



Ocular Morbidities in Indoor Pediatric Patients in the Ophthalmology Ward at a Tertiary Care Hospital

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Abstract

Introduction: Childhood blindness has nabbed 1.4 million children in the world. Africa and Asia have 1.3 blind million children. Two lakh blind children reside in India. The atrocities of the blindness of the child are magnified by the number of children affected and the number of years the child has to live with blindness. Preventable causes of blindness make up less than 50% of the causes. In developing nations, every minute a child goes blind.

Aims: A study was undertaken to identify the pattern of pediatric ophthalmic disorders in patients being admitted to Ophthalmology Department at a tertiary care hospital in Gujarat.

Settings and Design: Prospective observational design

Methods and Material: Children in the pediatric age group, from birth till 18 years visiting the outpatient clinic of the department of ophthalmology and being admitted for further management comprised the population selected for study, over one year, from 1st August 2019 to 31st July 2020. ICD classification was used.

Statistical Analysis Used: Frequency and percentage.

Results: The predominant subset of pediatric patients admitted were in the age group of 3-6 years of which male patients were 20% and female patients, 35%. The most common anatomical ocular structure involved was the cornea (54%). Most of the patients belonged to the trauma subgroup with a total of 36 patients (72%) and mainly had penetrating injuries.

Conclusions: With proper measures, preventable blindness can be avoided. Young children are susceptible to injuries while playing with fireworks, hence we suggest parents supervise their children.

Keywords: Ocular Complications; Visual Acuity; Ophthalmology; Children; Public Health; Ocular Trauma

Introduction

According to the World Health Organization estimates, 19 million children are visually impaired. Childhood blindness needs to be given attention, as 1.4 million children in the world suffer from it. 1.3 blind million children reside in Africa and Asia. 200,000 blind children reside in India [1]. The atrocities of childhood blindness are magnified by the number of children affected and

the number of years the child has to live with blindness. Its etiology comprises hereditary and preventable causes. Preventable Causes of blindness make up less than 50% of the causes. In developing nations, every minute a child goes blind [2].

Data collection limitations cause low and middle-income countries to use under-five mortality as a measure to calculate, the prevalence of childhood blindness. In India, it is estimated

that there are 0.8 blind for 1000 children. The affected anatomical sites in children are whole globe lesions, corneal scarring, retinal pathology, and afflictions of the lens [1].

India is a country in transition and needs to address preventable and treatable causes of childhood blindness at the same time. Studies among schools for blind children in India observed patterns of causes of visual loss to be intermediate between those seen in industrialized countries and in the poorest developing countries of the world. Corneal causes, globe abnormalities, cataracts, and retinal causes have been highlighted as important causes in the Indian context. Recent studies in the country suggest that there is a declining trend in relation to corneal blindness [2].

The Convention says childhood lasts until 18; it is a special, protected time, in which children must be allowed to grow, learn, play, develop and flourish with dignity [3]. Out of 19 million, visually impaired children, (globally) 12 million children are affected due to refractive error [4]. Data from developed countries suggest that the incidence of blindness in children resulting from acquired conditions has declined over the last few decades, but in developing countries data is not reliable. In the latter, a high proportion of children who become blind die within a few years of becoming blind, either from systemic complications of the condition causing blindness (e.g. vitamin A deficiency, measles, meningitis, and congenital rubella syndrome) or because of poor parents have more difficulty in caring for their blind children than their sighted siblings. Estimates of the number of prevalent cases of blindness in children therefore markedly underestimate the magnitude of the problem of blindness in children [5-7]. One of the most common causes of visual impairment around the world is a refractive error. Reliable data on prevalence and distribution of refractive error from population-based surveys are needed to plan cost-effective programs for reduction of visual impairment and blindness [8]. Ongoing school eye screening programs should be strengthened to reduce the prevalence of visual impairment due to refractive errors. A mandatory regular school eye screening program should be implemented. Health education activities in schools should be intensified [9,10].

