



## Pattern of Ocular Morbidity and Visual Disability in Children Attending Eye Out Patient Department in Gwalior, Madhya Pradesh

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### Abstract

**Purpose:** This study aims to evaluate the pattern of ocular morbidity in children less than 18 years.

**Methods:** An out patient (OPD) department based prospective observational and interventional study was done from July 2016 to June 2018.

**Results:** A total of 5000 children out of which 2960 (59.2%) were males and 2040 (40.8%) were females. These children were divided into groups based on age: 0-3 years, >3-7 years, >7-11 years, >11-15 years, >15-18 years. Maximum number of children who attended OPD were from age group >7-11 years and >11-15 years which was 1100 (22%). The most common cause of ocular morbidity was refractive error (34.4%) followed by ocular injury (12.2%), Vitamin A deficiency and conjunctivitis (6.8%), squint without amblyopia (5.6%), corneal opacity (4.8%), blepharitis (4.4%), squint with amblyopia (4.2%) and cataract (4.2%) and so on. Children under low vision category were 740 (14.8%), with economic blindness were 425 (8.5%), with social blindness were 122 (2.4%), manifest blindness were seen in 64 (1.2%) and absolute blindness were seen in 39 (0.78%). Overall 27.8% (1390) children were in category of blindness. In 190 (3.8%) children vision was indeterminable due to newborns, uncooperativeness, mentally handicapped or semi-conscious state.

**Conclusion:** This study revealed that the most common cause of ocular morbidity was refractive error. Most of the studies included school screening method but this can miss congenital malformations as most of these children don't go to school. Most common cause of absolute blindness was developmental followed by ocular trauma which in most cases can be preventable. Small awareness among parents can prevent devastating change in their child life.

**Keywords:** Ocular Morbidity; Epidemiology; Refractive Error; Strabismus; Visual Impairment in Children

### Introduction

Ocular morbidity includes different eye conditions which can be both visually impairing and non-visual impairing. Till mid of year 2016, population of India was 1311 million [1]. Population of Madhya Pradesh till the year 2011 was 72,597 comprising 6% of

total population of India [2]. In India till 2014, age group 0-4 years comprises 8.9% of population, age group from 5-9 years comprises 9.0% population, age group from 10-14 years group comprises of 9.7% and age group 15-19 years made 10.1% of population i.e. approximately 37.7% of Indian population is composed of children

[2] In the world there are approximately 1.4 million blind children throughout. Out of them around 73% of them live in low-income countries [3]. The prevalence of blindness in developed countries is as low as 0.1/1000 children aged 0–15 years and to 1.1/1000 children in the developing countries [4].

India has approximately 320,000 children as blind, which is much higher than any other countries of the world [5]. Around 0.80/1000 is approximate prevalence of low vision in India [6]. Population-based studies have estimated the prevalence of blindness as 1.25/1000 children in rural [7] and 0.53/1000 children in urban areas [8] in the age group of 5–15 years.

In children of age range 5–15 years, the visual impairment is 6.4%, with refractive errors as the major cause [9]. The importance of early detection and treatment of ocular morbidity and visual impairment in young children can be made by considering the fact that 30% of India's blind lose their sight before the age of 20 years [10].

The control of blindness in children is considered a high priority within the "WHO's Vision 2020 - The Right to Sight Programme" [11]. It can be said that control of childhood blindness can be linked to childhood expectancy as there are variety of conditions associated with blindness which can lead to childhood mortality [12].

A study on the pattern of ocular diseases in children is very important because, there are some eye conditions which just causes ocular morbidity in the form of discomfort, while others invariably may eventually lead to blindness. Also, while some conditions such as refractive errors and cataract are treatable others like measles and vitamin A deficiency are largely preventable [13].

In India blind population in child age group is mainly under 5 years of age. Prenatal or neonatal insults are common cause for paediatric ophthalmic disorders. Any abnormality in the visual system during this early developmental and maturation phase can modify the normal development of the occipital cortex and cause permanent severe visual loss [14].

Various interventions can be employed to manage paediatric disorders by means of using optical, orthoptic, medical and surgical ways. Their selection should be precise in children, as they are unable to express their problems, and they are potential candidates to develop amblyopia due to early visual impairment [15].

The child is future of not only a city, state or nation but also of world. Poor vision in childhood affects overall development of children, personality and lowers the confidence.

Most of the times children are not aware of the condition and they also cannot articulate their defective vision. But a careful observation even by parents can help us in detecting visual impairments and preventing visual hazards. Children develops different ways to adapt the situation either by squeezing the eyes, holding the books close to their face, rubbing eyes and preference to sit in front row. The early signs of refractive errors may present with stressful eyes associated with or without redness, with headache and watering. Most of the times these observations often go unnoticed by parents due to lack of awareness.

