Causes of pediatric cataract in rural population of North India

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Abstract

Aims: To identify the causes of childhood cataract in rural population of north India with special emphasis on potentially preventable causes.

Study design: Cross-sectional, observation study**.**

Place and Duration of Study: Department of Ophthalmology, UP University of Medical Sciences, Saifai, India, during December 2014 to November 2015.

Methodology: A total of 50 childhood cataract cases (0-15 years age) attending an eye OPD were evaluated including the detailed history comprising age, birth weight, evidence of maternal infection (especially the TORCH infections), rash or febrile illness during pregnancy, any other prenatal and perinatal history that may be pertinent (e.g., alcohol, tobacco, drug use, ionizing radiation exposure during pregnancy), history of ocular trauma, history of corticosteroid therapy and family history. Detailed ocular examination comprising anterior segment examination including morphology of cataract and posterior segment examination under full mydriasis was performed in both eyes, wherever possible. A slit-lamp examination of both the parents was done, that helps to establish the presence of familial cataracts and cataract-associated conditions. Serological investigations such as titers for rubella specific IgM, blood glucose, serum calcium, serum potassium and urine reducing sugars were carried out as indicated.

Results: Out of 50 (males 27, females 23) cases, 35 cases (70%) were non-traumatic and 15 cases (30%) were traumatic. Among 35 non-traumatic cases, 17 cases were bilateral and 18 cases were unilateral. For non-traumatic etiology, 9 cases (25.7%) were hereditary, 6 (17.14%) cases were due to congenital rubella syndrome (CRS) and 20 cases (57.14%) were idiopathic. In children under 1 year of age with no history of trauma, 30% cases were due to CRS. In 15 cases of trauma, the cause of trauma was found to be wooden stick in 4 cases(26.6%),thorn injury in 4 cases(26.6%), firecracker injury in 1case(6.6%), cricket ball injury in 4 cases(26.6 %) and 2 cases (13.3%) were due to pencil tip injury.

Conclusion: Potentially preventable causes like CRS and traumatic cataract constitute major proportion of cases. Awareness programs for childbearing age or pregnant females regarding TORCHES infection, school going children for factors which can cause traumatic cataract such as dangers of playing with firecrackers, sticks and other penetrating objects may also plays important role in reducing the burden. Early cataract surgery and prompt visual rehabilitation can prevent the development of amblyopia and ensures proper visual development with age.

Keywords: Congenital cataract, Etiology of cataract, Pediatric cataract, Rural population.

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Introduction

There are about 1.5 million estimated blind children worldwide with majority living in Asian and African regions, and probably in majority (approx. 75%) causes are curable or avoidable.[1] According to WHO, cataract is the second most common cause of avoidable blindness worldwide.[2] About 2 lakhs children are blind due to cataract worldwide, with addition of 20-40 thousand children with bilateral developmental cataract every year.[3] Childhood cataracts are responsible for 10% to 20% of blindness in children worldwide and for an even higher percentage of childhood visual impairment in developing countries. Various surveys for causes of childhood blindness in developing countries have shown cataract as one of the most important cause (**Table 1**).

Table 1: **Percentage of cases of childhood blindness attributed to cataract in various population surveys**

Region(Study year)[reference]	No. of subjects examined	No. with cataract	Percentage
South eastern Nigeria(2003) [4]	142	33	23.6%
North-eastern states of India (2008)[5]	376	28	10.9%
Iran(2005)[6]	362	49	13.5%
Malawi village, India(2008)[7]	151	53	35%
Rural southern India(2016)[8]	18	5	27.76%

Cataracts in children not only blur the retinal image but also disrupt the development of the immature visual

pathways in the central nervous system. Hence timely detection and removal of cataract followed by prompt visual rehabilitation is of utmost importance in children.

