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Etiological spectrum of Low vision and Blindness amongst children attending out patient of a tertiary care center for visual impairment certification in South India.

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Abstract

Objectives: To evaluate and analyse the causes of low vision and blindness, degree of visual impairment and associated factors in children who attended outpatient of tertiary care centre for visual impairment certification.

Materials and Methods: The study was a non-interventional, cross sectional analysis conducted on 210 children aged <16 years, from July 2019 to Dec 2021 who attended our Ophthalmology OPD for visual impairment certification. Demographic data, socioeconomic status, need for disability certification, area of residence, percentage of visual disability, and anatomical cause of visual disability was noted for all subjects and categorised. The causes of Low vision and blindness, degree of visual impairment, and other associated factors was compiled and analyzed from history, clinical examination and investigations. $P<0.05$ was taken as level of statistical significance.

Results: Of the 210 children who participated in the study, the major reason for availing visual disability certification was for monetary/finanacial assistance. In 30.47% of subjects history of a family member having some form of hereditary ocular disorder was noted. On evaluation of anatomical cause, whole globe deformities due to microphthalmos was the most common cause of permanent visual disability in 32.5% of subjects, followed by retinal pathologies in 25% and corneal pathologies accounting for 14%.

Conclusion: In our country major reason for availing visual disability certification is for financial reasons. Our study reflects a changing trend wherein unavoidable/ permanent visual morbidity due to hereditary factors is more common than blindness due to avoidable causes. The most common anatomical cause encountered currently appears to be due to whole globe deformities due to microphthalmos primarily. Based on the study results we recommend genetic linkage analysis, marriage counselling and education to decrease the incidence of visual disability due to hereditary causes. Specialised paediatric eye care units and trained

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paediatric ophthalmologists at all levels of health care needs to be made accessible to provide therapeutic, diagnostic and rehabilitative eye care to all children with ocular disabilities.

Keywords: Childhood, blindness, microphthalmos, whole globe deformity, retina, cornea.

Introduction

Visual morbidity has drastic influences on the social and psychological wellbeing of the individual, the family and society in general. It is more profound when the visual morbidity occurs at a young age during childhood. [1,2] Ninety percent of the life experiences are learnt through visual inputs, hence any visual impairment during the developmental years can affect the psychosocial development, literacy and vocational opportunities leading to increased disability adjusted life years, increased blind-years and decreased quality of life of the child.[3,4]

Childhood blindness accounts for a meagre 3% of the overall blindness, but the importance is understated.[5] Global estimates of children with severe visual impairment accounts for approximately 1.4 million out of which more than 70% reside in Asia and Africa.[5] From an Indian perspective, the prevalence of blindness among children <16 years is estimated to be 0.8% accounting for about 2,80,000 blind children, with half of them below the age group of 5 years and out of which 50% of the cases of childhood blindness or visual impairment is attributable to avoidable blindness.[6,7]

The primary causes for childhood blindness range from dietary habits, environmental factors, congenital and hereditary germ line mutations, maternal factors, and infections. In the developing country like ours avoidable causes like vitamin A deficiency, measles, ophthalmia neonatorum, trachoma and rubella can all contribute to childhood visual impairment.[8] Other causes like retinopathy of prematurity due to low birth weight and prematurity is a major concern among developing economies. Rarely childhood ocular trauma and tumors can also contribute to visual morbidity.[8]

In India, most of the data accrued on the etiology and prevalence of childhood blindness is by the blind school surveys and blindness registers of the hospitals and medical institutions.[9,10] However, this data does not provide a complete picture of the magnitude of the problem and data compilation, integration and maintaining registries has its own difficulties in many setups.[9] Due to the relatively low prevalence of childhood blindness compared to the overall blindness, more often than not, region specific data compilation from visual blindness certification offered by the Government of India for the empowerment of the blind children with > 40% visual disablilty would provide a lot more information about the causes of visual morbidity in each region of the country and provide a more accurate data to implement national and state level strategies for decreasing the incidence of childhood blindness.[5, 11,12] Hence in our study we aim to analyse and evaluate the etiological factors, percentage of visual disability and reasons for availing Visual Blindness Certification issued by the Government of India in children <16 years attending our institution in Karnataka.

