	40
		MMC	1 /7	14	3 /18	17
		MP	2 /7	29	2 /18	11
		FTP	2 /7	29	8 /18	44
		FD	1 /7	14	3 /18	17
		FC	0	0	1 /18	6
		FI	1 /7	14	1 /18	6

Abbreviations: MD – Mode of delivery, VD- vaginal delivery, CS- caesarean, sections, Com - complications of pregnancy, MMC-Maternal medical condition, MP-Mal presentation, FTP-Failure to progress, FD-Fetal distress, FC- Fetal Condition, FI- Failed Induction., IL-induced Labor, SL- spontaneous labor, ND – Normal Delivery, ID – Instrumental Delivery.

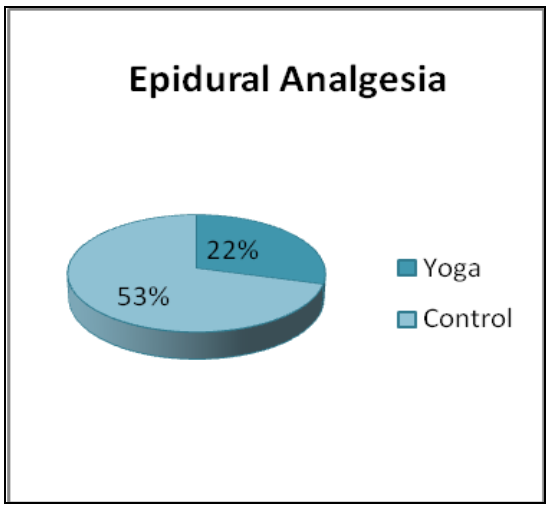
7.2.3. Analgesia requirement

The number of women who required epidural analgesia during labor was fewer (p<0 .001) in the yoga group (11/51) than the control group (24/45) with an odds ratio of 0.24 and a confidence interval of 0.11–0.59.

TABLE: 7.2.3.1. Requirement of analgesia

Variables	Yoga (n=51)		Control (n=45)		Difference between gps			
					95% CI		χ^2 test Sig P	Odd's Ratio
	N	%	N	%	Upper	Lower		
Epidural analgesia	11	22	24	53	0.58	0.09	0.001	0.24
Abbreviations: CI- confidence interval Legend: Yoga group shows significantly fewer numbers requiring Epidural Analgesia.								

GRAPH: 7.2.3.1. REQUIREMENTS OF ANALGESIA



7.3. EFFECT OF YOGA ON FETAL OUTCOME

7.3.1. Birth weight

The birth weight of babies was higher in the yoga group than control group with a mean difference of 0.35 kg (p<0.001).

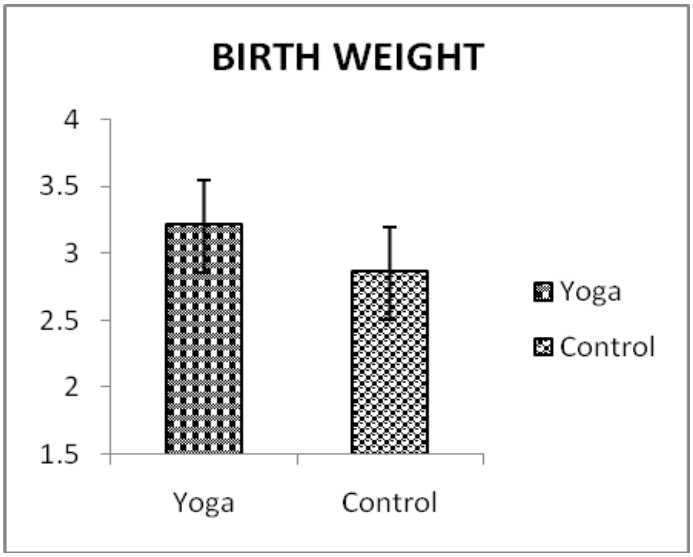
TABLE: 7.3.1.1. Birth weight: Results of parturition data in both groups

Variables	Yoga			Control			Effect size	% changes	Between groups Sig. P***
	Mean ±S.D	95% CI		Mean ±S.D	95%CI				
		LB	UB		LB	UB			
B.W.	3.22*** ±0.33	3.13	3.32	2.87 ±0.37	2.75	2.98	0.99	12.19	0.001

CI-Confidence Interval, LB: Lower Bound, UB: Upper Bound, B.W.: Birth weight, Independent sample t test.

Legend: Yoga group showed significantly higher birth weight than control group.

GRAPH: 7.3.1.1. BIRTH WEIGHT

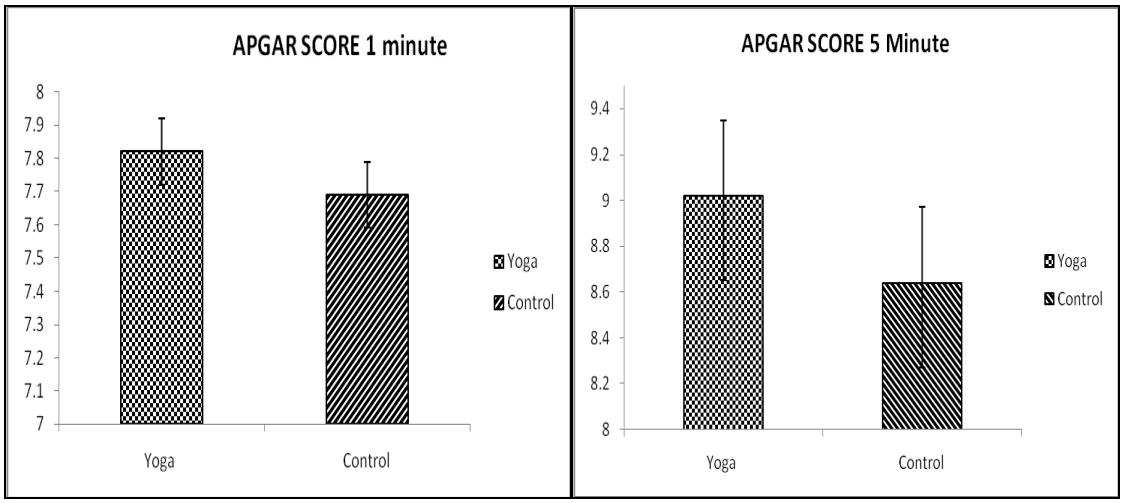


7.3.2. Apgar scores: Apgar scores: first minute Apgar scores showed no significant difference between groups ($p<0.221$). Fifth minute scores were significantly higher in the yoga group than the control group ($p<0.001$).

TABLE: 7.3.2.2. Apgar score: Results of parturition data in both groups.

Variables	Yoga			Control			E.S	% changes	Between groups Sig. P***
	Mean ±S.D	95% CI		Mean ±S.D	95%CI				
		LB	UB		LB	UB			
A.S. (1 min)	7.82 ±0.56	7.67	7.98	7.69 ±0.51	7.53	7.84	0.24	1.69	0.221
A.S. (5min)	9.02 *** ±0.55	8.87	9.17	8.64 ±0.48	8.50	8.79	0.73	4.39	0.001
CI- Confidence Interval, E.S: Effect Size, A.S.: Apgar score, LB: Lower Bound, Upper Bound. Independent sample t test, Legend: Yoga group showed significantly higher '5th minute Apgar score' of the infants than the control group.									

GRAPH: 7.3.2.2. APGAR SCORE (1 Minute) GRAPH: 7.3.2.3. APGAR SCORE (5 minute)



7.4 RESULTS OF YOGA ON MATERNAL PARAMETERS

7.4.1. Complications of pregnancy

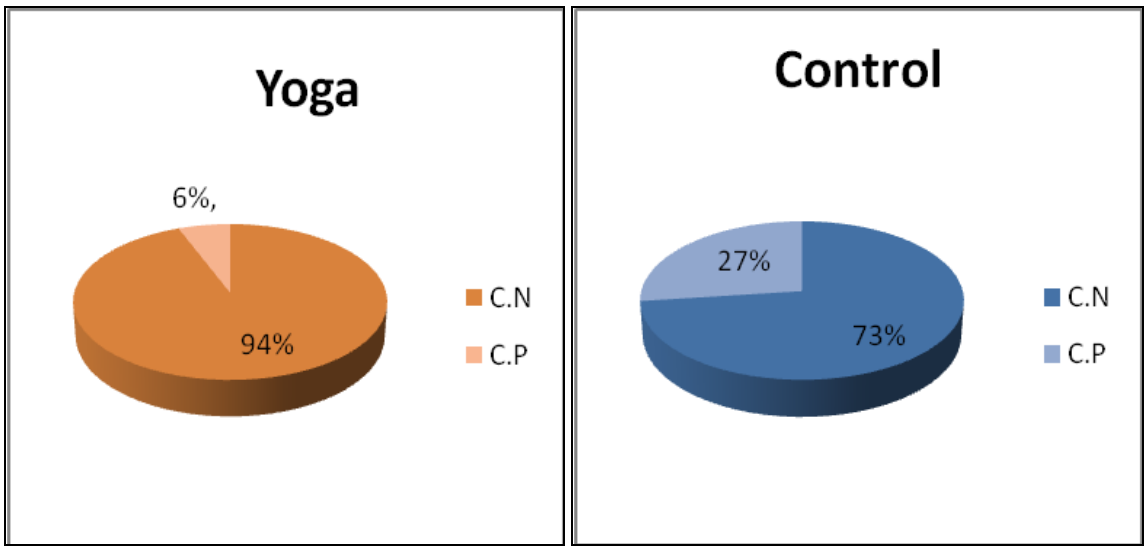
The total number of pregnancy complications was fewer in the yoga group compared to the control group ($p<0.01$) with an odd's ratio of 0.17. The subgroup analysis for different complications is also presented.

TABLE: 7.4.1.1.Complications of Pregnancy

Variables		Yoga (n=51)		Control (n=45)		Difference between gps			
						95% CI		Sig P *	Odd's Ratio
		N	%	N	%	UB	LB		
preg Compl	nil	48	94	33	73	0.65	0.04	0.010	0.17
	present	3	6	12	27				

* χ^2 test. Abbreviations: CI- confidence interval; Preg Compl - complications of pregnancy, Legend: Yoga group shows significantly fewer complications compared to control group.

GRAPH: 7.4.1.1. COMPLICATION OF PREGNANCY



COMPLICATION OF PREGNANCY

Table **7.**4.1.2. shows the subgroup analysis for different complications: (a) IUGR: yoga 0% (0/51) and control 7% (3/45); (b) PIH: yoga 6% (3/51) and control 11% (5/45); (c) gestational diabetes: yoga 0% (0/51) and control 4% (2/45); and (d) preterm delivery: yoga 0% (0/51) and control 4% (2/45).

TABLE: 7.4.1.2. Subgroup analysis of complications of pregnancy after the intervention.

Variables		Yoga		Control	
		N	%	N	%
Complication of Pregnancy	TOTAL	3/51	6	12 /45	27
	IUGR	0	0	3 /45	7
	PIH	3/51	6	5 /45	11
	GDM	0	0	2/45	4
	PTD	0	0	2/45	4
	Nil	48/51	94%	33/45	73
Abbreviations: EPA - Epidural analgesia , IUGR – Intra Uterine Growth Retardation, PIH- Pregnancy Induced Hypertension, GDM – Gestational Diabetic mellitus, PTD- Pre Term Delivery.					

7.4.2. Gestational age at delivery

There was no significant difference between groups in the gestational age at delivery.

7.5. AUTONOMIC VARIALBES

7.5.1. HEART RATE VARIABILITY (HRV)

Difference between PRE and DURING the sessions of DRT and SR.

Values for the components of the HRV spectrum (LF, HF, and the LF/ HF ratio) during the DRT period of the yoga module (yoga group) and the SR (supine rest) period of the exercise session (control group) are shown**.** Compared with the values obtained before the session, the LF band power (a measure of sympathetic tone) and the values for LF/HF ratio decreased and the HF band power increased during both DRT and SR ($P<0.001$), with a significant difference between the 2 groups ($P<0.001$). In the 36th week the degree of response to DRT (immediate effect) was significantly higher in the yoga group whereas the degree of response to SR was reduced in the control group.

TABLE. 7.5.1.1. HEART RATE VARIABILITY (HRV)

Difference in HRV between PRE and DURING sessions of DRT and SR periods in the 20th and 36th weeks of pregnancy in both groups (n=45).

Week	HRV band	Grp	PRE	DURING	% changes (Pre-During)	ES (Pre vs During)	Confidence Interval				*P* value Pre-During
							PRE		DURING		
							Lower	Upper	Lower	Upper	
20th	LF	DRT	74.76 ±5.87	58.64 ±11.72	-21.6	1.74	73.00	76.52	55.11	62.16	0.001*
		SR	73.31 ±7.95	40.84 ±15.42	-44.3	2.65	70.92	75.70	36.21	45.48	0.001*
	HF	DRT	25.23 ±5387	41.35 ±11.73	63.9	1.74	23.47	27.00	37.83	44.88	0.001*
		SR	26.74 ±7.96	59.28 ±15.35	121.7	2.66	24.35	29.14	54.66	63.89	0.001*
	LF /HF	DRT	3.51 ±0.21	1.59 ±1.07	-54.7	2.49	2.94	3.37	1.26	1.91	0.001*
		SR	2.89 ±0.83	0.92 ±0.87	-68.2	2.32	2.68	3.15	0.66	1.18	0.001*
36th	LF	DRT	76.31 ±4.85	41.97 ±12.17	-45.0	3.71	74.86	77.77	38.31	45.63	0.001*
		SR	74.17 ±9.53	51.23 ±14.03	-30.9	1.91	71.31	77.03	47.02	55.45	0.001*
	HF	DRT	23.24 ±4.91	58.02 ±12.17	149.7	3.75	21.76	24.72	54.36	61.68	0.001*
		SR	25.04 ±7.20	49.44 ±15.15	97.4	2.06	22.88	27.21	44.89	54.00	0.001*
	LF /HF	DRT	3.46 ±0.78	0.88 ±0.49	-74.6	3.96	3.22	3.70	0.73	1.03	0.001*
		SR	3.20 ±0.86	1.23 ±0.80	-61.6	2.37	3.20	2.94	0.99	1.48	0.001*

* Repeated measures analysis of variance.

Abbreviations: CI- confidence interval; ES- Effect size. DRT- Deep relaxation techniques; HF- High frequency; LF- low frequency; LF/HF: LF HF ratio; SR- Supine rest.LB: Lower bound,

Legend: Yoga group shows significantly higher changes after DRT compared to changes after SR in control group.

TABLE. 7.5.1**.2.** HEART RATE VARIABILITY (HRV)

Difference between PRE and POST sessions of DRT and SR.

The corresponding values after the DRT period of the yoga module (yoga group) and the SR period of the exercise session (control group) are shown in Table 7.5.1.2. In the 36th week, compared with the values obtained before the session, the LF band power was significantly reduced after the DRT period ($P<0.001$) but not after the SR period. Moreover, the reduction in the LF/HF ratio and the increase in the HF band power, which were not significant in the 20th week, were significant after both DRT and SR in the 36th week ($P<0.001$), indicating improved autonomic response after both practices.

TABLE. 7.5.1.2. HEART RATE VARIABILITY (HRV)

Difference in HRV between PRE and POST sessions of DRT and SR periods in the 20th and 36th weeks of pregnancy in both groups (n=45).

Week	HRV	Group	PRE	POST	% changes (Pre-Post)	ES (Pre/ Post	Confidence Interval				*P* value Pre-Post
							PRE		POST		
							UB	LB	UB	LB	
20th	LF	DRT	74.76 ±5.87	74.05 ±6.64	-0.9	0.15	73.00	76.52	72.06	76.05	NS
		SR	73.31 ±7.95	70.51 ±11.55	-3.8	0.32	70.92	75.70	67.04	73.98	NS
	HF	DRT	25.23 ±5.87	25.95 ±6.63	2.9	0.15	23.47	27.00	23.95	27.94	NS
		SR	26.74 ±7.96	29.39 ±11.60	9.7	0.31	24.35	29.14	25.90	32.87	NS
	LF /HF	DRT	3.51 ±0.21	3.07 ±0.95	-12.5	0.50	2.94	3.37	2.79	3.36	NS
		SR	2.89 ±0.83	2.81 ±1.15	-2.8	0.07	2.68	3.15	2.46	3.15	NS
36th	LF	DRT	76.31 ±4.85	72.51 ±6.00	-5.0	0.63	74.86	77.77	70.70	74.31	0.001
		SR	74.17 ±9.53	70.86 ±7.44	-4.5	0.33	71.31	77.03	68.62	73.10	NS
	HF	DRT	23.24 ±4.91	27.52 ±5.98	18.4	0.78	21.76	24.72	25.72	29.32	0.001*
		SR	25.04 ±7.20	29.13 ±7.44	16.3	0.49	22.88	27.21	26.89	31.37	0.006
	LF /HF	DRT	3.46 ±0.78	2.79 ±0.75	-9.4	0.83	3.22	3.70	2.56	3.02	0.001*
		SR	3.20 ±0.86	2.64 ±0.90	-17.5	0.61	3.20	2.94	2.37	2.92	0.001*

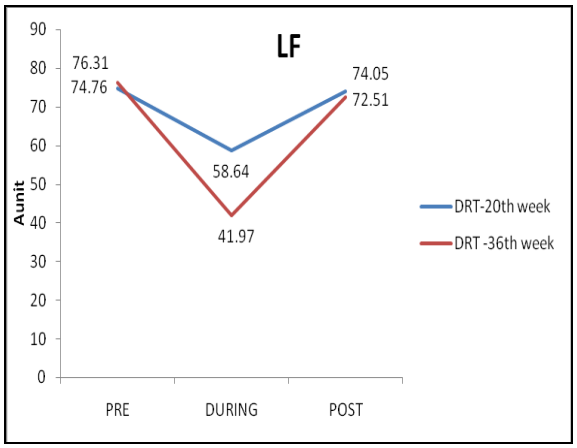
* Repeated measures analysis of variance.

Abbreviations: CI- confidence interval; ES- Effect size. DRT- Deep relaxation techniques; HF- High frequency; LF- low frequency; LF/HF: LF HF ratio; SR- Supine rest.

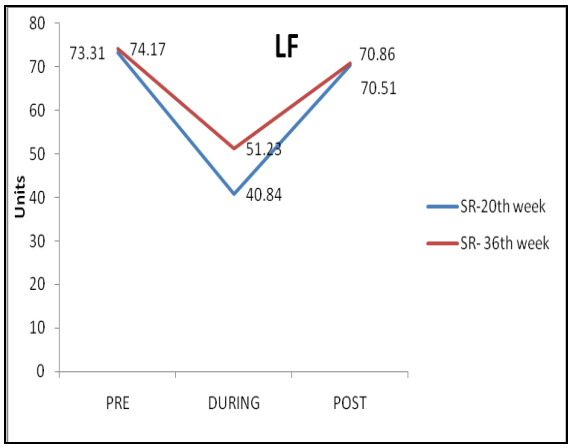
Legend: Yoga group shows significantly higher changes after DRT compared to changes after SR in control group.

HRV: GRAPH

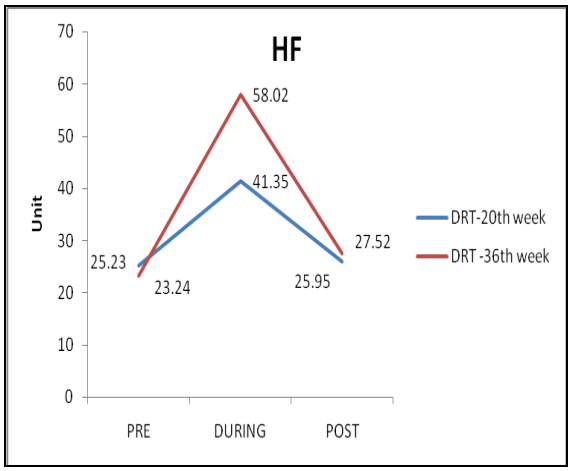
GRAPH.7.5.1.1. HRV (LF) in DRT.



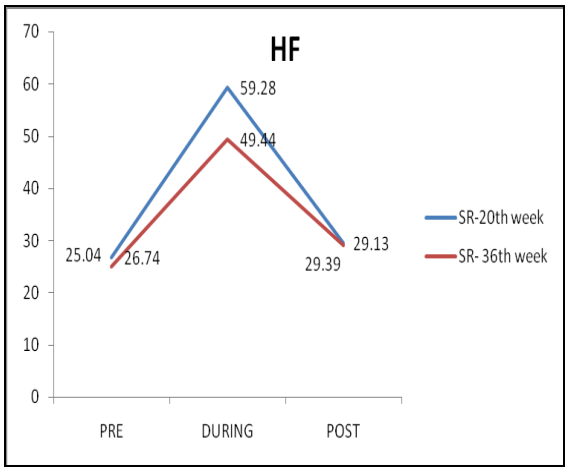
GRAPH. 7.5.1.2: HRV (LF) in SR.



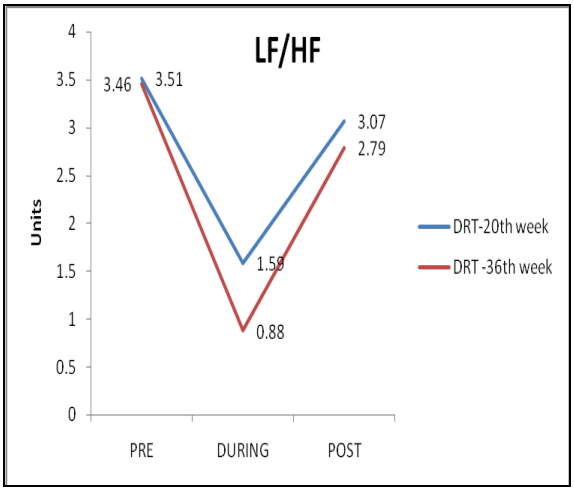
GRAPH.7.5.1.3. HRV (HF) in DRT.



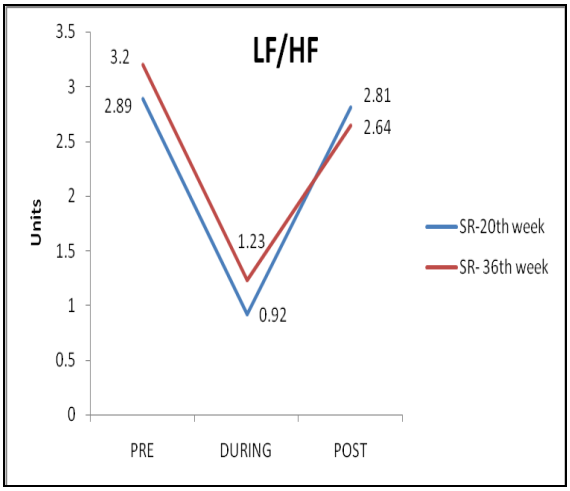
GRAPH. 7.5.1.4: HRV (HF) in SR.



GRAPH.7.5.1.5. HRV (LF/HF) in DRT.



GRAPH. 7.5.1.6: HRV (LF/HF) in SR.



7.6. RESULTS OF YOGA ON PSYCHOLOGICAL MEASURES

7.6.1. Perceived stress scale (PSS)

The mean baseline scores were 15.9 in the yoga group and 15.4 in the control group. These are marginally higher than the mean scores (14.1) in India for normal healthy volunteers. The mean perceived stress reduced by 31.57% in the yoga group and increased by 6.60% in the control group, and the difference was significant (P<0.001).

TABLE. 7.6.1.1. PERCEIVED STRESS SCALE (PSS)

Changes after intervention in both groups N=51(Y) & 45=(C).

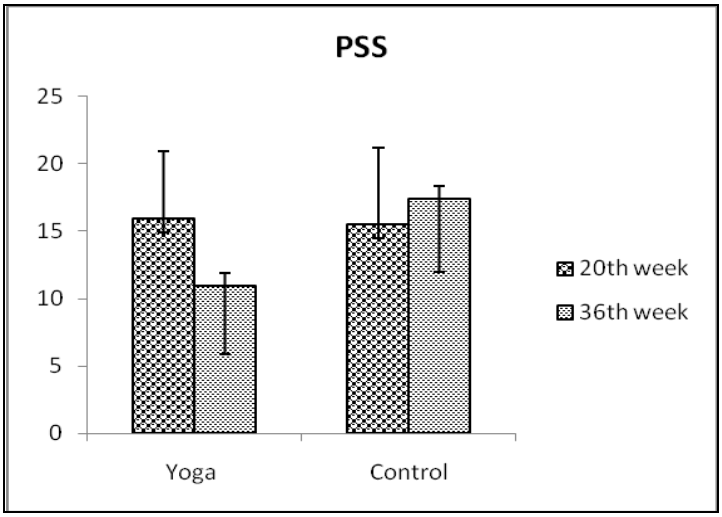
	Grp	20th week	36th week	ES	% change	Confidence intervals				P values	
						20th Week		36th Week		With in groups***	Between groups***
						LB	UB	LB	UB	Pre-Post	Post-Post
PSS	Y	15.90 ±5.01	10.88*** ± 4.97	0.29	31.57↓	14.49	17.31	9.48	12.28	0.001	0.001
	C	15.43 ±5.70	17.33** ±5.34	0.26	6.60↑	13.83	17.03	15.83	18.83	0.002	

Wilcoxon's signed ranks test (within groups); Mann Whitney U test (Between groups)

Abbreviations: ES: Effect size; PSS: Perceived stress scale.

Legend**:** There is significant difference between groups with better improvement in yoga group in perceived scale.

GRAPH: 7.6.1.1. PSS



7.6.2. Pregnancy Experience Questionnaire (PEQ): Pregnancy related experience questionnaire showed significantly better improvement in the yoga (26.86%, $p < 0.001$) group with significant difference between groups ($p < 0.001$).

TABLE. 7.6.2.1. PREGNANCY EXPERIENCE QUESTIONNAIRE (PEQ)

Changes after intervention in both groups N=51(Y) & 45=(C).

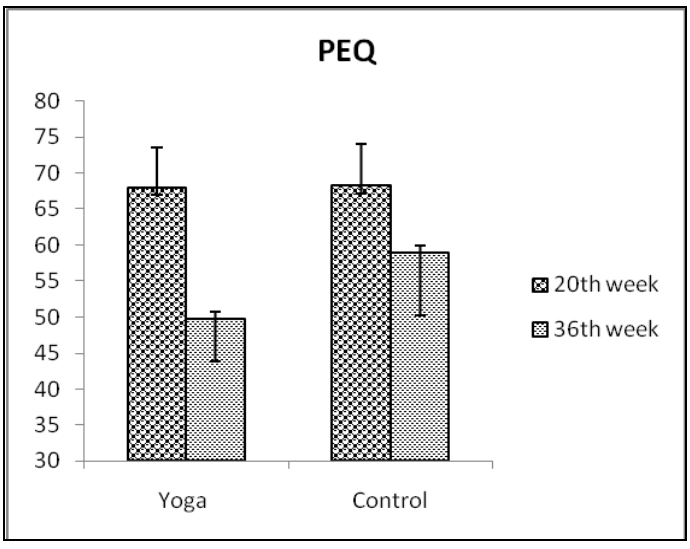
	Grp	20th weeks	36th weeks	E.S	% differ	Confidence intervals				Sig- P values ***	
						20th Week		36th Week			
						LB	UB	LB	UB	Within Gps Pre /Post	Between Gps Post/ post
PEQ	Y	68.02 ±5.47	49.75*** ±5.99	2.55	26.86↓	66.48	69.56	48.06	51.43	0.001	0.001
	C	68.20 ±5.84	58.96*** ±8.81	1.37	13.55↓	66.45	69.95	56.31	61.60	0.001	

Wilcoxon's signed ranks test (within groups); Mann Whitney U test (Between groups).

Abbreviations: LB: Lower Bound, UB: Upper Bound.

Legend: There is significant difference between groups with better improvement in yoga group in pregnancy experience.

GRAPH: 7.6.2.1. PEQ



7.6.3. State trait anxiety inventory (STAI)

State (STAI I) anxiety reduced in yoga (15.65%, $p < 0.001$) with significant difference between groups ($P < 0.001$); it increased in the control group (13.76 %, $p < 0.007$); Trait (STAI II) anxiety also reduced in yoga (8.97%, $p < 0.001$) and increased in the control group (5.02%, $p < 0.09$) with significant difference between groups ($p < 0.001$).

TABLE. 7.6.3.1. STATE TRAIT ANXIETY INVENTORY (STAI)

Changes after intervention in both groups N=51(Y) & 45=(C).

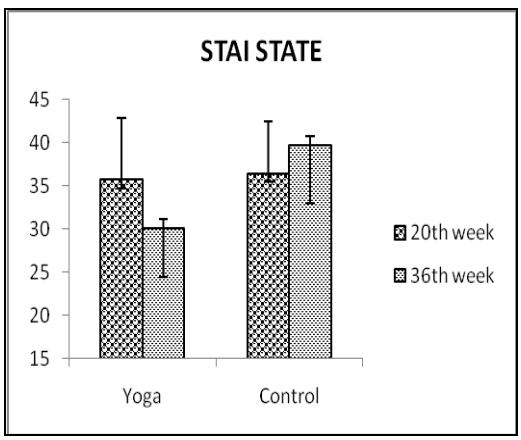
Variable	Grp	20th weeks	36th weeks	ES	% differ	Confidence intervals				Sig- P values ***	
						20th Week		36th Week			
						LB	UB	LB	UB	Within Gps Pre/Post	Between Gps Post / post
STAI-I	Y	35.71 ±7.10	30.12*** ±5.72	0.99	15.65↓	33.89	37.7	28.75	32.04	0.001	0.001
	C	36.44 ±5.99	39.71 ±6.8	0.68	13.76↑	34.18	37.7	36.76	41.04	0.007	
STAI-II	Y	36.18 ±6.81	31.20*** ±6.16	0.43	8.97↓	34.47	38.1	29.66	33.02	0.001	0.001
	C	37.64 ±5.93	39.53 ±7.20	0.26	5.02↑	35.36	38.8	36.40	40.83	0.090	

Wilcoxon's signed ranks test (within groups); Mann Whitney U test (between groups).

