Childhood blindness and associated factors: An observational study at the district disability rehabilitation centre, West Tripura district, India

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ABSTRACT

Background: In India, about 50% of all childhood blindness is either preventable or treatable. Hence, controlling childhood blindness may be an effective way to reduce blindness in this country in the long run. Strategies to combat childhood blindness require accurate data regarding its magnitude, distribution, and determinants in a population. In this regard, district disability rehabilitation centres (DDRC) are working in India to diagnose and rehabilitate the subjects with blindness of various degrees. Objectives: The objectives of the study are to estimate the proportion of childhood blindness among the visually challenged subjects registered under the DDRC of West Tripura district, to find out the different ocular morbidities in this population and to study the factors associated with these disabilities. Materials and Methods: This facility-based cross-sectional study was conducted using secondary data from 2,260 visually challenged subjects enlisted in the DDRC of West Tripura district of India from June 1, 2018, to May 31, 2020. Results: The proportion of childhood blindness was found to be 3.89% (88) among the visually challenged subjects catered by the DDRC of West Tripura district. About 68.18% of the study subjects belonged to the lower socio-economic class as per BG Prasad's socio-economic classification, 39.77% subjects had 30% blindness and 15.90% subjects had 100% blindness. Among these 88 cases (134 eyes) of blindness, 20.14% were refractive error, 7.50% corneal opacities, 12.68% phthisis bulbi, 3.73% congenital cataract and pseudophakia, 2.98% congenital glaucoma, 23.88% congenital globe anomalies, 8.20% retinal diseases, 11.94% nystagmus and 8.95% were due to miscellaneous causes. Conclusion: Childhood blindness is still a public health problem in this part of India. Congenital globe anomalies were found to be the commonest cause followed by refractive errors.

Keywords: Blindness, childhood, disability, rehabilitation

Introduction

Any blindness during the period starting from birth to 16 years of age is labeled as childhood blindness. According to the World Health Organization (WHO), blindness is the best-corrected visual acuity of <3/60 in the better eye and a severe visual impairment is the best-corrected visual acuity of <6/60 in the better eye but equal to or better than 3/60.¹ Childhood blindness is a public health problem. If left untreated, it hampers study, growth and overall development of the child. Such children instead of supporting the family and nation in future become a burden for both. The WHO has identified few major causes of blindness that require immediate attention for achieving the goals of Vision 2020. The target diseases identified for intervention under Vision 2020 initiative in India include cataract, childhood blindness, refractive error and low vision, corneal blindness,
Table 1: Blindness by socio-demographic characteristic of the study subjects (n=88 subjects)

| Socio-demographic characteristic | Visual disability |
|----------------------------------|-------------------|
| Variables                        | Subgroup          | Number | Percentage |
| Age group                        | 0-5 years         | 2      | 2.27       |
|                                 | >5-10 years       | 15     | 17.05      |
|                                 | >10-16 years      | 71     | 80.68      |
| Sex                              | Male              | 41     | 46.59      |
|                                 | Female            | 47     | 53.41      |
| Residence                        | Urban             | 27     | 30.68      |
|                                 | Rural             | 51     | 60.00      |
| Socio-economic status            | Upper class       | 2      | 2.27       |
|                                 | Middle class      | 26     | 29.55      |
|                                 | Lower class       | 60     | 68.18      |
| Literacy of the head of family   | Illiterate        | 4      | 4.55       |
|                                 | Primary educated  | 59     | 67.04      |
|                                 | Secondary and above | 25  | 28.41      |

Table 2: Different ocular morbidities among cases of childhood blindness (n=134 eyes)

| Morbidities                        | No. of eyes | Percentage |
|------------------------------------|-------------|------------|
| Refractive error                    | 27          | 20.14      |
| Corneal opacity                     | 10          | 7.50       |
| Phthisis bulbi                      | 17          | 12.68      |
| Congenital anomalies of eye         | 32          | 23.88      |
| Congenital cataract and pseudophakia| 5           | 3.73       |
| Congenital glaucoma                 | 4           | 2.98       |
| Retinal diseases                    | 11          | 8.20       |
| Nystagmus                           | 16          | 11.94      |
| Others                             | 12          | 8.95       |