Methodology:

The current observational analysis was a cross sectional record based evaluation conducted on 210 children less than 16 years of age, who attended the out-patient department (OPD) at a tertiary eye care institute in South India for the purpose of visual disability certification. The study was conducted with due approval from the institutional ethics committee and the study was conducted with strict adherence to the tenets of Declaration of Helsinki.[13] The study was

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conducted from July 2019 to December 2021 and subjects were chosen by purposive sampling method. All subjects aged less than 16 years who attended the OPD of our institute with permanent or untreatable visual impairment were included in the study. All those with preventable or avoidable causes of visual impairment were excluded from the current analysis.

Relevant demographic data, educational status, socio economic status, residence and history of blindness among family members, any significant birth history, any history of consanguineous marriage and the reason for availing visual disability certification was noted in all subjects. Participants were assessed for best corrected visual acuity, cycloplegic refraction, anterior segment examination by slit lamp bio microscopy and posterior segment evaluation by +90 D lens and +20 D indirect ophthalmoscopy was done. Other special investigations like B-scan ultrasonography, Optical coherence tomography and field testing was reserved as per the discretion of the consultant and observations noted accordingly. Percentage of visual disability was assessed as per the definitions of Low vision, severe visual impairment and blindness as per the criteria set by the Gazette of India described in table 1. [11,12]

Better eye Best Corrected	Worse eye Best corrected	Percent Impairment	Disability category
6/6 to 6/18	6/6 to 6/18	0%	0
	6/24 to 6/60	10%	0
	Less than 6/60 to 3/60	20%	1
	Less than 3/60 No Light Perception	30%	II (One eyed person)
6/24 to 6/60 Or Visual field less than 40 up to 20 degree around centre of fixation or heminaopia involving macula	6/24 to 6/60	40%	III a (low vision)
	Less than 6/60 to 3/60	50%	III b (low vision)
	Less than 3/60 to No Light Perception	60%	III c (low vision)
Less than 6/60 to 3/60 Or Visual filed less than 20 up to 10 degree around centre of fixation	Less than 6/60 to 3/60	70%	III d (low vision)
	Less than 3/60 to No Light Perception	80%	III e (low vision)
Less than 3/60 to 1/60 Or Visual field less than 10 degree around centre of fixation	Less than 3/60 to No Light Perception	90%	IV a (Blindness)
Only HMCF OnlyLight Perception	Only HMCF Only Light Perception No Light Perception	100%	IV b (Blindness)

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No Light Perception			

Table 1. Current guidelines for the evaluation of visual disabilities and the procedure for certification.

CF- Finger counting, HMCF- Hand movement close to face

Statistical analysis

The results of the cross sectional study was expressed in frequencies and percentages. Descriptive statistics like mean and standard deviation was applied for demographic data. All the data was master charted onto the Microsoft excel data sheet and inferential statistics like chi-square was used to assess the association between variables. Statistically analyses was performed by IBM SPSS Statistics version 21 (IBM Corp., Armonk, N.Y., USA). *p* value <0.05 was considered as the level of significance.[14]

Results

A total of 210 children were included in the study, out of which 58.09% (122) were males and 41.9% (88) females. The age of the study population ranged from 6 to 16 years, with a mean of 9.38±3.63 years. More than 82% of the subjects were from a low socio economic background as defined by the Kuppuswamy criteria, out of which more than 61% were residing in rural areas.

An overwhelming majority of the subjects who came to the OPD for visual disability certification was primarily for monetary/ financial gains accounting for 67.14%, followed by educational reasons and medical allowance accounting for 19.04% and 7.14% respectively as depicted in figure 1.