We did this study at a tertiary care hospital in Vadodara which caters to patients from nearby rural areas like Panchmahal, Narmada, etc., and also from neighboring states like Rajasthan and Madhya Pradesh. This study will be an indicator of the ocular

morbidities that are a population burden. The causes of visual disorders need to be classified in accordance with the classification of diseases as per the International Classification of Diseases publication of the WHO to facilitate retrieval and comparison with data from other sources. In the study, the International Classification of Diseases codes were used [11]. This study was undertaken to keep a record of successive admissions of patients with ophthalmic disorders in the pediatric age group, over a period of one year, and thereby identify the spectrum of such disorders. We studied the available diagnostic and therapeutic measures available to tackle the same.

Socioeconomic barriers and diverse cultural practices keep us from tackling childhood blindness. It is a herculean task for both the epidemiologist and a health care provider. Besides this, the major challenges faced are due to inequitable distribution of healthcare services, with most of the advanced eye care centers being located in the urban areas, and remote rural villages getting ignored. Therefore, the etiology of childhood blindness must be reviewed to strengthen childhood healthcare programs in India [12]. Effective screening methods (especially for refractive errors), genetic counseling, and therapeutic interventions are a dire necessity in the current situation [13].

Materials and Methods

This prospective study was approved by the Ethics Committee of the tertiary care hospital, Gujarat, and it was conducted in accordance with the tenets of the Declaration of Helsinki. Children in the pediatric age group (from birth to 18 years) were admitted to the Ophthalmology ward at the hospital. Defaulters were excluded. It was a prospective observational study comprising 50 patients. The study was done between 1st August 2019 to 31st July 2020.

Patients who met the eligibility criteria were included in the study. A detailed history of symptoms and their duration was noted. Patients were examined in the O.P.D. Birth history, developmental history, family history, immunization history, past history of similar complaints, significant systemic history, and any ocular surgery, medication, or other treatment history was taken.

The ocular examination included visual acuity, slit-lamp examination, fundus examination, and ocular examination. Specific ocular investigations included Schiotz tonometry, sac syringing, and retinoscopy. Entries were made at each follow-up. All patients

were followed up till the last date of the study. All the data analysis was performed by the Statistical Package for the Social Sciences (SPSS) version 20 software. Visual acuity was assessed as per recommended procedures for each eye. In the case of children, less than three years of assessment was done by occlusion of one eye and watching if the child resisted occlusion or followed the light and other objects of interest. Other tests for infants such as the Catford drum test, preferential looking test, and teller acuity cards test, were available.

In older children, Finger counting, Landolt’s rings, picture test, and standard Snellen charts were used. Intraocular pressure was measured by a Schiottz tonometer and Goldmann applanation tonometer. Slit-lamp examination was done to evaluate corneal tear, scleral tear, and any other anterior segment pathology. Ocular fundus examination was done using direct and indirect ophthalmoscope whenever required. Special ophthalmological investigations such as X-ray orbit, culture sensitivity of discharge and corneal scrapping, and ultrasonography B-scan have been performed as and when required. Systemic investigations such as Hemogram, blood urea, serum creatinine, X-ray chest, X-ray skull, and Montoux test were performed where indicated. Pediatric references pertaining to particular complaints were done whenever required.

Patients were treated either medically (e.g. nutritional deficiency, epithelial defects, chemical burns, corneal ulcer, orbital cellulitis) or surgically (e.g. perforating injuries, lid tears, cataract, squint, lid swelling, and others) depending upon the disease state.

Results

Age Group (yrs)	Present Study (2020)			
	Male		Female	
	No.	%	No.	%
0-3	6	20.00%	2	10.00%
3-6	6	20.00%	7	35.00%
6-9	6	20.00%	3	15.00%
9-12	5	16.67%	2	10.00%
>=12	7	23.33%	6	30.00%
Total	30	100.00%	20	100.00%

Table 1: Age and sex distribution of patients.

According to table 1, the predominant subset of pediatric patients admitted was in the age group of 3-6 years of which male patients are (n = 6) 20% and female patients were (n = 7) 35%. Here, all the patients (100%) belonged to low socioeconomic status.

Time (in days)	No.	%
0-1	23	46.00%
1-7	14	28.00%
>7	13	26.00%
Total	50	100%

Table 2: Interval between onset of symptoms and admission.

The interval between onset of symptoms and admission revealed that 46% (n = 23) of patients were admitted within 24 hours of the onset of symptoms. Male patients 43.33% (n = 13) and female patients 50% (n = 10) presented within 24 hours of the onset of symptoms [Table 2].