Table 3: Degree of blindness among the study subjects (n=88 subjects)

| No. of subjects | Percentage of blindness |
|-----------------|-------------------------|
| 14 (15.90%)     | 100                     |
| 3 (3.40%)       | 80                      |
| 12 (13.63%)     | 75                      |
| 3 (3.40%)       | 60                      |
| 21 (23.90%)     | 40                      |
| 35 (39.77%)     | 30                      |

Diabetic retinopathy, glaucoma and trachoma (focal). With the growth of health care facilities and availability of specialized eye care services, numerous blindness cases are treated regularly. But to control this problem, primordial and primary preventive strategies in the form of proper antenatal care, neonatal eye screening, paediatric surgical services and proper refraction strategies are also required. To design proper control measures, accurate epidemiological data regarding prevalence and risk factors for blindness and severe visual loss in children are essential. DDRCs are established throughout the nation for screening disabilities, including blindness, in the community. Apart from offering curative and rehabilitative services, they also issue disability certificates to the disabled subjects for enabling them to avail special benefits. The DDRC of West Tripura district organizes periodic camps in different places of the district throughout the year for identifying disabilities including blindness and provides curative and rehabilitative services including issuance of disability certificates for availing government benefits. Visual aids are also distributed to the eligible subjects. The attending subjects are routinely examined by the ophthalmologists using torchlight, slit lamp and dilated fundoscopy by a direct ophthalmoscope as per the requirement to make diagnosis, followed by treatment if required, and are also issued disability certificates. DDRCs are constantly in touch with the children who are visually challenged and maintain data regarding them. In this context, the present study was designed in collaboration with the DDRC of West Tripura district with the objectives to estimate the proportion of childhood blindness (<16 years) among the visually challenged subjects registered under the DDRC of West Tripura district, to find out the different ocular morbidities in this population and to study the factors associated with these disabilities. This will generate baseline information regarding the problem of childhood blindness and also reveal the associated factors, which may be taken up for addressing by the policy makers.

Materials and Methods

This facility-based cross-sectional study was conducted from June 1, 2018, to May 31, 2020, using secondary data of 88 cases (134 eyes) of childhood blindness (<16 years of age) maintained in the DDRC of West Tripura district of India. The DDRC of West Tripura district organized numerous eye screening camps throughout the district during the preceding year. In these camps, visual acuity was estimated by using Snellen's chart, and the best-corrected visual acuity of all the disabled persons were recorded after refraction. Data for the present study were extracted from the records maintained by the DDRC using a pretested proforma. During the study period, the DDRC of West Tripura district identified and catered to 88 cases (134 eyes) of childhood blindness (<16 years of age), and all these cases were included in this study. The proforma had provisions for recording information regarding treatment in different eye hospitals both inside and outside the state, including outcome, associated comorbid conditions, socio-demographic information and clinical examination findings. Prior permission from the competent authority of the DDRC of West Tripura district was obtained for accessing data and subsequent publications. Data were dealt with confidentiality, and extreme care was taken to not link the findings with the identity of the subjects.

Results

During the study period 2,260 subjects were identified to have some sort of visual disabilities and were issued disability certificates following the norms. The proportion of childhood blindness (<16 years) among the visually challenged subjects registered under the DDRC of West Tripura district was found to be 3.89%. Out of the total visually disabled subjects, 88
subjects were aged <16 years. Among the children, 46.59% (41) were male and 30.68% (27) were from the urban areas. Among these children, 2.27% (2) were aged between 0 and 5 years, 17.05% (15) were aged between >5 and 10 years and 80.68% (71) were aged between >10 and 16 years. Regarding socio-economic status, 2.27% (2) children belonged to upper socio-economic class, 29.55% (26) to middle class, and 68.18% (60) to lower socio-economic class as per BG Prasad’s socio-economic classification [Table 1].

Regarding the degree of blindness, majority of the subjects (35 children) had 30% blindness and 15.90% (14 children) had 100% blindness. Both eyes were found to be affected in 52.27% of the cases (46 children). Among 88 patients (134 eyes), majority, that is, 23.88% (32 eyes) had congenital anomalies, followed by 20.14% refractive errors (27 eyes), 12.68% had phthisis bulbi (17 eyes) and 8.20% (11 eyes) had retinal diseases [Table 2].