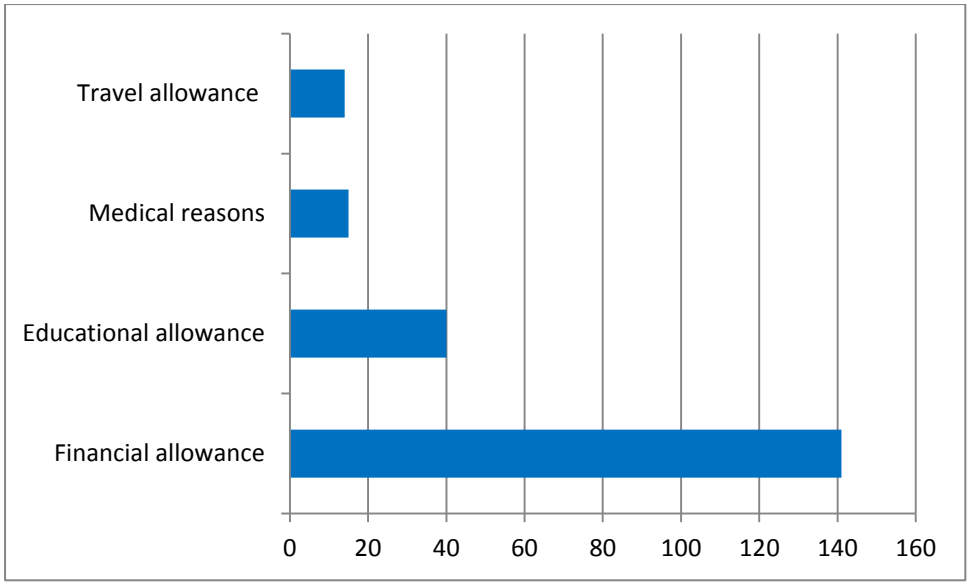

Figure 1 : Reasons for availing visual disability certification.

Approximately 81.8% (172) of the subjects who came to avail the certification were receiving formal school education, whereas 8.7% (18) attended and dropped out and the rest 9.5% (20) had never attended any blind school for educational purposes.

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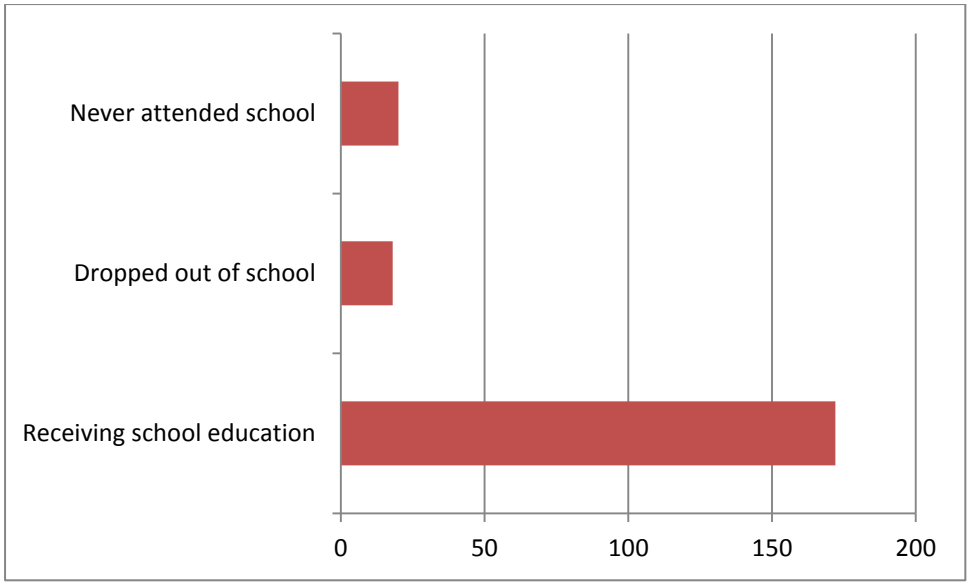

Figure 2: Status of schooling and education among those who came for disability certification.

On mapping the history of hereditary eye disorders among family members and causes other than hereditary causes in the current study, approximately 30.47% of subjects opined to have a positive history of hereditary disorder among their immediate family and relatives, commonly anopthalmos, microphthalmos and retinitis pigmentosa. A positive history of consanguineous marriage in their parents was observed in about 9.5% of subjects, and 55.2% of subjects had a negative or no significant family history of ocular pathology as observed in figure 3.