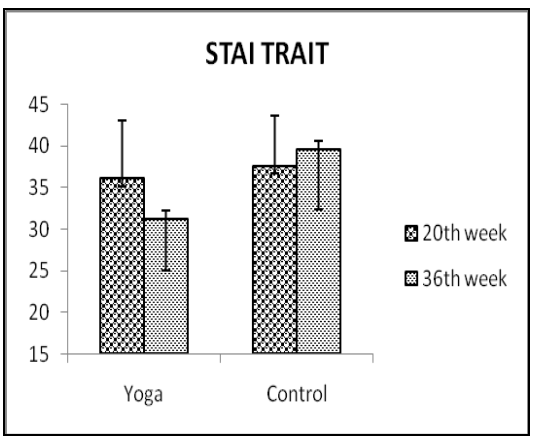
Abbreviations: LB: Lower Bound, UB: Upper Bound,

Legend: Yoga group shows significantly changes compared to control group.

GRAPH. 7.6.3.1. STAI (STATE)



GRAPH. 7.6.3.2. STAI (TRAIT)



7.6.4. Hospital anxiety & depression scale (HADS)

Anxiety as measured by HADS also reduced in yoga (29.12%, $p < 0.001$) with significant difference between groups ($p < 0.001$). Depression (HADS) reduced in yoga (30.67%, $p < 0.001$) with significant difference between groups ($p < 0.001$).

TABLE. 7.6.4.1. HOSPITAL ANXIETY DEPRESSION SCALE (HADS)

Changes after intervention in both groups N=51(Y) & 45=(C).

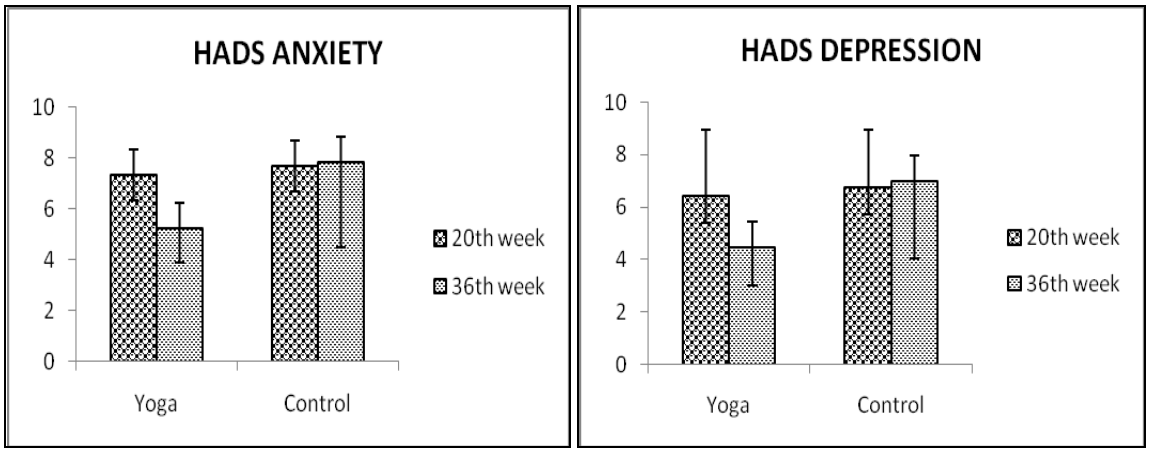
Variable	Grp	20th weeks	36th weeks	Effect Size	% differ	Confidence intervals				Sig- P values ***	
						20th Week		36th Week		Within Gps Pre/ Post	Between Gps Post/ post
						LB	UB	LB	UB		
HADS Anxiety	Y	7.35 ± 2.45	5.22*** ± 1.36	0.910	29.12↓	6.66	8.04	4.83	5.60	0.001	0.001
	C	7.69 ± 2.84	7.82 ± 3.43	0.048	1.69↑	6.84	8.54	6.79	8.85	0.731	
HADS Depression	Y	6.39 ±2.55	4.43*** ±1.39	0.796	30.67↓	5.67	7.11	4.04	4.82	0.001	0.001
	C	6.73 ±2.22	6.98 ±2.91	0.091	3.57↑	6.07	7.40	6.10	7.85	0.592	

Wilcoxon's signed ranks test (within groups); Mann Whitney U test (between groups).

Abbreviations: LB: Lower Bound, UB: Upper Bound,

Legend: Yoga group shows significantly changes compared to control group.

GRAPH. 7.6.4.1. HADS



7.6.5. Pregnancy related anxiety questionnaire (PRAQ)

Scores of Pregnancy related anxiety reduced in yoga group by 31.36 % and in control group by 16.06 % with significant difference between groups at $p<0.001$.

TABLE.7.6.5.1. PREGNANCY RELATED ANXIETY QUESTIONNAIRE (PRAQ)

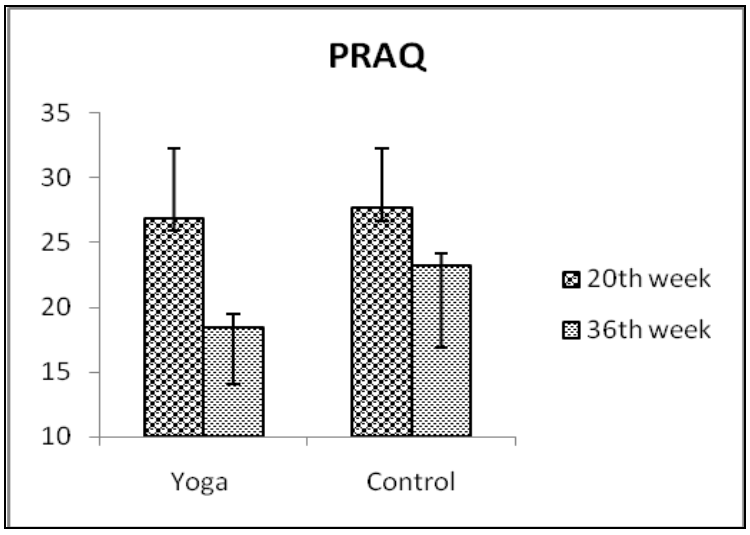
	Grp	20th weeks	36th weeks	Effect Size	% differ	Confidence intervals				Sig- P values ***	
						20th Week		36th Week			
						LB	UB	LB	UB	Within Gps Pre/Post	Between Gps Post/ post
PRAQ	Y	26.88 ±5.35	18.45*** ±4.33	17.23	31.36↓	25.38	28.39	17.23	19.67	0.001	0.001
	C	27.64 ±4.57	23.20*** ±6.31	21.30	16.06↓	26.27	29.02	21.30	25.10	0.001	

Wilcoxon's signed ranks test (within groups); Mann Whitney U test (between groups).

Abbreviations: CI: confidence Interval, UB: Upper Bound/ LB: Lower Bound.

Legend: Yoga group shows significantly better improvements than control group on Pregnancy related anxiety questionnaire.

GRAPH. 7.6.5.1. PRAQ



7.6.6. Quality of life (QOL-100)

This study compared the mean test and retest scores for each domain of WHOQOL-100 instrument. There was significant differences between groups with higher improvements in yoga than the control group in the Physical (P<0.01, Mann Whitney test, effect size=0.48), Psychological (P<0.01, Independent Sample T-Test, effect size=0.65), Social Relationships (P<0.01, Independent Sample T-Test, effect size=0.65), and the General Health (P<0.01 Independent Sample T-Test, effect size=0.65) domains.

TABLE 7.6.6.1. Result of the WHOQOL-100 test after intervention in both group.

Variables WHO QOL-100	Grs	20th week	36th week	ES	% change	Confidence intervals				P values
						20th Week		36th Week		Between groups***
						LB	UB	LB	UB	
Physical	Y	14.55 ±2.4	15.79 ±2.77	0.48	8.52	13.88	15.22	15	16.57	0.001 [b]
	C	14.27 ±2.32	14.12 ±2.14	0.07	1.05	13.62	14.92	13.51	14.72	
Psychological	Y	14.6 ±2.42	16.08 ±2.12	0.65	10.13	13.92	15.28	15	16.57	0.001 [a]
	C	14.5 ±1.83	14.7 ±1.63	0.12	1.37	13.98	15.01	14.24	15.17	
Independence	Y	15.44 ±2.31	15.91 ±2.2	0.21	3.04	14.79	16.08	15.29	16.53	0.065 [a]
	C	14.94 ±2.14	15.01 ±2.1	0.03	0.46	14.34	15.54	15.01	16.21	
Social relationship	Y	15.58 ±2.46	16.88 ±1.91	0.59	8.34	14.89	16.27	16.34	17.42	0.003 [a]
	C	15.11 ±2.76	15.67 ±2.09	0.23	3.70	14.34	15.89	15.08	16.26	
Environment	Y	15.32 ±1.86	16.25 ±2	0.48	6.07	14.8	15.85	15.69	16.82	0.001 [b]
	C	14.93 ±2.49	15 ±1.69	0.03	0.46	14.23	15.63	14.52	15.47	
Spiritual	Y	15.73± 2.48	16.02 ±2.42	0.12	1.84	15.03	16.42	15.34	16.70	0.23 [b]
	C	14.71± 2.44	15.41 ±2.67	0.27	4.75	14.02	15.39	14.66	16.16	

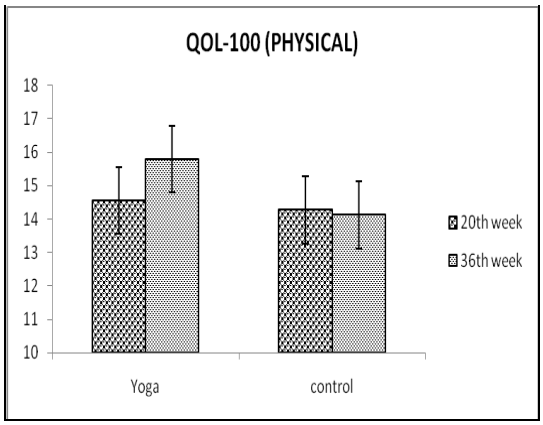
General health Quality	Y	15.76± 2.84	17.08 ±2.31	0.51	8.37	14.94	16.56	16.43	17.73	0.001 [b]
	C	14.98± 1.94	15.35 ±2.51	0.17	2.46	14.43	15.53	14.65	16.06	

[a] Independent Sample P-Value, [b] Mann-Whitney Test, (Between groups).

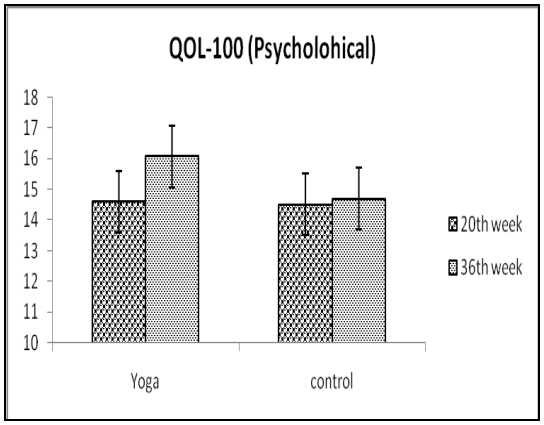
Abbreviations: ES: Effect Size, GR: Group, Y: Yoga, C: Control, LB: Lower Bound, UB: Upper Bound.

Legend: There is significant difference between groups with better improvement in yoga group in pregnancy experience.

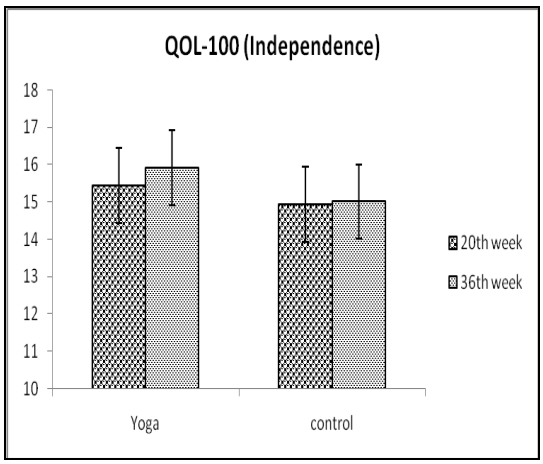
GRAPH 7.6.6.1.QOL: PHYSICAL



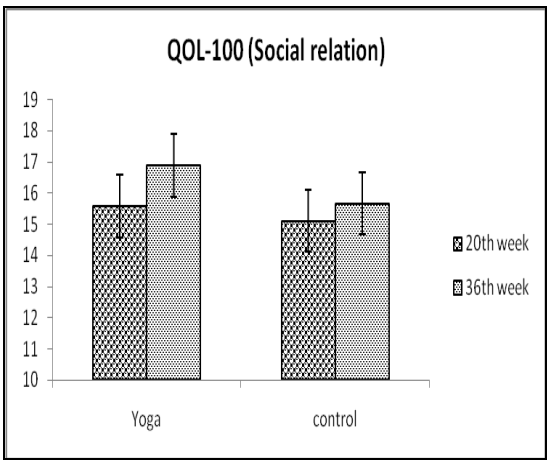
GRAPH 7.6.6.2.QOL: PSYCHOLOGICAL



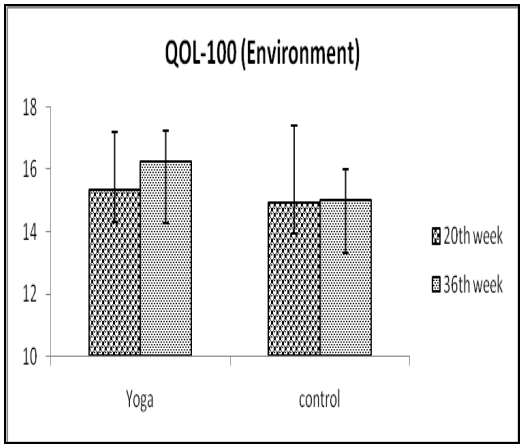
GRAPH 7.6.6.3.QOL: INDEPENDENCE



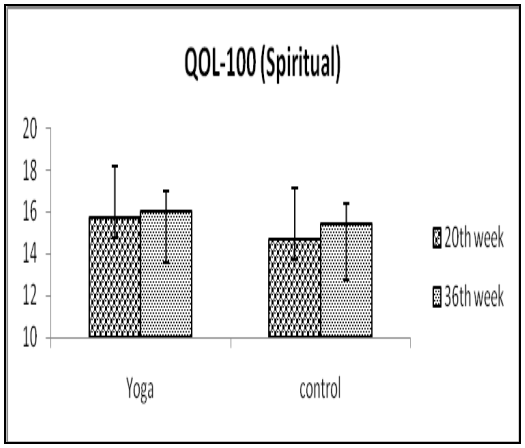
GRAPH 7.6.6.4.QOL: SOCIAL RELATION



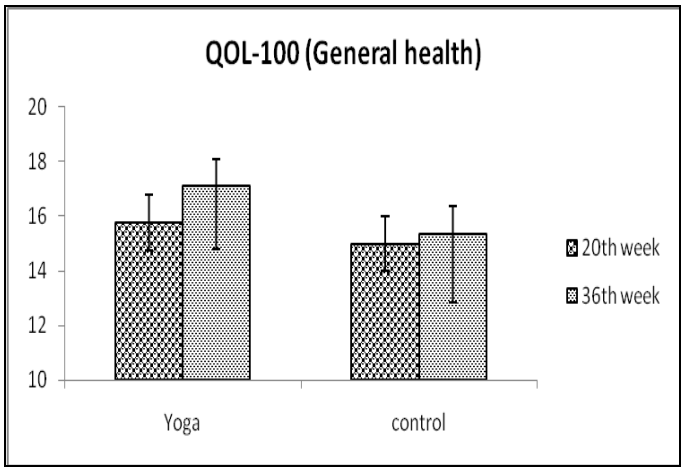
GRAPH 7.6.6.5.QOL: ENVIRONMENT



GRAPH 7.6.6.6.QOL: SPIRITUAL



GRAPH 7.6.6.7.QOL: GENERAL HEALTH



7.6.7. Fundamental interpersonal relations orientation (FIRO-B)

We compared the mean pre-interventions and post-interventions scores for each domain of FIRO-B questionnaire. The between groups statistical analysis showed significance in "Expressed Inclusion" (P=0.02, Independent Sample T-Test) and "Wanted Control" (P=0.009, Mann Whitney test) domains. However, within group analysis showed significant improvements in all domains for the yoga group (Expressed Inclusion: P=0.038, Wanted Inclusion: P=0.001, Expressed Control: P=0.013, Wanted Control: P=0.01, Expressed Affection: P=0.007, Wanted Affection: P=0.001) while no significant improvement in any domain for the control group.

TABLE. 7.6.7.1. Result of the FIRO-B (Interpersonal relationship) test after Intervention in both groups.

Variables	Gr	20th week	36th week	ES	% change	Confidence intervals				Sig- P values
						20th Week		36th Week		
						LB	UB	LB	UB	
Express Inclusion	Y	5.24±2.17	5.84±2.09	0.29	11.45	4.64	5.87	5.24	6.43	0.02 [a]
	C	5.18±2.06	4.88±2.07	015	-5.79	4.6	5.75	4.3	5.46	
Wanted Inclusion	Y	2.47±2.46	1.29±1.91	0.54	-47.77	1.73	3.16	0.76	1.83	0.07 [b]
	C	2.25±2.82	2.16±2.56	0.03	-4	1.46	3.05	1.44	2.88	
Express Control	Y	2.61±1.98	3.43±2.06	0.41	31.41	2.05	3.16	2.85	4.01	0.3 [b]
	C	3.16±2.77	3.12±2.71	0.02	-1.26	2.38	3.94	2.36	3.88	
Wanted Control	Y	3.37±2.17	2.41±2.39	0.42	-28.48	2.76	3.98	1.74	3.08	0.009 [b]
	C	3.94±2.56	3.69±2.6	0.1	-6.34	3.22	4.66	2.95	4.42	
Express Affection	Y	2.67±2.31	3.61±2.26	0.41	35.20	2.02	3.32	2.97	4.24	0.29 [b]
	C	3.06±2.03	3.10±1.81	0.02	1.30	2.49	3.63	2.59	3.61	
Wanted Affection	Y	3.1±2.3	2.12±1.98	0.46	-31.61	2.45	3.74	1.56	2.67	0.057 [b]
	C	2.84±2.1	2.76±1.98	0.04	-2.81	2.25	3.43	2.21	3.32	

[a] Independent Sample P-Value, [b] Mann-Whitney Test, (Between groups).

Statistically significant P- values are shown in bold

Independent sample test, b. Mann-Whitney test, c. paired sample test.

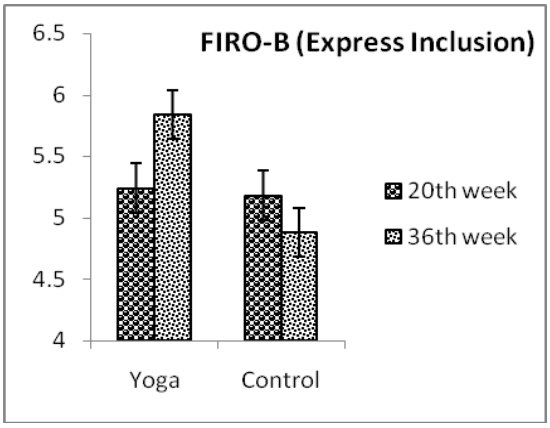
Independent Sample t-test; Paired Sample test; Mann Whitney U test (Between groups).

Abbreviations: ES: Effect Size, GR: Group, Y: Yoga, C: Control,

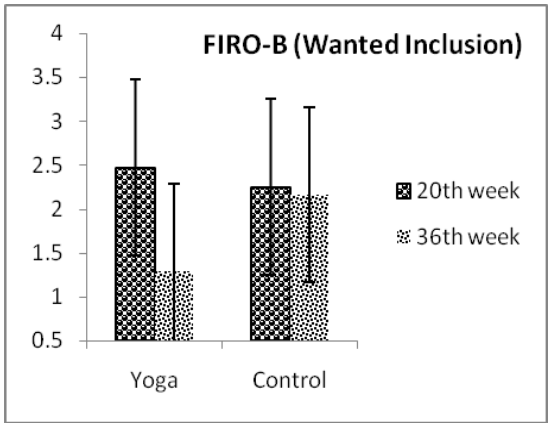
LB: Lower Bound, UB: Upper Bound.

Legend: There is significant difference between groups with better improvement in yoga group in pregnancy experience.

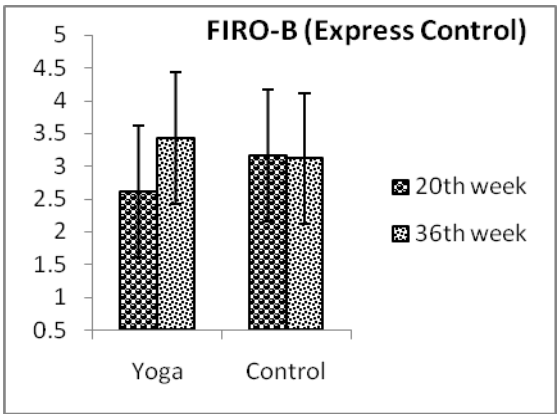
GRAPH. 7.6.7.1. FIRO-B (Express Inclusion)



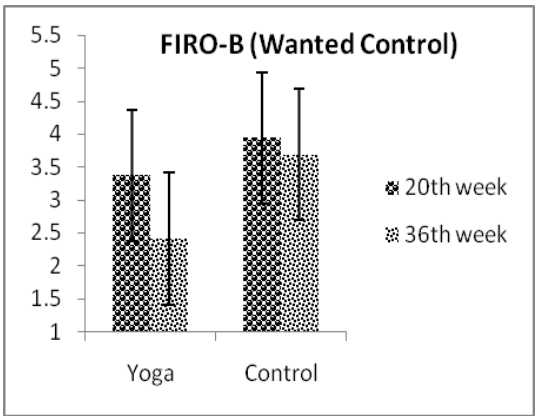
GRAPH. 7.6.7.2. FIRO-B (Wanted Inclusion)



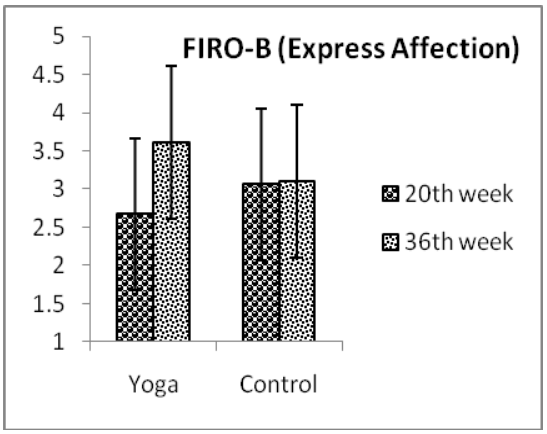
GRAPH. 7.6.7.3. FIRO-B (Express Control)



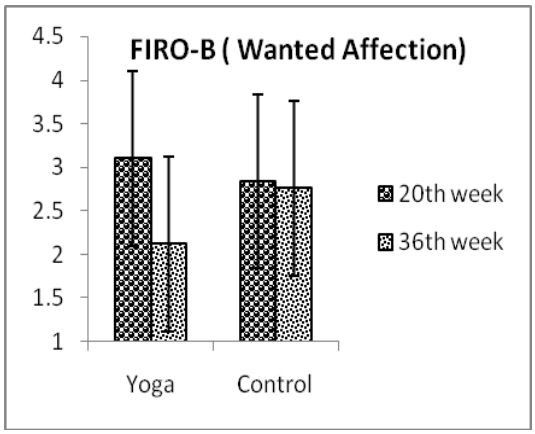
GRAPH. 7.6.7.4. FIRO-B (Wanted Control)



GRAPH. 7.6.7.5. FIRO-B (Express Affection)



GRAPH. 7.6.7.6. FIRO-B (Wanted Affection)



7. 7. RESULTS OF YOGA ON COGNITIVE FUNCTONS

7.7.1. Phonemic fluency test

The Phonemic Fluency showed significantly better increase in yoga (32.16 %) group than the control group (13.48 %) with significant difference between groups ($p<0.001$) with an effect size of 1.64 in the Yoga group and 0.76 in the control group.

7.7.2 Category fluency test

There was also significant improvement in Category Fluency (Animal Names) in both groups; 26.03 % (effect size 1.23) in yoga and 9.60 % (effect size 0.74) in control group with significant difference between groups at ($p<0.001$).

7.7.3 Design fluency test

The Design Fluency I (Free condition) Test also improved in yoga by 41.85 % (effect size 1.69) and in control group by 16.30 % (effect size 0.99) with significant difference between groups at ($p<0.001$). There was a similar improvement in Design Fluency II (Fixed condition) Test; 33.99 % (effect size of 0.80) in Yoga group and 15.36 % (effect size 0.88) in control group with significant difference between groups ($p<0.01$).

TABLE. 7.7.7.1. PHONEMIC FLUENCY, CATEGORY FLUENCY & DESIGN FLUENCY.

Changes after intervention in both groups N=51(Y) & 45=(C).

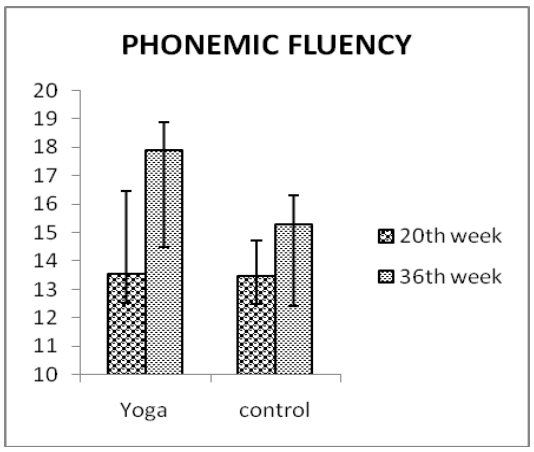
Variable		GrP	20th week (Mean ±SD)	36th week (Mean ± SD)	Effect Size	% change	Confidence interval				Sig- P values	
							20th Week		36th Week		Pre /Post	Post / post
							Upper	Lower	Upper	Lower	Within Gps	Between Gps
Fluency	PF	Y=51	13.53 ±2.94	17.89 ±3.40***	1.64	32.16	12.71	14.36	16.93	18.85	0.001	0.001
		C=45	13.48 ±1.24	15.30 ±2.88	0.76	13.48	13.11	13.86	14.44	16.17	0.001	
	CF	Y=51	15.98 ±2.22	20.14 ±3.68***	1.23	26.03	15.36	16.61	19.10	21.17	0.001	0.001
		C=45	15.93 ±1.53	17.47 ±2.25	0.74	9.60	15.47	16.39	16.79	18.14	0.001	
	DF I- Free	Y=51	13.31 ±2.80	18.88 ±3.96***	1.69	41.85	14.10	14.10	20.00	20.00	0.001	0.001
		C=45	13.07 ±2.65	15.20 ±2.78	0.99	16.30	13.86	13.86	16.03	16.03	0.001	
	DF II- Fixed	Y=51	21.80 ±6.17	29.22 ±8.69**	0.80	33.99	23.54	23.54	31.66	31.66	0.001	0.01
		C=45	21.09 ±3.41	24.33 ±3.87	0.88	15.36	22.11	22.11	25.50	25.50	0.001	

Independent Sample t-test; Mann Whitney U test.

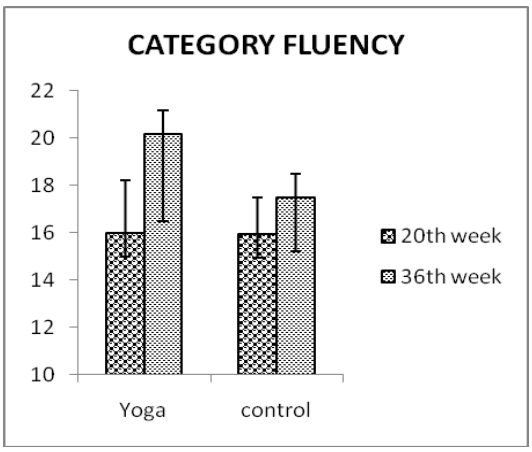
Abbreviations: PF: Phonemic Fluency, CF: Category Fluency (Animal Names), DF: Design Fluency, CI: confidence Interval, UB: Upper Bound/ LB: Lower Bound.

Legend: Yoga group shows significantly better improvements than control group on all three components of fluency test.

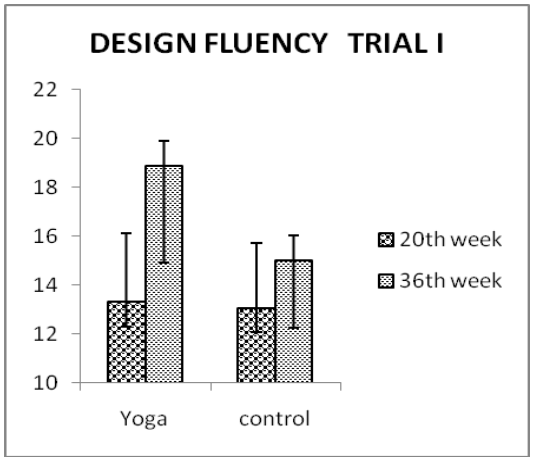
GRAPH: 7.7.7.1. PHONEMIC FLUENCY



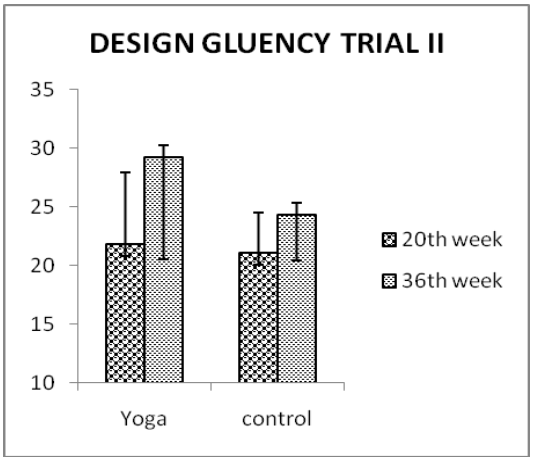
GRAPH: 7.7.7.2. CATEGORY FLUENCY



GRAPH: 7.7.7.3. DESIGN FLUENCY



GRAPH: 7.7.7.4. DESIGN FLUENCY



7.7.4. Stroop test

Stroop effect showed significant improvements within both groups; 23.16 % (effect size of 1.43) in the yoga group and 9.23 % (effect size of 0.74) in the control group. With significant difference between groups at ($p<0.001$). Stroop Error also reduced significantly in yoga (53.40 %, effect size 1.75) group as compared to control group (36.40 %, effect size 2.15) with significant difference between groups at ($p<0.05$).

