INTRODUCTION

Investing in children from the earliest years is not charity ‘says Dr. Gro Harten Brundtland - Director General of WHO.’ It is best way to ensure long term development, which holds true for children’s sight. Blindness and severe visual impairment have far reaching social, economic and personal implication. In children, it also causes serious barriers to the development at a formative stage. Blindness has tragic and far reaching social implication and costs community billions of dollars in terms of productivity, rehabilitation and special education. Eye sight is the most important source of information about one’s environment and hence is the vital developmental significance, more so in pediatric age group. The UNICEF defines ‘Childhood as 0-16 years inclusive and so, this is the age we are talking about when we say pediatric or childhood.

Visual disabilities in children are more complex compared to those in adults. Without visual stimuli, ‘the child’s overall development suffers. Childhood blindness has profound consequences not only for the individual child but also for the family and the community, who are also negatively affected. But, reassurance can grow their self esteem and confidence higher than normal.

- Visual communication of child with mother will be less developed.
- Blind child & family become less socialized.
- Siblings feel ignorance because more attention of parents goes towards blind child.
- Parents feel guilty about themselves for certain reasons [genetic, prenatal infections, drugs, injury might be the cause for blindness in child?].

A child’s eye is not merely a smaller version of an adult eye, and the causes of childhood blindness are equally different from adult blindness. It follows that the strategies that are effective against adult blindness need to be modified in order to combat blindness in children.

For a child the total number of years having disability is greater than for a person who becomes blind later in life. In terms of loss to society of productive human beings due to visual impairment, childhood blindness contributes significantly since the total number of blind-years suffered by a blind child is more than those suffered by a person who becomes blind in adulthood or in old age. Though accurate data on the prevalence of childhood blindness in the
developing world are not available, it is estimated that the total number of blind children is much less than the number of blind adults. However, it is estimated that the cumulative number of blind-person-years worldwide due to childhood blindness ranks second only after the cumulative number of blind-person-years due to cataract blindness. Thus, in terms of ‘Years of Blindness’ the burden of blindness in children is only second to that from cataract blindness which is responsible for enormous loss of Disability Adjusted Life Years (DALYs). The global cost of blindness with the onset in childhood in terms of lost capacity of earning has been estimated to be between US$ 6,000 to $27,000 million. This indicates a need to attempt effective control of childhood blindness.

We should address visual disabilities in children as a whole instead of only blindness. Diseases related to nutritional, communicable diseases should be addressed through strategies for achieving ‘Millennium Development Goals’. Facilities in African countries and countries with populations like India and China must be strengthened to address curable/preventable visual disabilities in children. Even though all efforts are done to strengthen, we will have 0.93 million blind children by 2020. Role of family physicians and pediatricians in trans-disciplinary approach to address visual disabilities in children is very crucial. If rational distribution of skilled human resources is not planned, visual disabilities will not reduce effectively. Rehabilitation of visually disabled children should be also an integral part of addressing childhood blindness. All stakeholders including parents of children with visual disabilities should work together to achieve the goals.

The WHO therefore gives childhood blindness and visual impairment the due importance as they deserve. In 1990, WHO along with its partners launched “VISION 2020: THE RIGHT TO SIGHT” - a global initiative to eliminate avoidable blindness. In 1990 the World Health Organization convened a global workshop on childhood blindness which was held in London. One of the recommendations of this workshop was the need for further epidemiological data on the prevalence and causes of blindness and severe visual loss in children in different parts of the world.

Many diseases causing visual disabilities in children show epidemiological transition. Nutrition and infection related causes mainly lead to corneal blindness. The citizens in countries facing
wars and civil conflicts suffer from poverty and poor hygiene like Iraq has recently reported
more blind children. Diabetes is a major challenge in countries with evolving economies and
children with juvenile diabetes would suffer from visual impairment and would need periodic
eye care. Improved health services will result in better survival of children with visual
impairment and multi-system diseases. Thus in coming years their numbers might increase.
However infants with severe birth defects become less as therapeutic abortions are more
acceptable and hence the number of children with cerebral visual impairment is likely to
decrease. In short, risk factors of childhood blindness in the next twenty years are likely to
change, requiring periodic review of the world data on childhood blindness for proper planning.