The etiology of pediatric cataract is diverse. The various causes include genetic, metabolic, prematurity, intrauterine infections, drug induced, traumatic and idiopathic. In approximately half of the cases of congenital cataract, definitive cause couldn't be identified i.e. idiopathic, and in particular majority are unilateral.[9,10] The usual mode of inheritance for hereditary cataract is autosomal dominant trait with associated microphthalmos.[11] Other modes of inheritance like autosomal recessive is uncommon.[12]

History for any febrile illness or skin rashes during pregnancy should be taken as rubella infection during first trimester is a cause for multiple severe congenital anomalies including cataract (unilateral or bilateral) which may present since birth or may develop during infancy.[9]

Other causes for pediatric cataract includes congenital infection with other viruses like varicella zoster, herpes simplex, toxoplasmosis, cytomegalovirus[13], metabolic disorders like galactokinase deficiency[14], galactose 1-P uridyl transferase[15], X-linked recessive conditions like Lowes syndrome[16], hypocalcemia[9], hypoglycemia[11], prematurity[17], ocular disorders like persistent hyperplastic primary vitreous[18], retinopathy of prematurity[19], aniridia[19], chromosomal abnormalities like Down's syndrome, Turner syndrome, Patau's syndrome,[9] etc.

Careful assessment should be done in all children with congenital cataract in an attempt to identify possible etiology. This should include detailed history, complete physical and ocular examination, examination of parents and siblings, and wherever indicated appropriate laboratory investigations. Collaboration of ophthalmologist, pediatrician and clinical geneticist is necessary to reduce unnecessary lab investigations.

We, in the present study, evaluated the various etiological factors for pediatric cataract in a rural setting of North India, particularly the causes which might be potentially preventable or avoidable.

Material and Methods

A cross sectional study of 50 pediatric cataract patients aged between 0-15 years presented to eye OPD at UPUMS (Uttar Pradesh University of Medical Sciences, Saifai, Etawah), from Dec 2014 to Nov 2015 was carried out. The particulars of patients were noted. The detailed history including age of child, age at onset of symptoms, birth weight, evidence of maternal infection (especially the TORCH infections), rash or febrile illness during pregnancy (may be suggestive of intrauterine infection), any other prenatal and perinatal history that may be pertinent (e.g., alcohol, tobacco, drug use, ionizing radiation during pregnancy), history of ocular trauma, history of corticosteroid therapy (especially in posterior sub capsular cataract) and family history (especially for bilateral cataract) was taken. Detailed ocular examination was done by attending ophthalmologist. Visual acuity assessment of both eyes and cycloplegic refraction of other eye in unilateral cases was done. Intraocular pressures were measured in both eyes using non-contact tonometry. Pupils were examined with torch light and anterior segment examination was done using slit lamp biomicroscopy. Posterior segment examination was performed under full mydriasis using +90 diopter lens with slit lamp and indirect ophthalmoscope, wherever possible. For documentation purpose, photographs of morphology of cataract were taken using slit lamp or operating microscope, wherever possible. A slit-lamp examination of both parents was done, that helps to establish the presence of familial cataracts and cataract-associated conditions. For children with non-traumatic causes and age less than 1 year, serological titers for IgM specific for rubella were estimated using standard laboratory tests, wherever indicated to rule out these disorders. Other investigations such as blood glucose, serum calcium, serum potassium and urine reducing sugars were carried out, wherever indicated.

Results

Out of total 50 paediatric cataract cases (27 males and 23 females, **Table 2**) seen, 35 cases (70%) were non-traumatic and 15 cases (30%) due to trauma (**Table 3**).

Table 2: **Showing distribution of cataract in male and female children**

Sex	No. of paediatric cataract cases	Percentage
Male	27	54
Female	23	46
Total	50	100

Table 3: Showing aetiology of childhood cataract in 50 children in rural population of north India by laterality

Causes	Unilateral		Bilateral		Total
	N	(%)	N	(%)	
Non Traumatic	18	(36)	17	(34)	35
Traumatic	15	(30)	0	(0)	15
Total	33	(66)	17	(34)	50

Non Traumatic aetiology

Table 4 encompasses all the causes of paediatric cataract with non-traumatic aetiology, out of which 10 cases (28.5%) presented before the age of 1 year (**Table 5**). In 57.14% non-traumatic cataract cases, we could not be able to identify any specific cause after examination and investigations, with majority of cases being unilateral. 25.7% cases were hereditary and in 17.1% cases, presumptive diagnosis of congenital rubella syndrome was made on the basis of maternal

history, clinical features, and serological investigations where found appropriate. The various causes of bilateral cataract are depicted in **Table 4.** Out of 17 cases with bilateral cataract; at least 8 cases (22.8%) were hereditary or truly congenital (determined by meticulous interview of parents).