TABLE: 7.7.4.1. STROOP TEST

Changes after intervention in both groups N=51(Y) & 45=(C).

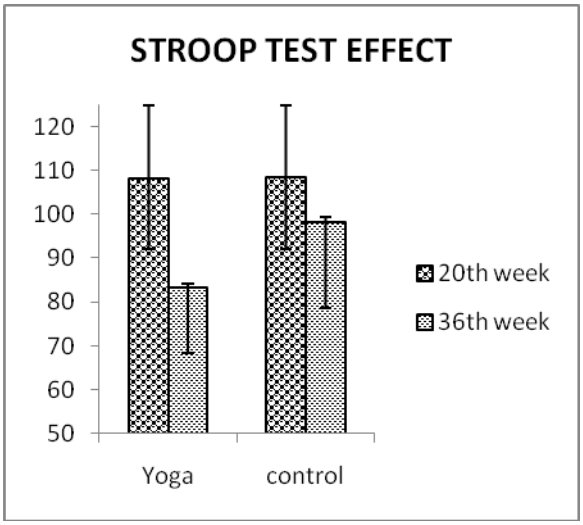
Variables	Grp	20th week	36th week	ES	% change	Confidence interval				Sig- P values	
						20th Week		36th Week		Pre /Post	Post /post
						Upper	lower	Upper	lower	Within Gps	Between Gps
Stroop Effect	Y=51	108.31 ±16.46	83.24± 14.96***	1.43	23.16	103.68	112.94	79.03	87.44	0.001	0.001
	C=45	108.33 ±16.27	98.33± 19.63	0.74	9.23	103.44	113.22	92.44	104.23	0.001	
Stroop Error	Y=51	4.12 ±0.65	1.92± 1.51*	1.75	53.40	3.93	4.30	1.50	2.35	0.001	0.05
	C=45	4.09 ±0.70	2.60± 0.91	2.15	36.40	3.88	4.30	2.15	2.33	0.001	

Independent Sample t-test; Mann Whitney U test.

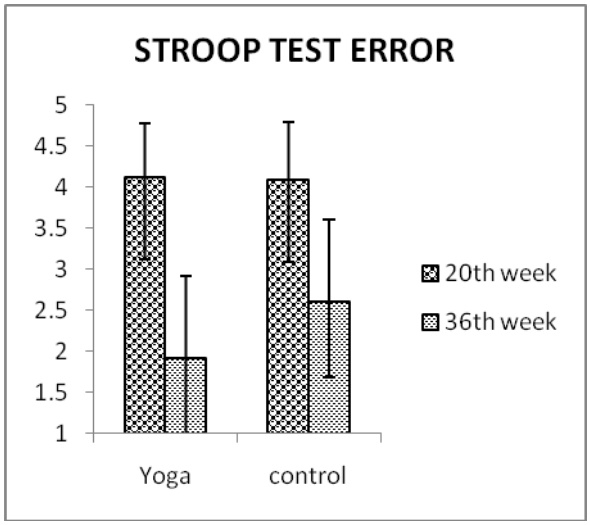
Abbreviations: CI: confidence Interval, UB: Upper Bound/ LB: Lower Bound.

Legend: There is significant difference between groups with better improvement in yoga group in on Stroop effects.

GRAPH: 7.7.4.1. STROOP EFFECT



GRAPH: 7.7.4.2. STROOP ERROR



7.7.5. Verbal working memory test

The scores of all the measures of verbal working memory were found to be higher ($p<0.001$) with in yoga group where as in verbal Trial II Hits component of verbal working memory showed significant improvement in yoga 22.97 %, (effect size 2.43) compared to control group 2.91 % (effect size 0.28) with significant difference between groups ($p<0.001$). No Significant changes were observed in rest of the variables of verbal working memory.

TABLE: 7.7.5.1.VERBAL WORKING MEMORY

Changes in Verbal Working memory after intervention in both groups.

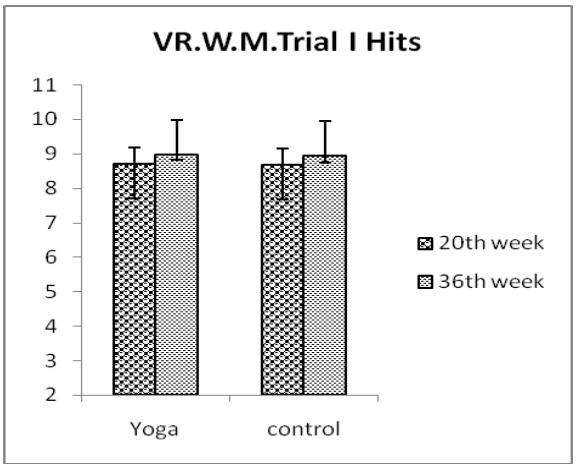
Variable	Group	20th week	36th week	ES	% change	Confidence interval				Sig- P values	
						20th Week		36th Week		Pre /Post	Post /post
						UB	LB	UB	LB	Within Gps	Between Gps
VERBAL Working Memory T- I Hits	Y=51	8.71 ±0.46	8.98± 0.14	0.79	3.09	8.84	8.58	9.02	8.94	0.000	0.487
	C=45	8.67 ±0.48	8.96± 0.21	0.78	3.34	8.81	8.52	9.02	8.89	0.000	
VERBAL Working Memory T- I Error	Y=51	0.31 ±0.47	0.16± 0.37	0.35	48.38	0.45	0.18	0.26	0.05	0.005	0.188
	C=45	0.33 ±0.48	0.27± 0.45	0.12	18.18	0.48	0.19	0.40	0.13	0.083	
VERBAL Working Memory T- II Hits	Y=51	6.92 ±0.72	8.51± 0.58***	2.43	22.97	7.12	6.72	8.67	8.35	0.000	0.001
	C=45	6.87 ±0.66	7.07± 0.72	0.28	2.91	7.07	6.67	7.28	6.85	0.061	
VERBAL Working Memory T- II Error	Y=51	1.82 ±0.87	0.84± 0.91	1.10	53.84	2.07	1.58	2.03	1.48	0.000	0.458
	C=45	1.76 ±0.81	1.07± 1.10	0.71	39.20	1.07	0.62	1.40	0.74	0.000	

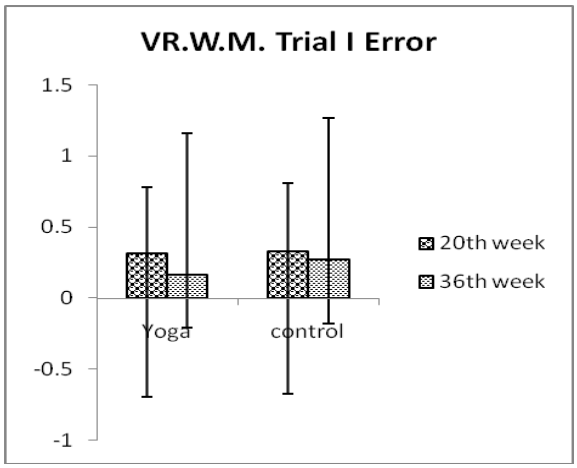
Independent Sample t-test; Mann Whitney U test.

Abbreviations: ES-effect size. UB: Upper Bound/ LB: Lower Bound.

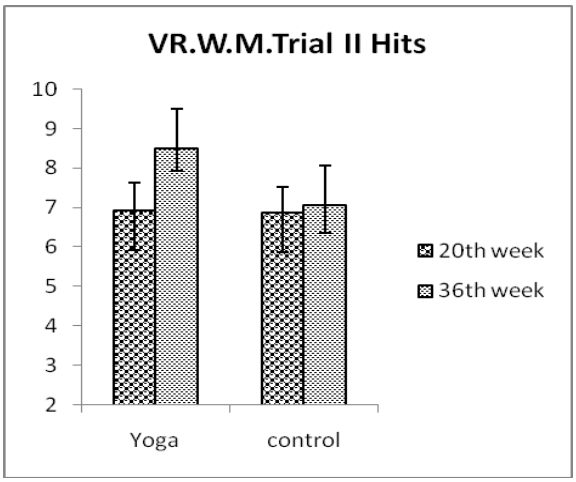
Legend: There is a significant change in verbal working memory in yoga group compared to control group.

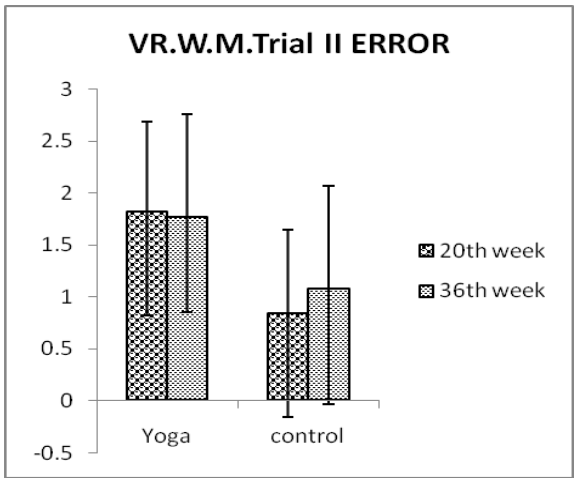
GRAPH 7.7.5.1.VR.W.M.TRIAL I HITS GRAPH 7.7.5.2.VR.W.M.TRIAL I ERROR





GRAPH 7.7.5.3. VR. W.M.TRIAL II HITS GRAPH 7.7.5.4. VR.W.M.TRIAL II ERROR





7.7.6. Visual working memory test

Significant changes were observed in all the variables within the yoga group on all variables ($p<0.001$) with non significant change in control group and significant difference between groups ($p<0.001$) on all the variables .details of values on Visual working memory Trial I Hit, and Trial I error, Visual working memory Trial II Hit and Trial II error with significant difference between groups ($p<0.001$) are also presented.

TABLES: 7.7.6.1. VISUAL WORKING MEMORY

Changes in Visual Working memory after intervention in both groups.

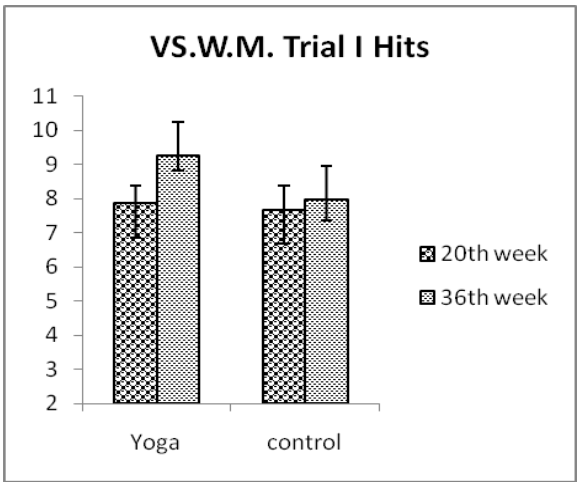
Variable	Group	20th week	36th week	ES	% change	Confidence interval				Sig- P values	
						20th Week		36th Week		Pre/ Post	Post/ post
						UB	LB	UB	LB	Within Gps	Between Gps
VISUAL Working Memory T- I Hits	Y=51	7.86 ±0.53	9.24± 0.43***	2.84	17.55	8.01	7.71	9.36	9.11	0.000	0.001
	C=45	7.67 ±0.71	7.96± 0.60	0.44	3.75	7.88	7.45	8.14	7.77	0.020	
VISUAL Working Memory T- I Error	Y=51	2.51 ±1.17	1.12± 1.07***	1.24	55.37	2.84	2.18	1.42	0.82	0.000	0.001
	C=45	2.47 ±1.10	2..02 ±0.81	0.46	18.21	2.80	2.14	2.27	1.78	0.001	
VISUAL Working Memory T- II Hits	Y=51	8.20 ±0.53	9.04± 0.69***	1.36	10.24	8.35	8.05	9.23	8.84	0.000	0.001
	C=45	8.16 ±0.56	8.24± 0.48	0.15	0.98	8.32	7.99	8.39	8.10	0.371	
VISUAL Working Memory T- II Error	Y=51	3.82 ±0.77	1.59± 0.67***	3.08	58.37	4.04	3.61	1.78	1.40	0.000	0.001
	C=45	3.80 ±0.63	2.89± 0.93	1.14	23.94	3.99	3.61	3.17	2.61	0.000	

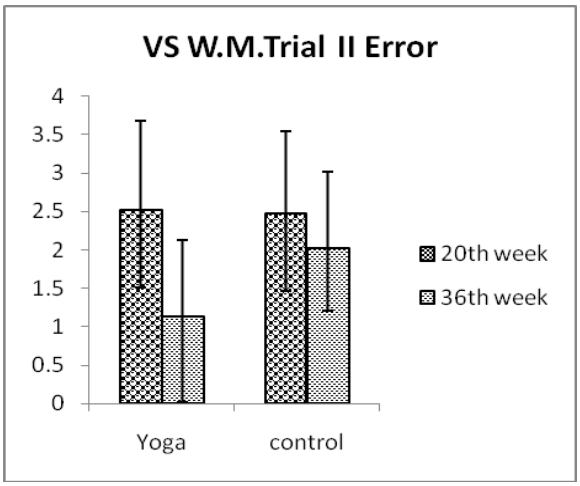
Independent Sample t-test; Mann Whitney U test.

Abbreviations: VIS WM: Visual Working memory, ES-effect size, UB: Upper Bound/ LB: Lower Bound.

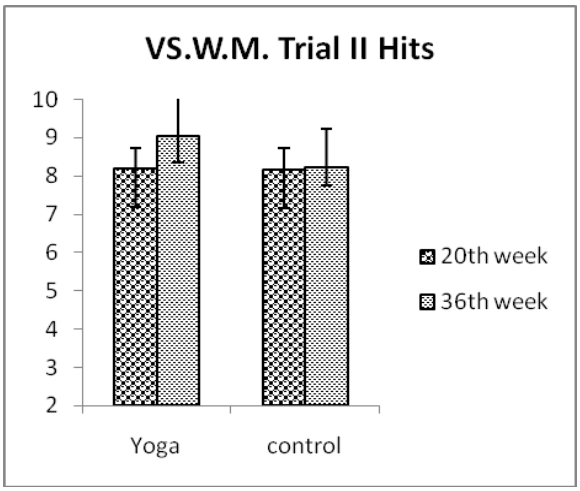
Legend: There is a significant change in visual working memory in yoga group compared to control group.

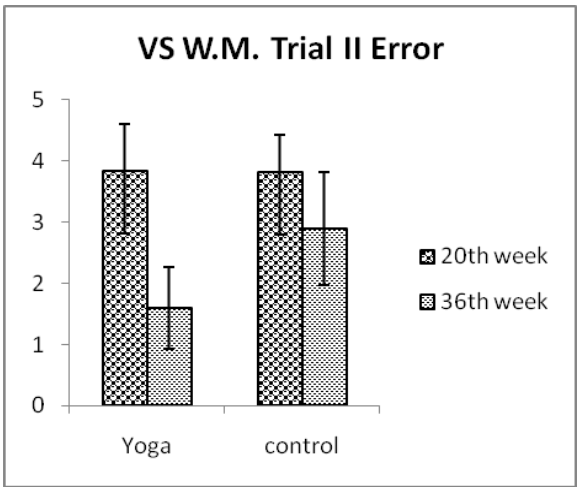
GRAPH: 7.7.6.1. VS.W.M. TRIAL I HITS GRAPH: 7.7.6.2. VS.W.M. TRIAL I ERROR





GRAPH: 7.7.6.3. VS.W.M. TRIAL II HITS GRAPH: 7.7.6.4. VS.W.M. TRIAL II ERROR





CHAPTER 8

DISCUSSION

This thesis is an attempt to understand the efficacy of yoga in normal pregnancy. After explaining the need for the study in chapter one, an exhaustive literature survey covered the earlier work from the 'best of the east' (authentic traditional texts of yoga and Indian philosophy on the concepts of why and how of human birth) and 'best of the west' (works on 'psyche in pregnancy' and 'mind body interventions in pregnancy' published in PUBMED and authentic text books) in chapters two and three. The experimental part of the work was a prospective randomized active controlled study that compared the effect of integrated antenatal yoga (selected specifically to suit the needs of different trimesters) with standard antenatal exercises, practiced (by both groups) under supervision, starting from 18 to 20weeks (n=45 each) till completion of labor. Primary outcome measures were: Duration of labor, autonomic response to relaxation using Heart Rate Variability, quality of life & cognitive functions. The secondary outcome measures were: Mode of delivery, Pregnancy complications, Epidural analgesia, Birth weight, Apgar scores, perceived stress, anxiety, depression and pregnancy experience. The results showed significantly better improvements in most of the variables in yoga group as compared to antenatal exercise group which is discussed below. The order of the variables has been arranged to suit the discussion of the variables that looked at the outcome at physical level (pregnancy outcome), psychological level and cognitive level. Summary of the results, comparisons with earlier studies and proposed mechanisms has been presented under each of the variables.

8. 1. DURATION OF LABOR

8.1.1. Summary, comparison with earlier studies & mechanism

The duration of all three stages of labor was significantly lower in the yoga group as compared to the control group although the same augmentation regime used in both groups. The first stage of labor was about 6.2 hours in the control group while it was 4.7hours in the yoga group, with a difference of about 1.5 hours (23.57% reduction). The mean duration of second stage was about 55minutes in control group and 23minutes in the yoga group, with a difference of about22 minutes (57.60% reduction). The duration of the third stage was 13 minutes and 9minutes in the control and yoga groups respectively, with a difference of 4 minutes (30 % reduction). The overall reduction of labor duration was more than 2 hours. It is interesting to note that Stage 2 was completed within 30 minutes by 42 out of 44 vaginal deliveries in the yoga group whereas only 2 out of 27 in the control group completed within 30 minutes.

Comparisons

The remarkable difference in the duration of the second stage with a median value of 20 min in the yoga group and 60 min in the control group is noteworthy. This is the first study that has shown such an impressive reduction in the duration of labor by yoga, a non-pharmacological and self-corrective technique. The only earlier RCT (Chuntharapat et al., 2008) that compared usual nursing care with add-on yoga in normal pregnancy (1 hr/day, once a week from the 28th week until delivery) documented shorter duration of labor in total labor duration and first stage ($p < 0.001$), with no significant difference in the duration of second stage of labor between the two groups. Another study on pelvic floor exercises did not show significant reduction in duration of the second stage of labor (Salvesen et al., 2004).

We hypothesize that this may be caused by the following factors:

A) Improvement in **coordinated performance of abdomino-pelvic musculature** resulting in well-controlled and better expulsive forces. Yoga practices in normal adults showed improved motor performance with better strength (Raghuraj et al., 1997), flexibility (Manjunath et al., 1999), dexterity (Raghuraj et al., 1997), and motor speed (Dash et al., 1999). **B**) **Alignmentof presenting part to pelvic axis:** Women in the yoga group practiced a yoga Posture called *Baddha konasana* (resembling squatting position) twice daily after 36 weeks of gestation and delivered in semi-recumbent position.



They were asked to repeat this yogic posture during each contraction in labor. The regular practice of this posture may have resulted in better alignment and application of the presenting part to the axis of the pelvis and the cervix. This could have contributed to healthy progress of labor resulting in reduction in the duration of the first and second stages, and also the need for induction in the yoga group. There are a few studies that have shown the beneficial effects of squatting position during labor. In a controlled trial that compared the outcome of labor in women squatting in an obstetric aid (the “birth cushion” that allows the parturient to sink into a supported squatting posture) with those in the conventional semi-recumbent position, the squatting group had significantly fewer forcep deliveries (9% vs. 16%) and significantly shorter second stages (median length of pushing

was 31 min vs. 45 min) than the semi-recumbent group. In our study, the second stage was reduced to 20 min as compared to the control group (60 min). (Gardosi et al., 1989).

C) **Stressreduction:** Reduced **psychological stress** resulting in more coordinated uterine contractions in the yoga group may explain the shorter duration of labor and reduced fetal distress in spite of the same augmentation regime used in both groups. This study has also demonstrated(Table 7.5.1.1., Table 7.5.1.2 & Table 7.6.1.1)that yoga can reduce stress levels and improve autonomic stability in normal pregnancy as observed by improved parasympathetic tone during guided relaxation (Satyapriya et al., 2009).

There are also studies (Chaya et al., 2006; Gupta et al., 2006; Manjunath et al., 1999; Telles et al., 1995; West et al., 2004) that have shown the stress-reducing effect of yoga practices in normal volunteers. (Hao et al., 1997) showed that psychological suggestions of encouragement during conversations by the attending nurse continuously during labor had shorter time of both the first and second stages of labor than the control group. One of the popular techniques using antepartum Lamaze-training psycho-prophylaxis showed no apparent effects on the length of labor, frequency of fetal distress, or mean Apgar scores although it reduced the analgesic requirement (Scott et al., 1976). It appears that yoga may provide better mind management techniques than other conventional psychotherapeutic interventions.

Reduced duration of the third stage of labor could be explained by the stress reducing effect of yoga on neuroendocrinal pathways influencing the release of oxytocin. There are studies that have shown the beneficial effects of yoga on hypothalamic-pituitary-adrenal (HPA) axis resulting in better cortisol rhythmicity. Decrease in serum cortisol during yoga practices has also been documented in patients with early breast cancer (Rao et al., 2009), which correlated with alpha wave activation (Kamei et al., 2000).

8.2. FLUENCY TEST & STROOP TEST PRAQ

8.2.1. Summary, Comparison with earlier studies & mechanism

There was significantly better improvements in the yoga group as compared to antenatal exercise group in all three components of fluency tests (Verbal, Category & Design fluencies) and Response inhibition test (Stroop test) .

Comparisons

To the best of our knowledge this is the first study on the effect of yoga on cognitive functions during pregnancy. Studies on yoga in normal healthy volunteers have been found to be effective in improving many cognitive functions such as memory and attention tasks. Performance on six letter cancellation task (SLCT) which requires selective attention, concentration, visual scanning abilities, and a repetitive motor response was studied before and after a meditation technique called cyclic meditation (CM) in healthy volunteers in a self as control design with significantly higher scores after sessions of CM (24.9%) than after Supine Rest sessions (13.6%) (Sarang et al., 2006). Further, a report from the same lab in 2009 (Pailoor et al., 2009) showed significant increase in scores on digit letter substitution test (DLST), letter-copying and circle-dotting tasks after CM suggesting better information processing. Similar results were noted in children after CM (Pradhan et al., 2009 & Pradhan et al., 2010). Chattha et al showed improvement in cognitive functions (remote memory, verbal retention and recognition, and delayed and immediate recall) in perimenopausal women after 8 weeks of integrated yoga in a randomized control active control study (Chattha et al., 2008). Patients with major depression who practiced Sahaja Yoga showed greater degree of improvement in executive functions like manipulation of information in the verbal working memory (Reverse digit span test) and attention span (SLCT) than those who had only anti depressant medication. (Sharma et al., 2006).

During pregnancy, profound changes occur in stress adaptation mechanisms that are involved in 'flight and fight system'. Although these changes are essential for healthy progression of pregnancy, heightened stress responses not only offer high risk to the health of the mother and fetus, but also affect her cognitive functions. Hypothalamo Pituitary Adrenal (HPA) axis, sympathetic-adrenal-medullary system (SMS) and changes in several neurotransmitter systems within the brain appear to be the mediators of these changes during stress. Heightened levels of adrenalin, noradrenalin and gluco-corticoids have been implicated. Although the entry of these hormones is restricted by blood-brain barrier, studies have shown their influence on cerebral functions (McGaugh et al., 2002 & Roozendaal et al., 2009). Excess stress also affects the dopaminergic projections from ventral tegmental area to prefrontal and anterior cingulate cortices (Finlay et al., 1997; Abercrombie et al., 1989; Arnsten et al., 1998 & Cenci et al., 1992], and the prefrontal glutamatergic system (Steciuk et al., 2000); and these are known to influence the cognitive functions.

Yogic techniques including relaxation techniques are found to improve sympatho-vagal balance by reducing the sympathetic tone in normal volunteers (Patra et al., 2009[a] and Sarang et al., 2006[a]). A two-day yoga program which involved relaxation technique decreased occupational stress levels and baseline autonomic arousal (Vempati et al., 2000). Yoga improved the amount of slow wave sleep following the practice of yoga based relaxation techniques twice a day (Patra et al., 2009[b]) suggesting enhancement in quality of sleep. It is well documented that a healthy sleep is necessary for improving various cognitive functions viz., memory and learning processes (Smith et al., 1986). More directly yoga and massage therapy program was found to be effective in symptom reduction and general health improvement in a variety of conditions that are relevant to pregnancy, such as anxiety, depression, back pain, and stress (Field et al., 2012). Moreover, a preliminary

research from a mindfulness-based childbirth and parenting education through a traditional mindfulness-based stress reduction program found improvements in measures of anxiety, depression, and positive affect in women participating in their third trimester of pregnancy (Duncan et al., 2010). A recent study by Teper et al. has shown greater degree of executive control in the participants who were practicing meditation (Teper et al., 2012).We reported a significant improvement in heart rate variability frequency spectra after regular practice of yoga during normal pregnancy. There was significant reduction in low frequency spectrum and the ratio of low & high frequency spectra suggesting improvement in autonomic adaptive responses to stress (Satyapriya et al., 2008).

Electrophysiological studies during cognitive functions in healthy volunteers have reported increase in peak amplitude with reduction in latency of P300 wave (a positive wave that occurs at 300th millisecond in the auditory evoked potentials in EEG tracing) after cyclic meditation (Sarang et al., 2006^{b}) indicating better information processing speed and increased activation of attentional resources in hippocampus and other prefrontal associated areas after CM (Sarang et al., 2007).

Thus, it may be hypothesized that the improvement in the executive functions observed in this study is due to the effect of yoga in bringing about better information processing in the subtle layers of the Prefrontal cortex. This in turn could be due to reduction of stress following the alertful rest that yoga offers.

8.3. VERBAL WORKING MEMORY AND VISUAL WORKING MEMORY

8.3.1. Summary, Comparison with earlier studies & mechanism

There was a significantly better improvement in the yoga group as compared to antenatal exercise group in all three components of Visual Working Memory (Visual memory Trial I Hit, Visual memory Trial I Error, Visual memory Trial II Hit, Visual memory Trial II Error). Where as in Verbal working memory, verbal Trial II hits component of verbal

working memory showed significant changes compared control group. No significant changes were observed in rest of the variables of verbal working memory.

Comparisons

Earlier study has showed improvement in cognitive function. Chattha et al showed improvement in cognitive functions (remote memory, verbal retention and recognition, and delayed and immediate recall) in perimenopausal women after 8 weeks of integrated yoga in a randomized control active control study (Chattha et al., 2008). Although this study has been done on older lady, In the present study similar cognitive changes has been found.

Estrogen significantly affects the microstructure of brain regions that are responsible for cognitive functions. The production and secretion of estrogen rises steeply and continuously throughout pregnancy (Roy et al., 1962 & Loriaux et al., 1972). Bilateralsalpingo-ophorectomy in rats, for example, there was a significant decrease in dendritic spine density in hippocampal CA1 pyramidal cells (which are crucial to memory and learning) (Gould et al., 1990). Longitudinal studies of Hormone Replacement Therapy (HRT) versus placebo following total abdominal hysterectomy and bilateral salpingo-ophorectomy reported a positive effect of estrogens on verbal memory (Xu et al., 1998 & Behl et al., 2002).

PET studies by Maki and Resnick in 2000 and Hall in 2001 examined the changes in regional cerebral blood flow (rCBF) over a two year interval in women on and off HRT (both with and without adjuvant progesterone therapy). Significant differences in rCBF were found in the right hippocampus, the parahippocampalgyrus, and the left middle temporal gyrus - regions which are crucial to memory. It was also reported that estrogen reduces age related differences in neuronal membrane breakdown (as measured by 1H magnetic resonance spectroscopy) in the hippocampus and parietal lobe, and this was related to memory function (Robertson et al., 2001). Thus there is increasing evidence

from in vivo brain imaging studies that estrogen modulates cognitive function, cerebral blood flow, and membrane breakdown.

8.4. QUALITY OF LIFE (WHO QOL-100)

8.4.1. Summary, Comparison with earlier studies & mechanism

This study has shown that integrated yoga interventions can significantly improve the quality of life of pregnant women in the physical, psychological, social and general health domains using WHO QOL-100 instrument. In the Independence domain, our results were just above the borderline (P = 0.065). Overall, the effect sizes for the IAY interventions used in the yoga group were significantly higher than those used in the control group, except for the spiritual domain. Among the seven domains of WHOQOL-100, the largest effect size in the yoga group was of the psychological (0.65) followed by social relations (0.59), general health (0.51), physical (0.48), and environmental (0.48) domains. Although there was no significant difference between groups in the spiritual domain, the control group scored higher (P: 0.27 control vs 0.12 yoga) than the control group. The questions of this domain refer to personal beliefs helping the person cope with difficulties in his/her life, and providing the person with a sense of well-being. For many people religion, personal beliefs and spirituality are a source of comfort, well-being, security, meaning, sense of belonging, purpose and strength. However, some people feel that religion has a negative influence on their life. Questions are framed to allow this aspect of the facet to emerge. The baseline scores were higher in the yoga group and the yoga group did reach higher mean values (16.02) than the control group (15.41) by 36^{th} week pointing to the higher levels of spiritual strength although this is brought out in the quantitative analysis.