The incidence of childhood blindness is very difficult to ascertain, and there is lack of resources of data. Similarly, not much data is available from central India regarding visual disability categories. Taking all these into consideration, our study was designed to estimate the prevalence of different types of ophthalmic morbidities, to find out visual disability categories and to derive a comprehensive comparative data between different studies done on the same in different parts of country and world with goal of prevention of blindness and creating awareness especially among parents by early detection and treatment of ocular morbidities.

There are less number of hospital-based studies on childhood ocular morbidity. Information obtained from these studies might be useful in improving the existing primary eye care facilities thereby reducing the prevalence of childhood blindness and severe visual impairment and for better development. With this background, the present study was conducted with the objective to determine the pattern of ocular morbidity among the children attending in the outpatient department (OPD) of an Ophthalmology of a tertiary care hospital of Gwalior.

## Methods

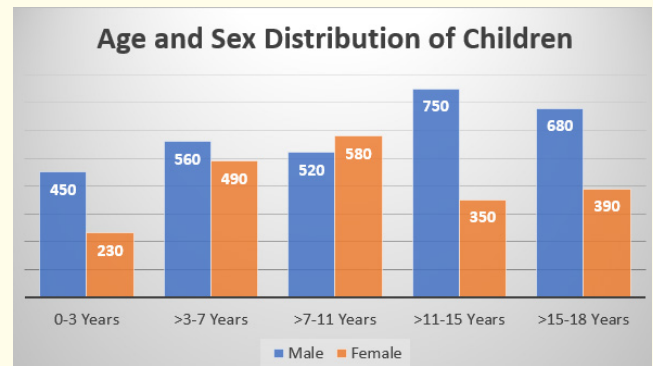
Institutional Review Board (IRB)/Ethics Committee approval was obtained. A prospective observational and interventional study was done from July 2016 to June 2018 in 5000 children in Gwalior, Madhya Pradesh at G.R.M.C and Jaya Arogya group of hospital. All children <18years of age whose parents accepted to sign consent for the study were included for the study.

All children underwent complete ophthalmologic evaluation including Visual Acuity assessment, cycloplegic refraction, orthoptics, a detailed anterior segment and posterior segment examination, relevant investigations, and the necessary management was done for the children. Children who needed surgical intervention underwent the required procedure. Interpretation and analysis of the data were done using Epi Info Software (developed by Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, USA) and *t*-test was used.

Mean and standard deviations were calculated. Means and standard deviations compared for calculating most common disorder. In order to assess differences between the different sexes, independent samples *t*-test and Chi-square test were conducted.

**Results**

A total of 5000 children between birth and 18 years of age were examined in the eye department during the study period. These children were divided into groups based on age: 0-3 years, >3-7 years, >7-11 years, >11-15 years and >15-18 years. Maximum number of children who attended OPD were from age group >7-11 years and >11-15 years which was 1100 (22%). The gender distribution was 2960 (59.2%) males and 2040 (40.8%) females. In all group males were prominent except for the age group >7-11 years [Graph 1]. Based on the part of the eye involved, ocular morbidities have been classified grossly [Table 1]. Most common symptom they had was blurring of vision (40.0%). Non-specific complaints included watering, discharge from eyes, reference calls for ocular manifestation of various diseases, ROP screening, etc. This is elaborated in table 2. Distribution pattern of refractive errors [Graph 2] is different in different groups. In 190 (3.8%) children vision was indeterminable due to newborns, uncooperativeness, mentally handicapped or semi-conscious state of the child. Myopia was the most common refractory error in all age group except for <3 years in whom hyperopia was the most common. Retinoscopic findings for myopia and hyperopia was divided into three groups based on severity Low Grade (<2.00D), Moderate grade (2.00D-6.00D) and severe grade (>6.00D). Retinoscopy of children with refractive errors indicated most of children had low grade myopia (27.5%) except in children <3 years who had high hyperopia as most common refractive error illustrated in Graph 3, 4 and 5. Strabismus accounts for 470 (9.4%). Type of strabismus and its prevalence is illustrated in table 3.



**Figure 1:** Demographics.

The gender distribution was 2960 (59.2%) males and 2040 (40.8%) females. In all group males were prominent except for the age group >7-11 years.

