

CHAPTER 3

SCIENTIFIC LITERATURE REVIEW

3 Role of Yoga in hypertension

3.1 Yoga and HTN

In last four decades several scientific investigations have been conducted to see the efficacy of yoga on various parameters in HTN.

In a study by Datey et al, 1969, 47 hypertensive subjects of which 10 were untreated, 22 were on anti-hypertensive medication and 15 were poorly controlled with drugs, underwent 3 weeks of *shavasana* practice, post intervention there was reduction of 27 mmHg in mean BP in untreated patients and of 10mmHg in mean BP in patients poorly controlled with medication compared to baseline (Datey, 1969). Similarly in a study by Sunder et al, 1984, 6 months of shavasana practice twice daily after three years of follow up showed significant decrease in blood pressure (14/11 mmHg) was noticed (Sundar,1984).

A non- randomized controlled trial by Baaga et al, 1983 compared the effect of 12 weeks of, 20 minute *shavasana* with transcendental meditation (TM) and control session sitting with eyes closed for the same duration. In this study they observed significant decrease in both systolic and diastolic blood pressure following *shavasana* (-8.94/4.6mmHg) and TM (-7.27/2.4mmHg (Bagga, 1983) compared to control group. In a randomized controlled study Modesti et al, showed a significant decrease in systolic and diastolic blood pressure following 3 months of slow breathing (5-6 breaths/minutes) for 5 minutes daily as compared to control group (Modesti, 2010).

In a another randomized controlled trial by Saptrish et al,2009 reported a significantly better reduction in blood pressure following 50-60 minutes of brisk walk daily for 8 weeks as compared 30-45 minutes of yoga and salt restricted die (Saptharishi, 2009).

Damodaran et al, 2002 studied comprehensive yoga intervention consisted of yoga postures, breathing practices and meditation. At the end of the study significant decrease in systolic

and diastolic blood pressure (22/17.4mmHg) along with improvement in blood glucose, lipid profile, subjective wellbeing, reduction in drug score was reported (Damodaran, 2002) Niranjan et al, 2009 compared effect of 9 months integrated yoga practice consisted of yoga postures, breathing practices and meditation with treadmill exercise, Yoga + exercise and controlled normotensive group. There was a significant decrease in blood pressure (7.57/6.12mmHg) in exercise group as compared to yoga group and exercise + yoga group (7.3/6.94mmHg) (Niranjan,2009;Chung et al, 2012 assessed effect of 2 weeks of sahaja yoga with medication and only medication intervention showed significant improvement in blood pressure (12.3mmHg and 6.1mmHg) in sahaja yoga group (Chung,2012). Another study by Damodar et al, 2002 three months of comprehensive yoga practice showed a significant decrease in blood pressure (22/17.4mmHg) (Damodaran, 2002). A study by Murthy et al, 2011 showed 21 days of integrated yoga with naturopathy and dietary modification reduced blood pressure by 10/5.1mmHg (Murthy, 2011). Deepa et al, 2012 showed significant decrease in blood pressure (18.9/13.7mmHg) following 3 months of yoga intervention consisted of asana, pranayama, meditation, along with antihypertensive medication whereas, control group also showed decrease of 10.3/4.4mmHg in blood pressure (Deepa, 2012).

A study by Lakshmikanthan, 1979, found a significant decrease in blood pressure (.7/8.8mmHg) following 5 weeks of yoga asanas and relaxation practice in 44 hypertensive patients (Lakshmikanthan, 1979). Vijaylaxmi, et al 2004 studied effect of one month yoga and pranayama practice in 13 hypertensive patients and found significant decrease in blood pressure (21/11.93mmHg) (Vijayalakshmi, 2004).

A study by Talukda 1996, studied effect of one month yoga practice on blood pressure in 30 hypertensive individuals and compared with age BMI matched normo-tensives. There was a

significant decrease in blood pressure in hypertensive patients 14.2/ 12.2mmHg whereas n significant improvement was found in normotensive group (Talukdar, 1996).