DEFINITION

• The World Health Organization define blindness as a corrected visual acuity in the better eye
  of less than 3/60, and severe visual impairment as corrected visual acuity in the better eye
  of less than 6/60 but equal to, or better than 3/60.

• Childhood is defined as 0-16 years inclusive.

• Childhood blindness is defined as best corrected visual acuity in the better eye of <3/60 in
  those <16 years of age.

Problems related to blindness definition:

• Tests for vision assessment:
  Visual acuity of counting fingers at 3 meters is considered equivalent to 3/60, though the
  former may be less reliable. Some children, especially the younger ones, are not able to
  cooperate with the usual visual acuity assessment with vision charts. In these children,
  fixation of light which is clearly not central, not steady and not maintained may be
  considered equivalent to visual acuity <3/60. Though sophisticated tests of visual acuity
  assessment have been developed for children who are not able to cooperate with vision
  charts, these test charts / instrumentations are not easily available in the developing country
  setting.
• **Uncorrected refractive error:**

There is still grey area about the importance of uncorrected refractive error. Unfortunately, current WHO definition of "blindness" does not include uncorrected refractive error. It is a major problem in children especially in Asian countries. Many children in these countries have limited access to refractive services. In Arab countries access to visual aids is granted, but frequently not wanted for cultural reasons. Without visual aids, these children remain functionally blind and are unable to perform activities for daily living. Hence a revision of definition was proposed to include vision as presented rather than best-corrected vision while defining blindness. If we use the definition of blindness as vision <3/60 *presenting* instead of *best corrected*, uncorrected refractive error would contribute 15% of the global blindness in children. So, World health Organization [WHO] has recommended a revision of the estimates of blindness to include uncorrected refractive error.

• **Blindness Definition in India:**

In industrialized countries and countries with rapidly developing economies like India, blindness is defined as vision <6/60 with best possible correction and corresponding restriction in field of vision. This is different from WHO recommended definition of blind. In view of high precision visual needs for daily activities, working on computer, entertainment through television, it is high time the definition of blindness especially in children is revised. If we make it stringent, the magnitude of blindness in children will definitely increase. A population-based survey in South India had defined blindness as vision <6/60 as presented. On its basis, the assumption is that India could have many more blind children. Global projections on basis of this definition will include both blindness and severe visual impairment.

• **Unilateral blindness:**

If a person with unilateral blindness has progressive eye disease or fellow eye is affected due to ocular trauma, he/she would become visually disabled in both eyes. Magnitude and epidemiology of unilateral blind children therefore would be of interest to the health planners. To our knowledge, data on the prevalence of unilateral blindness in children is scanty. A community based study of 6,610 children of <16 years of age in Oman suggested
that the prevalence of unilateral blindness was 9 per 10,000 children. In the same age group the rate of bilateral blindness was 7 per 10,000. If visual disability due to unilateral blindness is added in estimating the burden of visual impairment, it is likely that global estimates visual impairment in children will double.

MAGNITUDE

WORLD:

• The incidence of childhood blindness is unknown, but is probably in the range of 20-100 new blind children per year per million total populations depending on socio-economic conditions and available health care services.
• The prevalence of childhood blindness is one-tenth as frequent as blindness in whole populations.
• The prevalence of childhood blindness around 0.03% to 0.17 % [0.3/1000 to 1.7/1000 children].
• Total 1.5 million blind children live in the world of which 90% live in developing countries. About 60% in Asia and 20% in Africa.
• Every minute one child goes blind somewhere in the world.
• It was also estimated that approximately 50,000 children go blind each year in the world of which, 60-80% die within the subsequent 1 to 2 years from the disease which contribute their blindness.
• Countries with high under 5 mortality rate in excess of 170/1000 are likely to have prevalence of childhood blindness more than one per thousand while those countries with U5MR less than 30/1000 probably have prevalence of between 0.2 to 0.5 per thousand children.
• A child blind before age 2 years has around a 50% chance of dying before age 5 years.
• Half of childhood blindness could be avoided that means it is possible to save 250000 children from darkness every year. Many blinding eye conditions (estimated at between 50 and 75%) in children in the developing world are either preventable or treatable.
• The major causes of blindness vary from country to country and within a country over time, reflecting different level of socioeconomic development and provision of health services.
• The number of "blind years" resulting from childhood blindness is estimated at 75 million years based on the number of blind children now. And, because of that childhood blindness is the second largest cause of blind-person years, following cataract. The economic impact of this assumes huge importance as a public health priority with childhood blindness approaching adult cataract blindness in significance.

