

Uncorrected Refractive Error and Associated Childhood Visual Impairment – Any new steps for prevention?

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Uncorrected Refractive error and childhood blindness are the important priorities of VISION 2020: Right to Sight initiative. The causes of childhood blindness vary among countries. The most recent estimation based on childhood mortality rate has estimated that there is 0.4/1000 prevalence rate of childhood blindness in Nepal and the main avoidable causes are (Nepal Blindness Survey (NBS), 1981 and Mid-term review of NBS, 2010):

- Cataract
- Glaucoma
- Retinopathy of prematurity is emerging in major cities
- Refractive errors
- Low vision, which encompasses visual impairment and blindness from untreatable causes

Most of these cases are avoidable; either preventable or curable. Refractive error is again important cause for childhood blindness. Hence, the importance of correction and management of refractive error is significantly high for the management of visual impairment. Early detection is crucial as it may lead to amblyopia and other permanent visual impairment.

Simple screening programs targeted at school children can detect these problems easily. Blindness in children has more impact than in adults as the blind years that a child has to live be very long than an adult does. The early detection and treatment of vision disorders gives children a better opportunity to develop educationally, socially, emotionally and physically.

Refractive error is an anomaly of the dioptric system of the eye in which the rays of light are not focused on the retina. It includes myopia, hypermetropia and astigmatism. Refractive state of the eye is the function of axial length of the eye, corneal curvature, position and refractive index of crystalline lens. Whatever may be the etiologies, refractive error requires early detection and appropriate correction in the form of spectacles, contact lenses or, more recently, refractive surgery.

Visual impairment can be described as blindness (best corrected vision of < 20/400 in the better eye, by World Health Organization [WHO]) or low vision (best corrected vision of < 20/60 in the better eye according to WHO).

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Currently, 285 million people (4.25% of world population) are visually impaired [1] (Mariotti and Pascolini, 2010). Visual impairment has a significant impact on the development of every sector of individuals and societies [2] (Salomao, *et al.* 2009). The consequences secondary to it are important public health issues affecting developing countries more, where 80% of the world blindness prevails (Congdon, *et al.* 2003). Uncorrected refractive errors are common cause of visual impairment and blindness worldwide. 2.3 billion People are estimated to be living with this problem [3] (Brien, *et al.* 2000). Realizing its burden to the world and easy management, the World Health Organization has adopted the correction of refractive errors in developed and developing countries as one of the main priorities in its “Vision 2020: the right to sight” initiative. Refractive error is one of the most common causes of visual impairment around the world and the second leading cause of treatable blindness [4] (Dandona and Dandona, 2001). The number of visually impaired people due to cataract is decreasing. But; on the other hand, the number of people with uncorrected refractive error is increasing [5] (Bourne, *et al.* 2013). Visual impairment secondary to uncorrected refractive error starts at a younger age than cataract, which manifests itself in old age [6] (Dandona, *et al.* 2001). Visual health directly affects school achievement, economic productivity and as a whole quality of life [7] (IAPB, 2011).

In the context of Nepal, 1981 Nepal Blindness Survey didn't have refractive error as an etiology on its list. The mid-term review in 2010 included it as an important etiology of avoidable blindness and it constituted 4% of the total causes of Blindness. According to mid-term review of Nepal Blindness Survey 2010, estimated 1,013,141 children under 16 years of age have refractive error and the prevalence of refractive error among the children of this age group is assumed to be 10% based on different studies ranging from 3% to 20%. In 1998, a population-based study in school-age children in Eastern Nepal showed that 2.9% of children had visual morbidity of which 56% was due to refractive error [8] (Pokhrel, *et al.* 2000). A similar study conducted in three schools of Kathmandu valley in 2002 culminated refractive error as the commonest (8.1%) type of ocular morbidity [9] (Nepal, *et al.* 2003). In a series of studies called Refractive error study in children (RESC) large proportion of children with reduced vision ($\leq 6/18$) were due to refractive errors were reported from China [10] (94.9%) (He, *et al.* 2004) followed by India [11] (61%) (Dandona, *et al.* 2002) and Nepal [8] (56%) (Pokhrel, *et al.* 2000).

Facts file of WHO shows that globally, 19 million children are living with vision impairment and approximately 12 million children have a significant, uncorrected refractive error. Uncorrected or lately corrected refractive error may cause amblyopia and other complications. The educational and social interactions of such children may get hindered and overall development will be degraded. Uncorrected refractive errors are thought to be important cause of poor academic performances and high dropouts from schools.

Most unsatisfactory is the fact that even when spectacles are prescribed and made, children have unwillingness to wear them because of stigma, ignorance and negative parental attitudes etc. In the context of developing countries like Nepal, negative parental attitude to wearing spectacles is a major barrier to refractive correction in children. Pediatric populations are not quick in sharing their visual problems and also parents are unaware of the problems. So, most of children are presented lately and hence are forced to live visually impaired life prior to the interventions. Hence, refractive error diagnosis along with appropriate correction is very important. Timely diagnosis and appropriate treatment and referral are very important in pediatric age group. Visual impairment secondary to refractive errors suggests that eye care services in that region are inadequate. Since the treatment of refractive errors is perhaps the easiest and effective forms of eye care, it can easily be prevented.

Developing countries lack skillful manpower and thus can't reach to all people around the country. Basically, people in rural areas suffer a lot. Nepal is not an exception. Many school children and adults are deprived of health services. Ocular health services are also not reachable to the populations. This is the reason why eye camps and screenings in rural areas and in schools have been regular practices in developing countries like Nepal. Many camps and screenings are being organized at different corners of the country, but are they as fruitful as they could be? This question drove us hard and we came up with some different idea to make the school screenings more organized, more efficient and more reachable to more number of students.

We named it “Little Optometrist” program and first initiated in 11th October 2007. Our aim to start this program was to involve school children and teachers themselves in the screening programs and help in referring the needy students. We collect certain number of students as per allocated by the school administration; call them in the eye hospitals or eye clinics where they will be given extensive vision training in lecture (multimedia presentations) form first and then in practical session. They undergo pre-test and post-test session during the training. They are taught to take visual acuity, to differentiate manifest deviations, to differentiate red eyes, ptosis, proptosis and other frank abnormalities and finally to separate the students as referral requiring or not. These trained students under the guidance of teachers will then carry out vision screening in their respective schools and prepare a record of referral requiring students. Eye practitioners will then separate time for detail ocular examination in the school or the students are called in the clinics/hospitals for detail ocular examination.

The benefit of this initiation was that we could screen large numbers of students with less numbers of manpower; it reduces cost of the screenings and the coverage was outstanding. Involvement of teachers and students made it more effective, enthusiasm in participation and most importantly spread public awareness. We are still using this program during school screening and also the trainees are involved in general eye camps as well.

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