A study by Maria W, et al, 2016 assessed the impact of 12 week yoga intervention on quality of life in 80 atrial fibrillation subjects. After 12 week yoga intervention significant improvement in QoL was observed.

Another study by Ramkumar T, 2015 reported significant decrease in systolic & diastolic blood pressure following 12 weeks of yoga in addition to lifestyle modification compared to obly lifestyle modification.

Table 7: Previous studies on Yoga and autonomic dysfunction

Author, Year, Journal	Title of the study	Study design	Results	Conclusion
Satyprabha, 2008, Epilepsy & behaviour	Modulation of cardiac autonomic balance with adjuvant yoga therapy in patients with refractory epilepsy	Yoga (n=18) Exercise (n=16) 10 weeks intervention	Signicant decrease in seizure frequency and improvement in parasympathetic parameters in yoga group	suggest that yoga may have a role as an adjuvant therapy in the management of autonomic dysfunction in patients with refractory epilepsy.
Kastin Khabbat, 2007, Evidence based complementary and alternative medicine	Iyengar yoga increase the cardiac autonomous nervous modulation among healthy yoga practitioners.	11 yoga practitioners 5 week intervention one session/week 2 session of yoga 3 sessions of placebo practice	Significant higher cardiac autonomic parameters were reported during yoga session than placebo sessions	relaxation by yoga training is associated with a significant increase of cardiac vagal modulation. Since this method is easy to apply with no side effects, it could be a suitable intervention in cardiac rehabilitation programs.
Monika, 2009, Journal of complementary	Effect of slow and fast breathing exercise on autonomic functions	RCT study- Hypertensive subjects	Significant improvement in blood pressure across the both	Both types of breathing exercises benefit patients with hypertension.

and alternative medicine	in patients with hypertension.	Slow breathing Fast breathing 3 months intervention	group was observed Standing /Lying down ratio, 30:15 ratio, Expiration/Inspiration ratio, and BP response in the hand grip and cold pressor test showed significant change only in patients practicing the slow-breathing exercise	However, improvement in both the sympathetic and parasympathetic reactivity may be the mechanism that is associated in those practicing the slow- breathing exercise.
Viveka, 2013 Indian journal of endocrinology and metabolism	Cardiac autonomic functions in type 2 DM improve with comprehensive yogic breathing.	RCT 64 subjects. 28 subjects received six months of yogic breathing practices	Significant decrease in sympathetic activity in comprehensive yoga group after six month	Cardiac autonomic functions improved in patients with diabetes on standard treatment who followed the comprehensive yogic breathing program compared to patients who were on standard therapy alone.
Ravikiran, 2014,	Effect of yoga on migraine: A comprehensive study using clinical profile and cardiac autonomic function	RCT Conventional care (n=30) Yoga+ conventional care (n=30) 6 weeks intervention, 5 days a week	Both group showed significant improvement in clinical outcomes but yoga+conventional group showed better results Significant improvement in autonomic variables were found in yoga + conventional care	Headache frequency and intensity were reduced more in Yoga with conventional care than the conventional care group alone. Furthermore, Yoga therapy enhanced the vagal tone and decreased the sympathetic drive, hence improving the cardiac autonomic balance. Thus, Yoga therapy can be effectively incorporated as an adjuvant therapy in migraine patients.

All the above studies showed a significant decrease in sympathetic activity and increase in parasympathetic activity following different forms of yoga interventions. These studies show the potential role of yoga in autonomic balance through reducing sympathetic activity and enhancing parasympathetic tone in both healthy and clinical population. Autonomic dysfunction is predominantly found in many chronic health conditions including hypertension. This review finds yoga as a potential intervention to correct the autonomic dysfunction in hypertension.

3.2 Yoga and cognitive function

Literature researched showed a significant number of studies have assessed the impact of yoga on different domains of cognitions. Most of these studies found significant improvement in majority of cognitive facets assessed.