Table 4: **Showing causes of non-traumatic childhood cataract in 35 cases by laterality**

Causes	Unilateral		Bilateral		Total	
	N	%	N	%	N	%
Hereditary	1	(2.8)	8	(22.8)	9	(25.7)
Congenital Rubella Syndrome	1	(2.8)	5	(14.28)	6	(17.1)
Secondary	0	(0)	0	(0)	0	(0)
Others	0	(0)	0	(0)	0	(0)
Idiopathic	16	(45.7)	4	(11.4)	20	(57.14)
Total	6	(17.1)	29	(82.8)	35	(100)

Table 5: Showing aetiology of non-traumatic cataract in infant age group

Aetiology	No. of Cases	Percentage
Hereditary	2	20
CRS	3	30
Secondary	0	0
Idiopathic	5	50
Total	10	100

Hereditary cataract

In hereditary cases, autosomal mode of inheritance was considered when one of the parents was found to be aphakic due to surgery during childhood or have congenital cataract on slit-lamp bio microscopy. Autosomal dominant mode of inheritance was found in 7 cases (78%) of hereditary cataract, 86% being with bilateral presentation (**Table 6**). Microphthalmos was found in 1 autosomal dominant hereditary cataract. Autosomal recessively inherited cataract was observed in 1 case, but was difficult to diagnose because of often incomplete family history and lack of routine attendance of siblings at the clinic. X-linked inheritance was seen in bilaterally affected 1 male child with mildly affected mother.

Table 6: Showing mode of inheritance in non-traumatic hereditary congenital cataract with laterality

Mode of inheritance	Unilateral	Bilateral	Total
Autosomal dominant	1	6	7
Autosomal recessive	0	1	1
X linked recessive	0	1	1
Total	1	8	9

Secondary cataract

We did not find any case with associated uveitis, persistent hyperplastic primary vitreous, aniridia, posterior lenticonus, and other associated chromosomal syndromes and ocular anomalies.

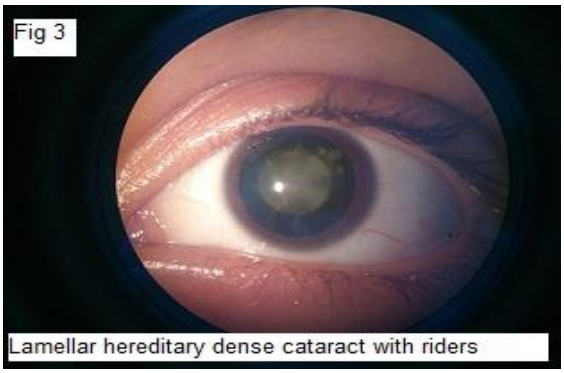
Rubella cataract

Various causative factors for non-traumatic cataract in children below 1 year of age are presented in **Table 5**. Nearly 50% cases had no definitive diagnosis, but congenital rubella syndrome was also presented in significant proportion of cases. Serological confirmation for rubella specific IgM was done in clinically suspected children under 1 year of age. In all cases with diagnosed CRS, centrally dense nuclear cataract surrounded by less dense cortical cataract with variable spread in the periphery was seen (*Fig. 1, 2*).

Morphological characteristics of non-traumatic cataract in infants with or without rubella are shown in **Table 7**.

Table 7: Showing morphological characteristics of non-traumatic cataract in infants

Morphology	Rubella	Non Rubella	Total
Lamellar(*Fig. 3*)	0	3	3
Blue dot	0	2	2
Nuclear(*Fig. 1, 2*)	3	1	4
Posterior polar	0	1	1
Posterior sub capsular	0	0	0
Mixed	0	0	0
Total	3	7	10



Idiopathic

In nearly 57.14% cases of non-traumatic congenital cataract, definitive aetiology could not be established.