Comparisons

Our results are consistent with previous studies that have used WHOQOL instrument in evaluating the quality of life of patients with various ailments using yoga intervention

(Lundgren et al., 2008 & Duraiswamy et al., 2007). Oken et al. used SF-36 instrument to assess health-related quality-of-life of healthy seniors using yoga intervention(Oken et al., 2006). Their results demonstrated significantly better benefits ($p<0.01$) in yoga group on vitality/energy and fatigue, role-physical, bodily pain, social functioning, and physical composite scale (Oken et al., 2006). While it is not possible to compare the different components of SF-36 and WHOQOL-100 instruments directly, it is meaningful to observe the closeness of the results in the pregnant and non-pregnant population.

8.5. PERCEIVED STRESS AND HEART RATE VARIABILITY (HRV)

8.5.1. Summary, Comparison with earlier studies & mechanism

Perceived stress

The perceived stress decreased by 31.6% in the yoga group and increased by 6.6% in the control group, and the difference was significant between ($P<0.001$).

Increased parasympathetic tone

Measurements of the components of the HRV spectrum showed that the sympathetic tone (LF band power and LF/HF ratio) decreased, and the parasympathetic tone (HF band power) increased during both DRT and SR periods in the 20th week. In the yoga group, the changes in HRV values during and after the DRT period were significantly enhanced in the 36th week. A 64% increase in the HF band power during DRT in the 20th week, and a 150% increase in the 36th week, demonstrates that the regular practice of the integrated yoga modules used in this study, with their guided yogic relaxation, improves parasympathetic tone. The con-comitant reduction in LF band power and LF/HF ratio, indicating reduction in sympathetic tone and increased autonomic balance, corroborate the beneficial effect of these yogic practices on the autonomic nervous system.

Plasticity of the autonomic nervous system

There was no change from the 20th week to the 36th week in the LF band values (sympathetic) or HF band values (parasympathetic) obtained before the DRT session in either yoga or standard exercise groups, which may be due to the natural dampening of autonomic responses, an expected phenomenon as pregnancy advances (de Weerth et al., 2005). In the yoga group, the reduction in sympathetic tone (with an increase in parasympathetic tone) during the DRT period was significantly higher in the 36th than in the 20th week. In the control group, compared with the values obtained in the 20th week, these responses were dampened in the 36th week. This finding shows that yoga was better than standard prenatal exercises in improving autonomic nervous system response and adaptability in the third trimester of pregnancy.

Comparisons

Yogic relaxation techniques are known to improve sympathovagal balance by reducing the sympathetic tone in normal volunteers. Guided relaxation has been shown to be more effective in reducing physiological arousal than supine rest (Sakakibara et al., 1994). Vempati et al. (Vempati et al., 1999) showed a significant reduction in sympathetic activity, with a decrease in the LF band power and increase in the HF band power during DRT, as well as a significant reduction in breath rate, volume of air inhaled, and oxygen consumption (Vempati et al., 2002). The stress reduction and healthier autonomic responses observed in this study may point to an all-important effect of yoga, that of enhancing the plasticity of the autonomic nervous system thereby improving the system's ability to quickly restore its basal state of relaxation after it has responded to a stressor. The components of *pranayama* integrated in the yoga program, ie, meditation and other mindfulness practices aimed at physiological rest, may explain the better parasympathetic

tone observed during and after DRT in the 36th week. During pregnancy, stressors activate the whole system of stress regulation (the hypothalamic-pituitary- adrenal axis) (Mulder et al., 2002), releasing large quantities of corticotropin-releasing hormone, corticotropin, cortisol, and noradrenalin into the systemic circulation, causing profound changes in the functioning of virtually every regulatory system in the body. The stress reduction and better autonomic response achieved by practicing yoga may be mediated through these pathways. Many pregnancy complications are traceable to biopsychosocial stresses, which involve neuro-endocrine-immuno-histochemical pathways.

8.6. MODE OF DELIVERY

8.6.1. Summary, comparison with earlier studies & mechanism

The number of normal deliveries was much higher in yoga than in control group, with significant reduction in the need for cesarean sections which was fewer (p =0 .004) in the yoga group (15%) than the control group (40%). Looking at the reasons for cesarean sections, although the numbers in each category were small, the most notable difference between the two groups was as follows:

44% (8/18) of cesareans in the control group were because of failure to progress compared to 29% (2/7) in the yoga group.

Comparisons

Reduction in fetal distress and good progress of labor in the yoga group could explain this. A positive and prepared attitude of the mother to accept labor as a physiological phenomenon could have contributed to these results similar to the observations in the Lamaze therapy study (Scott et al., 1976). In the study by (Saisto et al., 2006), group psycho-education and relaxation exercises were well received and rated as very helpful in reducing delivery fear, which helped in withdrawing their requests for elective cesarean section. The integrated yoga module used in this study that included breathing and

meditation practices seems to have contributed to these results through reduction in stress levels (Satyapriya et al., 2009).

8.7. ANALGESIA REQUIREMENT

8.7.1. Summary, comparison with earlier studies & mechanism

The number of women who required epidural analgesia was significantly lesser in yoga than the control group (7.2.3.1.).

Comparisons

There are many studies that have shown that nonpharmacological interventions can reduce analgesic requirement during labor. Acupuncture (Chung et al., 2003; Jenkins et al., 1993; Nesheim et al., 2006; Smith et al., 2006) during the active first stage of labor was found to be beneficial for the management of pain during labor with reduced use of epidural analgesia (Nesheim et al., 2006). Analgesic requirements during the duration of the first and second stages of labor were reduced in hypnotherapy group compared to control group (Jenkins et al., 1993). Breathing technique and massage were effective in reducing the perception of pain, leading to a more satisfactory birth experience (Yildirim et al., 2004). Prenatal mothers' knowledge, attitudes, and practice of Lamaze training has been shown to influence her attitudes toward labor, the requirement of narcotics and conduction of anesthesia during labor, and also improve her postnatal health (Scott et al., 1976 & Shih et al., 2005).This can be attributed to more coordinated uterine activity and lesser duration of labor. It has been shown that stress of pregnancy has negative effects on pain perception and analgesia requirement during pregnancy (Iwasaki et al., 1997 & Takahashi et al., 1991). Yoga, practiced throughout pregnancy, may have improved the stress adaptation mechanisms that may have contributed to this benefit.

8.8. COMPLICATIONS OF PREGNANCY, BIRTH WEIGHT, AND APGAR SCORES

8.8.1. Summary, Comparison with earlier studies & mechanism

The total number of pregnancy complications was fewer in the yoga group compared to the control group ($p < 0.010$) with an odds ratio of 0.17. Birth weight was higher for the yoga group than controls with a mean difference of 0.35 kg ($p<0.001$). Apgar scores: first minute Apgar scores showed no significant difference between groups ($p<0.221$). Fifth minute scores were significantly higher in the yoga group than the control group ($p<0.001$).

Comparisons

An earlier study with good sample size (169 in yoga and166 in control) showed positive effects on birth weight, mode of delivery, and pregnancy complications after integrated yoga practices in normal pregnancy (Narendran et al., 2005). However, that study could not remove the subject selection bias because the groups were not randomized. The present RCT adds supporting evidence to those earlier observations of improved birth weight, Apgar scores (fifth minute), and reduced prevalence of PIH and IUGR after yoga. Better Apgar score of babies may be attributed to (a) improved birth weight, and (b) decreased labor duration, the first correlating with general health and the second with decreased exposure to delivery stress. It appears that the mind management techniques of yoga, which are meant to improve the quality of life (Oken et al., 2006), greatly contribute to the harmonizing effect on the psycho-neuro-humoral-immunological pathways, thereby resulting in healthier pregnancy outcomes (FIGURE-8).

8.9. ANXIETY, DEPRESSION SCALE & PREGNANCY EXPERIENCE

8.9.1. Summary, Comparison with earlier studies & mechanism

Anxiety reduced in 36th week after yoga with significant difference between groups (P<0.001 on STAI-A, B). Although the women in control group were doing the practices of physical activity as planned and were reporting the regularity of practices, there was significant increase in state anxiety (STAI-A) by 13.76% and trait anxiety (STAI-B) by 5% as pregnancy advanced. Although it is well known that physical activity reduces stress and improves health, it appears from this study's results that, this may not be sufficient to prepare the woman to manage the psychological response (anxiety) to acute demanding situations of life, i.e. anticipation of complications and pain of delivery. Yoga, by definition is mastery over the modifications of mind (*Patanjali - chitta vrtti nirodhah*) and offers techniques that invoke the inbuilt capability to manage the psychological and physiological challenges. Regular practice of integrated yoga leads to a balanced state of mind (*samatvam* yoga as stated in *bhagavadgita*) that does not get perturbed by these challenges (Nagarathna et al., 2008) by improving neural plasticity (Allen et al., 2012). Anxiety and depression as measured by HADS scale also showed better reduction in anxiety scores in the yoga (29.12%) group compared to the control group (1.69%); reduction in Depression score was also higher in yoga (30.67%) than the control group (3.57%).

Looking at effect of yoga on the discomforts of pregnancy, we observed higher degree of improvement in the yoga (26.86%) group as compared to control group (13.55%) in their Pregnancy experience.

Comparisons

There are very few studies that have looked at the effect of yoga on stress, anxiety or depression during pregnancy. To our knowledge this is the first study that has reported the effect of yoga on pregnancy experience, anxiety and depression.

STAI in other conditions

Two studies have reported reduction in trait anxiety ($p<0.05$) in third trimester in healthy pregnant nulliparous women who practiced mindfulness-based yoga between 12 to 32 weeks (Beddoe et al., 2009 & Vieten et al., 2008). There are several studies that have looked at the effect of different types of yoga practices on anxiety, depression, wellness and quality of life in clinical conditions and normal healthy volunteers. Nidhi et al. reported significant reductions in both state (12.27%) and trait (14.97%) anxiety in adolescent girls with polycystic ovarian disease (Nidhi et al., 2012). Subramanya et al. (Subramanya et al., 2009) observed a reduction in state anxiety (22.4%) immediately after Cyclic Meditation in normal volunteers. Rao et al. in their randomized control study on early breast cancer patients observed reduction in both state and trait anxiety by add-on yoga (Rao et al., 2009). Twelve weeks of Iyengar yoga reduced the state and trait anxieties in normal volunteers (Woolery et al., 2004) and in women with mental distress (Michalsen et al., 2005). Our present study observeda15.65% reduction in state anxiety and 9% reduction in trait anxiety in yoga group of pregnant women.

HADS in other conditions

There was a 48.2% reduction in anxiety levels (HADS) after 6weeks of add-on yoga in breast cancer patients undergoing radiation therapy (Banerjee et al., 2007). *Sudarshan Kriya* and related practices reduced the scores on depression from 4.11 ± 2.99 to 2.73 ± 2.19 and Anxiety scores from 7.60 ± 3.71 to 5.87 ± 3.18 after yoga practice in adult

volunteers (Kjellgren et al., 2007). In the present study, there was better reduction in anxiety score (HADS) in the yoga (29.12%) group compared to the control group (1.69%); reduction in Depression score was also higher in yoga (30.67%) than the control group (3.57%). Looking at effect of yoga on the discomforts of pregnancy, we observed higher degree of improvement in the yoga (26.86%) group as compared to control group (13.55%) in their Pregnancy experience. Sun et al. (Sun et al., 2010). Studied the effects of a 12-14 week yoga program and showed significantly less discomfort in the 38to 40th week of gestation with higher self-efficacy expectancy and outcome expectancy in both the active and second stages of labor than the women in the control group.

Anxiety and depression are the experiences that a person actually feels in response to perceived stress. Studies using ultrasound Doppler flow velocimetry have shown high resistance of the uterine arteries in women with high anxiety scores in the third trimester (Teixeira et al., 1999). It has been reported that high scores on perceived stress and anxiety are related to increase in HPA-Axis-activity (Van Eck et al., 1996).Based on our results we may hypothesize that yoga's benefits would be mediated through reduction in the abnormal activity of the maternal sympathetic-adrenal-medullary system (SAM) and hypothalamic-pituitary-adrenocortical axis (HPA-axis)(de Weerth et al., 2005). Better autonomic stability with reduced sympathetic arousal and increased parasympathetic tone has been demonstrated in normal adults (Telles et al., 1993) after yoga. Also, we have shown reduced perceived stress and better autonomic adaptability during normal pregnancy after integrated yoga (Satyapriya et al., 2009) pointing to better plasticity of ANS and its ability to restore the basal state of relaxation quickly after a stress response. Better psychological health resulting from stress reduction may have contributed to the improvement observed on PEQ in this study. We have published earlier that these women had much better quality of life and interpersonal relationships (Rakhshani et al., 2010) that points to the positive

psychological state that yoga can induce. Thus, these psychological changes may explain the physiological changes observed as better outcomes seen in our earlier studies on integrated yoga in both normal (Narendran et al., 2005 & Satyapriya et al., 2009) and high risk pregnancies (Rakhshani et al., 2010 & Rakhshani et al., 2012). This may also promote a healthier ANS programming in the fetus (de Weerth et al., 2005 & Mastorakos et al., 2006) which may help in preventing diseases related to autonomic nervous system hyperactivity in the offspring. The Word yoga comes from a Sanskrit root 'Yuj' that means 'to yoke', 'to join', to unite the mind, body and the spirit; and to direct and concentrate one's attention by calming down the restless mind (Nagarathna et al., 2008). Thus the deep physiological rest that is achieved by the components of *pranayama*, meditation and other mindfulness practices incorporated in the integrated yoga program could be the major aspects that could explain the observed benefits.

8.10. FUNDAMENTAL INTERPERSONAL RELATIONS ORIENTATION (FIRO-B)

8.10.1. Summary, Comparison with earlier studies & mechanism

In the FIRO-B instrument, our within group analysis showed significant improvements in each domain (Expressed Inclusion (EI) P = 0.038; Wanted Inclusion (WI) P< 0.001; Expressed Control (EC) P= 0.013; Wanted Control (WC) P=0.01; Expressed Affection (EA) P=0.007; Wanted Affection (WA) P=0.001) in the yoga group and no statistical significant improvements in the control group. Between groups analysis showed statistically significant improvements in the Expressed inclusion and Wanted Control.

Fundamental Interpersonal Relations Orientation (FIRO) is a theory of interpersonal relations, introduced by William Schutz in 1958 (Schutz et al., 1958) who formulated three dimensions of interpersonal relations, which he believed were necessary and sufficient to explain most human interaction. He named these dimensions as: Inclusion, Control and

Affection. FIRO-B scores are graded from 0-9 in scales of expressed and wanted behavior, which define how much a person expresses to others, and how much he wants from others (Ryan et al., 1977). Therefore, the standard FIRO-B questionnaire consists of 6 different spheres: Expressed Inclusion (EI), Wanted Inclusion (WI), Expressed Control (EC), Wanted Control (WC), Expressed Affection (EA), and Wanted Affection (WA). Schutz believed that the level of interaction an individual wants can be measured in the areas of socializing, leadership and responsibilities, and more intimate personal relations within these spaces, as mentioned above, we found statistical significance in all domains of FIRO B in yoga group as compared to non significant changes in control group. This points to the improved social health similar what is seen in the social domain of WHOQOL which showed that there was significantly higher change (5% difference between groups, ($p< 0.01$) in yoga group as compared to control group (7.6.6.1.). In other words, it appears that the integrated yoga interventions helped the subjects in becoming more sensitive to the surrounding rather than being self centered with worries about the outcome of pregnancy or anxious or depressed. It is also interesting to note that the scores on 'wanting Inclusion, Control and Affection' have decreased in yoga group pointing to improved confidence in her. Also, the increase in scores of 'Expressed Inclusion, Control and Affection' point to the improvement in the attitude of caring for others which is a very important quality necessary for parenting that she must look forward to after delivery.

8.11. MECHANISMS

In this section I have tried to propose a conceptual downward causation model (*prasava*) of how the psychological stresses of the mother results in the physical complications during pregnancy based on the concepts that were reviewed in the Table 8.11.1 and Figure. 7 shows the flow chart of this downward causation of the problem that begins in the mind

(*manomaya kośa*) as uncontrolled emotional responses to demanding situations of life and manifests in the physical body, the *Annamaya kośa* as complications. Further, the Table 8.12.1. and Figure8 show the reversibility model based on the same scriptures of yoga. The concepts of integrated approach of yoga offer the techniques for this reversal which were used in this study that has shown the beneficial effects in both the psychological and the physical aspects, thus providing the evidence to support this model.

Annamaya kośa - At the level of ***Annamaya kośa***, imbalance at physical level cause the secretion of cortisol which is turn acts on the placental CRH affecting Utero placental blood flow.

Prānamaya kośa - At ***Prānamaya kośa***, excess and uncontrolled speed of *Prana* causes blockage of Nadis and thus leads to constriction of *Prana* in Nadis.

Manomaya kośa-Uncontrolled and excessive speed of thoughts causes activation of sympathetic nervous system at the level of ***Manomaya kośa***. Apart from this repetition of thoughts causes loop and sense of freedom is lost and these two above mentioned causes lead to malfunctioning of Hypothalamus and thus secretion of Corticotrophin releasing hormone is promoted which in turn stimulate the activity of Anterior pituitary for the release of ACTH.

Vijñānamaya kośa - During this period, conflict between right & wrong knowledge arises and the sense of 'I' feeling takes shape at ***Vijñānamaya kośa***.

Ānandamaya kośa - At ***Ānandamaya kośa***, freedom of an individual is lost and disharmony is established in one's health & right knowledge.

PSYCHOPHYSIOLOGICAL PATHWAY OF EFFECTS OF MATERNAL STRESS IN PREGNANCY ACCORDING TO INDIAN SCRIPTURES

(*TaittirīyaUpanisad, Yoga Vasiṣṭha, Patañjali yoga sutras)*

***Prasava* of Pregnancy and its complications.**

8.11.1. SUMMARY TABLE

***Ānandamaya kośa* - freedom from distress - perfect health**		**Expansion & non- activity**
Right knowledge – Our basic Nature is sat-cit-ānanda	**Total silence**	

↓ ↓

***Vijñānamayakośa* - Imbalance –conflict between right and wrong knowledge**		**Focussing begins**
lack of right knowledge of happiness	**Constriction of 'I'**	

↓ ↓

Prānamaya kośa* --- Imbalance of *prāna		**Imbalance descends to body**
Uncontrolled excess *prāna* speed	***prāna* constriction, blockage of *nadis***	

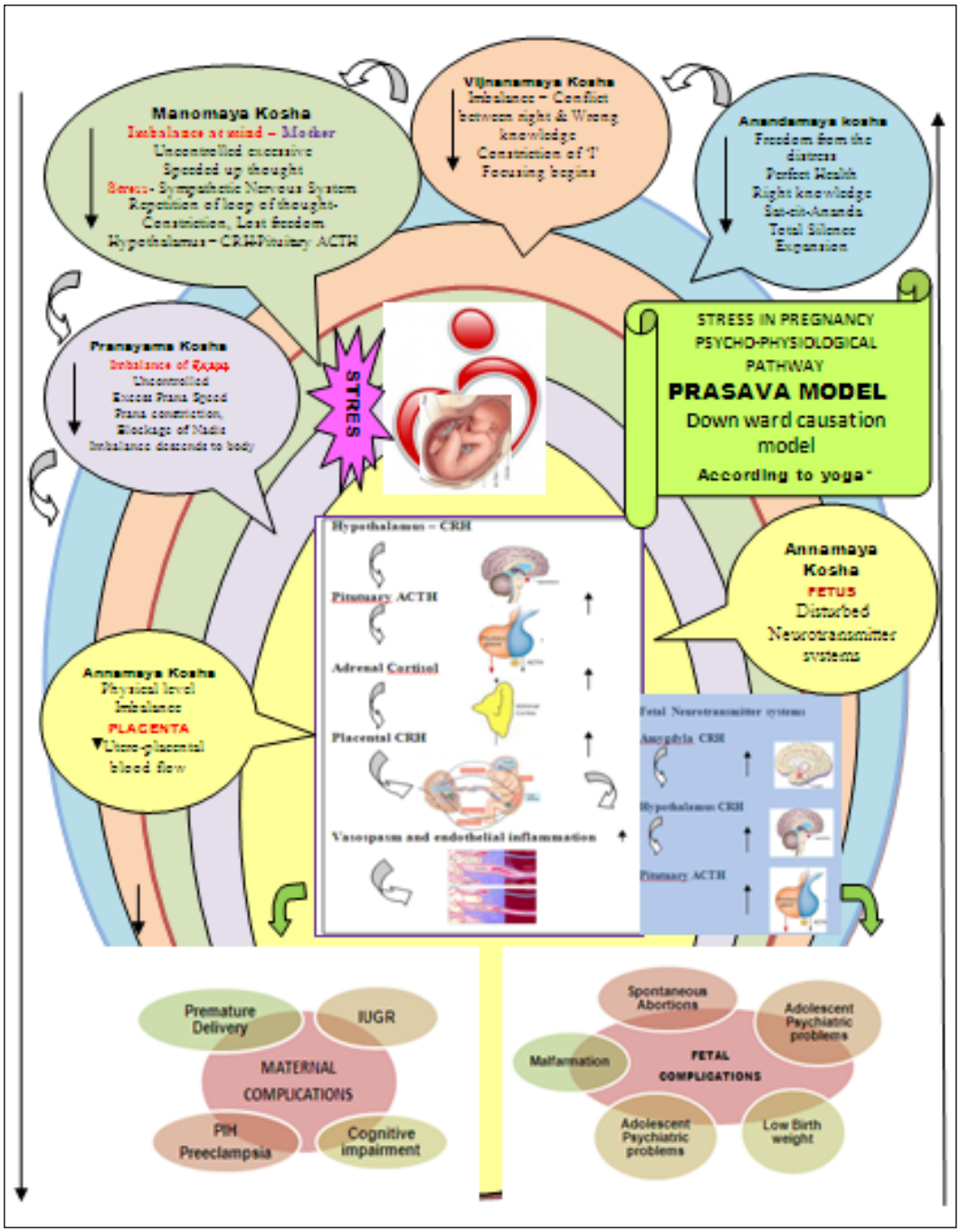
↓ ↓

***Manomaya kośa* --Imbalance at mind --- Mother**		**Lost freedom**
Uncontrolled excessive speeded up thoughts. Stress –Sympathetic Nervous System	**Repetition of loop of thoughts - constriction. Hypothalamus-CRH -Pituitary ACTH**	

↓ ↓

***Annamaya kośa* : Imbalance at physical level**	**Imbalance settles down. May lead to Spontaneous abortions. Structural Malformations, Pre eclampsia, Preterm Delivery, Reduced birth weight.**
Placenta - Adrenal Cortisol acting on the Placental CRH affecting the Uteroplacental blood flow Fetus- Neurotransmitter systems – Amygdale CRH- Hypothalamus CRH – Pituitary ACTH	

FIGURE. 7 MODELS: PRASAVA (YOGA)



Taittriya Upanisad,Yoga Vasistha,Patanjali yogasutras

YogicPRASAVA model of etiopathogenesis of pregnancy complications – the stress begins in manomaya kosha as persistent intrusive thoughts that percolate as uncontrolled excessive prana flow which results in physical manifestations of uncontrolled speed i.e. heightened SNS, HPA activation, in stress toxins, and inflammation.

PRATIPRASAVA MODEL THROUGH (PANCHA KOSHA VIVEKA)

Techniques of yoga at

Five *kośas* return to total health

(TaittirīyaUpanisad)

8.11.2. SUMMARY TABLE

REMEDY ↑ *Ānandamaya kośa*		**Expansion & non- activity**
Freedom from distress - Perfect health- Always untouched by any disease.		
Right knowledge – sat-cit-ānanda Blissful awareness during Meditation.	**Total silence - The inner most observe blissful awareness during action.**	

REMEDY ↑ *Vijñānamaya kośa*		**Focusing begins**
Knowledge – Happiness is Silence	**Knowledge of 'I am that'**	

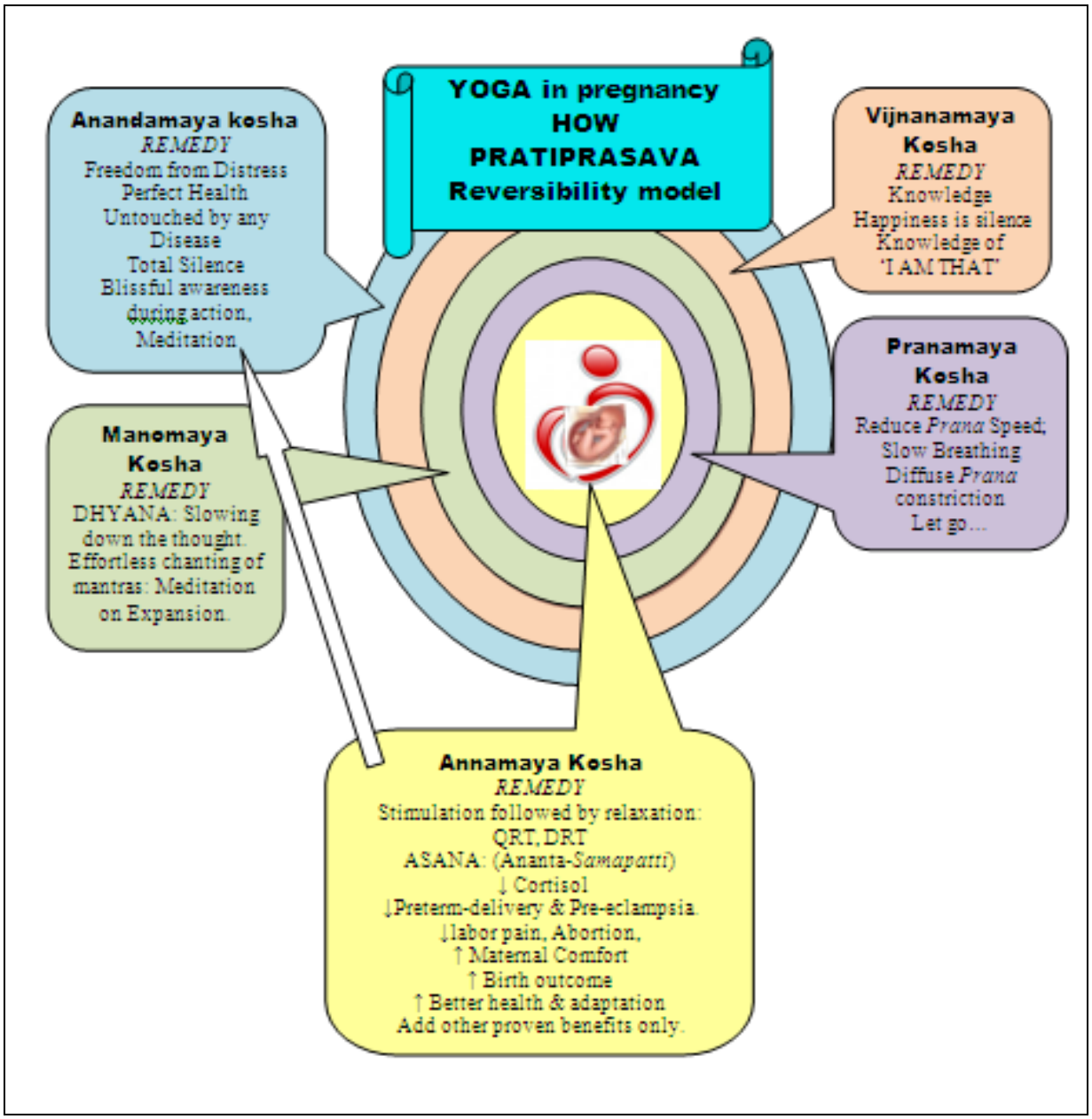
REMEDY ↑ *Manomaya kośa*	**Effortless chanting of mantras, meditation on expansion.**
Dhyana – Slow down the number of thought per second.	

REMEDY ↑ *Prānamaya kośa*	
Reduce *prāna* speed – Slow breathing	**Diffuse Prana constriction- Let go**

REMEDY ↑ *Annamaya kośa*	
Relax- QRT, DRT **Meditative Postures - (Prayatna caithilya)** **Body mind relaxed and calmness, self awareness ↓ Hypothalamus CRH level in mother and fetus, ↓ Pituitary ACTH in mother & Fetus,** **↓ Adrenal cortisol, & Placental CRH, & less chances of pre-eclampsia and preterm delivery.**	**Asana, Kriya – (Ananta – Samapatti)** **Stimulate followed by let go –** **↑Physical strength and flexibility,** **↓ labor pain, Lesser chances of abortions,** **↓Reduced chances of structural Malformations,** **↑Maternal comfort and better birth outcomes,** **↑Better health of the baby &** **Better adaption as a child, adolescent and adult.**

FIGURE. 8

MODEL: PRATIPRASAVA (YOGA)



8.12.2. REMEDY (PRATIPRASAVA)

Explanation:

Annamaya kośa-

The practices that were introduced for remedy at *Annamaya kośa* were Asanas (yogic postures), Kriyas (yogic cleansing techniques) and relaxation techniques. The principles based on which Yogic postures work at the body level are 'stimulation followed by letting go' and merging oneself with the state of silence. Postures also played an active role in increasing the physical strength & flexibility, maternal comfort & better birth outcomes, better health of the baby & better adaption as a child, adolescent, lowering labor pain & lesser chances of abortions, reduction in the chances of structural malformations. Similarly various yogic relaxation techniques helps in attaining relaxed and calm state of the mind and hence the malfunctioning at Hypothalamus which in turn inhibits the over secretion of CRH and ACTH from Pituitary in mother & fetus.

Prānamaya kośa-

Various practices of *Pranayama* which are supposed to be the operational tool at *Pranamaya Kosa* reduce the speed of *Prana* and thus slow down breathing and hence diffuse constriction of Prana.

Manomaya kośa-

'Dhyana' (meditation), which is the most effective practice practiced for the relieve at *Manomaya kośa* slows down the number of thoughts per second and thereby calm and relaxed state of mind is achieved.

Vijñānamayakośa-

For attaining relieve *at Vijñānamayakośa*, one should have the knowledge of happiness which is silence and eliminate the sense of 'I'.

Ānandamaya kośa –

At this level, one should understand her true nature which is 'Sat-cit-ānanda. Also the tools used for the operation of this Kosa make a person to be free from distress and thereby Perfect health is attained.

