CHAPTER 1

INTRODUCTION

Key Messages

- Visual impairment is the functional limitation of the eye or eyes.
- Vision loss has an adverse effect on all aspects of health.
- Childhood visual impairment is of global concern, estimating 19 million children age < 15 yrs are visually impaired globally.
- One-fifth of visually impaired children worldwide are living in India.
- Children with visual impairment have restricted participation in physical activities which consequences in lower levels of health-related aspects as compared to their sighted peers.
- Early intervention is essential for children with visual impairment as it lays a foundation for their all round development throughout their life.
- Yoga is well accepted at improving levels of fitness and health outcomes which may bring the same in such populations.

1.0 INTRODUCTION

The eye is the pivotal sense organ to perceive the external world responsible for transmitting to the brain 80-90% of its received information. Functioning eyes are essential for a person's ability to function independently, to perform activities of daily living, and to travel safely through the environment. Impairment (any type of anatomical defect) of vision or even mild abnormality in function causes barriers to physical, mental and motor development. Furthermore, if impairment of the visual system is present at birth or develops shortly thereafter, it adversely affects infant development, mobility, and, later, education, social, marital, and economic prospects, affecting the individual, their family, and the community. Visual impairment (VI) is more pronounced in its effects than other impairments.

1.1 DEFINITION OF VISUAL IMPAIRMENT

Various definitions of VI are used worldwide. The International Classification of Diseases (ICD-10) categorizes VI primarily on the basis of recommendations made by World Health Organization (WHO). In general, a wide range of visual function is described from low vision (LV) to total blindness, with four accepted levels of visual function, i) normal vision, ii) moderate VI, iii) severe VI, iv) total blindness.

Moderate VI combined with severe VI is grouped under the term “low vision”: low vision together with total blindness represents all VI (WHO, 2014).

As a broad concept, VI refers to limited vision in the better eye with presenting correction (eyeglasses, contact lens). ICD-10’s classification of VI is based on assessment of visual acuity (VA) and visual field (VF), and can be categorized as follows: i) Moderate VI (Category 1) —VA of 6/18–6/60, ii) Severe VI (Category 2)—VA of 6/60–3/60, iii) Blindness (Categories

3–5)—VA of 3/60 to no light perception or VF no greater than 10° in radius around central fixation (WHO, 2014).

A different VI classification is used specifically in sport-science literature. This classification is divided into three classes:

i) B1—no light perception in either eye up to light perception, but inability to recognize the shape of a hand at any distance or in any direction;
ii) B2—from the ability to recognize the shape of a hand up to VA of 2/60 and/or a VF of less than 5° in the best eye with presenting correction;
iii) B3—from VA above 2/60 up to 6/60 and/or a VF of less than 20° (United States Association of Blind Athletes [USABA], 2014).

1.2 CHILDHOOD VISUAL IMPAIRMENT

Childhood VI refers to a group of diseases and conditions occurring in childhood or early adolescence (<16 years of age), which, if left untreated, result in blindness or severe VI that are likely to be untreatable later in life (WHO, 2014). Due to the enormous loss of disability adjusted life years, childhood blindness is considered the second leading cause of burden due to blindness in the population (Rahi, Gilbert, Foster, & Minassian, 1999). A global estimate of the number of people with VI indicates that approximately 1% of the population from zero to 14 years of age has at least a moderate level of VI, and one tenth of those have total blindness (Pascolini & Mariotti, 2012).

1.3 PREVALENCE AND BURDEN – GLOBAL

Childhood VI is of global concern. WHO estimate that 19 million children aged below 15 years are visually impaired (WHO, 2014) contributing 5% of world blindness (Gilbert, Anderton, Dandona, & Foster, 1999; Gilbert & Foster, 2001). Three quarters of the world's blind children live in the poorest regions of Africa and Asia (Gilbert & Foster, 2001). Prevalence and causes

of childhood blindness depend on several factors, such as level of socioeconomic development, geographic area under study, or age of the patients. Developed countries have an estimated 0.1/1000 blind children, with 1.1/1000 in third world countries (Gilbert et al., 1999; Gilbert & Foster, 2001). The global cost of childhood onset blindness (i.e. starting 6 to 17 yrs) is $601.6 million for informal care (Wittenborn & Rein, 2013), while loss of earning capacity has been estimated to be US$6 to $27 billion (Smith & Smith, 1996).

1.4 PREVALENCE & BURDEN – INDIA

In India, approximately 6,80,000 children are visually impaired, about one-fifth of those worldwide, the most of any country (Dandona & Dandona, 2003). Limited evidence suggests that 1 child in a 1000 in India is blind (Dandona & Dandona, 2003; Murthy et al., 2002).

Various population based epidemiological studies have reported prevalence of childhood VI in different states of India: 0.65/1000 (95% confidence interval (CI): 0.15–1.15/1000) in urban and rural Andhra Pradesh in children aged 0–15 years (Dandona, Williams, Williams, & Rao, 1998); 1.25/1000 in children aged 5–15 years in rural Andhra Pradesh (Dandona et al., 2002); 0.53/1000 in children aged 5–15 years in Delhi (Murthy et al., 2002); and in rural Karnataka a prevalence of 1.06/1000 children ≤ 15 years has been reported (Gogate et al., 2009). India's lifetime economic loss from blind children is $22.2 billion, 29% of its $77.4 billion estimated total economic burden due to blindness (Thomas, Paul, Rao, Muliyil, & Mathai, 2005).