Ocular Involvement of Different Parts	Number (5000)	Percentage (%)
Disorders of eyelid, lacrimal system and orbit	480	9.6
Disorders of conjunctiva	340	6.8
Disorders of sclera, cornea, iris and ciliary body	240	4.8
Disorders of choroid and retina	180	3.6
Disorders of refraction and strabismus	2290	45.8
Disorders of lens	210	4.2
Congenital malformations of eye	360	7.2
Injury of eye and orbit	510	10.2
Glaucoma	50	1
Vitamin A deficiency	340	6.8

**Table 1:** Types of Ocular Involvement.

Most common morbidity was disorders of refraction and strabismus accounting for 2290(45.8%) and least common was glaucoma 50(1%).

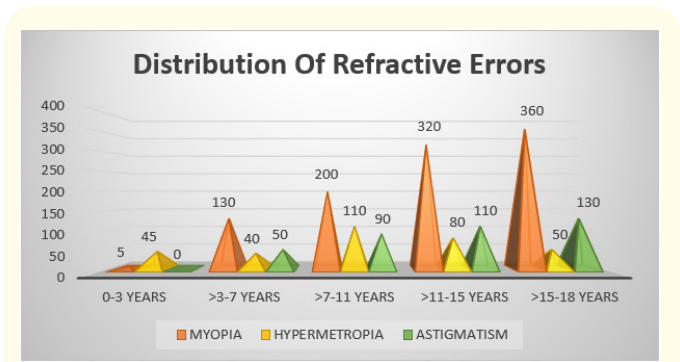


Figure 2: Distribution of Refractive Errors.

Overall myopia comprises 1015(59.01%), followed by astigmatism which was 380(22.09%) and hypermetropia 325(18.89%).

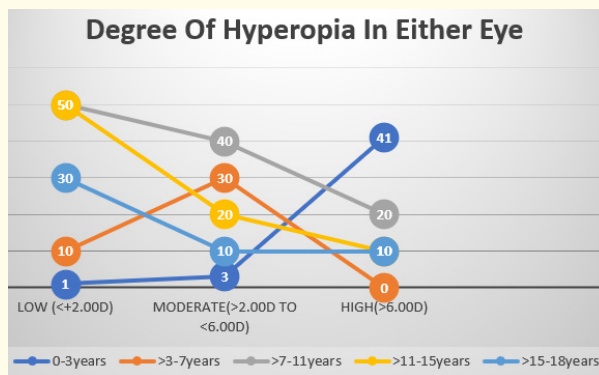


Figure 4: Degree of Hyperopia.

Children less than three years had high grade hypermetropia most commonly, while age group 11-15 years had low grade hyperopia in common.

Symptoms	Number of children in the group, (%)
Headache	1330, (30.8)
Blurring of Vision	2000, (40)
Redness and pain in eyes	560, (11.2)
Deviation of Eyes	570, (11.4)
Difficulty of vision at night	340, (6.8)
Non-specific	200, (4)

Table 2: Ocular Symptoms on Presentation.

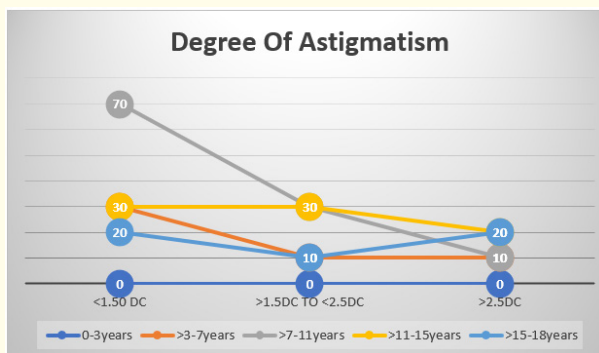


Figure 5: Degree of Astigmatism.

Low grade astigmatism was most commonly seen in age group 7-11 years, >15years of age had higher grade of astigmatism while there was no case of astigmatism noted in less than 3 years of age in our series.

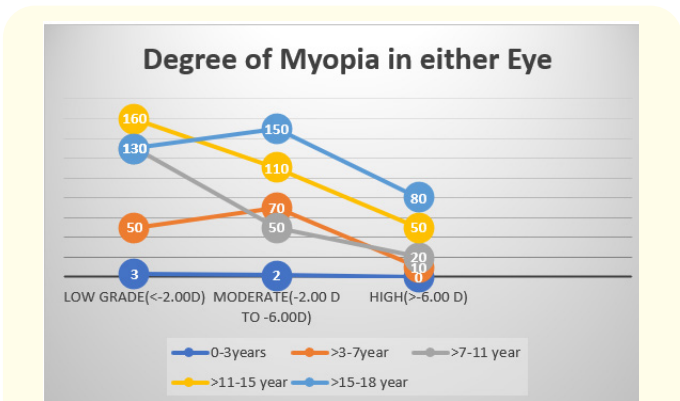


Figure 3: Degree of Myopia.