• In low-income countries childhood blindness is 5 times more than the number found in higher income economies. There would be even greater disparity in this prevalence, because of high rate of child mortality in those children blinded early in life in developing countries. There is a relative shortage of both providers and facilities with a child-centered approach to eye health and blindness prevention available in the developing world.

FUTURE:
The prevalence of childhood blindness was 0.3 per 1,000 children in industrialized countries and 1.2 per 1,000 children in the developing countries in the year 2000. Accordingly, it was estimated that there were nearly 1.5 million blind children in the world. Each year, an additional 50,000 children become blind and are added to this pool. And, if current trends are not reversed, by using evidence based information and few assumptions the total will increase to 2 million by year 2020. While projecting the magnitude by time in a chronic condition, childhood mortality rate should be accounted for. A study in UK suggested that 10% of children with severe visual impairment and blindness die within the first year of detection of their blindness because many of them have other potentially life threatening conditions. In another study in Sweden, 13% of blind children died due to other systemic conditions. Accordingly, world is likely to have 1.6 million blind children if no additional interventions are carried out. If all curable or avoidable causes are addressed, there would still be 0.93 million children with blindness. We have assumed that in next 25 years, no new intervention modalities shall be available to treat today's unavoidable causes (80% of childhood blindness) and we hope that that is not true. Considerable progress has been made in the field of genetics to locate disease related genes for congenital cataract, retinal diseases and conditions linked to cortical blindness. Scientists may soon find solutions to treat these conditions.
INDIA:

- There are as yet no good survey data on the prevalence of childhood blindness from countries like India. Registration data of blindness and severe visual impairment of children in European countries suggests a prevalence of approximately 0.3 per thousand children. Data from studies in Nepal and Bangladesh have indicated that the prevalence of childhood blindness ranges between 0.6 and 1.1 per thousand children. Thus, the estimated prevalence of childhood blindness in India would be in between i.e. 0.7 per thousand children.

- The census of India estimated the population of India to be 1.03 billion, of which 40.9% (420 million) are under 16 years of age. Thus applying an estimated prevalence of 0.7 (±0.3) per thousand children to the under 16 population or approximately 200 blind children per million total populations, it provides an estimate of 2,80,000 – 3,20,000 blind children in India. Accurate prevalence data of childhood blindness are difficult to obtain due to large sample size. The incidence of childhood blindness is also very difficult to obtain, requiring either very large longitudinal studies, accurate registers of blind or reliable active surveillance systems.

- No population based surveys have been undertaken in India, but data from studies done in West Bengal and in Andhra Pradesh showed the prevalence of childhood blindness to be 0.65 / 1,000 children [95% confidence interval, 0.51 – 0.82] and 0.51 / 1,000 children [95% CI, 0.37 – 0.65] respectively.

- The most common causes of childhood blindness are refractive error, amblyopia due to cataract and corneal disease.

- It is estimated that at least 15,000 children in India having severe visual impairment are in the schools for blind.

- Although approximately 50% of all childhood blindness in India is treatable.

- Studies of children in blind school and in integrated education demonstrated at least 60% of the students have visual acuity in the range of 6/60 to PL of which approximately 80% can be helped to read normal print with either distance spectacles and / or magnifiers.

- The economic burden of blindness in India for the year 1997 was Rs. 2,787 billion. Childhood blindness accounts for 28.7% of this life time loss.

Reduction of childhood blindness in India assumes particular significance. Estimation of the number of blind children in India and the causes of blindness are relatively crude as there are
little reliable epidemiologic data. As a result of this, there is no organized approach to the control of childhood blindness in India. In order to address this issue, a workshop on childhood blindness was held at the L.V. Prasad Eye Institute, Hyderabad in November 1996. The aim of this workshop was to review available data, consider possible strategies, and make recommendations concerning the control of childhood blindness in India. During this workshop, Dr. Lalit Dandona suggested to develop models at regional level in India for eye care in children. This models based on needs assessment of the community, which are likely to provide long-term benefit to society. These models would have the following components:

1. Epidemiological research
2. Community based prevention programmes
3. Provision of curative services
4. Rehabilitation programmes
5. Basic and clinical research for better understanding of the causes

Thus the first and foremost step for children eye care is to identify the causes of childhood blindness in the different parts of country in order to target the limited resources to most important priorities in each part.