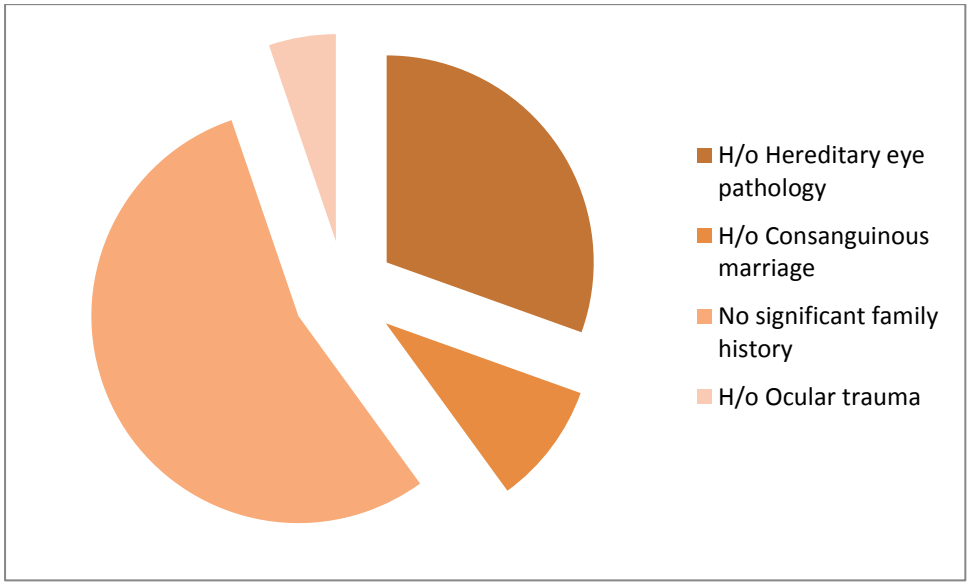

Figure 3**:** Depicting the history of hereditary ocular pathology among family members versus history of ocular pathology due to any other etiology.

The most common anatomical cause of visual disability among subjects showed a high percentage with whole globe deformity accounting for 32.5% (68), whereas retina and its anomalies accounted for 25%(52) of cases, followed by corneal causes, refractive etiology

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and optic atrophy accounting for 14.5%(27), 13.2%(15) and 7.3%(18) respectively as observed in figure 4.

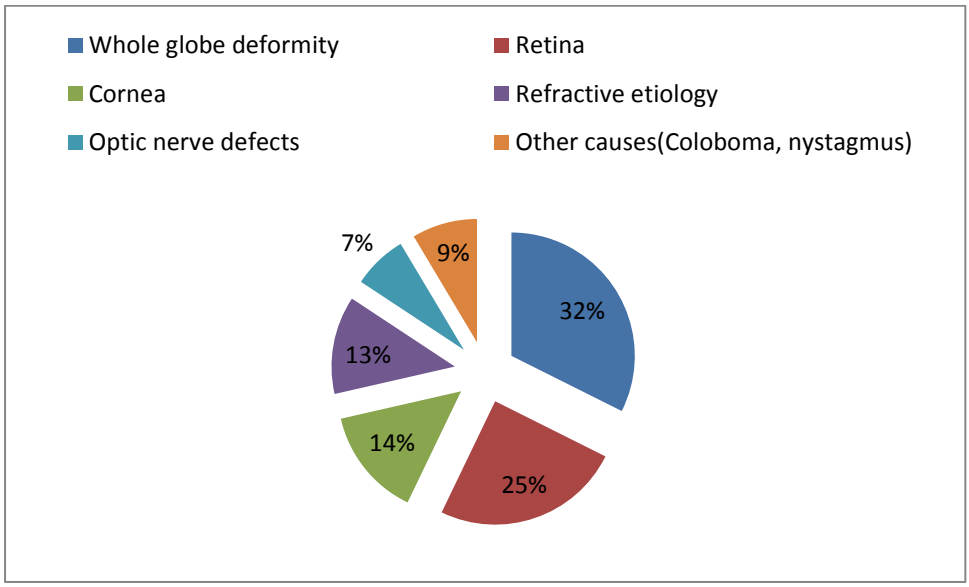

Figure 4**:** Anatomical site of anomalies leading to visual disability.