CHAPTER 9

APPRAISAL

9.1. SUMMARY AND CONCLUSIONS

This study has shown that regular practice of integrated yoga specifically designed for pregnancy, from the second trimester is better than the standard antenatal exercises that have been recommended by the Canadian associations of obstetricians. This is the first scientific evidence that points to the improvement in complex cognitive executive functions with improved quality of life and better autonomic response after integrated yoga in normal pregnancy.

9.1.1. Labor duration, mode of delivery, complication of pregnancy, epidural analgesia, birth weight & Apgar score.

We conclude that a specialized antenatal yoga program reduces the duration of all three stages of labor by more than 2 hours. It also reduces the analgesia requirement and rate of cesarean section with better fetal outcomes. We recommend the inclusion of such yoga programs in all antenatal clinics.

9.1.2. Heart Rate Variability & PSS.

Practicing integrated yoga from the 18th or 20thweek of a normal pregnancy reduces perceived stress better than standard prenatal exercises. The parasympathetic tone is increased and the sympathetic tone decreased during and after the guided deep relaxation period used in this study.

9.1.3. STAI, HADS, PRAQ & PEQ

Regular practice of integrated yoga in second and third trimester is more effective than antenatal exercises in reducing anxiety, Depression and improving the pregnancy experience.

9.1.4. Stroop test & fluency test

Integrated antenatal yoga starting from second trimester helps in improving cognitive executive functions (fluency and Response inhibition) and reducing anxiety pointing to the role of yoga in promoting better information processing in prefrontal cortex.

9.1.5. Verbal and visual working memory test

Visual and verbal working memory improves in pregnant women following IAYT module.

9.1.6. Conclusion of quality of life (WHO QOL-100) & (FIRO-B).

Integrated yoga practices can be used effectively to improve the quality of life of pregnant women who are distressed by the overwhelming physiological, psychological and emotional changes of pregnancy. We were also able to show that yoga interventions as well as other as other simple exercises could have a certain level of impact on the interpersonal relationships of the pregnant women.

9.2. STRENGTHS OF THE STUDY

Strengths of the study were:

(a) Its prospective randomized control design with a good sample size in which controls actively practiced a matched intervention for the same duration of time.

(b) Specially designed integrated yoga modules for different trimesters.

(4) Qualified instructors for both yoga and control interventions were used through the 16 weeks study.

(c) Measurement of yoga-induced stress reduction objectively.

(d) The groups were matched at baseline for maternal characteristics.

(e) Objective finding of improved autonomic response to guided relaxation in the third trimester in women practicing yoga.

(f) The deep physiological rest that is achieved by the components of *pranayama*, meditation and other mindfulness practices incorporated in the integrated yoga program that could explain the observed benefits.

(g) The first evidence on the benefits of yoga on cognitive functions during pregnancy.

(h) Evidence for Quality of life.

9.3. LIMITATIONS OF THE STUDY

Limitations of the study were:

(a) We could not control for possible social interaction between the two groups, although we had visualized this component and made suitable arrangements while designing the study.

(b) We had only relied on the diaries and verbal reports of the participants when checking for home compliance with the assigned practice.

(c) We were not able to find the exact reliability and validity of WHOQOL-100 and FIRO-B instruments for the Indian population although these instruments are widely used and their reliability has been well-documented globally in different socio-economic populations.

(d) Dropouts: The unplanned move to a different town in the third trimester due to social pressure, although they had registered go through their delivery in this hospital.

(e) Requests to shift from antenatal exercise group to yoga group because of the wide spread popularity of yoga through the media contributed to these drop outs from the RCT.

(f) The study population came from select obstetric units in South Bengaluru only.

(g) The documentation of the beginning of the first stage of labor was done by noting down either, (i) the time when there was cervical dilatation of three cms if the participant was already in the hospital or (ii) from the time of her arrival in the

hospital; although we did note down the degree of dilatation on arival, we would have missed the time when there was more than 3 cms dilatation on arrival. This may have caused some errors in deciding the duration of first stage. As we did not document how many of these women in the two groups had more than 3 cms dilatation at the time of admission to the hospital, our conclusions about the first stage in the two groups may be dubious. But this does not apply to the second or the third stage wherein the results are clear.

(h) This study had too many variables which may lead to a query about the accuracy of data although special care was taken to call the participants on different days over a period of one week to compete the data acquisition. Thanks to the examiner Dr Aruna Muralidhar who pointed out this limitation of the study.

(i) This study excluded high-risk pregnancies. Among these risk factors were women with hypertension and diabetics, which are quite prevalent in India. That could raise the question that whether the results of the study would apply to the general population.

9.4 SUGGESTIONS FOR FUTURE WORK

a. Further studies may evaluate the effect of yoga on neuromuscular dynamics and psychosocial stresses in pregnancy and its effect on the molecular biology of pregnancy and fetal programming.

b. Long term follow up of the off springs of these two groups would throw light on the positive effects of yoga on the development of cognitive functions in the child.

c. Multi centric trials including a more comprehensive battery of variables to measure ANS functions and changes in hormonal levels may unravel the hidden mechanisms of yoga, since the exact nature of the changes involved in stress adaptation are poorly understood (Mastorakos et al.,2006).

d. More studies in different ethnic groups, in abnormal pregnancies and by use of different types of Yoga may throw more light on yoga's ability to modulate the physiology in pregnancy for better homeostasis. Large cross-cultural cohort studies would be interesting to see if similar results could be obtained from a study targeting high-risk pregnancy population.

e. In future studies, these inexpensive yoga techniques may be tried in different cultures for the self-management of excessive stress. Such studies would throw more light on the generalizability of yoga practice and the reproducibility of the effects of yoga worldwide.

9.5. IMPLICATIONS OF THE STUDY

As this study offers the scientific evidence for the safety and benefits of this module of integrated yoga and yoga is widely accepted even in the west today and there are good number of centers round the globe which have been teaching yoga for pregnancy, we recommend that obstetricians incorporate these practices in all antenatal clinics in all sections of the society. This study has many clinical implications.

a. Subjects can avoid surgery during delivery
b. Pregnancy and delivery becomes enjoyable as the psychological distress reduces and quality of life improves.
c. Improved positive wellness and cognitive functions is a welcome social benefit of yoga that adds to promoting a healthy society with more mature mothers and off springs.

REFERENCES

- Abercrombie E D, Keefe K A, Difrischia D S, Zigmond M J. Differential effect of stress on in vivo dopamine release in striatum, nucleus accumbens, and medial frontal-cortex. J Neurochem. 1989; 52: 1655–1658.
- Albers L L, Schiff M, Gorwoda J G. The length of active labor in normal pregnancies. Obstet and Gynaecol. 1996; 87:355–359.
- Alder J, Fink N, Bitzer J, Hosli I, Holzgreve W. Depression and anxiety during pregnancy: a risk factor for obstetric, fetal and neonatal outcome? A critical review of the literature. J Matern Fetal Neonatal Med. 2007; 20:189–209.
- Alexander M P, Benson D F, Stuss D T. Frontal lobes and language. Brain Lang. 1989; 37:656-91.
- Alipour Z, Lamyian M, Hajizadeh E. Anxiety and fear of childbirth as predictors of postnatal depression in nulliparous women. Women Birth. 2012; 25:37-43.
- Allen M, Dietz M, Blair K S, van Beek M, Rees G, Vestergaard-Poulsen P, et al. Cognitive-affective neural plasticity following active-controlled mindfulness intervention. J Neurosci.2012; 32:15601-10.
- Arizmendi T G. Affonso D D. Stressful events related to pregnancy and postpartum. J Psychosom Res. 1987; 31:743-756.
- Arnsten A F T, Goldman-Racic P S. Noise stress impairs prefrontal cortical cognitive function in monkeys: Evidence for a hyperdopaminergic mechanism. Arch Gen Psychiatry. 1998; 55: 362–68.
- Babbar S, Parks-Savage A C, Chauhan S P. Yoga during pregnancy: a review. Am J Perinatol. 2012; 29:459-64.

- Balaskas J. Preparing for birth with yoga. London: Harper Collins Publisher Ltd; 2003.
- Banerjee B, Vadiraj H S, Ram A, Rao R, Jayapal M, & Gopinath K S. Effects of an integrated yoga program in modulating psychological stress and radiation induced genotoxic stress in breast cancer patients undergoing radiotherapy. Integr Cancer Ther. 2007; 6:242-50.
- Bastani F, Hidarnia A, Kazemnejad A, Vafaei M, Kashanian M. A randomized controlled trial of the effects of applied relaxation training on reducing anxiety and perceived stress in pregnant women. J Midwifery Womens Health. 2005; 50:36-40.
- Bastani F, Hidarnia A, Montgomery K S, Aguilar-Vafaei M E, Kazemnejad A. Does relaxation education in anxious primigravid Iranian women influence adverse pregnancy outcomes? A randomized controlled trial. J Perinat Neonatal Nurs. 2006; 20:138-46.
- Beckmann C, Beckmann C A. Effect of a structured antepartum exercise program on pregnancy and labor outcome in primiparas. J Reprod. 1990; 35:704–709.
- Beddoe A E, Paul Yang C P, Kennedy H P, Weiss S J, Lee K A. The effects of mindfulness-based yoga during pregnancy on maternal psychological and physical distress. J Obstet Gynecol Neonatal Nurs.2009;38:310-9.
- Beddoe A E, Lee K A, Weiss S J, Kennedy H P, Yang C P. Effects of mindful yoga on sleep in pregnant women: a pilot study. Biol Res Nurs. 2010; 11:363-70.
- Beddoe A E, Lee K A. Mind-body interventions during pregnancy. J Obstet Gynecol Neonatal Nurs. 2008; 37:165-75.
- Behrman R E, Butler A S. Preterm birth: causes, consequences, and prevention. Washington, DC: National Academy Press; 2006.

- Bench C J, Frith C D, Grasby P M, Friston K J, Paulesu E, Frackowiak R S J, Dolen R J. Investigations of the functional anatomy of attention using the Stroop test. Neuropsychologia. 1993; 31:907-22.
- Bennett H A, Einarson A, Taddio A, Koren G, Einarson T R. Prevalence of depression during pregnancy: systematic review. Obstet Gyneco Obstetrics and Gynecology. 2004; 103:698–709.
- Benton A L, Hamsher K S, Varney N R, Spreen O. Contributions to neuropsychological assessment. 1983. Oxford University Press, New York.
- Benton, A L & Hamsher K S. Multilingual Aphasia Examination. 2nd edn, 1989. Iowa City, AJA Associates, Inc.
- Berg M, Lundgren I, Hermansson E, Wahlberg V. Women's experience of the encounter with the midwife during childbirth. Midwifery. 1996; 12:11–15.
- Beydoun H, Saftlas A F. Physical and mental health outcomes of prenatal maternal stress in human and animal studies: a review of recent evidence. Paediatr Perinat Epidemiol. 2008; 290:595-596.
- Bhavanani A B, Madanmohan, Sanjay Z. Immediate effect of chandra nadi pranayama (left unilateral forced nostril breathing) on cardiovascular parameters in hypertensive patients. Int J Yoga. 2012; 5:108-11.
- Bidwell A J, Yazel B, Davin D, Fairchild T J, Kanaley J A. Yoga training improves quality of life in women with asthma. J Altern Complement Med. 2012; 18: 749-55.
- Bjelland I, Dahl A A, Haug T T, Neckelmann D. The validity of the Hospital Anxiety and Depression Scale. An updated literature review. J Psychosom Res. 2002; 52:69-77.

- Bogaerts A F, Van den Bergh B R, Witters I, Devlieger R. Anxiety during early pregnancy predicts postpartum weight retention in obese mothers. Obesity. 2013; 21: 1942-9.
- Bonomi AE, Patrick D L, Bushnell DM & Martin M. Validation of the United States' version of the World Health Organization Quality of Life (WHOQOL) instrument. J Clin Epidemiol. 2000; 53:1-12.
- Brown, WA Pregnancy related fears. In: Anonymous Psychological care during pregnancy and the postpartum period. 1979; 23-33. New York: Raven Press.
- Bryar R, Sinclair M. Theory for Midwifery Practice, Palgrave Macmillan, New York, NY, USA, 2nd edition, 2011.
- Cade W T, Reeds D N, Mondy K E, Overton E T, Grassino J, Tucker S, Yarasheski K E. Yoga lifestyle intervention reduces blood pressure in HIV infected adults with cardiovascular disease risk factors. HIV Medicine. 2010; 11:379-388.
- Cameron R P, Wells J D, Hobfoll S E. Stress. Social support and coping in pregnancy: taking gender and ethnicitiy into account. J Health Psychol. 1996; 1:195-208.
- Cannella D, Lobel M, Monheit A. Knowing believes: information and attitudes towards physical activity during pregnancy. J Psychosom Obstet Gynaecol. 2010; 31:236-42.
- Cenci M A, Kalen P, Mandel R J, Bjorklund A. Regional differences in the regulation of dopamine and noradrenaline release in medial frontal-cortex, nucleus-accumbens and caudate-putamen - a microdialysis study in the rat. Brain Res. 1992; 581: 217-28.
- Cepicky P, Mandys F. Reproductive outcome in women who lost their husbands in the course of pregnancy. Eur J Obstet Gynecol Reprod Biol. 1989; 30:137-40.

- Challis J R G, Matthews S G, Van Meir C, Ramirez M M. The placental corticotrophin-releasing hormone–adrenocorticotrophin axis. Placenta. 1995;16:481-502
- Chandran M, Tharyan P, Muliyil J, Abraham S. Postpartum depression in a cohort of women from a rural area of Tamil Nadu, India. Incidence and risk factors. Br J Psychiatry. 2002; 181: 499-504,
- Chandwani K D, Thornton B, Perkins G H, Arun B, Raghuram N V, Nagendra H R, Cohen L. Yoga improves quality of life and benefit finding for women undergoing radiotherapy for breast cancer. J Soc Integr Oncol. 2010; 8:43–55.
- Charil A, Laplante D P, Vaillancourt C, King S. Prenatal stress and brain development. Brain Res Rev. 2010; 65:56–79.
- Chattha R, Nagarathna R, Padmalatha V, Nagendra H R. Effect of yoga on cognitive functions in climacteric syndrome: A randomized control study. BJOG. 2008; 115:991-1000.
- Chattha R, Raghuram N, Venkatram P, Nagendra H R. Treating the climacteric symptoms in Indian women with an integrated approach to yoga therapy: A randomized control study. Menopause. 2008; 15:862-870.
- Chaya M S, Kurpad A V, Nagendra H R, Nagarathna R. The effect of long term combined yoga practice on the basal metabolic rate of healthy adults. BMC Complement Altern Med. 2006; 31:28.
- Chaya M S, Nagendra H R. Long-term effect of yogic practices on diurnal metabolic rates of healthy subjects. Int J Yoga. 2008; 1:27-32.
- Chinmayananda S. Mandukya Upanisad. Bombay, India: Sachin Publisher; 1984.

- Chung U L, Hung L C, Kuo S C, Huang C L. Effects of LI4 and BL 67 acupressure on labor pain and uterine contractions in the first stage of labor. J Nurs Res. 2003; 11:251-260.
- Chuntharapat S, Petpichetchian W, Hatthakit U. Yoga during pregnancy: Effects on maternal comfort, labor pain and birth outcomes. Complement Ther Clin Pract. 2008; 14: 105-115.
- Coe C L, Lubach G R. Fetal programming: prenatal origins of health and illness. Curr Dir Psychol Sci. 2008; 17:36-41.
- Cohen D L, Bloedon L T, Rothman R L, Farrar J T, Galantino M L, Volger S, Townsend R R. Iyengar yoga versus enhanced usual care on blood pressure in patients with pre hypertension to stage I hypertension: A randomized controlled trial. Evid Based Complement Alternat Med. 2011; 2011:546428.
- Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav. 1983; 24:386–96.
- Collen A C, Manhem K, Sverrisdottir Y B. Sympathetic nerve activity in women 40 years after a hypertensive pregnancy. J Hypertens. 2012; 30:1203-10.
- Collins C. Yoga: Intuition, preventive medicine, and treatment. J Obstet Gynecol Neonatal Nurs. 1998; 27:563-8.
- Copper R L, Goldenberg R L, Das A, Elder N, Swain M, Norman G, Meier A M. The Preterm Prediction Study: Maternal stress is associated with spontaneous preterm birth at less than thirty-five weeks' gestation. Am J Obstet Gynecol. 1996; 175:1286-1292.
- Coulter HD. Anatomy of hatha yoga. Honesdale, PA: Body and Breath; 2001.
- Crawley R A, Dennison K, Carter C. Cognition in pregnancy and the first year post-partum. Psychol Psychother. 2003; 76:69-84.

- Da Costa D, Larouche J, Dritsa M, Brender W. Variations in stress levels over the course of pregnancy: factors associated with elevated hassles, state anxiety and pregnancy-specific stress. J Psychosom Res. 1999; 47: 609-21.
- Da Costa D, Rippen N, Dritsa M, Ring A. Self-reported leisure-time physical activity during pregnancy and relationship to psychological well-being. J Psychosom Obstet Gynaecol. 2003; 24:111-9.
- Da Costa D. A prospective study of stress, anxiety and depression in women with pregnancy complication. Unpublished Master's thesis. 1992. Montreal, Que: Concordia University.
- Damodaran C, Subramanian V S, Krishnaswami C V. HLA, ESD, GLOI, C3 and HP polymorphisms and juvenile insulin dependent diabetes mellitus in Tamil Nadu (south India). Diabetes Res Clin Pract. 1994; 25:51-59.
- Danel I, Berg C, Johnson C H, Atrash H. Magnitude of maternal morbidity during labor and delivery: United States, 1993-1997. Am J Public Health. 2003; 93:631-34.
- Dash M, Telles S. Yoga training and motor speed based on a finger tapping task. Indian J Physiol Pharmacol. 1999; 43:458-462.
- Davies G A, Wolfe L A, Mottola M F, MacKinnon C, Arsenault M Y, Bartellas E, et al. Exercise in pregnancy and post partum period. J Obstet Gynaecol Can. 2003; 25:516-29.
- Dayan C, Creveuil M, Herlicoviez C, Herbel E, Baranger C. Role of Anxiety and Depression in the Onset of Spontaneous Preterm Labor. Am J Epidemiol. 2002; 155: 293-301.

- de Groot R H M, Hornstra G, Roozendaal N, Jolles J. Memory performance, but not information processing speed, may be reduced during early pregnancy. J Clin Exp Neuropsychol. 2003; 25:482-88.
- De Vire J & Van Heck GL. The World Health Organization Quality of Life assessment instrument (WHOQOL-100): Validation study with the Dutch version. Eur J Psychol Assess. 1997; 164-178.
- de Weerth C, Buitelaar J K. Physiological stress reactivity in human pregnancy: a review. Neurosci Biobehav Rev. 2005; 29:295 - 312.
- DiPietro J A. The role of prenatal maternal stress in child development. Curr Dir Psychol Sci. 2004; 13:71-74.
- Duncan L G, Bardacke N. Mindfulness-Based Childbirth and Parenting Education: Promoting Family Mindfulness during the Perinatal Period. J Child Fam Stud. 2010; 19:190-202.
- Dunkel-Schetter C, Glynn L. Stress in pregnancy: empirical evidence and theoretical issues to guide interdisciplinary researchers. In: Contrada R, Baum editors. Handbook of stress science: biology, psychology, and health. New York, NY: Springer Publishing Company; 2011. pp. 321–343.
- Dunkel-Schetter C, Lobel M. Pregnancy and birth: a multilevel analysis of stress and birth weight. In: Revenson T, Baum A, Singer J, editors. Handbook of health psychology 2. Mahwah, NJ: Lawrence Erlbaum; 2011. pp. 427–453.
- Dunkel-Schetter C, Tanner L. Anxiety, depression and stress in pregnancy: implications for mothers, children, research, and practice. Curr Opin Psychiatry. 2012; 25:141-8.
- Dunkel-Schetter C. Maternal stress and preterm delivery. Prenat Neonatal Med. 1998; 3: 39 - 42.

- Dunkel-Schetter C. Psychological science on pregnancy: stress processes, biopsychosocial models, and emerging research issues. Annu Rev Psychol. 2010; 62:531-558.
- Dunkel-Schetter C. Stress processes in pregnancy and preterm birth. Curr Dir Psychol Sci. 2009; 18:205-209.
- Duraiswamy G, Thirthali J, Nagendra HR, Gangadhar BN. Yoga therapy as an add-on treatment in the management of patients with schizophrenia - Acta Psychiatrica Scandinaviva. 2007; 116:226-232.
- E J H Mulder, P G Robles de Medina, A C Huizink B R H, Van den Bergh, J K Buitelaar, G H A Visser. Prenatal maternal stress: effects on pregnancy and the (unborn) child. Early Hum Dev. 2002 ; 70:3-14.
- Ebnezar J, Nagarathna R, Yogitha B, Nagendra H R. Effect of integrated yoga therapy on pain, morning stiffness and anxiety in osteoarthritis of the knee joint: a randomized control study. Int J Yoga. 2012; 5:28-36.
- Ekstrom A, Nissen E. "A mother's feelings for her infant are strengthened by excellent breastfeeding counseling and continuity of care. Pediatrics. 2006;118:309-314,
- Elfgren C I , Risberg J. Lateralised frontal bold flow increases during fluency tasks: influence of cognitive strategy. Neuropsychologia. 1998; 36:505-12.
- Eriksson C, Jansson L, Hamberg K. Women's experiences of intense fear related to childbirth investigated in a Swedish qualitative study. Midwifery. 2006; 22: 240-248.
- Eslinger P J, Grattan L M. Frontal lobe and frontal-striatal substrates for different forms of human cognitive flexibility. Neuropsychologia. 1993; 31:17-28.

- Faul F, Erdfelder E, Lang A G, Buchner A. G*Power 3: a flexible statistical power analysis program for the social, behavioral, and biomedical sciences. Behav Res Method. 2007; 39:175–91.
- Fenster L, Schaefer C, Mathur A, Hiatt R A, Pieper C, Hubbard A E. Psychologic stress in the workplace and spontaneous abortion. Am J Epidemiol. 1995; 142:1176-83.
- Fenwick J, Gamble J, Nathan E, Bayes S, Hauck Y. Pre- and postpartum levels of childbirth fear and the relationship to birth outcomes in a cohort of Australian women. J Clin Nurs. 2009; 18:667- 677.
- Field T, Diego M A, Hernandez-Reif M, Schanberg S, Kuhn C. Massage therapy effects on depressed pregnant women. J Psychosom Obstet Gynaecol. 2004; 25:115-22.
- Field T, Diego M, Hernandez-Reif M, Figueiredo B, Deeds O, Ascencio A, et al. Comorbid depression and anxiety effects on pregnancy and neonatal outcome. Infant Behav Dev. 2010; 33:23-9.
- Field T, Diego M, Hernandez-Reif M, Medina L, Delgado J, Hernandez A. Yoga and massage therapy reduce prenatal depression and prematurity. J Bodyw Mov Ther. 2012; 16:204-9.
- Field T, Diego M, Hernandez-Reif M. Prenatal depression effects on the fetus and newborn. Infant Behav Dev. 2004; 27:216–229.
- Field T, Hernandez-Reif M, Hart S, Theakston H, Schanberg S, Kuhn C. Pregnant women benefit from massage therapy. J Psychosom Obstet Gynaecol. 1999; 20: 31-8.
- Finlay J M, Zigmond M J. The effects of stress on central dopaminergic neurons: Possible clinical implications. Neurochem Res. 1997; 22: 1387–94.

- Frith C, Fristan K, Liddle P, Frackowiak D. A PET study of word finding. Neuropsychologia. 1991; 29:1137-48.
- Gardosi J, Hutson N, B-Lynch C. Randomized controlled trial of squatting in the second stage of labor. Lancet. 1989; 2:74–77.
- Gausia K, Ryder D, Ali M, Fisher C, Moran A, Koblinsky M. Obstetric complications and psychological well-being: experiences of Bangladeshi women during pregnancy and childbirth. J Health Popul Nutr. 2012; 30:172-80.
- Geogory A L D, Larry A W, Michelle F M, Catherine M. Exercise in Pregnancy and post partum period, J Obstet Gynaecol Can. 2003; 25:516-22.
- Giles W B, McLean M, Davies J J, Smith R. Abnormal umbilical artery Doppler waveforms and cord blood corticotrophin-releasing hormone. Obstet Gynecol. 1996; 87:107– 111.
- Gitau R, Cameron A, Fisk N M, Glover V. Fetal exposure to maternal cortisol. Lancet. 1998; 353:707– 8.
- Glover V, Bergman K, Sarkar P, O'Connor T G. Association between maternal and amniotic fluid cortisol is moderated by maternal anxiety. Psychoneuroendocrinology. 2009; 34:430–435.
- Glover V. Prenatal stress or anxiety during pregnancy and the development of the baby. Pract Midwife. 1999; 2:20-2.
- Glynn L M, Schetter C D, Hobel C J, Sandman C A. Pattern of perceived stress and anxiety in pregnancy predicts preterm birth. Health Psychol. 2008; 27:43-51.
- Glynn L M, Wadhwa P D, Dunkel-Schetter C, Chicz-Demet A, Sandman C A. When stress happens matters: Effects of earthquake timing on stress responsively in pregnancy. Am J Obstet Gynecol. 2001; 184: 637-642.

- Goland R S, Jozak S, Warren W B, Conwell I M, Stark R I, & Tropper P J. Elevated levels of umbilical cord plasma corticotropin-releasing hormone in growth-retarded fetuses. J Clin Endocrinol Metab. 1993; 77: 1174–1179.
- Goodman P, Mackey M C, Tavakoli A S. Factors related to childbirth satisfaction. J Adv Nurs. 2004; 46:212–219.
- Greenaway R, Mogg K, Bradley B P. Attentional bias for smoking-related information in pregnant women: relationships with smoking experience, smoking attitudes and perceived harm to foetus. Addict Behav. 2012; 37:1025-28.
- Gregory A L D, Larry A W, Michelle F M, Catherine M. Exercise in pregnancy and post partum period. J Obstet Gynaecol Can. 2003; 25:516-22.
- Grote N K, Bridge J A, Gavin A R, Melville J L, Iyengar S, Katon W J. A meta-analysis of depression during pregnancy and the risk of preterm birth, low birth weight, and intrauterine growth restriction. Arch Gen Psychiatry. 2010; 67:1012–1024.
- Guardino C M, Dunkel-Schetter C, Bower J E, Lu M C, Smalley S L. Randomized controlled pilot trial of mindfulness training for stress reduction during pregnancy. Psychol Health. 2014: 29: 334-49.
- Gupta N, Khera S, Vempati R P, Sharma R, Bijlani R L. Effect of yoga based lifestyle intervention on state and trait anxiety. Indian J Physiol Pharmacol. 2006; 50:41-7.
- Hafner-Holter S, Kopp M, Günther V. Effects of fitness training and yoga on well-being stress, social competence and body image. Neuropsychiatry. 2009; 23:244-8.
- Hall W A, Hauck Y L, Carty E M, Hutton E K, Fenwick J, Stoll K. Childbirth fear, anxiety, fatigue, and sleep deprivation in pregnant women. J Obstet Gynecol Neonatal Nurs. 2009; 38:567-576.

- Halligan S L, Murray L, Martins C, Cooper P J. Maternal depression and psychiatric outcomes in adolescent offspring: a 13-year longitudinal study. J Affect Disord. 2007; 97:145-154,
- Hamilton B E, Martin J A, Ventura S J. Births: Preliminary Data for 2009. Natl Vital Stat Rep. 2010; 59:3.
- Hammer A L & Schnell E R. FIRO-B Technical Guide. Mountain View, 2000.CA: CPP, Inc.
- Melender H L. Experiences of Fears Associated with Pregnancy and Childbirth: A Study of 329 Pregnant Women. Birth. 2002; 29:101- 111.
- Hansen D, Lou H C, Olsen J. Serious life events and congenital malformations: a national study with complete follow-up. Lancet. 2000; 356:875-80.
- Hao T Y, Li Y H, Yao S F. Clinical study on shortening the birth process using psychological suggestion therapy. Zhonghua Hu Li Za Zhi. 1997; 32; 568–570.
- Haram K, Søfteland E, Bukowski R. Intrauterine growth restriction. Int J Gynaecol Obstet. 2006; 93:5-12.
- Hartfiel N, Burton C, Rycroft-Malone J, Clarke G, Havenhand J, Khalsa SB, Edwards RT. Yoga for reducing perceived stress and back pain at work. Occup Med. 2012; 62:606-12.
- Hedegaard M, Hendriksen T B, Sabroe S, Secher N J. The relationship between psychosocial distress during pregnancy and birth weight for gestational age. Acta Obstet Gynecol Scand. 1996;75:32-39.
- Hedegaard M, Henriksen T B, Secher N J, Hatch M C, Sabroe S. Do stressful life events affect duration of gestation and risk of preterm delivery? Epidemiol. 1996; 7:339-45.

- Henry J D, Rendell P G. A review of the impact of pregnancy on memory function. J Clin Exp Neuropsychol. 2007; 29:793-803.
- Hermansson E, Martensson L. Empowerment in the midwifery context—a concept analysis. Midwifery. 2011; 27:811–816.
- Herrmann C. International experiences with the hospital anxiety and depression scale e a review of validation data and clinical results. J Psychosom Res. 1997; 42:17-41.
- Hewitt P L, Flett G L, Mosher S W. The Perceived Stress Scale: factor structure and relation to depression symptoms in a psychiatric sample. J Psychopathol Behav Asses. 1993; 14:247–57.
- Hobel C J, Dunkel-Schetter C, Roesch S C, Castro L C, Arora C P. Maternal plasma corticotropin-releasing hormone associated with stress at 20 weeks' gestation in pregnancies ending in preterm delivery. Am J Obstet Gynecol. 1999; 180:257- 63.
- Hobel C. Stress and preterm birth. Clin Obstet Gynecol. 2004; 47: 856-880.
- Howland J G, Cazakoff B N, Zhang Y. Altered object-in-place recognition memory, prepulse inhibition, and locomotor activity in the offspring of rats exposed to a viral mimetic during pregnancy. Neurosci. 2012; 201:184-98.
- Huizink A C, Mulder E J, Robles de Medina P G, Visser G H, Buitelaar J K. Is pregnancy anxiety a distinctive syndrome? Early Hum Dev. 2004; 79:81-91.
- Huizink A C, Robels de Medina P G, Mulder E J, Visser G H, Buitelaar J K. Stress during pregnancy is associated with developmental outcome in infancy. J Child Psychol Psychiatry. 2003; 44:810-8.
- Huizink A C. Prenatal stress and its effects on infant development. Academic Thesis, University Utrecht, The Netherlands. 2000:1-217.