**CAUSES FOR CHILDHOOD BLINDNESS**

A. Genetic/Hereditary causes

B. Intrauterine causes

C. Perinatal/Neonatal causes

D. Infancy/Childhood causes

**GENETIC CAUSES:**
A large proportion of childhood blindness in India is estimated to be due to genetic/hereditary causes. This includes, with varying degrees of genetic influence, anophthalmos, microphthalmos, retinal dystrophies, and optic atrophy. Genetic causes are responsible for at least 25% of all
causes of childhood blindness. It is likely that consanguineous marriages, which are common in certain parts of India contribute to these causes. Efforts are needed in the following areas in order to deal with childhood blindness due to genetic/hereditary causes:

- Health education programs to promote awareness of the increased risk from consanguineous marriages, particularly between close relatives. Consanguinity has complex social origins, and education programs exposing the risks of consanguinity would have to be developed keeping in mind the sensitive nature of this issue. Involving people from communities with high levels of consanguinity in the development and implementation of these education programs might increase their acceptance.

- Genetic counseling, based on sound scientific methodology, would be helpful in informing couples of the potential risk of having a child with a certain genetic disorder if someone in the family is already affected. More widespread training in genetic counseling for the genetic causes of childhood blindness would help meet this objective.

- Laboratory facilities for diagnosing genetic defects in families with genetic diseases would help in the long-term in dealing with genetic causes of childhood blindness. Development of these facilities and expertise would be feasible only at a few centres, perhaps at regional centres designated to deal with childhood blindness. The cost-effectiveness and cost-benefit of this investment for the whole society would have to be taken into account when using scarce health care resources for this purpose.

**INTRA UTERINE INFECTION:**

A recent study from India has suggested that as much as a quarter of the cataracts in the first year of life may be due to intrauterine rubella infection. Rubella infection, particularly during the first trimester of pregnancy, can give rise to a range of systemic abnormalities, including ocular anomalies. This is referred to as congenital rubella syndrome. The eye signs in this include cataract, microphthalmos, corneal opacities, retinal pigment epithelium changes, and glaucoma. The question arises whether rubella immunization could reduce the occurrence of childhood blindness. The World Health Organization has recently recommended that rubella immunization programs not be introduced until sound epidemiological data are available. The reason for this
recommendation is that if rubella immunization rates of infants are lower than the levels of protection conferred by natural immunity, there is a risk that there may be more cases of congenital rubella, as was the case in Panama. The Indian Association of Pediatrics recommends universal immunization of infants against rubella, but a policy decision has not been taken by the Government of India. Before rubella immunization of infants is adopted as a policy, the following issues need to be addressed:

1) How significant is congenitally acquired rubella a cause of childhood disability, including blindness, in India? This could be assessed by testing infants with congenital cataracts, microphthalmos, glaucoma, or deafness for the presence of rubella specific IgM using saliva antibody capture techniques.

2) What is the level of susceptibility to acquired rubella in women of child-bearing age in India?

3) Can high levels of rubella immunization coverage in infants be maintained?

Efforts to obtain epidemiological data regarding these issues would help determine if rubella immunisation can contribute significantly to the reduction of childhood blindness in India.

- Intrauterine infection with toxoplasma or cytomegalovirus may also result in ocular abnormalities including optic atrophy.

- Another potential intrauterine cause of childhood blindness is optic nerve hypoplasia due to maternal use of alcohol or certain drugs during pregnancy. With limited data regarding these as causes of childhood blindness in India, the one reasonable thing at this stage would be to attempt the health education programs to prompt awareness about the deleterious effects on the fetus of maternal smoking, use of alcohol or illegal drugs during pregnancy.