The congenital anomalies included microphthalmos (11.19%), anophthalmos (4.47%), microcornea with iris coloboma (4.47%) and iris coloboma (3.73%). The refractive errors included myopia, hypermetropia and amblyopia. Retinal disease included congenital retinal dystrophy, chorio-retinal degeneration, Coats disease, retinopathy of prematurity and traumatic maculopathy. Corneal opacities following injury and infections were found in 10 eyes (7.46%) [Table 3].

Out of total, 11.94% of the blindness (16 cases) was associated with nystagmus. Among the study eyes, 3.73% (five) had congenital cataract, and out of these three were operated. Congenital glaucoma was associated with 2.98% (four eyes) of the cases. Others like squint, ptosis, enucleated eye, eviscerated eye and anterior staphyloma were associated with 8.95% of the blindness (12 eyes) [Table 4].

Table 4: Etiology of childhood blindness (n=134 eyes)

| Etiological factors                  | Number of eyes | Percentage |
|--------------------------------------|----------------|------------|
| Genetic factors                      | 20             | 14.92      |
| Maternal/intrauterine factors        | 6              | 4.47       |
| Prematurity                          | 2              | 1.49       |
| Eye infection                        | 18             | 13.43      |
| Eye injury                           | 14             | 10.44      |
| Uncorrected refractive errors        | 14             | 10.44      |
| Unknown factors                      | 60             | 44.81      |

Discussion

Congenital globe anomalies

Anatomical causes of childhood blindness include developmental defects in the cornea, lens, retina and globe. In the present study, majority of the childhood blindness had congenital anomalies of eye (23.88%, 32 eyes) and the cases involving globe were anophthalmos (4.47%), microphthalmos (11.19%), microcornea with iris coloboma (4.47%) and iris coloboma (3.73%). Similarly, Garg et al. found microphthalmos and anophthalmos as the important causes of childhood blindness in India and Sri Lanka. In the present study also congenital globe anomalies were found to be the major factors. Apart from hereditary factors, various teratogenic factors (toxins or maternal deficiencies) might have been responsible for the causation of these anomalies in this population.

Refractive errors

Refractive errors constituted the second largest group of blindness (27 eyes, 20.14%) in this study, which are amenable to correction of refractive errors in time. Timely correction of refractive error is important for preventing the development of amblyopia. The present study has revealed that the failure of timely correction of refractive error in children and lack of awareness among the parents were contributing to visual impairment in the study population. Jose and Sachdeva in their study, have demonstrated that timely correction of refractive errors could prevent future development of amblyopia.

Phthisis bulbi

In this study, 12.68%, 17 eyes, had phthisis bulbi as a consequence of either infection or injury to the eye. This may be due to lack of awareness of the parents and delay in initiating treatment. Many of the times, minor eye injuries are ignored by the parents leading to infection and further complications in the future.

Retinal diseases

In this study, 8.2%, 11 eyes, suffered retinal diseases leading to childhood blindness. In the majority of such cases, very less can be done to improve the vision as the underlying causes are mainly hereditary and congenital in nature.

Attention has to be paid in early diagnosis and treatment for retinopathy of prematurity as it is a preventable cause of blindness. Foster, in his study, found that the current important causes of retinal blindness in India and Sri Lanka are hereditary retinal dystrophies. Many of these dystrophies are autosomal recessive and therefore difficult to prevent by means of genetic counseling. Retinopathy of prematurity is still a rare cause of childhood blindness which occurs in children born with birth weight of less than 1,500 g.

Cataract in childhood

The present study has found that out of five cases of congenital cataract, three were operated. In them, postoperative visual outcome was poor as the surgery was performed late.

Prevention of blindness is focused on the prompt detection and treatment of visually significant lenticular opacities before deprivation amblyopia becomes irreversible.
Rubella infection in pregnancy is an important cause of congenital cataract. The study conducted in Madurai[6] has reported that approximately one quarter of all cataracts in the first year of life were due to rubella infection in pregnant mothers.

Other causes of cataract in childhood include hereditary factors (approximately one quarter of all cases) and 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. A study conducted by Gilbert and Foster[7] has found that rubella immunization under universal immunization program has brought down the childhood blindness due to intrauterine causes among the babies born to the vaccinated women.