- Iwasaki H, Namiki A. A review of pregnancy induced analgesia. Masui. 1997; 46:598–606.
- Jenkins M W, Pritchard M H. Hypnosis: Practical applications and theoretical considerations in normal labour. BJOG. 1993; 100:221-226.
- John P J. Neuropsychological and spectral EEG correlate of dimensions of schizophrenia. 1998. Unpublished MD thesis submitted to National Institute of Mental Health and Neuroscience, Bangalore, India.
- Jones-Gotman M, Milner B. Design fluency: The invention of nonsense drawings after focal cortical lesion. Neuropsychologia. 1977; 15: 653– 74.
- Kamei T, Toriumi Y, Kimura H, Ohno S, Kumano H, Kimura K. Decrease in serum cortisol during yoga exercise is correlated with alpha wave activation. Percept Mot Skills. 2000; 90:1027-1032.
- Kamysheva E, Wertheim E H, Skouteris H, Paxton SJ, Milgrom J. Frequency, severity, and effect on life of physical symptoms experienced during pregnancy. J Midwifery Womens Health. 2009; 54:43-9.
- Kinsella M T, Monk C. Impact of maternal stress, depression, and anxiety on fetal neurobehavioral development. Clin Obstet Gynecol. 2009; 52:425-440.
- Kjellgren A, Bood S A, Axelsson K, Norlander T, Saatcioglu F. Wellness through a comprehensive yogic breathing program e a controlled pilot trial. BMC Complement Altern Med. 2007; 19:7-43.
- Korukcu O, Fırat M Z, Kukulu K. Relationship between fear of childbirth and anxiety among Turkish pregnant women. Procedia Social and Behavioral Sciences. 2010; 5: 467-470.
- Kubo A, Hung Y Y, Ritterman J. Yoga for heart failure patients: a feasibility pilot study with a multiethnic population. Int J Yoga Therap. 2011; 21:77-83.

- Kurki T, Hiilesmaa V, Raitasalo R, Mattila H, Ylikorkala O. Depression and anxiety in early pregnancy and risk for preeclampsia. Obstet Gynecol. 2000; 95:487- 90.
- Labonte R. Health promotion and empowerment: reflections on professional practice. Health Education Quarterly. 1994; 21:253-268.
- Landbergis P A, Hatch M C. Psychosocial work stress and pregnancy-induced hypertension. Epidemiology. 1996; 7:346-51.
- Lazarus R S, Folkman S. Stress, appraisal, and coping. New York. 1984; NY: Springer Publishing Company, Inc.
- Lederman R P. Relationship of anxiety, stress, and psychosocial development to reproductive health. Behav medicine. 1995; 21:101-112.
- Lee A M, Lam S K, Sze Mun Lau S M, Chong C S, Chui H W, Fong D Y Prevalence, course, and risk factors for antenatal anxiety and depression. Obstet Gynecol. 2007; 110: 1102-1112.
- Leiferman J A, Evenson K R. The effect of regular leisure physical activity on birth outcomes. Matern Child Health J. 2003; 7: 59-64.
- LePage J. Creating yoga therapy classes and individual sessions that work. Int J Yoga Therapy 2002; 12:13-23.
- Leung T N, Chung T K H, Madsen G, McLean M, Chang A M Z, Smith R. Elevated mid-trimester maternal Corticotrophin-releasing hormone levels in pregnancies that delivered before 34 weeks. Br J Obstet Gynaecol. 1999; 106:1041– 6.
- Levin J S. The factor structure of the pregnancy anxiety scale. J Health Soc Behav. 1991; 32:368-381.

- Lezak M D. Neuropsychological Assessment. 3rd edn, 1995. Oxford University Press, New York.
- Lobel M, Cannella D L, Graham J E, DeVincent C, Schneider J, Meyer B A. Pregnancy-specific stress, prenatal health behaviors, and birth outcomes. Health Psychol. 2008; 27:604-615.
- Lobel M, Dunkel-Schetter C. Conceptualizing stress to study effects on health: environmental, perceptual, and emotional components. Anxiety Res. 1990;3: 213-230
- Lockwood C J. Stress-associated preterm delivery: The role of corticotropin-releasing hormone. Am J Obstet Gynecol. 1999;180: 264-266.
- Lotgering F K, Struijk P C, Van Doorn M B, Wallenburg H C. Errors in predicting maximal oxygen consumption in pregnant women. J Appl Physiol. 1992; 72(2):562 –7.
- Lou H C, Hansen D, Nordentoft M, Pryds O, Jensen F, Nim J et al. Prenatal stressors of human life affect fetal brain development. Dev Med Child Neurol. 1994; 36: 826-32.
- Lumbiganon P, Laopaiboon M, Gulmezoglu A M, Souza J P, Taneepanichskul S, Ruyan P. World Health Organization Global Survey on Maternal and Perinatal Health Research Group. Method of delivery and pregnancy outcomes in Asia: The WHO global survey on maternal and perinatal health 2007- 08. Lancet. 2010; 375:490–499.
- Lundgren T, Dahl J, Yardi N, & Melin L. Acceptance and commitment therapy and yoga for drug-refractory epilepsy: A randomized controlled trial. Epilepsy & behavior, 2008; 13, 102-103.

- Lupien S J, Nair N P, Briere S, Maheu F, Tu M T, Lemay M et al. Increased cortisol levels and impaired cognition in human aging: implication for depression and dementia in later life. Rev Neurosci. 1999; 10:117-39.
- Lynn F A, Alderdice F A, Crealey G E, McElnay J C. Associations between maternal characteristics and pregnancy-related stress among low-risk mothers: an observational cross-sectional study. Int J Nurs Stud. 2011; 48:620-627.
- MacDonald A W, Cohen J D, stinger N A, Carter C S. Disassociation the role of the dorsolateral prefrontal and anterior cingulated cortex in cognitive control. Science. 2000; 288:1835-38.
- Mahapure H H, Shete S U, Bera T K. Effect of yogic exercise on super oxide dismutase levels in diabetics. Int J Yoga .2008; 1:21-6.
- Majzoub J A, Karalis K P. Placental corticotropin-releasing hormone: function and regulation. Am J Obstet Gynecol. 1999; 180:242- 6.
- Majzoub J A, McGregor J A, Lockwood C J, Smith R, Taggart M S, Schulkin J. A central theory of preterm and term labor: Putative role for corticotrophin-releasing hormone. Am J Obstet Gynecol. 1999; 180:232-234.
- Malliani A, Pagani M, Lombardi F, Carutti S. Cardiovascular neural regulation explored in the frequency domain. Circulation. 1991; 84(2):482–92.
- Mancuso R S, Dunkel-Schetter C, Rini C M, Roesch S C, Hobel C.J. Maternal prenatal anxiety and corticotropin-releasing hormone associated with timing of delivery. Psychosom Med. 2004; 66: 762–769.
- Manjunath N K, Telles S. Factor's influencing changes in tweezer dexterity scores following yoga training. Indian J Physiol Pharmacol. 1999; 43:225–229.

- Mantz J, Thierry A M, Glowinski J. Effect of Noxious Tail Pinch on the Discharge Rate of Mesocortical and Mesolimbic Dopamine Neurons - Selective Activation of the Mesocortical System. Brain Res. 1989; 476: 377–81.
- Mastorakos G, Pavlatou M G, Mizamtsidi M. The hypothalamice pituitarye adrenal and the hypothalamicepituataryegonadal axes interplay. Pediatr Endocrinol Rev. 2006; 1:172-81.
- McGaugh J L, Roozendaal B. Role of adrenal stress hormones in forming lasting memories in the brain. Curr Opin Neurobiol. 2002; 12: 205–10.
- McLean M, Bisits A, Davies J, Woods R, Lowry P, Smith R. A placental clock controlling the length of human pregnancy. Nature Medicine. 1995; 1:460–463.
- Melender H L. Experiences of fears associated with pregnancy and childbirth: a study of 329 pregnant women. Birth. 2002; 29:101-111,
- Mian A I. Depression in pregnancy and the postpartum period: balancing adverse effects of untreated illness with treatment risks. J Psychiatr Pract. 2005; 11:389-96.
- Michalsen A, Grossman P, Acil A, Langhorst J, Lüdtke R, Esch T, et al. Rapid stress reduction and anxiolysis among distressed women as a consequence of a three-month intensive yoga program. Med Sci Monit. 2005; 11:555-61.
- Michalsen A, Jeitler M, Brunnhuber S, Ludtke R, Bussing A, Musial F et al. Iyengar yoga for distressed women: a 3-armed randomized controlled trial. Evid Based Complement Alternat Med. 2012; 2012: 408727.
- Mulder E J, Robles de Medina P G, Huizink A C, Van den Bergh B R, Buitelaar J K, Visser G H. Prenatal maternal stress: effects on pregnancy and the unborn child. Early Hum Dev. 2002; 70:3-14.
- Nagarathna R, Nagendra H R. Yoga for bronchial asthma: a controlled study. Br Med J. 1985; 291:1077-9.

- Nagarathna R, Nagendra H R, Monro R. Yoga for a healthy lifestyle. London: Gaia Books Limited; 1990.
- Nagarathna R, Nagendra H R. Yoga for promotion of positive health. Swami Vivekananda Yoga Prakashana, Bangalore; 2001.
- Nagarathna R, Nagendra H R. Yoga for promotion of positive health. Revised ed. SVYP Publication, Bangalore; 2008.
- Nagarathna R. Yoga in medicine. In S. J. Shah (Ed.), API textbook of medicine (Chap. 6). New York, 2009. NY: Associated Press
- Nagendra H R, Nagarathna R. An integrated approach of yoga therapy for bronchial asthma: A 3-54-month prospective study. J Asthma. 1986; 23:123-137.
- Nagendra H R, Nagarathna R. New perspectives in stress management. Bangalore, India: Vivekananda Kendra Yoga Prakashan; 1988.
- Narendran S, Nagarathna R, Gunasheela S, Nagendra H R. Efficacy of yoga in pregnant women with abnormal Doppler study of umbilical and uterine arteries. J Indian Med Assoc. 2005; 103:16-7.
- Narendran S, Nagarathna R, Narendran V, Gunasheela S, Nagendra H R. Efficacy of yoga on pregnancy outcome. J Altern Complement Med. 2005; 11:237-44.
- Nesheim B I, Kinge R. Performance of acupuncture as labor analgesia in the clinical setting. Acta Obstet Gynecol Scand. 2006; 85:441-443.
- Neugebauer R, Kline J, Stein Z, Shrout P, Warburton D, Susser M. Association of stressful life events with chromosomally normal spontaneous abortion. Am J Epidemiol. 1996; 143:588- 96.

- Newham J J, Wittkowski A, Hurley J, Aplin J D, Westwood M. Effects of antenatal yoga on maternal anxiety and depression: a randomized controlled trial. Depress Anxiety. 2014:631-40.
- Nidhi R, Padmalatha V, Nagarathna R, Amritanshu R. Effect of holistic yoga program on anxiety symptoms in adolescent girls with polycystic ovarian syndrome: a randomized control trial. Int J Yoga. 2012; 5:112-7.
- Nieminen K, Stephansson O, Ryding E L. Women's fear of childbirth and preference for cesarean section--a cross-sectional study at various stages of pregnancy in Sweden. Acta Obstet Gynecol Scand. 2009; 88:807-813.
- Nilsson L, Thorsell T, Hertfelt Wahn E, Ekstrom A. Factor influencing positive Birth Experiences of First time Mothers. Nurs Res Pract. 2013; 2013: 349124.
- Nimby G T, Lundberg L, Sveger T, McNeil F. Maternal distress and congenital malformations: do mothers of malformed fetuses have more problems? J Psychiatr Res. 1999; 33:291-301.
- Niskanen J P, Tarvainen M P, Ranta-aho P O, Karjalainen P A. Software for advanced HRV analysis. Comput Methods Programs Biomed. 2004; 76:73–81.
- Nordentoft M, Lou H C, Hansen D, Nim J, Pryds O, Rubin P, et al. Intrauterine growth retardation and premature delivery: The influence of maternal smoking and psychosocial factors. Am J Public Health. 1996; 86: 347-354.
- O'Connor T G, Ben-Shiomo Y, Heron J, Golding J, Adams D, Glover V. Prenatal anxiety predicts individual differences in cortisol in preadolescent children. Biol Psychiatry. 2005; 58:211-217.
- O'Connor T G, Caprariello P, Blackmore E R, Gregory A M, Glover V, Fleming P. Prenatal mood disturbance predicts sleep problems in infancy and toddlerhood. Early Hum Dev. 2007; 83:451-458.

- O'Donnell K, O'Connor T G, Glover V. Prenatal stress and neurodevelopment of the child: focus on the HPA axis and role of the placenta. Dev Neurosci. 2009; 31:285–292.
- Oakley S, Evans E. The role of yoga: breathing, meditation and optimal fetal positioning. Pract Midwife. 2014; 17:30-2.
- Oken B S, Zajdel D, Kishiyama S, Flegal K, Dehen C, Haas M, Leyva J. Randomized, controlled, six-month trial of yoga in healthy seniors: Effects on cognition and quality of life. Altern Ther Health Med. 2006; 12: 40–47.
- Onyper S V, Searleman A, Thacher P V, Maine E E, Johnson A G. Executive functioning and general cognitive ability in pregnant women and matched controls. J Clin Exp Neuropsychol. 2010; 32:986-95.
- Oweis A, Abushaikha L. Jordanian pregnant women's expectations of their first childbirth experience. Int J Nurs Pract. 2004; 10:264-271.
- Paarlberg K M, Vingerhoets A J, Passchier J, Dekker G A, Heinen A G, van Geijn H P. Psychosocial factors and pregnancy outcome: a review with emphasis on methodological issues. J Psychosom Res. 1995; 39:563- 95.
- Paarlberg K M, Vingerhoets A J, Passchier J, Dekker G A, van Geijn H P. Psychosocial predictors of low birth weight: a prospective study. Br J Obstet Gynaecol. 1999; 106:834- 41.
- Pailoor S, Telles S. Performance on psychomotor tasks following two yoga-based relaxation techniques. Percept and mot skills. 2009; 109:1-14.
- Painter R C, de Rooij S R, Bossuyt P M, Phillips D I, Osmond C, Barker D J et al. Blood pressure response to psychological stressors in adults after prenatal exposure to the Dutch famine. J Hypertens. 2006; 24:1771-78.

- Pandya D P, Vyas V H, Vyas S H. Mind-body therapy in the management and prevention of coronary disease. Compr Ther. 1999; 25:283-93.
- Patra S, Telles S[b]. Positive impact of cyclic meditation on subsequent sleep. Med Sci Monit. 2009; 7:375-81.
- Patra S, Telles S[a]. Heart rate variability during sleep following the practice of cyclic meditation and supine rest. Appl Psychophysiol Biofeedback. 2010; 35:135-40.
- Perkins A V, Linton E A, Eben F, Simpson J, Wolff C D A, Redman C W G. Corticotrophin-releasing hormone and corticotrophin-releasing hormone binding protein in normal and pre-eclamptic human pregnancies. Br J Obstet Gynaecol. 1995; 102:118–22.
- Pradhan B, Nagendra H. Immediate effect of two yoga-based relaxation techniques on attention in children. Int J Yoga. 2010; 3:67-69.
- Pradhan B, Nagendra H. Normative data for the digit-letter substitution task in school children. Int J Yoga. 2009; 2:69-72.
- Pujol J, Vendrell P, Kulisevsly J, Mrti-Vilalta J L, Garcia C, Junque C, et al. Front lobe activation during word generation studied by functional MRI. Acta Neurol Scand. 1996; 93:403-10.
- Raghuraj P, Telles S. Muscle power, dexterity skill and visual perception in community home girls trained in yoga or sports and in regular school girls. Indian J Physiol Pharmacol. 1997; 41:409–415.
- Rahman A, Iqbal Z, Bunn J, Lovel H, Harrington R. Impact of maternal depression on infant nutritional status and illness: a cohort study. Arch Gen Psychiatry. 2004;61:946-952,

- Rai Bahadur Srisa Chandra Vasu. (1996) *Siva Samhita*. Pub-Munshiram Manoharlal, New Delhi-110005.
- Rakhshani A, Maharana S, Raghuram N, Nagendra H R, Venkatram P. Effects of integrated yoga on quality of life and interpersonal relationship of pregnant women. Qual Life Res. 2010; 19:1447-55.
- Rakhshani A, Nagarathna R, Mhaskar R, Mhaskar A, Thomas A, Gunasheela S. The effects of yoga in prevention of pregnancy complications in high-risk pregnancies: a randomized controlled trial. Prevent Med. 2012; 55:333-40.
- Rao M R, Raghuram N, Nagendra H R, Gopinath K S, Srinath B S, Diwakar R B, Varambally S. Anxiolytic effects of a yoga program in early breast cancer patients undergoing conventional treatment: A randomized controlled trial. Complement Ther Med. 2009; 17:1-8.
- Rao S L, Subbakrishna D K, Gopukumar K. Nimhans Neuropsychology battery. 1st edn, 2004, NIMHANS, Bangalore, India.
- Ravi Prakash Arya. (2000) *The Yoga Vasistha of Valmiki*. VOLUME-I, Utpatti Prakarana, pub- Parimal., 27/28, Shakti Nagar, Delhi.
- Ravi Prakash Arya. (2000) *The Yoga Vasistha of Valmiki.* VOLUME-IV, Nirvana-Prakarana, pub-Parimal., 27/28, Shakti nagar, Delhi.
- Richter J, Bittner A, Petrowski K, Junge-Hoffmeister J, Bergmann S, Joraschky P, et al. Effects of an early intervention on perceived stress and diurnal cortisol in pregnant women with elevated stress, anxiety, and depressive symptomatology. J Psychosom Obstet Gynaecol. 2012; 33:162-70.
- Rodgers J, Martin C R, Morse R C, Kendell K, Verrill M. An investigation into the psychometric properties of the Hospital Anxiety and Depression Scale in patients with breast cancer. Health Qual Life Outcomes. 2005; 14:3-41.

- Roesch S C, Dunkel Schetter C, Woo G, Hobel C J. Modeling the types and timing of stress in pregnancy. Anxiety Stress Coping. 2004; 17:87–102.
- Rondo P H, Ferreira R F, Nogueira F, Ribeiro M C, Lobert H, Artes R. Maternal psychological stress and distress as predictors of low birth weight, prematurity and intrauterine growth retardation. Eur J Clin Nutr. 2003; 57:266-272.
- Roozendaal B, McEwen B S, Chattarji S. Stress, memory and the amygdala. Nat Rev Neurosci. 2009; 10: 423–33.
- Ross L E, McLean L M. Anxiety disorders during pregnancy and the postpartum period: A systematic review. J Clin Psychiatry. 2006; 67:1285-98.
- Ryan D, Milis L, Misri N. Depression during pregnancy. Can Fam Physician. 2005; 51:1087- 93.
- Ryan L R. Clinical interpretation of the FIRO-B. Palo Alto, 1977. CA: Consulting Psychologists.
- Ryan L R. Clinical Interpretation of the FIRO-B. Consulting Psychologists Press. 1977. Palo Alto, CA.
- Sahay B K. Role of yoga in diabetes. J Assoc Physicians India. 2007; 55:121-26.
- Saisto T, Toivanen R, Salmela-Aro K, Halmesmäki E. Therapeutic group psychoeducation and relaxation in treating fear of childbirth. Acta Obstet Gynecol Scand. 2006; 85: 1315–1319.
- Sakakibara M, Takeuchi S, Hayano J. Effect of relaxation training on cardiac parasympathetic tone. Psychophysiology. 1994; 31(3):223–8.
- Salvesen K A, Mørkved S. Randomised controlled trial of pelvic floor muscle training during pregnancy. BMJ. 2004; 329:378–380.

- Sanderson D A, Wilcox M A, Johnson I R. The individualized birth weight ratio: a new method of identifying intrauterine growth retardation. Br J Obstet Gynaecol. 1994; 101: 310-314.
- Sandman C, Glynn L, Dunkel-Schetter C, Wadhwa P, Garite T, Chicz-DeMet A, Hobel C. Elevated maternal cortisol early in pregnancy predicts third trimester levels of placental corticotropin releasing hormone (CRH): Priming the placental clock. Peptides. 2006; 27:1457- 63.
- Sarang P, Telles S[a]. Effects of two yoga based relaxation techniques on heart rate variability (HRV). Int J Stress Manag. 2006; 13: 1–16.
- Sarang P, Telles S. Immediate effect of two yoga-based relaxation techniques on performance in a letter-cancellation task. Percept Mot Skills. 2007; 105: 379–85.
- Sarang P, Telles S[b]. Changes in p300 following two yoga-based relaxation techniques. Int J Neurosci. 2006; 116:1419-30.
- Schell L M. Environmental noise and human prenatal growth. Am J Physiol Anthropol. 1981; 56:63-70.
- Schneider M L, Moore C F. Effect of prenatal stress on development: a nonhuman primate model. In: Nelson CA, editor. The effects of early adversity on neurobehavioral development. Encyclopedia of chiild development. PhD thesis. 2003. University of Wisconsin-Madison, USA.
- Schnell E R, Hammer A. Introduction to the FIRO-B in organizations. Palo Alto, 1993. CA: CPP, Inc.
- Schutz W C. FIRO: A three dimensional theory of interpersonal behavior. 1958. New York: Holt, Rinehart, and Winston.
- Schutz W C. FIRO: A Three Dimensional Theory of Interpersonal Behavior. 1958. Holt, Rinehart, & Winston, New York, NY.

- Scott J R, Rose N B. Effect of psychoprophylaxis (Lamaze preparation) on labor and delivery in primiparas. N Engl J Med. 1976; 294:1205–1207.
- Sercekus P, Okumus H. Fears associated with childbirth among nulliparous women in Turkey. Midwifery. 2009; 25:155-162.
- Sharma V K, Das S, Mondal S, Goswami U, Gandhi A. Effect of Sahaj Yoga on neuro-cognitive functions in patients suffering from major depression. Indian J Physiol Pharmacol. 2006; 50:375-83.
- Sheehan T J. Creating a psychosocial measurement model from stressful life events. Social Science in Medicine. 1996; 43:265-271.
- Shih H C, Lee T Y, Chen W H, Tung T H. The effectiveness of the video-based Lamaze method on prenatal mothers' knowledge, attitudes, and practice. Hu Li Za Zhi. 2005; 52:27–38.
- Shim C S, Lee Y S. Effects of a yoga-focused prenatal program on stress, anxiety, self confidence and labor pain in pregnant women with in vitro fertilization treatment. J Korean Acad Nurs. 2012; 42:369-76.
- Sivasankaran S, Pollard-Quintner S, Sachdeva R, Pugeda J, Hoq S M, Zarich S W. The effect of a six-week program of yoga and meditation on brachial artery reactivity: do psychosocial interventions affect vascular tone? Clin Cardiol. 2006; 29:393-98.
- Smith C A, Collins C T, Cyna A M, Crowther C A. Complementary and alternative therapies for pain management in labour. Cochrane Database Syst Rev. 2006; 18-4. CD003521.
- Smith C A, Levett K M, Collins C T, Crowther C A. Relaxation techniques for pain management in labour. Cochrane Database Syst Rev. 2011; 12:CD009514.

- Smith C, Lapp L. Prolonged increases in both PS and number of REMS following a shuttle avoidance task. Physiol Behav. 1986; 36:1053-57.
- Souza J P, Gulmezoglu A, Lumbiganon P, Laopaiboon M, Carroli G, Fawole B, Ruyan P. Caesarean section without medical indications is associated with an increased risk of adverse short-term maternal outcomes: The 2004–2008 WHO Global Survey on Maternal and Perinatal Health. BMC Med. 2010; 8:71.
- Speed-Andrews A E, Stevinson C, Belanger L J, Mirus J J, Courneya K S. Pilot evaluation of an Iyengar yoga program for breast cancer survivors. Cancer Nurs. 2010; 33:369-81.
- Spielberger C D, Gorusch R L, Lushene R. The state-trait anxiety inventory: test manual. Palo Alto, CA, USA: Consulting Psychological Press; 1970.
- Spinelli M G, Endicott J. Controlled clinical trial of interpersonal psychotherapy versus parenting education program for depressed pregnant women. Am J Psychiatry. 2003; 160:555-62.
- Spreen O, Strauss J. A compendium of Neuropsychological tests. Administration, Norms and Commentry. 2nd edn, 1998, Oxford University Press, New York.
- SPSS Inc. (1999). SPSS Statictics for windows, version 10.0. Chicago, IL: SPSS.
- Sri Ramakrishna Math. (1951) *The Bṛhadāraṇyaka Upaniṣat*. Pub-Sri Ramakrishna Math, Mylapore, Madras.
- Steciuk M, Kram M, Kramer G L, Petty F. Immobilization-induced glutamate efflux in medial prefrontal cortex: blockade by (+)-Mk-801, a selective NMDA receptor antagonist. Stress. 2000; 3:195–99.
- Stephenson M, Kutteh W. Evaluation and management of recurrent early pregnancy loss. Clin Obstet Gynecol. 2007; 50:132-45.

- Striegel-Moore R H, Goldman S L, Garvin V, Rodin J. A prospective study of somatic and emotional symptoms of pregnancy. Psychol Women Q. 1996; 20:393-408.
- Stuss D T, Floden D, Alexander M P, Levine B, Katz D. Stroop performance in focal lesion patients: dissociation of process and frontal lobe lesion location. Neuropsychologia. 2001; 39:771-86.
- Subramanya P, Telles S. Effect of two yoga-based relaxation techniques on memory scores and state anxiety. Biopsychosoc Med. 2009;13:3-8.
- Subramanya P, Telles S. Changes in midlatency auditory evoked potentials following two yoga-based relaxation techniques. Clin EEG Neurosci. 2009; 40:190-95.
- Sun Y C, Hung Y C, Chang Y, Kuo S C. Effects of a prenatal yoga programme on the discomforts of pregnancy and maternal childbirth self-efficacy in Taiwan. Midwifery. 2010; 26:31-6.
- Swami Gambhirananda. (2006) *Aitareya Upaniṣat*. Pub-Advaita Ashrama, Kalkata.
- Swami Gambhirananda. (2008) *Kaṭha Upaniṣat*. Pub-Advaita Ashrama, Kalkata.
- Swami Swahananda. (1984) *Chāndogya Upaniṣat*, Pub-Sri Ramakrishna Math, Mylapore, Madras.
- Taimini I K. (2001) *The Science of Yoga.* Pub-The Theosophical Publishing House, Adger, Chennai.
- Takahashi M. Stress-induced analgesia. Yakubutsu Seishin Kodo. 1991; 11:279–95.

- Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology. Heart rate variability: standards ofmeasurement, physiological interpretation, and clinical use. Eur Heart J. 1996; 17:354–81.
- Taylor M J. Yoga therapeutics: an ancient dynamic systems theory. Techn Orthopedics 2003; 18(1):115–25.
- Teixeira C, Figueiredo B, Conde A, Pacheco A, Costa R Anxiety and depression during pregnancy in women and men. J Affect Disord. 2009; 119: 142-148.
- Teixeira J M A, Fisk N M, Glover V. Association between maternal anxiety in pregnancy and increased uterine artery resistance index. BMJ. 1999; 318:153-7.
- Tekur P, Singphow C, Nagendra H R, Raghuram N. Effect of short-term intensive yoga program on pain, functional disability and spinal flexibility in chronic low back pain: a randomized control study. J Altern Complement Med. 2008; 14:637-44.
- Telles S, Desiraju T. Autonomic changes in Brahmakumaris raja yoga meditation. Int J Psychophysiol. 1993; 15:147-52.
- Telles S, Mohapatra R S, Naveen K V. Heart rate variability spectrum during Vipassana mindfulness meditation. J Indian Psychol. 2005; 22:215–9.
- Telles S, Nagarathna R, Nagendra H R. Autonomic changes during 'OM' meditation. Indian J Physiol Pharmacol. 1995:39:418–420.
- Telles S, Reddy S K, Nagendra H R. Oxygen consumption and respiration following two yoga relaxation techniques. Appl Psychophysiol Biofeedback. 2000; 25(4):221 –7.
- Telles S, Yadav A, Kumar N, Sharma S, Visweshwaraiah N K, Balkrishna A. Blood pressure and purdue pegboard scores in individuals with hypertension after

alternate nostril breathing, breath awareness, and no intervention. Med Sci Monit. 2013; 21:61-6.

- Teper R, Inzlicht M. Meditation, mindfulness and executive control: the importance of emotional acceptance and brain-based performance monitoring. Soc Cogn Affect Neurosci. 2013; 8:85-92.
- The Apgar Score. American Academy of Pediatrics, Committee on Fetus and Newborn, American,College of Obstetricians and Gynecologists and Committee on Obstetric Practice. Pediatrics. 2006; 117; 1444-1417.
- Thorpe K J, Dragonas T, Golding J. The effects of psychosocial factors on the emotional well-being of women during pregnancy: A cross-cultural study of Britain and Greece. J Reprod Infant Psychol. 1992; 10: 191-204.
- Tomlinson J. Yoga for new moms: pre-and post-natal (last accessed June 20th, 2003) /http://newmoms.bodytrends. com/newmoms/articles/yoga_prepost.htmS.
- Udupa K N. A manual of science and philosophy og yoga. Journal of Research in Indian Medicine, Yoga and Homeopathy. J Res Indian Med Yoga Homeopathy. 1976; 11; 1-103.
- Vadiraja S H, Rao M R, Nagendra R H, Nagarathna R, Rekha M, Vanitha N, et al. Effects of yoga on symptom management in breast cancer patients: a randomized controlled trial. Int J Yoga. 2009; 2:73-9.
- Van den Bergh B R H, Mulder E J H, Mennes M, Glover V. Antenatal maternal anxiety and stress and the neurobehavioural development of the fetus and child: links and possible mechanisms. A review. Neurosci Biobehav Rev. 2005; 29:237-258.