1.5 IMPACT OF VISUAL IMPAIRMENT IN CHILDREN

Children with VI do not have the same opportunities as sighted children, since their primary mode of obtaining information to observe and imitate the world is restricted. Visual imitation plays a critical role in early learning. It is involved in almost every aspect of childhood development. Delays result in fine and gross motor development, daily living skills, behavioural

skills, cognitive, language and emotional development (Brambring, 2006; Levtzion-Korach, Tennenbaum, Schnitzer, & Ornoy, 2000; Ophir-Cohen, Ashkenazy, Cohen, & Tirosh, 2005).

In addition, childhood VI restricts early movement and causes barriers to participation in physical activity, which is imperative to integrate into the lives of children and adolescents. It establishes foundations to facilitate and maintain adequate fitness, providing psychosocial and physiological health, protecting against many chronic diseases, and living an active healthy life throughout adulthood (Biddle & Asare, 2011; Cragg & Cameron, 2006). Studies reveal that children with VI do not meet the WHO recommendation of at least 60 mins moderate to vigorous physical activity daily (WHO, 2010). Individuals with VI are therefore at greater risk of developing serious health problems (Lieberman & McHugh, 2001; Shapiro, Moffett, Lieberman, & Dummer, 2005).

Children with VI are observed to be less physically active (Houwen, Hartman, & Visscher, 2009; Lieberman & McHugh, 2001), less physically fit (Lieberman, Byrne, Mattern, Watt, & Fernandez-Vivo, 2010), have poor locomotive functions and object control skills (Wagner, Haibach, & Lieberman, 2013), impaired balance (Navarro, Fukujima, Fontes, Matas, & Prado, 2004), lower quality of life (Chadha & Subramanian, 2011), higher anxiety levels (Bolat, Doğangün, Yavuz, Demir, & Kayaalp, 2011), and greater physiological arousal (Telles, Rajesh, & Srinivas, 1999) than their sighted peers. Early vision loss thus adversely affects physical, mental, social and psychological health, and quality of life (Bekibele & Gureje, 2008). Children with VI require more support to fulfil all aspects of their lives.

To tackle these issues, activities such as balance exercises (Jazi, Purrajabi, Movahedi, & Jalali, 2012), aerobics (Jovelyn, 2011), ice skating (Dursun et al., 2015), gymnastics skills (Hashemi, Dehghani, Saboonchi, Roozbahani, & Roonasi, 2012), goal ball game (Karakaya, Aki, & Ergun, 2009), and rope jumping as exercise training (Chena & Linb, 2011) have been specially

adapted for children with VI. Yoga is well accepted as a physical activity today, as beneficial or better than exercises at improving levels of fitness (Bal & Kaur, 2009) and health outcomes (Ross & Thomas, 2010).

1.6 YOGA AS A SOLUTION

Yoga is a widely performed ancient Indian form of conditioning practice. Yoga asanas are postures combined through slow, smooth, steady, and graceful movements. They are rated as a low to medium intensity exercise (Ray, Pathak, & Tomer, 2011), and asserted to develop strength and fitness at physical, mental and emotional levels (Nagarathna & Nagendra, 2013). Yoga has received much attention from the scientific community over the last 20 years due to its effectiveness in enhancing muscular strength, endurance, body flexibility (Woodyard, 2011), generating balanced energy, vitality (Arora & Bhattacharjee, 2008), and cultivating calmness of mind (Nagarathna & Nagendra, 2013).

Empirical research on yoga in children has been primarily directed towards potential benefits for the normal sighted (Kaley-Isley, Peterson, Fischer, & Peterson, 2010), with the goal of improving physical fitness (Bhavanani, Udupa, & Ravindra, 2011; D'souza & Avadhany, 2014; Telles, Singh, Bhardwaj, Kumar, & Balkrishna, 2013), cognitive abilities (Chaya, Nagendra, Selvam, Kurpad, & Srinivasan, 2012) and psycho-social wellbeing (Hagins, Haden, & Daly, 2013; Khalsa, Hickey-Schultz, Cohen, Steiner, & Cope, 2012; Noggle, Steiner, Minami, & Khalsa, 2012). Yoga can be as effective at improving health related outcomes as many contemporary forms of exercise including walking, jogging, cycling, and aerobics (Ross & Thomas, 2010). Accumulating evidence suggests that yoga based health promotion programs are well received by sighted children and may bring favourable improvements the development of children with VI.

Studies have been published documenting positive effects of yoga for children with VI including, proprioception (Mohanty, Pradhan, & Nagarathna, 2014), autonomic functions (Telles et al., 1999), and self-concept and emotional maturity (Berwal & Gahlawat, 2013). Generally, however, there is a paucity of research on benefits of yoga for children with VI.

1.7 NEED FOR THE PRESENT STUDY

According to WHO, of the children with VI in the world, 1.4 million are irreversibly blind, and will remain so for the rest of their lives. These need visual rehabilitation interventions for full psychological and personal development (WHO, 2014). Research on this population has been limited, however. Early intervention is essential for them to lay a foundation for their all round development. Research on yoga for these children is still in its early stages, but will probably not be added to regular curricula for those with VI until its beneficial effects are more widely appreciated. Scarcity of yoga studies on health related outcomes in particular led us to plan this study aimed at investigating effects of yoga practice on their physical and psychological health.