The most common anatomical ocular structure involved was the cornea 54% (n = 27). Note: Here, the group of ‘others’ included the lesions of lids and extraocular muscles.

Disease	ICD Code	No.	% of Cases
Trauma	H00-H06, H15-H22, H25-H28	36	72.00%
Corneal Lesions	H15-H22	28	56.00%
Cataract	H25-H28	10	20.00%
Lid-Infective and Growth	H00-H06	1	2.00%
Lid-Traumatic	H00-H06	4	8.00%
Dacryocystitis	H00-H06	1	2.00%
Disorders of Eyelid and Orbit	H00-H06	1	2.00%
Disorders of Ocular Muscles, Binocular Movement	H49-H52	2	4.00%
Disorders of Optic Nerve and Visual Pathways	H46-H47	1	2.00%
Disorders of Sclera and Cornea	H15-H22	2	4.00%

Table 3: Causes of pediatric disorders.

In the present study, most of the patients belonged to trauma with a total of 36 patients making 72% of the total number of patients taken in this study according to ICD classification [Table 3].

AGE (in Years)	No.	%
0-3	2	5.56%
3-6	11	30.56%
6-9	7	19.44%
9-12	6	16.67%
> = 12	10	27.78%
Total	36	100.00%

Table 4: Age-wise distribution of cases of trauma.

Among a total of 36 cases of trauma, 30.56% of cases belonged to 3-6 years of age, and 27.78% belonged to more than 12 years of age. The presentation among gender was M: F ratio being 1.1:1 which was almost equal. The most common object causing trauma was wood which comprised about 38.0% (n = 19) of the cases [Table 4].

Type of Injury		No.	%
Injury to Globe	Mechanical	Rupture	0 0.00%
		Penetrating	28 77.78%
		IOFB	1 2.86%
		Closed Globe	2 5.71%
	Non-Mechanical	Lime burns	2 5.71%
Injury to Adnexa	Lid tear	4 11.43%	
		Total	36 100.00%

Table 5: Nature of eye injuries.

Out of all cases of trauma, penetrating injuries were found to be the most common comprising 77.78% (n = 28) while lid tear was the second most common comprising 11.43% (n = 4) [Table 5].

Lesion	No.	%
Corneal Tear	27	56.25%
Cataract	10	20.83%
Hyphema	5	10.42%
Uveal Prolapse	1	2.08%
Lid tear	4	8.33%
Corneal foreign body	1	2.08%
Total	48	100.00%

Table 6: Clinical features among patients with trauma.

Most of the clinical features of the patients in the present study were corneal tears comprising 56.25% (n = 27) [Table 6].

Management	No.	%
Cataract extraction with PCIOL (closed globe injury)	1	11.11%
Perforation suturing with secondary IOL	2	22.22%
Perforation suturing	1	11.11%
Perforation Suturing with Cataract Extraction with IOL Implantation	5	55.56%
Vitrectomy	0	0.00%
Total	9	100.00%

Table 7: Management of traumatic cataract.

Out of a total of 9 patients, 5 patients with traumatic cataracts were managed by cataract extraction with IOL implantation with perforation suturing at the same sitting, comprising 55.56% [Table 7].

Discussion

Seasonal variation and distance traveled by the patients to get ophthalmic services were the factors that reduced the number of ocular injuries observed during the study period in the eye unit [14]. Central nervous system disorders affecting vision dominate in wealthy parts of the world. Poorer countries face vision impairment due to corneal scarring [15].

Age distribution

In the present study, a maximum number of patients (55%) of which male: female ratio was 1:1.15 belonged to the age group of 3-6 years.

This observation is significant. As this age group of 3-6 years appears to be the most vulnerable the primary focus of any preventive, diagnostic, and managerial approach should first focus on this population group. Congenital and acquired diseases manifest in this age group. Also, they are better detected at this age due to greater cooperation as compared to younger children.

There is an increased susceptibility in this group as the children in this age group are the most active, predisposing to more exposure, with a corresponding greater incidence of trauma.

In a study done by N.Wagle., *et al.* [16]. out of a sample size of 41 children high-frequency group was 10-15 years which constituted 43.90%. Here, the school-going age group was found to be most susceptible owing to increased activity in this age group.