- Van den Bergh B R H. Maternal emotions during pregnancy and fetal and neonatal behaviour. In: Nijhuis JG, editor. Fetal behaviour. Developmental and perinatal aspects, vol. 851. Oxford: Oxford Univ. Press. 1992:157-74.
- Van Eck M, Berkhof H, Nicolson N, Sulon J. The effects of perceived stress, traits, mood states, and stressful daily events on salivary cortisol. Psychosom Med. 1996; 58:447-58.
- Vempati R P, Telles S. Baseline occupational stress levels and physiological responses to a two day stress management program. J Indian Psychol. 2000; 18: 33–37.
- Vempati R P, Telles S. Yoga based isometric relaxtation versus supine rest: a study of oxygen consumption, breath rate and volume, and autonomic measures. J Indian Psychol. 1999;17(2):46-2.
- Vempati R P, Telles S. Yoga-based guided relaxation reduces sympathetic activity judged from baseline levels. Psychol Rep. 2002; 90(2):487–94.
- Ventegodt S, Flensborg-Madsen T, Andersen N J, Merrick J. The health and social situation of the mother during pregnancy and global quality of life of the child as an adult. Results from the prospective Copenhagen Perinatal Cohort 1959-1961. Sci World J. 2005; 2:950-8.
- Verbruggen F, Logan G D. Response inhibition in the stop-signal paradigm. Trends Cogn Sci. 2008; 12:418-24.
- Vieten C, Astin J. Effects of a mindfulness-based intervention during pregnancy on prenatal stress and mood: results of a pilot study. Arch Womens Ment Health. 2008; 11:67-74.

- Villar J, Valladares E, Wojdyla D, Zavaleta N, Carroli G, Velazco A, Acosta A. Caesarean delivery rates and pregnancy outcomes: The 2005 WHO global survey on maternal and perinatal health in Latin America. Lancet. 2006; 367: 1819–1829.
- Wadhwa P D, Garite T J, Porto M, Glynn L, Chicz-DeMet A, Dunkel-Schetter C, Sandman C A. Placental corticotropin-releasing hormone (CRH), spontaneous preterm birth, and fetal growth restriction: A prospective investigation. Am J Obstet Gynecol. 2004; 191:1063–1069.
- Wadhwa P D, Sandman C A, Porto M, Dunkerl Schetter C, Garite T J. The association between pre - natal stress and infant birth weight and gestational age at birth: a prospective investigation. Am J Obstet Gynecol. 1993; 169: 858-865.
- Wadhwa P, Porto M, Garite T, Chicz-DeMet A, Sandman C. Maternal corticotrophin releasing hormone levels in the early third trimester predict length of gestation in human pregnancy. Am J Obstet Gynecol. 1998; 179:1079-1085.
- Wahn E H, Nissen E, Ahlberg B M. Becoming and being a teenage mother: how teenage girls in south western Sweden view their situation. Health Care Women Int. 2005; 26:591-603,
- Waldenstrom U, Borg I M, Olsson B, Skold M, Wall S. The childbirth experience: a study of 295 new mothers. Birth. 1996; 23:144–153.
- Waldenstrom U. Experience of labor and birth in 1111 women. J Psychosom Res. 1999; 47:471-482.
- Wang H L, Lee T C, Kuo S H, Chou F H, Chen L L, Su Y C, Chen L M. Relationships among Constitution, Stress, and Discomfort in the First Trimester. Evid Based Complement Alternat Med. 2012; 2012:486757.

- Wang H L, Lee T C, Kuo S H, Chou F H, Chen L L, Su Y C, Chen L M. Relationships among Constitution, Stress, and Discomfort in the First Trimester. Evid Based Complement Alternat Med. 2012; 2012:486757.
- Waterman J A, Rogers J. Introduction to the FIRO-B. Palo Alto, 1996. CA: CPP, Inc.
- Weinstock M. Does prenatal stress impair coping and regulation of hypothalamic-pituitary-adrenal axis? Neurosci Biobehav Rev. 1997; 21:1-10.
- Weinstock M. The long-term behavioural consequences of prenatal stress. Neurosci Biobehav Rev. 2008; 32:1073-86.
- Weinstock M. The potential influence of maternal stress hormones on development and mental health of the offspring. Brain Behav Immun. 2005;19(4):296–308.
- Weisberg R B, Paquette J A. Screening and treatment of anxiety disorders in pregnant and lactating women. Womens Health Issues. 2002; 12:32-36.
- Weissman M M, Wickramaratne P, Nomura Y, Warner V, Pilowsky D, Verdeli H. Offspring of depressed parents: 20 Years later. Am J Psychiatry. 2006; 163:1001–1008,
- West J, Otte C, Geher K, Johnson J, Mohr D C. Effects of Hatha yoga and African dance on perceived stress, affect, and salivary cortisol. Ann Behav Med. 2004; 28:114-8.
- WHOQOL Group. Field Trial WHOQOL-100. February 1995: facet definitions and questions. 1995. Geneva, WHO (MNH/PSF/95.1.B).
- Wilkins A J, O'Callaghan M J, Najman J M, Bor W, Williams G M, Shuttlewood G. Early childhood factors influencing health-related quality of life in adolescents at 13 years. J Paediatr Child Health. 2004; 40:102-9.

- Wirshing D A, Boyd J A, Meng L R, Ballon J S, Marder S R, Wirshing W C. The effects of novel antipsychotics on glucose and lipid levels. J Clin Psychiatry. 2002; 63:856-65.
- Wisner K L, Sit D K Y, Hanusa B H, Moses-Kolko E L, Bogen D L, Hunker D F, Perel J M, Jones-Ivy S, Bodnar L M, Singer L T. Major depression and antidepressant treatment: impact on pregnancy and neonatal outcomes. Am J Psychiatry. 2009; 166: 557-566.
- Wood C. Mood change and perceptions of vitality: a comparison of the effects of relaxation, visualization and yoga. J R Soc Med. 1993; 86:254-8.
- Woodyard C. Exploring the therapeutic effects of yoga and its ability to increase quality of life. Int J Yoga. 2011; 4:49-54.
- Woolery A, Myers H, Sternlieb B, Zeltzer L. A yoga intervention for young adults with elevated symptoms of depression. Altern Ther Health Med. 2004;10:60-3.
- Yadav R K, Magan D, Mehta N, Sharma R, Mahapatra S C. Efficacy of a short-term yoga-based lifestyle intervention in reducing stress and inflammation: preliminary results. J Altern Complement Med. 2012; 18:662-7.
- Yang C C, Chao T C, Kuo T B, Yin C S, Chen H I. Preeclamptic pregnancy is associated with increased sympathetic and decreased parasympathetic control of HR. Am J Physiol heart Circ Physiol. 2000;278(4):1269–73.
- Yildirim G, Sahin N H. The effect of breathing and skin stimulation techniques on labor pain perception of Turkish women. Pain Res Manag. 2004; 9:183–187.
- Zar M, Wijma K, Wijma B. Pre and postpartum fear of childbirth in nulliparous and parous women. Scandinavian Journal of Behaviour Therapy. 2001; 30: 75-84.
- Zigmond A S, Snaith R P. the hospital anxiety and depression scale. Acta Psychiatr Scand. 1983; 67:361-70.

APPENDIX 1

INFORMED CONSENT FORM

PROJECT: EFFECT OF INTEGRATED APPROACH OF YOGA IN NORMAL PREGNANCY- A RANDOMIZED ACTIVE CONTROL TRIAL

Dr Raghuram Nagarathna
M.D.FRCP
Principal Investigator
Dean, Division of Yoga & Life Science
SVYASA, Bangalore- 560 018
Ph: 080-26507585

Satyapriya Maharana
M.S., (PhD)
Clinical Supervisor,
SVYASA, Bangalore-560018
Ph: 080-26612669

Description of Study: In this research study, we will be looking at the relationship between psychological stress and its effect on pregnancy. The objective of this study is to assess whether yoga, a psychotherapeutic intervention, can reduce these complications in pregnancy. Yoga based lifestyle interventions will help to improve quality of treatment, quality of life and could help to reduce the complications. You have been selected as a participant based on your diagnosis and we seek your participation in this yoga for health research project. The total duration of study is 4 months where in you will be asked to attend yoga classes three days a week for one month and one hour daily home practice. If you agree to participate, you will be given a structured clinical interview and then will be asked to complete two self-report measures to evaluate anxiety, mood, and depression, positive and negative effect.

At the conclusion of this research study, a discussion of the findings will be available upon request by contacting principal investigator Dr.R.Nagarathna or the clinical supervisor M. Satyapriya.

Role of stress during pregnancy: Stress increases the level of a group of hormones, which can constrict the blood flow to the placenta, so the fetus may not receive nutrients and oxygen it needs for optimal growth. It may increase the risk of fetal complications & maternal complications in pregnancy.

Yoga can prevent stress: Yoga is defined as a tool for achieving positive health. This is called stress management program. Here yoga is a relaxation technique. Reduction in stress

can be achieved through deep relaxation at the body level by different postures, slowing down the rate of breathing through Pranayama, calming down the mind in meditation and chanting. These relaxation techniques are simple, harmless, safe, selected specially by expert obstetricians.

Risks/Benefits to the Participant: This stress management program is expected to improve the quality of life, prevent the complications of pregnancy, improve your interpersonal relationship to a level of mutual respect by nurturing pure love and correct the pattern of tension ridden working style by learning a new style of working for the joy of contribution and learning. Risks are judged to be minimal.

Safety: The safety of these physical practices has been tested by earlier practitioners both in India and abroad. These practices will be introduced in a gentle and slow pace to bring adequate relaxation. If you have any concerns about the risks/benefits of participating in this study, we will be happy to discuss and explain the details. In case of any injuries that may occur due to any yoga postures, you will be provided all the necessary treatment for these injuries .

Cost and Payments to the Participant: There is no cost for participation in this study. Participation is completely voluntary and no payment will be provided.

Confidentiality: Information obtained in this study is strictly confidential unless disclosure is required by law. You will be assigned a research number, rather than your name, which will be recorded on the assessments you receive. You will be asked to fill up the information sheet which will be kept confidential and will require you to reveal information which cognizes the state of your mental well being, moods and how you are coping with this disease at mental, emotional, social and physical level. These sheets have questions for which you will only be asked to respond with a single word or number and will not be asked to elaborate upon responses. All data will be secured in a locked filing cabinet. Your name will not be used in the reporting of information in publications or conference presentations.

Participants Right to withdraw from the Study: You have the right to refuse to participate in this study, the right to withdraw from the study and the right to have your data destroyed at any point during or after the study, without penalty, except in situations that violate state and/or federal law and regulations.

Termination of Participation: Subject's participation in the study may be terminated by the Investigator under such circumstances wherein:

i) The subject fails to adhere to the requirement and regulations put forth till the end of the study.

ii) The subjects default on the treatment or intervention or investigations frequently.

iii) Participant's request to withdraw for whatever reason.

VOLUNTARY CONSENT BY THE PARTICIPANT

Participation in this research project is completely voluntary, and your consent is required before you can participate in this research. If significant new information related to this study becomes available and this information may affect your health negatively, Dr Nagarathna / Satyapriya M will alert you immediately.

I have read this consent form (or it has been read to me) and I fully understand the contents of this document and voluntarily consent to participate or consent to participate. All of my questions concerning this research have been answered if I have any questions in the future about this study they will be answered by the investigator listed above or his/her staff. I understand that this consent ends at the conclusion of this study. A copy of this form has been given to me.

Participant's Signature …….Date……

Witness's Signature

……..Date:…….....

--

Counter signed by:

Signature of the staff Study Coordinator

APPENDIX 2

YOGA INTERVENTION

Introduction to Yoga Practices

The yoga practices consist of loosening exercises, breathing exercises, sitting postures, prone postures, supine postures and *Prāṇāyāma*. Emphasis is given to relaxation techniques like IRT (Instant Relaxation Technique), QRT (Quick Relaxation Technique), and DRT (Deep Relaxation Technique); also *āsana*s and *Mudr*ās to strengthen the Pelvic floor, which is the most important organ for a pregnant woman, will be taught. Cautions and contra-indications at different trimesters during the practice will be followed.

All pregnant women should start their yoga āsanas with breathing exercises and neck loosening exercises to get prepared for further practices.

Special tip for breathing practices (for beginners)

i. Learn correct movements of hands, legs, abdominal or thoracic muscles as needed in each exercise.
ii. Use 'in' and 'out' instructions for inhalation and exhalation. Emphasize on complete breathing each time.
iii. Synchronize the breathing with the corresponding movements.
iv. Initially the movements will be faster to cope with the higher breathing rate. As progress is made, the movements will get slower.
v. Close the eyes and repeat a few rounds retaining the awareness.

A. First 15 minutes of each session will be lectures focusing on:

1. Information on healthy Pregnancy & its changes.
2. Concept of yogic healthy life style including moral values (yama Niyama).
3. Concept of Pañca Koṣa
4. Benefits of Antenatal exercise.
5. Benefits of āsanas, Prānāyama & meditation.
6. Yogic diet for pregnancy.
7. Yogic lifestyle.

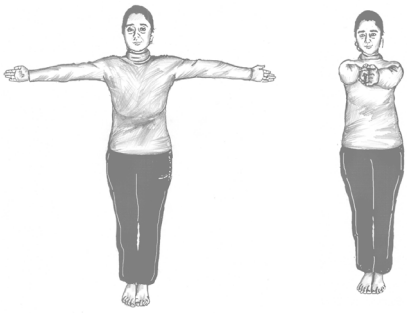
Yoga and Exercise Intervention Group Practice Details.

(60 minutes daily)

Yoga group	2nd Trimester	3rd Trimester	Control group	2nd Trimester	3rd Trimester
A. LECTURES	15min	10 min	A. LECTURES	15 min	10 min
B. BREATHING EXERCISES	10min	5 min	B. LOOSENING EXERCISES	10 min	5 min
1.*Hasta āyāma śvasanam* (Hands in and out breathing)	Yes	Yes	1. Twisting	Yes	Yes
			2. Forward & backward bend	Yes	No
2.*Hasta vistāra śvasanam* (Hands stretch breathing)	Yes	Yes	3. Side bending	Yes	Yes
			4. Calf-raise	Yes	Yes
3.*Gulpha vistāra śvasanam* (Ankle stretch breathing)	Yes	Yes	5. Hamstring stretch	Yes	Yes
			6. Lat Pulls- up & down	Yes	No
4. *Vyāghra śvasanam* (Tiger breathing)	Yes	No	7. Calf extension	Yes	No
			8. Hip Abduction	No	Yes
5.*Setu bandha śvasanam* (Bridge posture breathing)	Yes	No			
C. ASANA POSTURES	15min	10min	C. ANTENATAL EXERCISES	15min	10min
<u>Standing Asanas</u>			<u>Standing exercises.</u>		
1. *Tadasana* (tree pose)	Yes	Yes	1. Thigh stretch	Yes	Yes
			2. Push-up & Down	Yes	Yes
2. *Ardhakati-chakrasana* (Lateral Arc Pose)	Yes	Yes	3. Pulls Downs	Yes	No
			4. Low-Back lift	Yes	No
3. *Trikonasana* (triangle pose)	Yes	Yes	<u>Sitting Exercises.</u>		
			5. Inner thigh Stretch	Yes	Yes
<u>Sitting Asanas</u>			6. Calf stretch	Yes	Yes
4. *Vajrasana* (The Ankle Posture)	Yes	Yes	7. Dips	Yes	No
			8. Squatting	No	Yes
5. *Vakrasana* (spine twist pose)	Yes	No	9. Hip abduction	Yes	Yes
			10. Shoulder-chest stretch	Yes	Yes
6. *Siddhasana* (sage pose)	No	Yes	11 Neck & upper back stretch	Yes	Yes
			12. Seated Rowing	Yes	Yes
7. *BaddhaKonasana* (Bound Ankle Pose)	No	Yes	13. Oblique curis	Yes	Yes
			14. Kick backs	Yes	Yes
8. *UpavistaKonasana* (sit with legs apart)	No	Yes	15. Pelvic Tilt	Yes	Yes
9. Squatting (Garland pose)	No	Yes			
<u>Supine Asanas</u>					
10. *Viparita karani* (half shoulder stand)	Yes	No			
11.*Ardha- pavanamuktasana* (folded leg lumbar stretch)	Yes	Yes			
D . PRANAYAMA & MEDITATION	10min	20min	D. SLOW WALKING	10min	20min
1. Sectional breathing,	Yes	Yes			
2. Nadisuddhi,	Yes	Yes			
3. Sheetali,Bhramari	Yes	Yes			
4. Nadanusandhana	Yes	Yes			
5. Om Meditation	Yes	Yes			
E. DRT(Deep relaxation technique)	10min	15min	E. SUPINE REST (10 minutes)	10min	15min

B. BREATHING EXERCISES

1. Hands In and Out Breathing *(Hasta āyāma śvasanam)*



Sthiti: ***Tadāsana***

Technique:

- Stretch out your arms in front, in level with your shoulders and bring the palms together.
- Inhaling spread your arms sideways in horizontal plane.
- While exhaling bring the arms forward with palms touching each other.
- Repeat 5 times, making your arm movements, continuous and synchronizing with the breath flowing in and out rhythmically.
- Relax in Tadāsana. Feel the changes in the breath and the body the back of the neck.

2. Hands Stretch Breathing (*Hasta vistāra śvasanam)*

Sthiti: ***Tadāsana***

Technique:

- Stand erect with feet together (heels together and toes 4 to 6 inches apart) relaxed by the side of the body.
- Gently bring your hands in front of the chest.
- Interlock the fingers and place the palms on the chest.
- Collapse and relax your shoulders.
- Close your eyes.

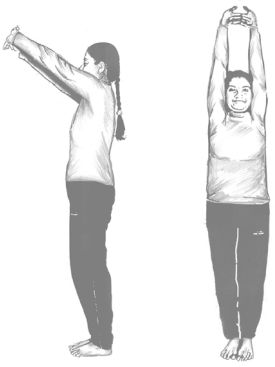
Technique:

Stage I: (Horizontal)

- While inhaling, stretch the arms straight out in front of your body so that the arms are at shoulder level.
- At the same time twist the hands so that the palms face outwards.
- Fully stretch the arms, but do not strain.
- Now, while exhaling reverse the process and bring the palms back on

to the chest.

- Collapse the shoulders again.
- This is one round. Repeat 5 times.



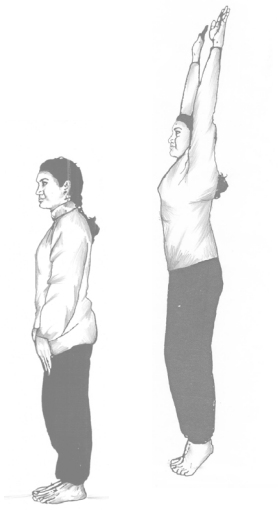
Stage II: (At 135 ®)

- Repeat the same movements now stretching the arms above the forehead at an angle of 135®
- Repeat 5 times.

Stage III: (Vertical)

- Again repeat the same movements, this time stretching the arms vertically above the head.
- While moving up and down the palms close to the nose tip.
- Repeat 5 times.

3. Ankle stretch breathing *(Gulpha vistāra śvasanam)*

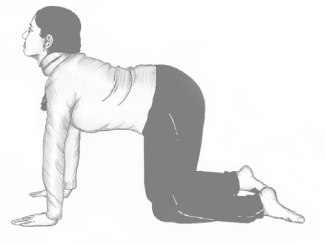


Sthiti: ***Tadāsana***

Technique:

- Open the eyes and fix your gaze on a point on the wall ahead. Place the palms on front of your thighs.
- While inhaling, raise your hands and stretch the ankles. Feel yourself growing taller and firm.
- As you exhale, bring your hands and heels down.
- Repeat 5 times keeping the movement of hands and ankles continuously, breathing in synchronization. Feel the stretch from your ankles up to finger tips as you reach upwards.
- Relax in standing position, hands by the side of the thighs. Observe your breath and enjoy the stability for a few seconds.

4. Tiger Breathing *(Vyāghra śvasanam)*



Sthiti: ***Dandāsana***

Technique:

- Come to Vajrāsana.

- Lean forward and place the hands flat on the floor in line with fingers pointing forward. Arms, thighs and heels should be about one shoulder width apart. The arms and thighs are perpendicular to the floor.
- While inhaling raise the head and look at the ceiling.
- At the same time, depress the spine making it concave.
- While exhaling, arch the spine upwards and bend the head downward bringing the chin towards the chest.
- This constitutes one round of tiger breathing.
- Repeat 5 rounds.

5. ***Setu bandha śvasanam*** (Bridge posture breathing)

Sthiti: ***Dandāsana***

Technique:

- Lie supine with your legs together and hands by the side of the body.
- Fold both the legs placing the heels on the ground near to the buttocks.
- While inhaling raise the buttocks and the trunk up as far as you can.
- While exhaling slowly lower them down to the floor.
- This is one round, Repeat five times.

C. ASANA POSTURES

Standing Asanas

1. ***Tadāsana*** **(Tree pose) Initial Standing posture - Tadāsana**

- Stand erect with feet close together.
- Place the hands along the thighs with fingers stretched out.
- The legs, trunk and the head are aligned in a straight line.
- Close the eyes and observe the balance.

2. ***Ardhakati-chakrāsana*** **(Lateral Arc Pose)**

Sthiti: ***Tadāsana***

Technique:

- While inhaling, slowly raise the right arm sideways up above the head until arm touches the ear, palm facing left.
- Bend slowly on the left side; slide the left palm down as far as possible along the left leg. Exhale as you bend. Raised hand should not bend at the elbow. Knees straight. Breathe normally. Breathe normally. Maintain for about a minute.
- Close the eyes for a few minutes at the final posture. If it is difficult to maintain the body balance, better keep the eyes open.
- Return to position 1 inhaling completely.
- Bring the hand down to sthiti position.
- Repeat on the left side, by bending towards the right.

3. *Trikonāsana* (triangle pose)

Sthiti: *Tadāsana*

Technique:

- While inhaling, spread the feet apart by about a meter and raise both the hands slowly till they reach the horizontal position simultaneously.
- Slowly bend to the right side until the right hand reaches the right foot. The left arm is straight up, in line with the right hand. Palms face forward. Stretch up the left arm and see along the fingers.
- Maintain for about one minute with normal breathing.
- Return slowly to Sthiti.
- Repeat on the left side.

Sitting Āsanas

4. *Vajrāsana* (The Ankle Posture or Thunderbolt Pose)

Sthiti: *Dandāsana*

Technique:

- This is also a sitting meditative posture.

- Slowly bend the right leg and keep the right heel stretched under the buttocks.
- Bring the left leg under the left buttock.
- Keep the knees close to each other, spine erect, the head, shoulders and buttocks in a vertical line. Rest the palms on the upper part of the thighs or covering the knees.
- Bring the awareness to breathing.
- Focus on the normal rhythm of breathing, sensing the weight settling into the pelvis as the lower back lengthens with exhalations and the upper body and chest becomes lighter during inhalations.
- Circle the shoulders loosely to release them and lengthen the back of the neck by bringing the chin down slightly towards the chest.
- Return to Sthiti.

5. *Vakrāsana* (spine twist pose)

Sthiti: *Dandāsana*

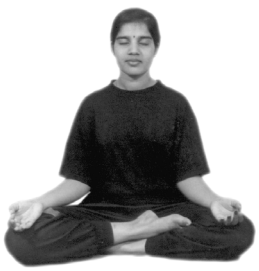
Technique:

- Bend the right leg at the knee and place it beside the left knee.
- Straighten and twist the waist towards the right as you exhale. Bring the left arm around the right knee and catch the right big toe.

- Take the right arm back and keep the palm on the ground in such a way that the trunk is kept erect with a proper twist.

- After maintaining for about a minute with normal breathing return to Sthiti and relax for a while in *Sithila Dandāsana*
- Repeat the same on the other side.

6. *Siddhāsana* (sage pose)



Sthiti: *Dandāsana*

Technique:

- Bend the right leg completely at the knees and place the foot under the left thigh with the heels pressed against the perineum.
- Bend the left leg at the knee and place the left heel on the right heel.
- Tuck the toe of the left foot in the fold of the right knee.
- Push the right hand into the fold of the left knee and pull up the right big toe to ensure that it is kept pressed against the inner thigh.
- Make sure that both the knees are resting on the ground.
- Sit erect with hands resting on the thighs in Cin Mudra with elbows bent.

7. *BaddhaKonāsana* (Bound Ankle Pose)

Sthiti: ***Dandāsana***

It is also called as Tailor Sitting Pose. The following postures are the basic pregnancy exercise, which I recommend you try to practice every day throughout your pregnancy. While they benefit your whole body, they are especially useful in increasing the mobility of your pelvis and enhancing your awareness of the parts of your body, which are most involved in giving birth. They will help you to feel at ease and comfortable in natural upright positions for birth and labour, and to be in touch with your instincts. These are the most important postures to practice in this period.

Sthiti: Sitting perpendicular to the ground

Technique:

- Slowly bend the knees and bring the soles of your feet together at a comfortable distance from your body. Later, when you have relaxed a little, you can draw them in closer. The outside edges of the feet should be touching, with the soles of the feet opening outwards eventually.
- If your thighs are not touching or close to the floor then you can place a soft cushion underneath each knee support.
- Focus on your breathing and the way your body contacts the floor.

i. Leaning Back

- Now mobile away from the wall if you are using are using one. Lean back, supporting your body with hands, making sure your shoulders are relaxed.

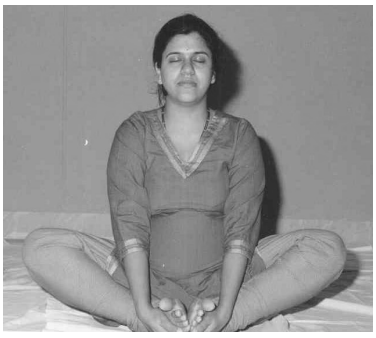
- Focus on your breathing and allow the breath to flow through your whole body, imaging the exhalation starting from the base of your skull, traveling down your spine, through your pelvis and hips all the way to your feet. Imagine the inhalations coming through the soles of your feet, around your knees, through your thighs and hips, and then up slowly to fill the whole length of your lungs, from the base to just under the collarbones. Continue in this way in a comfortable rhythm for three or four cycles of the breath, feeling tension in the groin releasing as you breathe.
- Now move back against the wall so that your lower back is supported and, still in tailor sitting, bring your feet towards your body, keeping a feeling of softness in the groin so that the energy can flow freely through your body. Use your hands gently to relax the muscles of your legs, loosening the calf muscles and turning the thigh muscles from the inside to the outside of the thighs.

ii. Leaning Forward

- Now lean forward slightly from the hips, touching the ground in front of you gently with your hands.
- Relax your spine and allow your head to tilt towards your chest to relax the back of your back.
- Focus your awareness on your breathing, and as in basic sitting feel your hips and the base of your spine lengthen downwards as if you are planting the root of the spine into the ground each time you exhale. With each inhalation, keep this grounded feeling and slowly lengthen and uncurl to come up into an upright position, your spine making contact with the wall one vertebra at a time. Take your time, remembering that it is the breath that returns your body to the upright position.

iii. Sitting Upright

- Relax and spread your shoulders, letting your hands rest on your knees with the palms up.
- Now close your eyes and feel the pull of gravity underneath you. Notice the way you're sitting bones



make contact with the floor and release your lower back downwards towards the roots like a long heavy tail. Feel your hip joints going down on the ground.

- Bring your awareness to the rhythm of your breathing. Focus on the exhalations and feel the ripple of the breathe move from the top of your neck all the way through the curves of the spine to the root, but without pushing the exhalation down. Just let it happen. Imagine the roots going deep into the earth.
- When the breathe comes in, keep the grounded feeling in the pelvis and the hip joints. Feel the inhalations being from the roots and ripple from the base upwards, so that your spine releases and lengthens while the incoming air and be aware of a gentle lengthens while the incoming air and be aware of a gentle lengthening of your trunk each time you inhale. Allow the inhalations to fill the whole length of your lungs from the base of the collar bones.
- Continue breathing comfortably, feeling any tightness in the hips or the groin melting and releasing with the breath. Enjoy a feeling of openness in the pelvis. Relax and release the muscles of the pelvic floor. Be aware of the gentle lengthening of the space your baby occupies between the top rim of your pelvis and the lower rim of your pelvis and the lower rim of your rib cage while releasing and letting go of your shoulders. Continue for up to three minutes. You can continue for up to ten minutes once you feel comfortable and relaxed in the position.

8. *UpavistaKonāsana* (sit with legs apart)

Sthiti: ***Dandāsana***

Technique:

- Sitting on the floor with legs wide apart is both comfortable and beneficial in pregnancy. The pelvis is well grounded and the diameters of the pelvic canal widen, encouraging a feeling of openness. Mobility of the hip joints increases while the muscles of the inner thighs and the backs of the legs lengthen and release. This posture stabilizes and anchors the pelvis and so enhances the release of tension along the spine and in the neck and shoulders.
- Regular practice of this position will increase your confidence in being able to open your body to give birth and enhance your awareness of the way your pelvis is widening and loosening to make space for your baby. You can sit like this as often as you like or use this position for your breathing practice.

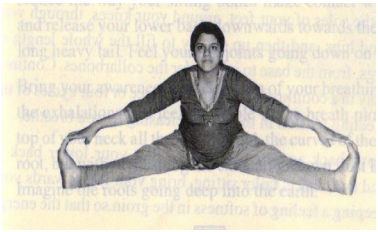
- Start in the basic sitting position with your lower back supported by a wall or a corner. This posture can also be done sitting back-to-back with a partner or with your partner's feet supporting the spine.
- Spread your legs as wide apart as possible without exceeding your natural limit. It is not important how wide you can open your legs but rather how comfortable you feel. Focus your awareness on your breathing and the way your body contacts the floor.