A study by Rocha 2015 assessed effect of six month yoga practice on memory in thirty six army healthy persons between age ranges 20-40 years and compared with 19 age matched persons who followed 6 months of exercise (4 sessions/week). In post-intervention between group analysis yoga groups showed significantly better improvement in short term and working memory compared to control group (Rocha2012).

A study by Naveen et al, 1997 showed improvement in spatial memory following breathing from particular nostril (Naveen, 1997). Another study by Saranga, 2007 showed significant improvement in letter cancellation performance following yoga based relaxation technique as compared to supine rest (Sarang SP, 2007). Mary, 2008 assessed effect of 8 week Iyengar yoga practice on cognition in breast cancer patients. This study found significant improvement in cognitive tasks (Galantino, 2008). A study on 30 healthy female participants assessed the acute effect of yoga session showed to be significantly better than exercise and

control session(Neha Gothe, 2013). Gothe, 2013 compared the impact single yoga session verses aerobic exercise in 30 female students. Yoga intervention showed significant better improvement flanker task and N back test suggesting shorter reaction times and accuracy compared to aerobic exercise session.

Another randomized controlled trial by Barry, 2006 assessed six month yoga intervention on cognition and QoL in elderly. After six month no significant improvement in attention and alertness was observed in yoga or exercise group compared to baseline.

A study by Orjana, 2010 demonstrated a significant improvement in 17% improvement following after 10 weeks of yoga intervention in subjects with multiple sclerosis.

3.3 Yoga and anxiety

Significant number of studies has been conducted to assess the impact of yoga on anxiety in last 5 decades. Most of these studies have assessed symptoms and severity of anxiety and depression.

In a randomized controlled trials study by Sat Bir Khalsa, 2009, 45 muccians were divided into 3 group, yoga and meditation group, yoga lifestyle and control group. All the subjects were underwent respective intervention for two months. Post intervention between group comparisons showed a significant decrease in aperformance anxiety inStudied 2 months yoga and meditation intervention on performance anxiety in both yoga lifestyle and yoga and meditation group compared to contrl group.

In another study 30 subjects with major depression were randomly divided into Sahaj yoga group or control group. Subjects in Sahaj Yoga group practiced yoga for 8 weeks along with anti-depressant medication and control group followed notral routines with anti-depressannt medication after 8 weeks significant improvement in depression and different cognitive assessments was reported in Sahaja group compared to control group (Sharma, 2006). A study

by Indu, 2004 compared the impact of 2 month yoga intervention (9 subjects) vs conventional care (12 subjects) in terms of IBS related symptoms and anxiety. After two months both the groups showed significant improvement in IBS related symptoms and anxiety whereas, yoga group showed additional benefits in improving parasympathetic activity compared to conventional care.

Another study by Sahasi, 1989 compared the effect of 3 months yoga (n=38) vs diazepam medication (n= 53) in subjects with anxiety neurosis. After two months 6.7% of yoga group subjects reported completely asymptomatic compared to 1% in diazepam group.

Javnabhak et al, 2009, assessed impact of two months of yoga practice twice in a week on (n = 34) women with anxiety disorder and compared to a age matched non-yoga group (n = 31) after 2 months of intervention significant decrease in state and trait anxiety in women with anxiety disorder.

A study by Gangadhar et al, 2013 compared the effect of generic yoga with anti-depressant drug in subjects with depression. Total of 137 subjects received either yoga or anti-depressant medication or both. Significant improvement was found in the entire group in depression and severity of depression. Yoga alone and yoga with medication groups showed significantly better improvement compared to medication only.

Banerjee, et al, 2007 assessed the effect of 6 weeks of yoga intervention on anxiety in patients with breast cancer whereas control group did not show any improvement.

Alison Woolery, 2004 assessed effect of short term Iyengar yoga intervention of 5 weeks (1 session/week). 28 mildly depressed young adults were divided into yoga group (n=13) and wait-list control (n=15). Post intervention comparison showed a significant decrease in anxiety and depression compared to wait-list control group.

Summary: Most of the studies mentioned here showed a significant improvement anxiety and depression symptoms. This review indicates yoga as a potential intervention for reducing anxiety and depression.