Sex distribution

In the present study, out of a total of 50 patients there were 30 male patients and 20 female patients, thus male: female ratio was 1.5:1. In the comparative study done in 2006 at the same hospital out of a total of 102 cases, there were 66 males and 36 females: the ratio being 1.8:1. Whereas, in a similar study done at the same tertiary hospital in 1995 there was a total of 100 pediatric patients out of which 55 were male and 45 female, making the male: female ratio 1.2:1. In the 1995 study, the most common etiology requiring treatment was a refractive error and hence there was an almost equal preponderance between male and female patients.

Whereas in the current study and the comparative study of 2006, the most common etiology among patients was trauma hence there was an increased male preponderance.

There were 29 males (70.73%) and 12 females (29.26%) in a study done by N.Wagle, *et al.* The predominance of males in ocular morbidities is probably because boys are more involved in outdoor activities than girls [16].

In the present study majority of patients came to the hospital within 24 hours of the onset of symptoms which is 46%. Whereas in a comparative study of 2006 only 4.9% came to the hospital after the onset of symptoms, which suggests that gradually people are becoming aware of the importance of timely management of ocular morbidities, and also presently better adequate health care services are available for timely referral of patients than before.

Site of Lesion	Aravind Eye Institute (Hospital based study) 2005	Comparative study (Vadodara) 2006	M V S Prakash et al,2017	Present study (Vadodara)
Retina	17.60%	0.98%	18.2%	0.00%
Cornea	14.40%	42.16%	15.6%	54.00%
Globe	20.80%	23.53%	2%	6.00%
Lens	8.00%	26.47%	12.9%	20.00%
Optic Nerve	12.80%	0.98%	24.8%	2.00%
Angle of anterior chamber	5.60%	2.94%	6.6%	0.00%
Others	20.80%	28.43%	4.9%	18.00%

Table 8: Site of lesion.

In the present study maximum number of patients had involvement in the cornea which comprised 54% followed by the lens which was 20%.

In the hospital-based study done by Aravind eye institute, a maximum number of patients had involvement of the globe (20.8%) followed by the retina (17.6%).

In a study conducted by M V S Prakash, *et al.* a maximum number of cases belonged to the optic nerve comprising of 24.8%, whereas the lowest was the whole globe related ocular morbidities comprising 2%.

In the present study, we did not admit any patient having retinal pathology, while in the comparative study of Vadodara

2006 involvement of the retina was 0.98%. This was significantly different from other studies due to the lack of super specialist facilities at the given institute necessitating the referral of such patients to a higher center and hence are not included in this study [Table 8].

The results of this study vary from other studies mentioned in the table as the present study includes patients admitted with ocular morbidity and not necessarily with visual impairment while the rest of the studies are based on children with visual impairment.

In the present study 72% of patients presented with trauma while 20.0% had cataracts. Corneal lesions accounted for 56%. In a study conducted by N. Wagle, *et al.* 2018, on pediatric ocular

Disease	ICD Code	No.	% of cases			
			Comparative study, 2006	M VS Prakash., <i>et al.</i> 2017	N. Wagle., <i>et al.</i> 2018	Present study
Trauma	H00-H06, H15-H22, H25-H28	36	47.06%		36.5%	72.00%
Corneal Lesions	H15-H22	28	42.16%	11.59%	12.1%	56.00%
Cataract	H25-H28	10	26.47%	7.28%	34.14%	20.00%
Lid-Infective and Growth	H00-H06	1	4.9%			2.00%
Lid-Traumatic	H00-H06	4	6.86%			8.00%
Dacryocystitis	H00-H06	1	4.9%			2.00%
Disorders of Eyelid and Orbit	H00-H06	1				2.00%
Disorders of Ocular Muscles, Binocular Movement	H49-H52	2				4.00%
Disorders of Optic Nerve and Visual Pathways	H46-H47	1		24.17%	9.7%	2.00%
Disorders of Sclera and Cornea	H15-H22	2				4.00%
Disorders of choroid and retina	H30-H36		1.96%	17.21%		
Glaucoma	H40-H42		2.94%	6.6%		

Table 9: Causes of pediatric disorders.

morbidity profile in the inpatient department of a tertiary health care hospital in Goa on 41 children, 15 patients had ocular injuries which accounted for 36.58% of the study population [16]. Ocular trauma score has a high probability to predict the final visual acuity of pediatric traumatic cataracts following penetrating ocular trauma [17].