A. Leaning Back

- Move away, if you are using the wall for support, and then lean on to your hands to release tension in the groin, as you did in tailor sitting. Support your trunk with your arms without tensing your neck and shoulders.
- Using your imagination, breathe through your whole body as you did in tailor sitting, the exhalations moving from the top of your neck to your feet, and the inhalations from your feet upwards.

B. Leaning Forward

- Lean forward slightly, moving so that your lower back is supported by the wall again if you are using one. Touch the ground lightly with your hands, your weight going down into the ground through your sitting bones and hip joints.



- Use your breathing as you did leaning forward in tailor sitting, grounding the root the root of the spine while exhaling and slowly lengthening and uncurling along the length of your spine while inhaling until you are sitting upright once more.
- Then spread out and relax your shoulders and drop your arms by your sides, hands resting lightly on your thighs, palms up.

***9. Malāsana* (Garland pose)**

Sthiti: ***Dandāsana***

Technique:

- Malāsana regularly helps to increase the mobility of your and hip joints. When you squat, the extensor muscles in the back, buttocks and pelvic floor lengthen and relax, while the muscles in front of your body shorten or contract. In this position, your pelvic floor relaxes and the blood supply to the whole pelvic area improves. The perineal tissues relax and can stretch evenly when you squat, so regular practice may help to prevent tearing in the final stages of the birth.

- Squatting is a perfectly natural sitting and resting position which every toddler uses instinctively before standing and walking.

Supine *Āsana*

Sthiti (Initial) for Supine Posture

- Lie down on the back with legs together.
- Stretch the hands straight above the head, biceps touching the ears and the
- Palms facing the ceiling.
- Close the eyes.

Technique:

Sithila (Relaxation) for Supine Posture - *Savāsana*

- Lie supine on the ground with hands and feet apart.
- Slightly stretch the body and allow the whole body to relax completely with eyes gently closed.
- Become aware of different parts of the body starting from toes to head. Feel the spread of relaxation in all parts of the body progressively.
- With regular long practice, the relaxation will become deeper, natural and spontaneous. Then the whole body is relaxed to the extent that one forgets the body. The mind experiences alert full rest.

10. *Viparita karaṇī* (Half shoulder stand)

Sthiti: *Savāsana*

Technique:

- Begin by lying on the ground, legs raised, knee bent, feet against the wall, buttocks 30-40 cms. away from it. Do not bring the thighs too near the abdomen, for this will block blood circulation in the groin region.
- Make sure the back, neck and head are in a straight line, with the chin slightly lowered in order to avoid arching the neck and tightening the cervical vertebrae.

- Keep the arms at a slight distance from the trunk, if possible with the palms if the hands turned upward, thus resting the shoulder blades properly on the ground.
- Before relaxing spend a few seconds straightening the shoulders blades properly on the ground.
- Before relaxing spend a few seconds straightening the shoulders as if to fix them to the ground.

11. ***Ardha- pavanamuktāsana*** **(Folded leg lumbar stretch)**

Sthiti: ***Savāsana***

Technique:

Type-I (with one leg)

Lie down on your back with legs together and hands spread sideways at shoulder level.

Palms are placed firmly pressed on the ground.

Fold the right leg at the knee, placing the right ankle by the side of the left knee.

Inhale.

While exhaling slowly move the right knee to the right side towards the floor, as far as comfortable and simultaneously turn the head to the left as far as you can.

Then inhaling, raise the right knee up & turn the head back to the centre.

Now, while exhaling move the right knee to the left towards the floor and simultaneously turn the head to the right.

While inhaling bring back the right knee and the head to the starting position (i.e to the centre).

This is one round

Repeat the same on the left side i.e. with the left leg folded and right leg straight on the floor.

Type-II (with both legs)

Repeat as in type-I with both legs folded.

D. PRĀṆĀYĀMA **& MEDITATION**

1. Sectional Breathing

This is a preparatory breathing practice for doing *Prāṇāyāma*. It chiefly corrects the breathing pattern and increases the vital capacity of the lungs. It has 3 sections:

A. Abdominal Breathing of Diaphragmatic Breathing (Adhama)

i. Sit erect in Vajrāsana Exhale. Inhale completely, slowly and continuously. This is called puraka. The abdomen is made to bulge continuously with the air entering especially into the lower sections of the lungs. Before exhaling stop the breath (Antarya Kumbhaka) for a second. While exhaling (Rechaka) the abdomen is drawn inwards continuously and slowly. Before the breath is reversed, stop the breath (Bahya Kumbhaka) for a second and inhale. Repeat the breathing cycle. There should be no jerks in the whole process. It should be smooth, continuous and relaxing.

ii. The diaphragm separating the thorax from the abdomen descends during inhalation with the bulging of the abdomen. This increases the airflow into the lower sections of the lungs. The rhythmic movement of the diaphragm massages the contents of the abdomen gently, and helps the organs to function normally. It promotes the general circulation also.

B. Thoracic (chest) breathing or intercostals breathing (*Madhyamā*)

i. In this sectional breathing performed while sitting erect in Vajrāsana, inhalation and exhalation are performed by expanding and contracting the chest only. Air flows through both nostrils. Slowly and continuously. The abdomen is controlled to avoid its bulging.
ii. The middle lobes are opened up fully by this of breathing.

C. Upper lobar breathing or Clavicular breathing (*Adya*)

i. Sit erect in Vajrāsana. Raise the collar bones while inhaling. Keep the abdominal muscles contracted. The air is forced into the uppermost regions of the lungs thus ventilating the upper lobes.
ii. The sparingly used upper lobes of the lungs will be properly aerated by this breathing.
iii. These three sectionalized breathings are also called 'Adhama', 'Madhyama' and 'Adya'.
iv. In complete Yogic breathing technique all the above three types will be combined. During inhalation, the 'Adhama, Madhyama and Adya occur sequentially and during exhalation the same sequence namely abdominal, chest and Clavicular breathings occur.
v. The whole process should be relaxing and comfortable, without any tension on the face.
vi. Four Mudrā are generally associated with these sectional breathings. They are Cin Mudrā for Adhama, Cinmaya Mudrā for Madhyama and Adi Mudrā for Adya and Brahma Mudrā for complete Yogic breathing.

D. Full Yogic Breathing

Full yogic breathing is a combination of all the three sections of sectional breathing.

Sthiti: *Vajrāsana*

Technique:

1. Place the hands resting on the abdomen at the navel in Brahma Mudrā.

2. During inhalation, the Adhama, Madhyama and Ādya Prāṇāyāma occur sequentially.

3. Now exhale in the same sequence (abdominal, chest and clavicular).

4. Repeat this breathing cycle five times.

2. ***Nāḍiśuddhi***

(Purification of Subtle Perception Paths)

i. The Nāḍiśuddhi is similar to Anuloma, Viloma, with the difference that inhalation and exhalation are done through alternate nostrils.

ii. Sit erect in Padmāsana (or any other meditative posture). Exhale completely.

iii. Close the right nostril with the thumb of the right hand. Inhale slowly, steadily and deeply as long as possible. Follow the entire course f the breath by feeling the movement of air. Do not hold the breath inside (Kumbhaka).

iv. Release the right nostril and close the left with the little and ring fingers of the right hand, and breathe out through the right nostril. Again breathe in through the right nostril. This forms one round of Nāḍiśuddhi.

v. Inhalation and exhalation from each side should be of the same duration (in the beginning the duration may be unequal).

vi. OM "AUM" can be mentally recited during inhalation and exhalation.

vii. To start with, one can have nine rounds and this can gradually be increased.

viii. Early morning and late evening are good for this practice.

3. Śītali Prāṇāyāma (Beak-Tongue Prāṇāyāma**)**

i. Fold up the sides of partially protruded tongue so as to form a long narrow tube resembling the beak of a bird. The passage is further narrowed by pressing the lips round the tongue. Inhale, making a hissing sound and perceive the cooling effect of the air as it passes through the tongue.

ii. Allow the breath to be stopped effortlessly. Exhale through both nostrils.

iii. Then allow the breath to be held comfortably before the next inhalation.

iv. Repeat the cycle 5 times.

4. *Bharāmari*

(Bee - Sounding Prāṇāyāma)

i. Sit in Padmāsana.

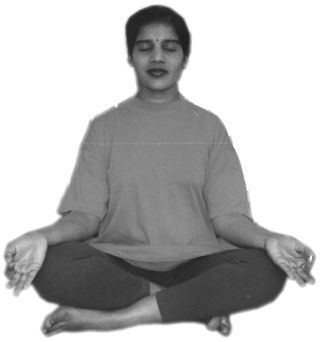
ii. Breathe in through both nostrils in such a way that a fine sound like the one produced by a male bee is heard.

iii. Allow the breath to sop effortlessly, slowly exhale while producing a sound from the mouth and nose, so as to produce a sweet musical humming sound like a female bee.

iv. Hold the breath and slowly release.

v. Repeat the cycle 5 times.

vi. It is said about Bharāmari.



5. Nadanusandhana (A-Kara, U-Kara, M-kara, A-U-M)

A. A-Kara Chanting

Sthiti: *Vajrāsana*

Technique:

- Sit in any meditative posture and adopt cin- mudrā.
- Feel completely relaxed and close your eyes.
- Inhale slowly and completely.
- While exhaling chant 'AAA' in a low pitch.
- Feel the sound resonance in the abdomen and the lower parts of the body.
- Repeat nine times.

B. U-Kara Chanting

Sthiti: *Vajrāsana*

Technique:

- Sit in any meditative posture.
- Adopt Cinmaya Mudrā.
- While exhaling chant 'AAA' in a low pitch.
- Feel the sound resonance in the chest and the middle part of the body.
- Repeat nine times.

C. M-Kara Chanting

Sthiti: *Vajrāsana*

Technique:

- Sit in any meditative posture.
- Adopt Adi Mudrā.
- Inhale slowly and completely.
- While exhaling chant 'MMM' in low pitch.
- Feel the sound resonance in the entire head region.
- Repeat nine times.

D. A-U-M Chanting

Sthiti: ***Vajrāsana***

Technique:

- Sit in any meditative posture.
- Adopt Brahma Mudrā.
- Inhale slowly and completely to fill the lungs.
- While exhaling chant 'A-U-M' in a low pitch.
- Feel the sound resonance throughout the body.
- Repeat nine times.

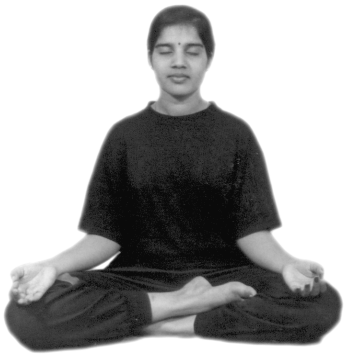
6. OM-Meditation

Sthiti: Sit in any comfortable meditative posture feeling completely relaxed

Technique:

Phase-I

Close your eyes and start chanting OM mentally. Allow the mind to repeat Om continuously without break. If there are distractions, you chant OM faster, not giving a chance for distractions. After a while the chanting slows down. Consciously slow it down further. If the mind jumps to distractions, again increase the speed of japa of OM kara. Thus, by increasing and allowing the speed to slow down, you should be able to have an unbroken stream of the japa in the mind.



Phase – II

Make the chanting soften and soften and gentler and gentler, and more and more effortless. As you progress on the path of meditation, you will reach the second phase of japa in which you start feeling the vibration of the japa in some parts of the body and later throughout the body.

Phase – III

As you slow down the japa of OM, observe the gap between two OM's. Further you slow down. Further you slow down; the gap widens and widens to diffuse into silence.

Phase – IV

The very deep experience of silence helps to expand from the 3 dimensional awareness of the body to all pervasive awareness. The bed of silence becomes deeper and more expansive – an ocean of silence with waves on it. Now merge into complete silence AJAPA. This silence is the source of creativity, Power, Knowledge and Bliss.

Phase – V

From this deep ocean of silence in the heart region, let one OM emerge as an audible sound which diffuses into the entire body and the space all around. Enjoy the beautiful vibrations. Blink the eyes slowly, gently open the eyes and come out of meditation.

E. Deep Relaxation Technique (DRT)

Sthiti: ***Savāsana***

TECHNIQUE

Gently move your whole body, make yourself comfortable and relax completely.

Phase-I

Bring your awareness to the tip of the toes, gently move your toes and relax. Sensitize the soles of your feet; loosen the ankle joint; relax the calf muscles; gently pull up the knee caps release and relax; gently pull up the knee caps release and relax; relax your thigh muscles, buttock muscles; loosen the hip joints, relax pelvic region and the waist region. Totally relax your lower part of the body. R..e..l..a..x.. . Chant A-kara and feel the vibration in your lower parts of the body.

Phase- II

Gently bring your awareness to the abdominal region and observe the abdominal movement for a while, relax your abdominal muscles and relax the chest muscles. Gently

bring your awareness to your lower back, relax your lower back, and loosen all the vertebral joints one by one. Relax the muscles and nerves around the backbones. Relax your middle back, shoulder blades and upper back muscles, totally relax. Shift your awareness to the tip of the fingers, gently move them a little and sensitize. Relax your fingers one by one. Relax your palms, loosen the wrist joints, relax the forearms, loosen the elbow joints, relax the hind arms-triceps, biceps and relax your shoulders. Shift your awareness to your neck. Relax your middle part of the body, totally relax. R..e..l..a..x.. . Chant U-kara and feel the vibration in the middle part of your body.

Phase-III

Gently bring your awareness to your head region. Relax your chin, lower jaw and upper jaw, lower and upper gums, lower and upper gums, lower and upper teeth and relax your tongue. Relax your palates-hard and soft, relax your throat and vocal chords. Gently shift your awareness to your lips, relax your lower and upper lips. Shift your awareness to your nose, observe your nostrils, and feel the warm air touching the walls of the nostrils as you exhale and feel the cool air touching the walls of the nostrils as you inhale. Observe for a few seconds and relax your nostrils. Relax your beautiful smile on your cheeks. Relax your eye balls muscles, feel the heaviness of eye balls, relax eyelids, eye brows and in between the eye brows. Relax your forehead, temple muscles, ears, the sides of the head, back of the head and crown of the head. Relax your head region, totally relax, R..e..l..a..x.. . and chant M-Kara feel the vibration in your head region.

Phase-IV

Observe your whole body from toes to head and relax, chant an AUM in a single breath. Feel the resonance throughout the body.

Phase-V

Slowly come out of the body consciousness and visualize your body lying on the ground completely collapsed.

Phase-VI

Imagine the vast beautiful blue sky. The limitless blue sky. Expand your awareness as vast as vast as the blue sky. Merge yourself into the blue sky. You are becoming the blue sky. You are blue sky. You are becoming the blue sky. Your are the blue sky. Enjoy the infinite bliss. E....N…..J…..O…..Y the blissful state of silence and all pervasive awareness.

Phase-VII

Slowly come back to body consciousness. Inhale deeply. Chant an 'AUM-kara'. Feel the resonance throughout the body. The soothing and massaging effect from toes to head.

Phase-VIII

Gently move your whole body a little. Feel the lightness, alertness and movement of energy throughout the body. Slowly bring your legs together and the hands by the side of the body. Turn over to the left or the right side and come up when you are ready.

Savasana in Lateral Position (*Matsayā Kridāsana*)

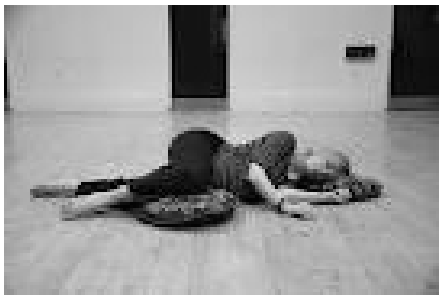
Sthiti: Life supine on the ground with ground with hands and feet apart. Raise the left arm above the head and turnover to left side; keep leg straight and the other knee is bent and support on cushion.

i. Slightly stretch the body and allow the whole body and allow the whole body to relax completely.

ii. By concentrating the mind on different parts of the body starting from the toes to the head, a feeling of relaxation is propagated.

iii. This auto suggestion can be learnt initially with the help of the guide or the teacher who gives the instructions. Gradually one learns to suggest oneself to relax part by part.

iv. As one gets control, the art of relaxation will be natural and spontaneous. Then the whole body is relaxed to the extent one forgets the body and the mind experiences alertful rest.



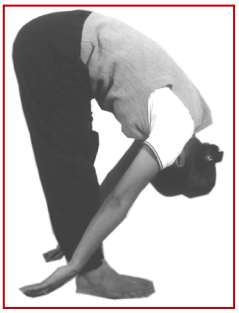
CONTROL INTERVENTION

A. LECTURES

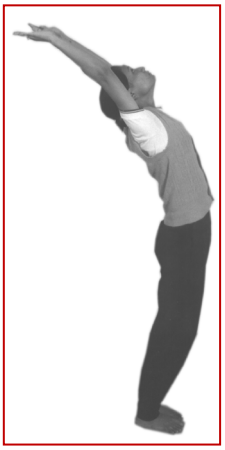
1. Twisting

Technique:

- Spread the legs about one meter apart.
- Raise the hands sideways parallel to the ground while inhaling.
- Keep the legs firm on the ground and twist to the right, keeping the right hand straight.
- Simultaneously twist the neck and look at the tip of the fingers.



- Bend the left hand at the elbow to bring the hand close to the chest.
- Come back while inhaling.
- Repeat the same on the left.
- Gradually increase the speed to your maximum capacity.



- Repeat 10 to 20 rounds.
- Slow down the speed and stop the practice.
- Relax in Tadasana.

2. Forward & Backward Bending

Technique:

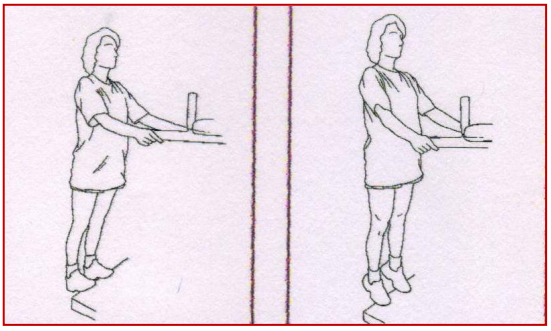
- Stretch the arms straight above the head with the palms facing forward.
- Inhale and bend backwards with arms stretched above the head.

- While exhaling bend forward as much as possible.
- While inhaling come up and bend backwards and go on rapidly to forward bending with exhalation.
- Repeat 20 times with increasing speed.
- Gradually slow down and ultimately stop the practice.

3. Side bending

Technique:

1. Keep the legs about one meter apart.
2. Raise the hands sideways parallel to the ground while inhaling.
3. Bend to the right till the right hand touches the right heel while exhaling. Bend in the same plane.
4. Look at the palm of the left hand directing forwards. Come up with inhalation.
5. Repeat 4 or 5 times to the right and left side alternately.
6. Relax in Tadasana.



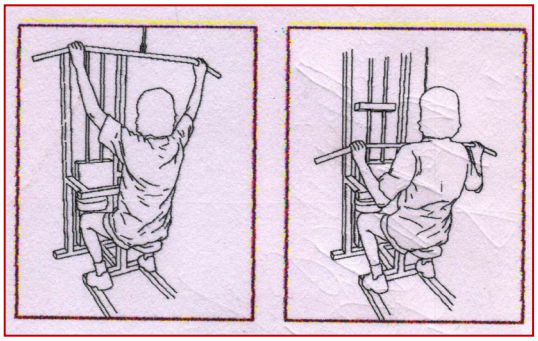
4. Calf Raise

Forefeet supported on a low board, raise up on the toes the slowly lower heel to the floor.

5. Hamstring stretch.

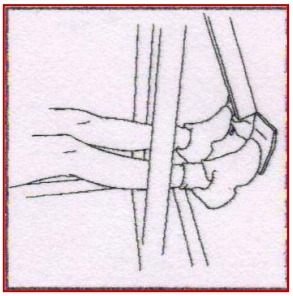
Using a char for balance, place one leg in front with heel on the floor. Keep your leg straight and bend forward from the waist until you feel a gentle stretch in the back of your leg and buttocks. Remember not to bounce during these exercises.

6. Lat Pulls- up & down



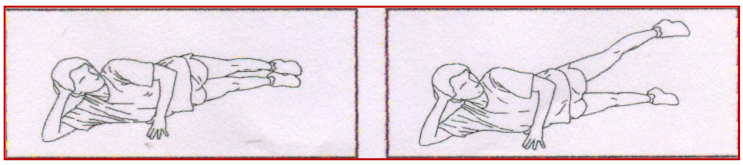
Seated on a bench (kneeling on the knee) Grasp the bar slightly wide than shoulder width apart, pull the bar down in front of your face shoulder levels than under control return to the start position.

7. Calf extension

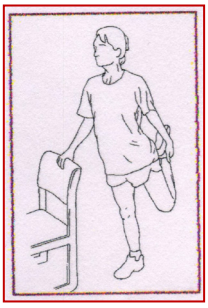


Insteps on the pedals and legs Straight,
Push pedal away From you with your toes.
Under return to the starting Position.

8. Hip Abduction- For Hips



Lying on your side, raise your top leg 10 – 15 cm. Switch side and repeat.



C. ANTENATAL EXERCISES

STANDING EXERCISES

1. Thigh stretch

Holding onto the back of a chair for balance.

Bend one leg up behind you and gasp the ankle.

Slowly move the leg back until you feel a gentle stretch.

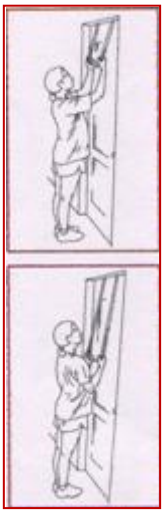
To increase the stretch you can pause your hip gentle forward.

2. Push-up & Down (chest/Shoulder)

With back firm and flat (not sagging) and hand under the shoulder, push up Straightening the arms.

To maintain comfort, use the knee instead of your toes as the pivot point / support or use the table or bench for hands placement.

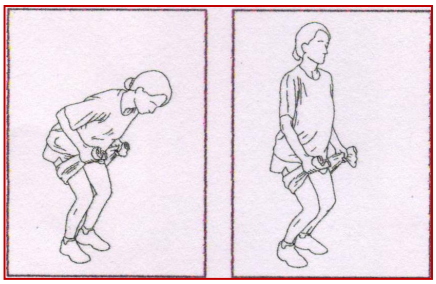
As your pregnancy progress, doing push-Ups to a table or a bench may accommodate the growing abdomen and help you maintain proper posture while doing exercises



3. Pulls Downs (Mid-Back/Posterier shoulder)

Drape your tubing evenly over the top of an open door, with a towel between the tube and the door to protect the tubing. Reach up with your arms and grasp the tubing such that there is some resistance at the start of the pull-down. While bending at the elbows, pull downward with your arms until your hands reach shoulder height. Slowly return to the start position and repeat. Note that as your pregnancy progress it may become difficult to get closer enough to the door. At this stage a hook in the wall or a sturdy shower rod may be a good alternative.

4. Low-Back lift



Put a skipping rope or long towel under both thighs and hang onto both ends. With your knee bent 45˚ and hip at 90˚, straighten at the waist using with your lower back. Hold for 20 seconds and then relax. Repeat 10 – 15 times.

SITTING EXERCISES.

1. Inner thigh Stretch

In a setting position, put the soles of your feet together.

Placing your hands behind for support.

Lower your knees toward the floor.

2. Calf stretch

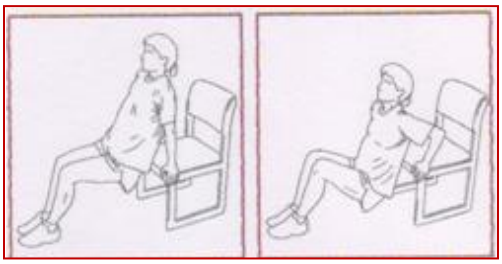
Using a chair or the wall for the support,

Extent one leg behind,

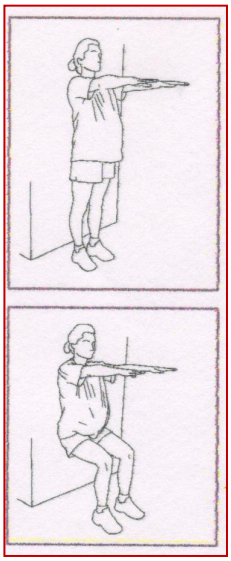
Keeping both feet flat on the floor.

With toes pointing forward.

3. Dips



With the palms supported on a chair or bench, behind your back, extend the arms until they are straight. Lower your body so that your upper arm is parallel to the ground. For varying levels of difficulty, you can keep your legs fully extended and pivot off your heels or you can bend your knees and keep your feet flat on the ground. If necessary, use a support booster under your buttocks.

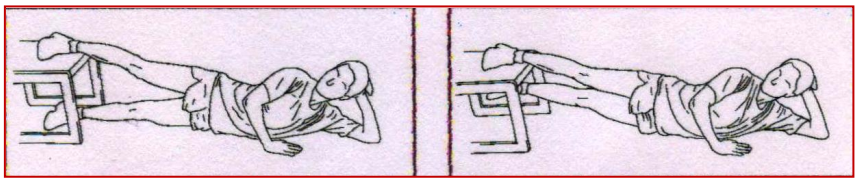


4. Squatting

With your arms held out front for balance, Feet Shoulder- width apart a toes pointing slightly outward, bend the leg squatting (not lower than thighs parallel with the floor) then return to the full standing position. Try to keep your knee directly above your ankle during these exercises.

Use a wall for back support if you wish. As your pregnancy progresses try to holding unto a hair or ledge for support. Alternative, you can perform a front lunge by steeping forward with one leg, bending the knee shifting your weight over it while keeping the upper body erect and back 'flat'. Repeat alternately to the other side.

5. Hip abduction (for Inner thigh)

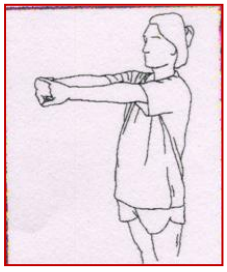


Lying on your side, rest the foot of the top Leg on bend about 30 cm high then pull the bottom leg up to the top one. Switch sides and repeat.

6. Shoulder-chest stretch

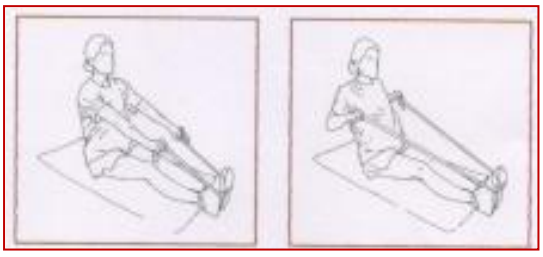
Stand facing the wall, placing your palm and forearm against it, then turn your body Away from the wall you feel gentle and stretch in your chest and shoulder Maintain a small bend in your elbow.

7. Neck & upper back stretch



While standing, grasp Hand
Together and reach the arms
Out front at chest height.

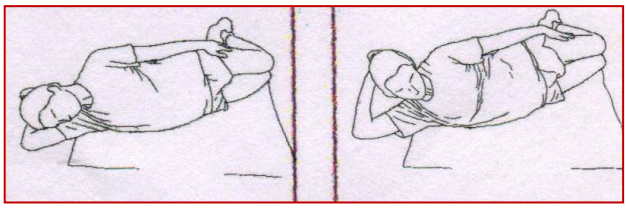
8. Seated Rowing



Setting on the ground with your leg extended back straight or slightly leaning back, hook the tubing under the soles of your feet, Reach forward and grasp the tubing such that you have some resistance when you start rowing. With your elbow bent, pull backwards until your hands are at your side. At the end of this movement your shoulder blades should be squeezed together and your chest pushed forward. Slowly return to the start position.

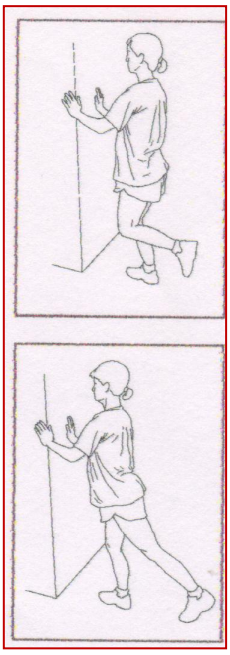
9. Oblique curis

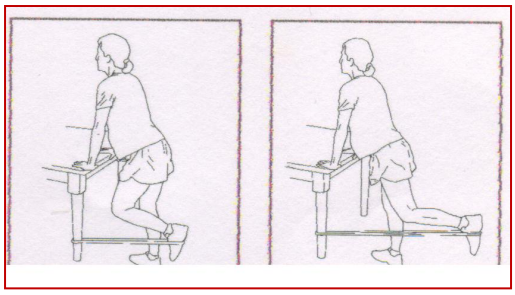
Lie on your side with your knees bent, and your shoulders, hips and knees in line. Lift your upper body off the floor by reaching towards your feet with your top arm. Do 10 – 15 repetition on each side.



10. Kick backs

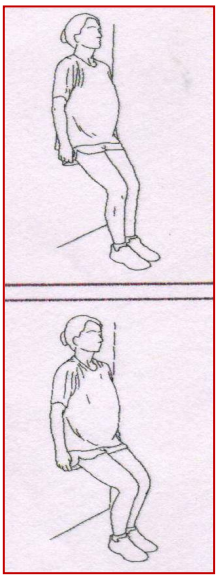
Stand facing the wall, using it for support. With one knee bent and hip flexed, extend the opposite leg back then slowly returns the starting position. To increase the load, Hook and piece of tubing around sole of one foot and extend that leg back then slowly return to the starting position. Be sure to keeping the knee bend and hip flexed in the supporting leg





11. Pelvic Tilt

Stand facing away from the wall, with your feet shoulder- width Apart 12 to 30 cm from the wall. Bent the knees and tilt the pelvis Backward to the lower back is pressed against the wall. Slowly extend the knees keeping the lower back against the wall and your abdominal muscles tight. Hold 20 seconds, relax, and repeat 5 times. (You can make this exercise more difficult by doing it with your feet closer to the wall.)



D. SLOW WALKING

E. SUPINE REST