Traumatic cataract

Penetrating injury to eye was found to be more common as compared to blunt injury (10:5) in childhood as cause of visually significant cataract (**Table 7**). 86% of cases of traumatic cataract were found in children above age of 5 years i.e. incidence of injuries increases with the age of child.

Table 7: **Showing type of trauma in childhood cataract cases with traumatic aetiology**

Type of trauma	No. of cases
Penetrating trauma(*Fig. 4*)	10
Blunt trauma (*Fig. 5*)	5
Total	15

Table 8 highlights the various cause of injury against the age of affected child. Most cases of trauma occurred in the playing age group. The all cases of traumatic cataract were unilateral (**Table 3**).

Table 8: **Showing aetiology of traumatic cataract in various age groups**

Age group(year)	Wooden stick	Thorn	Firecracker	Cricket Ball	Pencil tip	Total
<1 year	0	0	0	0	0	0
1-5 year	1	1	0	0	0	2
5-10 year	2	2	0	2	2	8
10-15 year	1	1	1	2	0	5

Discussion

Many previous studies on etiology of childhood cataract have been performed in developed and developing world to determine the various factors responsible.[20-24] In developed countries, although sporadic cases and familial cases constitute majority of total burden of congenital or childhood cataract, while rubella associated embryopathy is less common. [21] This scenario may be unlikely in the developing world where infection due to rubella encountered during pregnancy is common and is a potentially preventable cause of childhood cataract.

Numerous studies conducted in different parts of India have shown different causes of childhood cataract in different regions.[22-24] A study from south India delineates various causes of non-traumatic childhood cataract including 25% hereditary cases, 15% secondary to congenital rubella syndrome, and 51% cases were undetermined.[22] A study of 200 cases of pediatric cataract in north India found that 31% cases were idiopathic, 21% were due to rubella and 14% were hereditary.[25]

In our study, we found that 17% cases of congenital cataract were due to rubella which is much more equal to 15% and 21% reported in south[22] and north india[25], respectively. As in rural population chances of infection are higher due to overcrowding and poor hygiene.

Rubella cataracts show generally nuclear opacity[26], but in the present study we also found total opacity.

Awareness programs for child bearing age or pregnant females regarding TORCH infection may also plays important role in reducing the incidence of potentially preventable cause.

However, Indian data shows unknown cause is the most common cause of infantile cataract.[22,23]

In nearly 50% of the cases for which no identifiable cause could be ascertained, there is need for meticulous evaluation to identify possible etiology. Well documented record of all the medicines taken during pregnancy will further help in getting the cause of the congenital cataract.

Trauma is one of the commonest causes of unilateral cataract in the developing countries.[24]

To reduce the burden of traumatic cataract, health education must be imparted to playing age group school children regarding the dangers of playing with firecrackers, sticks and other penetrating objects.

Conclusion

Awareness programs for child bearing age or pregnant females regarding TORCH infection may also plays important role in reducing the incidence of this potentially preventable factor.

Health education must be imparted to school going children regarding the dangers of playing with firecrackers, sticks, other penetrating objects and factors which can cause traumatic cataract. Thus might be useful in reducing the incidence of childhood cataract.

Early cataract surgery and prompt visual rehabilitation can prevent the development of amblyopia and ensures proper visual development with age.

Competing Interests: No competing interests exist.

Authors' Contributions

'Author 1' designed the study and wrote the protocol, 'Author B' wrote the first draft of the manuscript, managed the analyses of the study and 'Author C' managed the literature searches…… All authors read and approved the final manuscript."

Consent: Not required.