In subjects with whole globe deformity, the most common cause was microphthalmos observed in 38 subjects, and anophthalmos in 22 subjects, however, phthisis bulbi and eviscerated eye accounted for 5 and 3 patients respectively. Among the retinal causes for visual impairment, 23 subjects had retinitis pigmentosa and macular dystrophies was noted in 21 patients and sequelae of ROP was observed in 8 subjects in our study. Corneal abnormalities due to corneal dystrophies was observed in 6 children, corneal scar due to trauma noted in 14 subjects, and anterior staphyloma and adherent leucoma were observed in 3 and 7 subjects included in our study. High refractive errors leading to pathological myopia and amblyopia in early untreated media opacities were also noted in our study in 16 and 11 children in our analysis. Other causes of visual disability like Optic atrophy was observed among 15 patients, whereas colobomas and nystagmus accounted for 14 and 5 patients respectively.

WHOLE GLOBE DEFORMITY		**RETINA**		**CORNEA**		**REFRACTIVE ANAMOLIES**		**OTHER CAUSES**	
Anophthalmos	22	ROP	8	Corneal Dystrophy	6	Pathological myopia	16	Optic atrophy	15
Microphthalmos	38	RP	23	Corneal Scar	14	Amblyopia	11	Coloboma	14
Pthisis Bulbi	5	Macular pathology	21	Anterior Staphyloma	3			Nystagmus	5
Evisceration	3			Adherent Leucoma	7				

Table 2: Etiology of Visual disability based on the anatomical site.

Evaluation of the percentage of visual disability as per the criteria set by the Gazette of India, 67.6% (142) of subjects were in the 40% to 80% range of visual morbidity, whereas the

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remaining 32.4% (68) were categorised as having >80% to 100 % visual disability as depicted in figure 5.

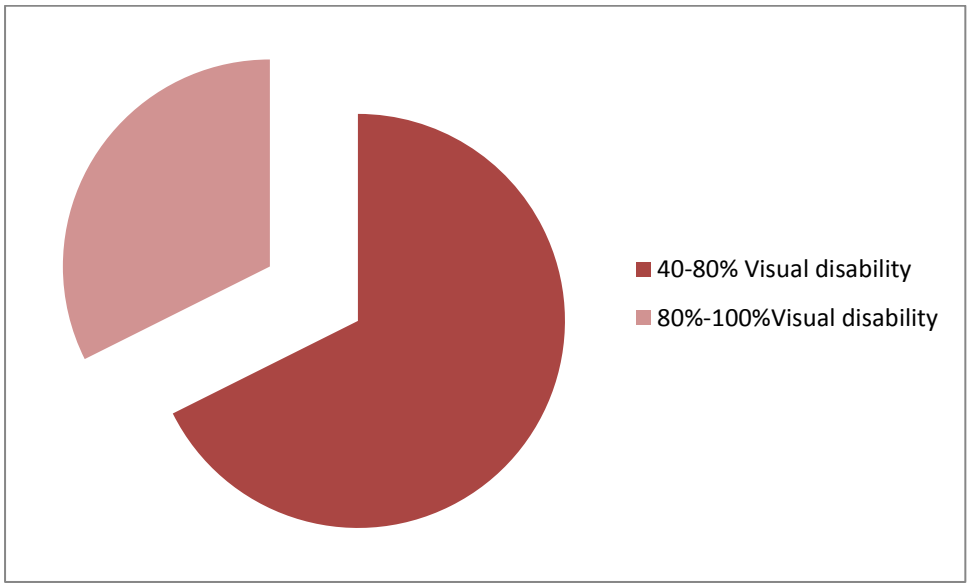

Figure 5: Frequency of the percentage of visual disability encountered in our analysis.

Discussion:

Childhood blindness acts as a mirror to the socio economic and health indicators of a country, hence it is imperative to design, customise and implement national level and state level childhood blindness prevention activities vigorously in a scientific and evidence based manner.

In our current study 58.09% of boys came for visual disability certification which was significantly higher than that of girls 41.9%. Similar findings of our study was also emulated by Dandona R et al,[6] wherein the proportion of boys was 60%. However, a Andra Pradesh blind school study estimated that the blindness was observed more among females. This variation in the results of the many studies published can be mitigated by state wise population based surveys which would give the true prevalence of childhood blindness in the region. [15]

Primary reason for availing visual disability certification was significantly higher monetary/ financial allowance services (51.8%) provided by the Government of India, followed by educational and medical reasons. Although direct comparative studies to assess the reasons for availing visual disability certification are lacking, similar study by Ambastha et al[16] on adults availing visual disability certification seconded the results of our study.