Low grade myopia was common in age group 0-3 years and 11-15 years. 3-7 year and >15 years of age group had moderate grade of myopia in common.

Age	Esotropia, %± Alphabet Patterns, %	Exotropia, %± Alphabet Patterns, %	CCDS*, %
0-3 years	40, (8.51)	0	20, (4.25)
>3-7 years	70, (14.89)	30, (6.38)	10, (2.12)
>7-11 years	60, (12.76)	20, (4.25)	0
>11-15 years	80, (17.02)+1	20, (4.25)	10, (2.12)
>15-18 years	70, (14.89)	40, (8.51)	0

**Table 3:** Types of Strabismus.

\*CCDS(Congenital Cranial Disintegrational Disorders).

Overall most common type of strabismus noted was esotropia (68.08%) followed by exotropia (23.40), congenital cranial disintegrational disorders (CCDDs) (8.51) and alphabetic pattern strabismus 2(0.42%) and both were V pattern.

Ocular injuries were the second most common ocular disorders seen in 610 (12.2%) children, male preponderance of 70.58% and females with 29.41%. Ocular injuries were most common in age group from >15-18 years of age making 39.2%. Types of ocular injury are illustrated in table 4. Most common place where injury occurred was playground 257 (50.39%) followed by house 246 (48.23%) followed by school 7 (1.37%).

Visual Disability Categories in children less than 3 years presenting with signs of eye poking, nystagmus, unilateral deviation of eye, coloboma, white reflex, searching eye movements were considered to have poor vision [16] less than 6/60. In children upto 18 months Catford drum was used to assess the visual acuity at 60 cm [16]. Other methods in preverbal children depend

Type of Ocular Injury	Sex		Age (Years)					Total No. of Patients ,(%)
	Male	Female	0-3	>3-7	>7-11	>11-15	>15-18	
Contusion	60	40	10	10	20	30	30	100,(19.6)
Superficial FB*	40	10	0	0	20	10	20	50(9.8)
Adnexal and Lacrimal Lac-eration	30	10	0	10	10	10	10	40(7.8)
Corneal burn	10	10	0	0	0	10	10	20(3.9)
Partial thickness wound	50	20	0	10	10	20	30	70(13.7)
Rupture	10	0	0	0	0	0	10	10(1.9)
	<b>PENETRATION</b>							
Corneal	80	30	10	20	10	30	40	110(21.5)
Scleral	20	10	0	10	10	0	10	30(5.8)
Corneo-scleral	40	20	0	10	10	20	20	60(11.7)
Perforating ± IOFB †	20	0	0	0	0	0	10	20(3.9)
Total(%)	360 (70.59)	150 (29.41)	20 (3.9)	70 (15.6)	90 (17.6)	130 (25.4)	200 (39.2)	510 (100)

**Table 4:** The Relationship between the Types of Injury With Gender and Age (N = 510).

\*FB = Foreign body, † IOFB = Intraocular foreign body.

Most common type of injury occurred due to penetrating corneal injury seen in 110(21.5%) followed by contusion 100(19.6%).

upon preferential looking using a patterned target [16]. In children from 18months till 3 years Kay’s Picture test was used [16]. In 190 (3.8%) children visual acuity could not be determined either due to uncooperativeness, mentally handicapped or semi-conscious state of the child. The categories of visual disability [Table 5] has been done based upon protocol used all over India [17].

**Discussion and Conclusion**

In the present study, a total of 5000 children were examined from 0-18years. These children were divided into groups based on age:0-3 years, >3-7 years, >7-11 years, >11-15 years, >15-18 years. In present study ocular morbidity was 2960 (59.2%) males and 2040 (40.8%) females. This was similar to studies done in Berhampur [18], Mengaluru [19], Allahabad [10], Etawah [22], Dezful, Iran

	0-3yr	>3-7yr	>7-11yr	>11-15yr	>15-18yr
Total (N)	680	1050	1100	1100	1070
Indeterminable(x)	123	50	10	05	02
Final(N-x)	557	1000	1090	1095	1068
Low Vision [17] (20%)	05(0.89%)	33(3.3%)	155(14.22%)	250(22.83%)	379(35.48%)
Economic Blindness [17] (40%)	02(0.35%)	17(1.7%)	26(2.38%)	82(7.48%)	58(5.43%)
Social Blindness [17] (75%)	20(3.59%)	45(4.5%)	55(5.04%)	48(4.38%)	37(3.46%)
Manifest Blindness [17] (100%)	00	55(5.5%)	108(9.90%)	30(2.73%)	12(1.12%)
Absolute Blindness [17] (100%)	10(1.79%)	10(1%)	50(4.58%)	20(1.82%)	10(0.93%)

**Table 5:** Visual Disability Categories among Children.

Absolute blindness was found in 100(2%) children. Most common cause for absolute blindness was developmental 66% followed by trauma 34%.