References

1. Foster A, Gilbert C. Epidemiology of childhood blindness. Eye 1992;6:173–176.
2. Gilbert C, Foster A. Childhood blindness in the context of VISION 2020: The Right to Sight. Bulletin of the World Health Organization 2001; 79:227–32.
3. Foster A, Gilbert C, Rahi J. Epidemiology of cataract in childhood: a global perspective. J Cataract Refract Surg. 1997; 23 Suppl 1:601-4.
4. Ezegwui IR, Umeh RE, Ezepue UF .Causes of childhood blindness: results from schools for the blind in south eastern Nigeria. Br J Ophthalmol. 2003 Jan; 87(1):20-3.
5. Bhattacharjee H, Das K, Borah RR, Guha K, Gogate P, Purukayastha S, Gilbert C .Causes of childhood blindness in the northeastern states of India. I J O. 2008 Nov-Dec;56(6):495-9.
6. Mirdehghan S A, Dehghan M H, Mohammadpour M, Heidari K, Khosravi M. Causes of severe visual impairment and blindness in schools for visually handicapped children in Iran. B J Ophthalmol 2005;89(5):612–14.
7. Kalua K, Patel D, Muhit M, Courtright P. Causes of blindness among children identified through village key informants in Malawi. Can J Ophthalmol. 2008 Aug;43(4):425-7.
8. Kemmanu V, Hegde K, Giliyar SK, Shetty BK, Kumaramanickavel G, McCarty CA. Prevalence of Childhood Blindness and Ocular Morbidity in a Rural Pediatric Population in Southern India: The Pavagada Pediatric Eye Disease Study-1. Ophthalmic Epidemiol. 2016 Jun;23(3):185-92.
9. Kohn BA: The Differential Diagnosis of Cataracts in Infancy and Childhood. Am J Dis Child 1976;130:184-92.
10. Lambert SR, Amaya L, Taylor D. Detection and treatment of Infantile Cataracts. Int Ophthalmol Clinics 1989;29:51-6.
11. Merin S, Crawford JS. The Etiology of Congenital Cataracts. Can J Ophthalmol 1971;6:178-82.
12. Saebo J. An investigation into the mode of heredity of Congenital and juvenile cataracts. Br J Ophthalmol 1949;33:601-29.
13. Lambert S, Hoyt C. Ocular manifestations of intrauterine infections. In: Taylor D ed. Pediatric Ophthalmology, Blackwell;1990:91-102.

14. Gitzelmann R. Hereditary galactokinase deficiency, a newly recognized cause of juvenile cataracts. Pediatr Res 1967;1:14-23.
15. Segal S. Disorders of galactose metabolism. In: Scriver CR et al. eds. The metabolic basis of inherited disease, McGraw-Hill, New York 1989:453-80.
16. Johnson SS, Nevin NC. Ocular manifestations in patients and female relatives of families with the oculocerebrorenal syndrome of Lowe. Birth Defects 1976;12:567-72.
17. Alden ER, Kalina RE, Hodson WA: Transient cataracts in low birth weight infants. J Pediatr 1973;82:314-18.
18. Karr DJ, Scott WE: Visual acuity results following treatment of persistent hyperplastic primary vitreous. Arch Ophthalmol 1986;104:662-7.
19. Crawford JS, Morin JD: The Lens. In: Crawford JS, Morin JD eds. The eye in Childhood, Grune and Stratton 1982:259-287.
20. Yi J, Yun J, Li ZK, Xu CT, Pan BR. Epidemiology and molecular genetics of congenital cataracts. Int J Ophthalmol. 2011;4(4):422–32.
21. Wirth MG, Russell-Eggitt IM, Craig J E, Elder JE, Mackey DA. Aetiology of congenital and paediatric cataract in an Australian population. Br J Ophthalmol 2002;86:782-86.
22. Eckstein M, Vijayalakshmi P, Killedar M, Gilbert C, Foster A. Aetiology of childhood cataract in south India. Br J Ophthalmol. 1996 Jul;80(7):628-32.
23. Jain IS, Pillay P, Gangwar DN, Dhir SP, Kaul VK. Congenital cataract: etiology and morphology. J Pediatr Ophthalmol Strabismus. 1983 Nov-Dec;20(6):238-42.
24. Johar SR, Savalia NK, Vasavada AR, Gupta PD. Epidemiology based etiological study of pediatric cataract in western India. Indian J Med Sci. 2004 Mar;58(3):115-21.
25. Angra SK. Etiology and management of congenital cataract. Indian J Pediatr. 1987 Sep-Oct;54(5):673-7.
26. Gregg NM. Congenital cataracts following German measles in mother. Trans Ophthalmol Soc Aust 1941;3:35-46.