The above-mentioned studies show that the most common ocular morbidity is ocular trauma for which pediatric patients are admitted to the Ophthalmology ward at a hospital.

In a study conducted by M VS Prakash., *et al.* 2017 it was found that a maximum number of cases had optic nerve atrophy (24.17%) [18]. The difference in the findings of M VS Prakash., *et al.* 2017

with our study could be due to the inclusion of all pediatric patients in this study, even those not requiring admission, while the present study was based on only the admitted patients [Table 9].

In a study by C Chakraborti., *et al.* 2014, M: F ratio was 2.3:1. In a study done by AH Madan., *et al.* 2020, M: F ratio was 1.65:1 [19]. The male child in the age group of 6-10 years was found to be the most commonly affected group in the Katiyar., *et al.* study. Besides parents prefer to seek treatment for the injured male child [20]. The higher occurrence of trauma in males is found in all the studies due to greater exposure of males as a result of their unabridged freedom.

Our study found an almost equal preponderance of ocular trauma between males and females which could be due to an

increase in awareness among low-income group people about emergency ocular health care services or due to a decrease in discrimination against female children leading to their increased indulgence in outdoor activities.

MacEwen CJ found the commonest cause of eye injury occurring at home. Sporting activities were the commonest cause of injury in the 5-14 age group [21]. A study by C Chakraborti., *et al.* 2014, also found that most ocular pediatric injuries occurred at home. Hence, children at home should be supervised by parents/guardians and if need be safety eye goggles must be worn [22]. Post-traumatic endophthalmitis did not occur in our study. According to S Narang., *et al.* study, the incidence of endophthalmitis in their series was 54.17% (39 of 72 eyes) [23].

Saxena R., *et al.* study, reported that closed globe injuries accounted for 42.2% of injuries, open globe for 53.9% and 3.9% were chemical injuries. In a study conducted by AH Madan., *et al.* the nature of injuries was classified into open (63.9%) and closed globe (24.6%), and perforating open globe injury to the cornea (n = 29, 47.5%) was the most common injury. Our study correlates with this study, as both show a maximum number of patients with open globe injuries. Ocular trauma seems to be one of the prime contributors to unilateral partial or total loss of sight [24,25].

Cataract patients were 20%. Most surgeons recommend deferring primary IOL implantation in infants below 3 months in unilateral cataracts and <7 months in bilateral cases [26]. On the contrary, according to Ram J., *et al.* meticulously performed primary IOL implantation and primary posterior capsulorrhexis with anterior vitrectomy in the first two years of life is a safe and effective method of aphakic correction [27].

In a study done by C Chakraborti., *et al.* closed globe injury was the commonest (418 patients, 62.19%), followed by open globe injuries (127 patients, 19%). Our study doesn't correlate with the study of C Chakraborti., *et al.* because their study had a finger or fist as the most common object causing injury. Finger or fist have a high propensity to cause a closed globe injury than an open globe injury. In our study wood was the most common object causing injury which has a higher propensity to cause open globe injuries. Perhaps factors such as immature motor skills,

carelessness, and uncontrolled emotions which are inherent in young children may be more important in causing injury than most preventable causes [28-30].

The covid-19 pandemic led to the lockdown of Gujarat from March 2020. Therefore, we were instructed by the state government to reduce planned surgeries. The pandemic also leads to a reduction in the number of patients visiting the Ophthalmology outpatient department.

The most common causes of ocular morbidity are largely treatable or preventable. These results suggest the need for awareness campaigns and early intervention programs [31].

Conclusion

Data about pediatric Ophthalmic disorders, especially those that require hospital admission gives us an insight into the plight of childhood blindness.

This insight can lead us to come up with algorithms to remove the causes of preventable childhood blindness. However, more epidemiological studies are needed regarding this.

Young children are susceptible to injuries while playing with fireworks, sharp objects, and other objects of potential harm. Hence, we suggest parents supervise their children. While playing with fireworks, children can maintain an arm's distance from them and wear protective eyewear. Effective restrictive firework legislation will have remarkably lower trauma incidence rates. A standardized international template for reporting on eye injuries might be useful, like the reporting occurring through the US Eye Injury Registry.

Early detection and prompt management are critical for the success of programs targeting avoidable blindness in children.

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