**PERI-NATAL & NEO-NATAL.**

The two most common agents causing ophthalmia neonatorum / conjunctivitis during the first four weeks of life are Neisseria gonorrhoea and Chlamydia trachomatis. Infection of the newborn during passage through the birth canal of the mother infected with the former can quickly lead to corneal involvement and blindness, and that with the latter can lead to ocular and systemic
morbidity. Reduction of childhood blindness due to ophthalmia neonatorum can be achieved with the following efforts:

1. Prophylaxis against ophthalmia neonatorum in the developing world is not practiced regularly. When practiced, tetracycline 1% eye ointment or silver nitrate 1% eye drops in a single dose are the common agents used. However, a recent study has shown that povidone-iodine 2.5% eye drops may be the preferred choice because of efficacy and lower cost. A policy decision about providing povidone-iodine drops for as many births as possible at all levels of health care should be attempted.

2. Training of the traditional birth attendants (daies), midwives, doctors and other personnel involved with childbirth should emphasize the ease and benefit of prophylaxis against ophthalmia neonatorum.

3. Health education programs to make pregnant women aware of the benefits to themselves and to their to-be-born baby of getting their own and their partner's sexually transmitted disease treated should be made more effective. Education of the parents of a newborn should include making them aware that in case of purulent discharge from the eyes of the neonate, immediate medical attention should be sought to reduce the risk of blindness.

**Retinopathy of prematurity (ROP)** is a condition in which abnormal retinal fibrovascular proliferation occurs in preterm infants as a result of interruption of the normal process of retinal vascularisation. Though ROP is not a major cause of blindness throughout the country at this stage, it is expected to be one of the reasonable contributor in another two decades since the quality of neonatal care and maternity care are increasing uniformly. The main risk factors for ROP are preterm birth, low birth weight, and fluctuating levels of blood gases (oxygen and carbon dioxide) during the first few weeks of life. The advanced stages of ROP can cause childhood blindness. Large clinical trials have shown that cryotherapy to the avascular retinal periphery in high risk (threshold) cases is effective in reducing the blinding consequences by 50%. Similar results are expected with laser photocoagulation. Currently, ROP is not a recognized major cause of childhood blindness in India. However, the current expansion of neonatal services in India is similar to that seen in the West in the 1940s and 1950s, which led to increased survival of preterm and low-birth-weight babies, in whom the “first epidemic” of blinding ROP was seen. It is possible that a similar situation may occur in India. There is some
evidence for this, as in a recent study, 16% of babies with birth weight <2,000 gms developed severe enough ROP for which treatment was required. Appropriate screening for ROP in babies at risk would minimize chances of blindness. In the West, babies with birth weight <1,500 gms and those born at <30 weeks gestational age are included in the screening programs. To decrease the chances of ROP becoming a major cause of childhood blindness in India, the following issues need to be addressed:

- Determine the survival rate of preterm (born before 33 weeks gestation) and low birth weight (<2,000 grams) to project the population of infants that may require screening for ROP.
- Determine ROP screening guidelines according to gestational age and birth weight that are appropriate for India rather than using those developed for the West.
- Assess the magnitude of the need for ROP screening, and accordingly increase awareness amongst neonatologists/ pediatricians and ophthalmologists of this need.
- Based on the assessed need for ROP screening, train ophthalmologists in evaluation and treatment of ROP.

INFANCY/CHILDHOOD CAUSES:

VITAMIN A DEFICIENCY

A survey of blind school students in 9 Indian states revealed that 18.6% of the blindness was due to vitamin A deficiency and another 3.2% due to measles which precipitates vitamin A deficiency. On the other hand, vitamin A deficiency contributed to only 5.5% of the childhood blindness in a population-based survey in West Godavari district of Andhra Pradesh. The magnitude of childhood blindness due to vitamin A deficiency probably varies considerably in different parts of India. This may be related to variations in socioeconomic status. Vitamin A deficiency also contributes to child mortality, which can be reduced with vitamin A supplementation. There are global initiatives to eliminate this public health problem in the affected areas. In India, programs include:

(i) Vitamin A supplementation for preschool children with the first dose being given at 9 months of age with the measles immunization.
(ii) Food-based strategy including nutrition education.

