CONCLUSION

"Not blindness, but the attitude of the seeing to the blind is the hardest burden to bear"

Helen Keller

This study has only attempted to identify the major causes of bilateral blindness in children of Gujarat state. No attempt has been made to discuss the causes and control of unilateral blindness or of lesser degrees of visual loss in children, including refractive errors and amblyopia.

• There are marked variations in the prevalence of childhood blindness.
• Congenital cataract is the most important treatable cause of childhood blindness for which early diagnosis and referral, surgery by an experienced ophthalmologist, and long-term follow-up and management of aphakia and amblyopia are essential.
• Along with preventive measures like vitamin A supplementation & measles immunization, the development of corneal transplantation facilities with standard eye banking system for bilaterally blind children due to corneal opacity should be taken into consideration.
• Surveillance will be increasingly required in neonatal units for the emergence of retinopathy of prematurity as a preventable cause of childhood blindness.
• Avoidable and affordable spectacles are a major part of strategy to combat childhood blindness. The issue and hurdles of quality, supply, distribution, cost and acceptance all need to be settled. A best possible plan is to be prepared to deliver vision at doorstep.
• The development of a standard basic curriculum together with supply of basic requirements for pediatric ophthalmology set up is utmost important.
• More stringent measures should be taken for issuing a certificate of blindness in children. It should be given only at tertiary centres after all proper steps being taken for improving the vision in that particular child even after low vision aids. This can also reduce the prevalence of avoidable childhood blindness because blind schools will grant admission only after verifying the certificate issued only by tertiary centres.
• We should develop proper human resources to meet the strategy designed by VISION 2020: THE RIGHT TO SIGHT. This includes pediatric ophthalmologist, optometrist, health care workers, nursing staff, pediatric anesthetist, rehabilitation workers.
The treatment strategy to reduce childhood blindness could be of 3 stages:

1. **Primary treatment**: Here the total preventable and treatable causes include measles, vitamin A deficiency, ophthalmia neonatorum and rubella syndrome.

2. **Secondary prevention**: Condition that could have been treated early to prevent blindness includes glaucoma and ROP.

3. **Tertiary prevention**: Condition of blindness where sight can be restored include cataract and selected cases of corneal scarring.

The provision of low vision services (by a low vision team) are necessary to enable severely visually impaired and blind children to read and write print through a combination of spectacles and magnifiers.

Research work is required in following areas as a priority basis:

1. Identify the causes of microphthalmos, anophthalmos and other anomalies of the globe in children.

2. Operation research on the best means of prevention of corneal scar, pediatric keratoplasty techniques & outcomes.

3. Etiology of childhood cataract, surgical techniques, intra ocular lens designs and contact lens practice especially for aphakic correction.

4. Epidemiological research related to risk factors for retinopathy of prematurity and different treatment modalities for their outcomes and timing.

5. Operational research on delivery and outcomes of low vision services.

6. Epidemiological research on the causes and prevalence of low vision in children.

In order to reduce the incidence of childhood blindness it is necessary to improve maternal and child health services, particularly immunization, better nutrition and the control of diarrhea. There is also a need to develop specialized paediatric ophthalmic services for the management of surgically correctable conditions, particularly cataract, and to provide low vision services for severely visually impaired children. Low vision can restrict the overall development and education of a child, which in a long run become a social and financial burden to the society and the nation.
To deal with childhood blindness requires an integrated effort by a large number of agencies with team work profile which includes ophthalmologist and other eye care workers, community leaders & legislators, educators, traditional medical practitioners / healers, rehabilitation groups and last but not least – parents.

'Visual disabilities in children' including the 'Childhood Blindness' should be addressed through a comprehensive program approach. Incoming years should focus on integrated program approaches in India (with large populations) if significant reductions of curable/preventable childhood blindness are to be achieved.

We should rename priority eye disease 'childhood blindness' as 'Visual disabilities in children' in the 'VISION 2020' initiative. This will highlight importance of addressing unilateral blindness, low vision, amblyopia and uncorrected refractive errors. Visual disabilities in children due to nutritional deficiencies, measles, rubella and uncorrected refractive errors should be managed if countries attempt to reach the 'Millennium Development Goals (MDGs)'.

Even if we address all avoidable blindness we will be left with around 1 million blind children due to unavoidable cases of blindness. Better liaison of prevention of blindness program with program for control of birth defects, school health and child health care is recommended. Awareness among health care providers and the parents will improve the rehabilitation of disabled children. In countries with a high prevalence (Africa, India and China) training human resource and their placement in rural areas would be crucial. Modern technologies including telemedicine could assist eye care personnel in remote areas of countries with developing economies. However, they should be cost effective to be sustainable.