Children with severe visual impairment/blindness who were attending blind schools in our study was 81.8%, however 8.7% had dropped out of blind school and 9.5% had never attended any blind school. Under the aegis of National Programme for Control of Blindness, Maternal and Child health programmes and Reproductive and child health services, identification of children with visual disability and rehabilitation services, there is increased number of children with visual morbidity attending blind schools in India. The deficit in availing education for visually impaired children could be due to apathy/ neglect, ignorance or lack of access and infrastructure. Although similar studies are few and lacking, Bhalerao et al[9] analysis in Allahabad pointed out an overwhelming 97.8% of children with some form of visual morbidity attending blind schools.

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Analysis of hereditary and consanguineous marriage versus non hereditary causes of visual disability based on history in our study 40% of subjects had some history of a family member having visual disability, and approximately 60% did not have any significant family history. Observations of our analysis were lower than that of the Bhalerao et al[9] study wherein hereditary causes accounted for 56.9% of subjects. This could be due to a subjective bias, recall bias or ignorance and an increasing awareness about the risk of consanguineous marriage and genetic counselling offered by many institutions to mitigate the risk of hereditary disorders. Although further genetic linkage analysis studies would provide more information regarding the same.

Whole globe deformity (32.5%) was the most common anatomical cause of visual disability encountered in our patients, out of which the majority was due to microphthalmos and anophthalmos, followed by phthysis bulbi and eviscerated eye. Our study findings were in concurrence with Krishnaiah et al[17] and Bhattacharjee et al[18] study wherein whole globe and congenital deformity of ocular structures accounted for 41.3% and 36.1 % respectively. This is a tremendous shift from the data from earlier studies wherein the most common causes of visual disability was avoidable causes like vitamin A deficiency, measles, infections, refractive errors and ocular trauma, which indicates the tremendous work done by our on-going blindness control programmes in the country. The shift from avoidable blindness to unavoidable or permanent blindness indicates highly effective health and blindness prevention policies at the regional levels, although more can be done.

Retina and its anomalies were the second most common cause of visual disability among children in our study accounting for 25% of cases, which is slightly higher than 16.7% observed in Dandona et al study.[6,15] Retinitis pigmentosa and macular pathologies formed the major bulk of cases and most cases had a positive family history of visual disability and history of consanguineous marriage. Although the above mentioned causes of visual disability cause permanent visual disability, genetic counselling and education regarding consanguineous marriage among those with a history of relatives with visual disability can mitigate progression of mutations.

Avoidable causes of visual disability observed in our study are predominantly due to corneal causes like corneal scar, anterior staphyloma, adherent leucoma, followed by high refractive errors, early media opacity induced amblyopia and ROP sequelae, all of which accounted for 28.09%(59) subjects compared to Dandona et al[6,15] study where in approximately 33% of the childhood blindness could have been avoidable, out of which more than 16% was attributed to corneal causes similar to that of our analysis wherein corneal caiuses accounted for 14.5%. This reduction in the prevalence of avoidable blindness in our country is again a testament to the policy and ground work of the blindness control programmes running across the country as many paediatric eye care sub specialization and personnel training for early and effective management of paediatric cataracts and corneal trauma has been given prime importance.

Conclusion:

In our study, the most common reasons for availing visual disability certification in children <16 years is for monetary/ financial assistance followed by educational purposes. History of hereditary visual disability was noted in 40% of the subjects examined. Overall unavoidable causes of visual disability was significantly more compared to avoidable causes. Whole globe deformities like microphthalmos and anophthalmos are the most common anatomical cause

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of visual disability encountered, followed by retinal pathologies and corneal defects. Among avoidable causes of childhood blindness, corneal pathologies and amblyopia due to high refractive errors and early media opacities were the most common causes. Based on the study results we recommend genetic linkage analysis, marriage counselling and education to decrease the incidence of visual disability due to hereditary causes. Specialised paediatric eye care units and trained paediatric ophthalmologists at all levels of health care needs to be made accessible to provide therapeutic, diagnostic and rehabilitative eye care to all children with ocular disabilities. and mitigate the visual morbidity.

Lacunae in the study : A large population based sample size would provide more accurate data.

Conflict of interest – Nil

Financial interest – Nil

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