There are no recent population-based data regarding the extent of vitamin A deficiency as a public health problem in India, or on the effectiveness of vitamin A supplementation and nutrition education programs. In order to deal with vitamin A deficiency as a cause of childhood blindness, effort is needed to:

- Assess the current magnitude of vitamin A deficiency as a public health problem in the at-risk parts of India, especially those where vitamin A deficiency has previously been perceived to be a significant public health problem, using the prevalence criteria suggested by WHO to define this problem.
- Streamline vitamin A intervention programs (supplementation and education) by making them focus more intensively on areas with significant vitamin A deficiency.
- Establish a surveillance system for detecting cases of keratomalacia (corneal melting due to vitamin A deficiency) in areas with vitamin A deficiency as a significant public health problem.
- Increase awareness amongst ophthalmologists that the preferred way to treat vitamin A deficiency is with oral supplementation rather than intramuscular injection, except in cases of severe vomiting and diarrhea.

Corneal blindness due to vitamin A deficiency is a major cause of childhood blindness in many area of the region. In south India, corneal xerophthalmia is now being seen in the first 6 months of life probably reflecting inadequate maternal vitamin A status. If Bitot’s spot is greater than 0.5% - it has to consider as a public health problem. With the realization that vitamin A deficiency is not only a cause of morbidity from blindness but also of morbidity and mortality from diarrhea and respiratory tract infections- greater emphasis is now being given to the prevention of vitamin A deficiency in children. There are marked regional variations in the relative importance of vitamin A deficiency as a cause of childhood blindness. The most important long-term and sustainable strategy for the control of vitamin A deficiency is an improvement in the nutrition of infants and pre-school children. To achieve this will require not only health education of urban and rural populations, but a change in the cultural and behavior practices of mothers and their families. While these long-term control strategies are being
implemented, it is also essential to make sure that any child with clinical vitamin A deficiency (night blindness, Bitot's spots, corneal xerosis or corneal ulcer) or children at high-risk of vitamin A deficiency (children with measles, obvious malnutrition or malabsorption) receive full and adequate treatment for vitamin A deficiency, i.e. vitamin A capsules 200,000 IU on days 1, 2 and 14 (half this dose should be given to children under the age of 1 year). Immunization to prevent measles, and the prevention and adequate treatment of gastroenteritis, are also important strategies to remove major risk factors which can lead to vitamin A deficiency. Vitamin A deficiency in children is decreased considerably in India because we are fortunate to have production of vitamin-A supplements required in the country itself, which is very cheap, however distribution is expensive and needs close monitoring.

**UNCORRECTED REFRACTIVE ERRORS**

It is estimated that approximately 5% of school children have some degree of refractive error and at least 0.5-1% of children require spectacles greater than 1 diopter power. Increasing parental and teachers' awareness by actual screening at school, making the needs spectacles available to their children and their regular long follow ups should be the strategies.

Uncorrected refractive errors are thought to be a common cause of visual impairment during childhood in India. 2.8% of the childhood blindness in the population-based assessment in Andhra Pradesh was caused by amblyopia associated with uncorrected high refractive error. In a survey of 4,029 school children in Hyderabad, uncorrected refractive errors resulted in visual acuity ≤6/60 in the better eye in 1.1%, including 0.5% who had acuity <6/60 in the better eye (equivalent to economic blindness in India). All these children had visual acuity >6/60 after refractive correction. A method of screening school children for refractive errors by school teachers in India has been described, and success reported with this method. The issues that need to be addressed to reduce visual impairment due to uncorrected refractive errors are:

- Increase parental awareness that symptoms in a child suggestive of poor vision such as bringing books very close to the face or colliding with objects frequently should prompt them to consult an ophthalmologist for eye check up.
Both Eyes Congenital Cataract

Congenital Cataract

Strabismus with poor vision in both eyes due to uncorrected refractive error
• Make vision screening of school children more effective by increasing coverage and working out the logistics of providing spectacles to those children who need them.

• Make an attempt to link vision screening with other population-based activities with broad coverage of children, such as comprehensive health care and vaccination program.

CONGENITAL CATARACT

Between 10-20% of admission to blind school has cataract. The hospital studies indicate that 20-25% of childhood blindness is due to cataract. It is estimated that the incidence of bilateral cataract in childhood is at least 10 cases / million population / years.

The major causes of bilateral cataract in childhood in India are rubella 25%, inherited 25%, unknown 50%. Rubella infection can be confirmed using specific IgM antibody titers in blood and saliva. Enough consideration should be given to implementing a rubella immunization programme. It is likely that a programme to immunize 12 year old females would probably be the safest, but a thorough analysis of the costs and benefits would be required before initiating any programme. Other causes of cataract in childhood include hereditary factors (approximately one quarter of all cases) with the remaining 50% of cases being of undetermined etiology. Trauma is an important cause of unilateral cataract in older children, but this does not usually lead to bilateral blindness.