**LIMITATION OF STUDY:**
Although blind school studies are useful in identifying the major causes of childhood blindness, because a large number of children can be examined using a standard protocol by one ophthalmologist in a relatively short time, these studies do suffer from selection bias. This study can not provide cause-specific prevalence rates and it is likely to under represent certain groups of visually handicapped children, i.e. those who have limited access to blind schools / hospital because of
• lack of parental awareness
• distance of residence
• those who die at earlier age
• those with multiple disabilities often refused entry to blind schools
• with unilateral or mild bilateral visual impairment
• infants and pre-school children

Thus, this study would represent those children in whom SVI / BL are the main disability and who gain access to blind school or hospital.

SIGNIFICANCE OF THE STUDY:

• Childhood blindness and visual loss is important because of the impact on the child’s development, education, future work opportunities & quality of life. This handicap has serious social & economic consequences on the family and the society. These negative effects are experienced throughout the child’s life often lasting 50 or more years. In order to develop a programme to control visual loss in children it is necessary to assess the need (magnitude and causes of visual loss) and the available resources, (particularly trained eye health workers and facilities).

• A study of childhood blindness should be consider separately because the major causes and so, the strategies to prevent blindness are entirely different from those for adults.

• At least half and possible three quarters of childhood blindness are avoidable. In order to prevent childhood blindness it is necessary to identify important causes and monitor the changing patterns over time.

• For effective planning of eye-care services to reduce childhood blindness, a reliable population-based data are needed from different parts of India regarding the prevalence and the causes of childhood blindness. There is very limited data on the prevalence and causes of childhood blindness, which is the basic requirement for developing strategies towards its prevention or management. The first issue that needs to be addressed when attempting control of childhood blindness is the availability of reasonably accurate estimates of prevalence rates and information on the causes of childhood blindness. Such data are lacking
at present. It is obvious that without these data effective long-term planning to reduce childhood blindness in India would probably continue to be just wishful thinking.

- Since crude estimates indicate that the prevalence of childhood blindness may be relatively low, a large number of children need to be studied to reliably estimate the true prevalence of childhood blindness in a population. For example, if 7 per 10,000 children are actually blind in a population, assuming Poisson distribution for this relatively rare event, 100,000 children would have to be examined to have 95% confidence that the estimate would be between 5.5 and 8.8 per 10,000. This is a huge number to deal with, and therefore, population-based estimation of the prevalence and causes of childhood blindness probably has to be linked with other on-going population-based activities such as vaccination of children and child survival programmes. As reliable, population based data on the causes of childhood blindness are difficult to obtain in developing countries as registers of blind do not exist, and very large sample sizes would be required for formal cross sectional surveys. In the absence of population-based data, an idea about the pattern of the causes of blindness in children can also be obtained by examination of blind school students. Alternative sources include the use of key informants, and examination of children identified as blind in community based rehabilitation programmes and hospital based study. Examination of children in special education and hospital has increasingly been used to provide data on the causes of blindness in children, but possible sources of bias need to be born in mind. The advantage of blind school and hospital based study is that many children can be examined in a standard manner by limited resources.

- Repeating this exercise at intervals of 5 or 10 years would be useful in detecting changes in trends for the causes of childhood blindness. Use of a standard form, developed by the World Health Organization (WHO) for recording childhood visual impairment, would help in standardization of the data.

- India has a system of federal government and this is reflected in health care and in the socioeconomic conditions experienced in different parts of country. Health policy planning and implementation occur at central and state level. Information on the causes of childhood blindness needs to identify by states in order to target limited resources to the most important priorities. Such studies for childhood blindness could initially be developed at the regional level in India. With the elementary knowledge that the cumulative number of blind-person-
years due to childhood blindness is comparable to the leading causes of blindness in other age groups, it may be reasonable to start experimentation with such projects in India. The causes indicate the importance both of preventive public health strategies and of specialist pediatric ophthalmic and optical services in the management of childhood blindness in Gujarat state. Allocation of limited resources for health should be prioritized based on returns to society. As more information about childhood blindness becomes available, an area that could help better understand the justification for investment of societal resources in developing this sector is health economics. Cost-benefit ratio between the resources invested and the expected benefit to society in the long-term would help to determine what priority these problem should get in the overall context of health care in India. This mainly depends on how cost-effective interventions for various diseases or causes are. Thus the first step in understanding this process would be to estimate the burden of diseases / causes for a specific problem.