[23], Chennai [24], South East Turkey [27] where males were more and it was different from West U.P [20], Southeast Iran [21], Central Ethiopia [25], Rural Karnataka [29], Saudi Arabia [34] where females were predominant. This differences could possibly be due to differences in the sample size, differences in the selected age group of the study, gender bias and also differences in the prevalence of ocular morbidity in different parts of the world, as compared to the present study.

Comparision of types of ocular morbidities was done between published studies after 2010 with sample size >500 with our results [Table 6]. Studies which compared only refractive errors were not included in the table. In our study most common ocular morbidity was refractive error which was similar to studies done in Mengaluru [19], Vietnam [31] and so on. Compared to studies done in Central Ethiopia [25], Etawah [22] most common ocular morbidity was conjunctivitis which is likely due to the dusty local environment (largely farming communities), the study season (which

favors vernal catarrh), and the climate itself. Moreover, rural living is a risk factor for the development of chronic allergic conjunctivitis in children [25]. The cause of higher incidence of allergic conjunctivitis can be because of the tropical climate with long summer weather and low socio economic status of the patients in the population covered by the Institution.

In our study, the most common refractive error was myopia (61.62%), followed by Astigmatism (22.09%) and hypermetropia (16.27%). We compared studies published after 2010 with sample size >500 with our results. In West Bengal myopia was most common (54.44%), followed by hypermetropia (24.85%) and astigmatism (20.71%) [35]. This was different in Nepal where most common refractive error was Astigmatism (46.99%) followed by Myopia (34.21%) and Hypermetropia (14.66%) [33] which was similar to study done in Central Ethiopia [25]. Whereas West China prevalence of hypermetropia and astigmatism were almost similar [36]. One of the major differences of these studies is the age range

Study	Refractive Error (%)	Strabismus (%)	Ocular Injury (%)	Eyelids, Lacrimal system morbidity (%)	Congenital Malformation (%)	Others (%)
Gwalior	34.4	11.4	10.2	9.6	9.2	25.2
Mengaluru [19]	87.16	NM*	1.49	1.19	NM	10.16
West U.P [20]	17.36	0.27	NM	2.9	0.16	79.31
Chennai [24]	19.3	1.4	NM	NM	0.12	22.29
Vietnam [31]	95.4	NM	NM	NM	NM	4.6
Rural Karnatka [29]	5.54	0.61	NM	2.54	NM	36.08
West China [36]	20.69	0.29	0.13	NM	0.62	14.47
Central Ethiopia [25]	11.4	1.8	11.8	8.3	NM	66.7
Etawah [22]	31.37	3.66	8.37	9.2	NM	47.4
Kolkata [35]	23.67	0.56	12.74	19.61	13.59	29.83
Surendarnagar [28]	29.5	1.66	2.16	5.35	NM	61.33

**Table 6:** Comparison of Ocular Morbidities among Different Studies.

\*NM: Not Mentioned.

In our study most common ocular morbidity was refractive error whereas in Central Ethiopia, Etawah, the most common ocular morbidity was conjunctivitis.

of the studied population. In some studies, sampling was population-based and included 5-year-old children while other studies were school based and including 7 to 15-year-old children or similar age ranges [30] Since some studies have suggested ethnicity, genetics and lifestyle as possible determinants of myopia [37,38], these factors may also account for the difference in the results of studies presented in table. The prevalence of astigmatism has been reported to be higher in East Asian countries probably due to genetic factors [39]. The differences in prevalence of myopia across the surveys in different populations that have been performed to date suggest that race/ethnicity is an associating factor. It remains difficult to assess, however, the extent to which the differences can be attributed to genetic susceptibility and to environmental influences. It is possible that lifestyle differences may appear to be race/ethnicity related [32]. In addition, the degree of strabismus was measured only at a short distance, which is another possible reason for the discrepancy between this and other studies [36]. This difference is also due to difference in calculation method, some have calculated prevalence [26,27,30,31,36] whereas some has calculated percentage [25,32-35]. In central India, refractive error

was the most common cause of ocular morbidity which is treatable followed by ocular injury by penetrating object especially while playing and at home. Parents much be educated regarding dangers while keeping such objects at children approach. Most common cause of absolute blindness was developmental followed by ocular trauma which in most cases can be preventable. Small awareness among parents can prevent devastating change in their child life.

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