Nystagmus

In this study, nystagmus was present in 11.94%, 16 eyes, and were associated with other eye diseases. One child had albinism. Nystagmus is difficult to treat, and evaluation of nystagmus was also not performed in them in due time. Attention towards education and rehabilitation with low visual aids are helpful in such cases.

Lack of low vision services

Foster[9] recommended that children with a visual acuity of <6/60 should be fully assessed by a team consisting of paediatric ophthalmologist, an optometrist with low vision experience and a low vision therapist. Deployment of such team is important in diagnosis, assessment and prescription of optical devices for children with severe visual impairment. The role of therapist is essential in training and motivating the child in using low vision aid to achieve the maximum benefit. Unfortunately, all these were deficient in the present setting, which might have contributed to the burden of childhood blindness.

Other factors

The present study has found the prevalence of childhood blindness to be slightly higher in female though the study population did not differ much in sex ratio (41 males and 47 females). The present study had a small sample size hence studies with larger sample sizes are required to investigate these factors. Childhood blindness was more prevalent among the low and middle socio-economic groups. Evidence showed that congenital glaucoma is a rare visual problem, which is also consistent with the findings of the present study (2.98%). Blindness due to corneal diseases occurs mainly due to congenital causes such as corneal dystrophy, infection, injuries, vitamin A deficiency, and so on. In the present study, childhood blindness due to corneal diseases was found to be less in number. It may be due to high coverage of vitamin A supplementation program and other community nutrition programs. A systematic review conducted by Wadhwani et al.[8] has shown that causes of childhood blindness in India have shifted from mainly corneal causes to whole globe abnormalities. On the contrary, Kubrey and Jareda,[9] in their study, have found that corneal pathologies (31.91%) were the leading cause of blindness followed by congenital globe anomalies (23.40%), trauma (14.89%) and congenital cataract (12.77%).

Conclusion

The present study has found the problem of childhood blindness to be 3.89% among the subjects registered with visual disabilities in the DDRC of West Tripura district. Regarding different ocular morbidities, congenital globe anomalies were found to be the commonest followed by refractive errors in this population. Majority of the blindness was untreatable. Female children and those belonging to the low and middle socio-economic groups were mostly affected by blindness. Late reporting for correction of refractive errors was found to be one of the contributory factors of blindness in this population. Primary care physicians, who are often the first point of contact with the cases of childhood blindness in a country like India, will be sensitized by the findings of this study that early detection and timely referral of children with visual impairment may be the turning point in restoring vision.

Recommendation

Early correction of refractive errors may help in reducing the burden of childhood blindness in this population. Proper antenatal checkup, genetic counseling and avoiding consanguineous marriages may help in preventing congenital globe anomalies, which were found to be common in this population.

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Conflicts of interest

There are no conflicts of interest.

References

1. Haque OI, Rizvi SA, Aktar N, Maheshwari R, Warris A. Incurable childhood blindness in India: A review. ARC Int J Ophthalmol 2019;4:9-12.
2. Khurana AK. Comprehensive Ophthalmology. 5th ed. New Age International Pvt. Ltd. New Delhi; 2012 p. 477, 482.
3. Wadhwani M, Vashist P, Singh SS, Gupta V, Gupta N, Saxena R. Prevalence and causes of childhood blindness in India: A systemic review. Indian J Ophthalmol 2020;68:311-5.
4. Garg P, Qayum S, Dhingra P, Sidhu HK. Congenital ocular deformities: Leading cause of childhood blindness-A clinical profile study. Indian J Clin Exp Ophthalmol 2016;2:22-7.
5. Foster A. Childhood blindness in India and Sri Lanka. Comm Eye Care 1996;44:57-60.
6. Jose R, Sachdeva S. School eye screening and the national program for control of blindness. Indian Pediatr 2009;46:205-8.
7. Gilbert C, Foster A. Blindness in children: Control priorities and research opportunities. Br J Ophthalmol 2006;85:1025-7.
8. Wadhwani M, Vashist P, Singh SS, Gupta V, Gupta N,
Saxena R. Prevalence and causes of childhood blindness in India: A systematic review. Indian J Ophthalmol 2020;68:311-5.

9. Kubrey SS, Jareda J. Clinical profile of childhood blindness in a tertiary eye care centre in central India. Indian J Clin Exp Ophthalmol 2018;4:503-6.