In order to improve the results of visual outcome, it requires a greater awareness on the part of general physicians, pediatricians and general ophthalmologists of the need for early diagnosis, immediate referral and surgical treatment by an experienced ophthalmologist.

To achieve good visual outcome, the visual axis must be kept clear and the refractive error fully corrected. Cataract in children is very different from adult cataract. The surgery is more complex and postoperative follow-up care is much more demanding. For pediatric cataract management - diagnosis, surgery and visual rehabilitation should be done as early as possible. Aphakic child has to be given proper glasses and/or contact lens. Both of these modalities have their own advantages and disadvantages. The role of intraocular lenses in young children is still an area of
contention which will require a well-designed clinical trial before a definitive statement can be made.

**By Whom:** The surgery should be done by ophthalmologists who are skilled for pediatric surgery.

**When:** Surgery must be done as soon as possible after the development of visually disabling lens opacity preferably before critical/sensitive period of vision stimulation ends. For unilateral cataract, it is between 4-6 weeks and for bilateral cataract, it is between 6-10 weeks.

**Where:** Tertiary centre having proper facilities for pediatric cataract management.

**CHILDHOOD GLAUCOMA**

The incidence is estimated at 1 in 10000 live births that is 2-3 cases per million populations per year. Clinical presentation depends on intraocular pressure elevation and age of the child. Early diagnosis can be done by the pediatrician through symptoms of intolerance to light & watering along with diffuse corneal opacification and enlarged cornea. Early intervention with regular follow up is the key factor for management of childhood glaucoma (buphthalmos).

**RETINAL DISEASES**

- The most important cause of retinal blindness at the present time in our region is hereditary retinal dystrophies. Many of these dystrophies are autosomal recessive and therefore difficult to prevent through genetic counseling.

- **Retinopathy of Prematurity** is also an emerging cause of childhood blindness. Recent work in Latin America has indicated that retinopathy of prematurity begins to emerge as an important cause of childhood blindness in situations where there are neonatal units and when children with a birth weight of less than 1500gms survive. It is therefore likely that in the next decade, with the development of neonatal care services, retinopathy of prematurity will begin to increase. It is important for ophthalmologists to be aware of this problem and for pediatric-orientated ophthalmologists to work with neonatologists in order to screen premature and low birth weight children (less than 1500gms) to provide prophylactic treatment.
Retinitis Pigmentosa

Corneal opacity

Optic Atrophy

Retinitis Pigmentosa
Left Eye Injury with Loss of vision [Unilateral blindness]

Congenital Anomalies of Globe

Subluxation of Cataract due to metabolic Disorder
The incidence of blindness due to **retinoblastoma** is estimated to be 1-3 cases / million populations per year. To provide proper treatment for this disorder, children need to be identified early and referred to pediatric ophthalmologist who has experience in this field.

**EYE INJURIES**

Ocular injuries are most common cause loss of vision in one eye - unilateral blindness. Boys are more affected than Girls & the peak age is 10 years. Prompt and earlier referral impact the visual outcome. Though good data on the prevalence of childhood blindness due to trauma in India are not currently available, it is felt that monocular vision loss due to trauma may not be negligible in children. Most ocular trauma in children occurs as part of everyday activities. Ocular injury with callously disposed hypodermic needles as part of hospital waste has recently been noticed with increasing frequency in children. Attempts can be made to minimize visual loss in children due to trauma by:

- Increasing public awareness about risk of vision loss due to trauma.
- Legislation to restrict dangerous toys and fireworks.
- Legislation to impose strict hospital waste disposal regulations to prevent injury with hypodermic needles.
- To encourage the public to seek early treatment for eye injuries, and training of ophthalmologists necessary to effectively manage ocular trauma.

**CONGENITAL ANOMALIES OF GLOBE**

Microphthalmos and anophthalmos are important causes of childhood blindness. It is likely that hereditary factors are responsible for some cases, but it is also possible that various teratogenic factors (toxins or maternal deficiencies) could be harmful to the developing fetus. Further work is required to identify the causes of the relatively high proportion of childhood blindness due to these anomalies in India.

**OTHERS - ETIOLOGY INDETERMINATE**

In this category are causes of childhood blindness for which the etiology usually can not be determined easily. These causes include:
1. Cataract and other lens-related causes contributed to 15.3% of childhood blindness in the population-based assessment, and 12.3% in the blind school study.

2. Glaucoma was responsible for 4.2% of the childhood blindness in the population-based assessment, and 2.6% in the blind school study.

3. Retinoblastoma caused 1.4% of the childhood blindness in the population-based assessment.

**Trends in major causes of childhood blindness:**

Causes of childhood blindness can vary over time in response to changing economic development and the introduction of health interventions. For example, ophthalmia neonatorum was a major cause in European countries at the turn of the century. Infection causes were important in Saudi Arabia, but now hereditary disease predominates. ROP was the single commonest cause of childhood blindness in Europe during 1950s, but now accounts for only 5-15%. ROP is becoming an important cause of blindness in middle-income countries as they introduce neonatal intensive care services. A reduction of corneal blindness has been documented in Asian counties, in response to improved measles immunization coverage rates. Due to huge international efforts to combat vitamin A deficiency, keratomalacia is reported as being much less frequent in many parts of the world. It is likely that countries in transition will develop patterns of blindness similar to those seen now in middle-income countries. Regions of the world in which economic development is in decline may witness a resurgence of causes due to diseases that were thought to be in the past.

**Targets for control of childhood blindness in VISION 2020 programme:**

(A) **Specific disease control measures**:

- Reduce the global prevalence of childhood blindness from 0.75 per 1000 children to 0.4 per 1000 by the year 2020.
- Eliminate corneal scarring caused by vitamin A deficiency or measles.
- Eliminate new cases of congenital rubella syndrome.
• Appropriate surgery to all children with congenital cataract with immediate and effective optical correction.
• Ensure that all babies at risk of ROP have fundus examination and treatment as and when required.
• Vision screening examination in school health programme for all school children and provision of glasses for refractive error.

(B) Human resources development:
• Ensure that prevention of childhood blindness is an explicit aim of all primary health care programmes.
• All secondary level eye clinics should provide glasses for refractive errors.
• One refractionist per 1,00,000 people by the year 2010.
• One worker to manage low vision for every 20 million people by 2010, and for every 5 million by 2020.
• One pediatric ophthalmologist for every 50 million people by 2010 and one per 10 million by 2020.

(C) Appropriate technology and infrastructure development:
• Develop low cost, high quality and low vision devices widely available.
• Establish a network of specialist “child eye care” tertiary centers.

(D) Low Vision Services:
“A person with low vision is one who has impairment of visual functioning even after treatment and/or standard refractive correction, and has a visual acuity of less than 6/18 to light perception, or a visual field of less than 10 degree from the point of fixation, but who uses, or is potentially able to use, vision for the planning and/or execution of a task.”

It is increasingly recognized that children with a visual acuity of less than 6/18 but equal or better than 1/60 can usually be assisted with a combination of spectacles and low vision aids (magnifiers) to read normal print. The ability to read normal print allows easier integration into normal schooling for these severely visually disabled children. Children with a visual acuity of less than 6/60 should be fully assessed by a team including a pediatric orientated ophthalmologist, an experienced optometrist with low vision services and a low vision therapist. Such a team is important in diagnosing,
assessing and prescribing the appropriate optical devices for children with severe visual loss. The therapist is essential in training and motivating the child in the use of the low vision aid in order to achieve maximum benefit.

**Primary level:** Identification, referral and provision of refraction, low vision devices and planning for basic rehabilitation.

**Secondary Level:** Providing low-power magnifiers after refraction by an eye unit of a hospital or in an educational or rehabilitation centre.

**Tertiary level:** For very young children with sever ocular / multiple disabilities that need complex or high powered low vision devices.

The disability act 1995 endeavors to promote integrated education, setting up of special schools and imparting special training to such persons; however the facilities are extremely limited. Most of the children with visual handicap still remain without opportunity for development, education and social status. India has witnessed phenomenal expansion in the education opportunities in the post independence era. Visually handicapped children however, have not been benefited from this growth, though the legislature gives them the “right to see” and “right to have education”. Much needs to comply for the benefit of visually handicapped children.