

# Prevalence of Childhood Blindness in State of Jharkhand, a Region of Eastern India

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## ABSTRACT

**Introduction:** Childhood blindness is a global problem in developing countries. We have over one fourth of total blind population worldwide and the number is still increasing. 22-100 new children per million of total population get added to blind population per year in India. This study was undertaken to estimate the prevalence of childhood blindness in the state of Jharkhand for public health interest. Data in this regard is lacking in our country, particularly in eastern region of India.

**Material and methods:** It was a prospective, hospital based study done in Regional Institute of Medical Sciences, Ranchi, a tertiary care teaching institute in Jharkhand. The study was done from July 2015 to December 2016. Children under 16 years of age were included in this study. Comprehensive eye examination was done in every child and best corrected visual acuities were recorded under standardized conditions with LogMar chart. Children under 3 years and those who cannot understand the 'E chart' were assessed for their ability to fix and follow the light at objects. The diagnosis was based on clinical examination and was assisted by sophisticated investigations like electroretinography, neuroimaging of the brain with CT scan and pathological tests.

**Results:** A total number of 48627 patients were examined in aforesaid period, out of which 12103(24.8%) were children. Boys (58.8%) outnumber the girls (41.7%). Majority of the children (60.7%) having visual impairment were from urban background. Present study revealed that 21.2% children were visually impaired. The incidence of childhood blindness was 1.71%. 14.2% children had low grade of visual impairment and 5.2% of children had moderate visual impairment.

**Conclusion:** As far as prevalence of childhood blindness in this eastern part of India is concerned, more than two third (71.5%) of children has visual impairment due to refractive error which can be easily treated and 83.7% of childhood blindness was due to avoidable causes, of which injury was the leading cause (5.6%), followed by vitamin A deficiency and malnutrition (4.4%) and infection (2.1%). Remedial measures should be taken to improve the visual status of children to lower the incidence of childhood blindness. Regular school health and population screening can be a major step in planning for its prevention and cure.

**Keywords:** Childhood blindness, Visual impairment, Refractive error, Congenital cataract.

## INTRODUCTION

Childhood blindness is one of the priority targets of vision 2020.<sup>1,2</sup> It is a global problem especially in developing countries. In comparison to adults, blindness in children is a life time sentence. Furthermore disturbing is the fact that nearly two third of childhood blindness is preventable and many a times it goes unnoticed and irreversible. Thus it is an outstanding problem in the field of ophthalmology, posing a great challenge to the medical profession in general and ophthalmologist in particular.

## Magnitude of problem in India

WHO has estimated that there are 1.4 million blind children in the world, two third of whom lives in the developing countries.<sup>3,4</sup> The magnitude of problem in our country is much higher, this can be gauged from the fact that nearly 12 million blind persons are in India which amounts to one fourth of blind population worldwide. The incidence of childhood blindness can be determined by several factors, which can be geographical locations, socio economic status, and available health care facilities.<sup>5-8</sup> The prevalence of childhood blindness in high income countries of the world such as Europe, USA, Canada and Japan is estimated to be 0.3-0.4/1000 children. In middle income countries, comprising Western pacific region, it is about 0.2-0.7/1000 children. In low income countries comprising Asia it is estimated 0.9/1000 children while in very low income countries including Africa is roughly 1.2/1000 children<sup>4</sup>.

Very few surveys has been conducted in India to know the exact prevalence of childhood blindness, yet based on different studies, there are approximately 2 million blind children in India. Probably, 22-100 new children per million of total population get added to blind population per year.

## Impact of childhood Blindness

Though incidence of childhood blindness is only 4% of total blindness, however, it produces an enormous effect on the health and economy of an individual, family, society, and nation as a whole, as the number of blind years (active productive life) is much greater compared to blindness in adult. Thus in place of contributing to economy, they became the burden on the family. The economic burden of childhood blindness in India is enormous, as having agriculture based economy, most of the children become unable to be a productive member of the community. On the contrary, they take away nearly 10% of the productive time of the economically productive member of the family.

## Causes

The etiology of childhood blindness is multifactorial and is determined by anatomic disturbances, which can be summarized as

1. Corneal abnormalities, resulting from malnutrition,

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- Vitamin A deficiency, infection, malnutrition, trauma, etc.
- 2. Childhood cataract,
- 3. Anomalies of globe, anophthalmos, microphthalmos,
- 4. Retinal disease, comprising retinal dystrophies, retinopathy of prematurity, retinoblastoma,
- 5. Refractive errors, strabismus, amblyopia,

#### Depending upon nature of cause, it can be

- 1. Trauma,
- 2. Infection,
- 3. Vitamin A deficiency and malnutrition
- 4. Hereditary,
- 5. Refractive error,
- 6. Excessive use of modern electronic gadgets, like computers, laptops, mobile, etc.

Due to sparingly available data on incidence of childhood blindness in this region of India, this study was undertaken to estimate the prevalence analysis of blindness in the state of Jharkhand for public health interest.

### MATERIAL AND METHODS

It was a prospective, hospital based study done in Regional Institute of Medical Sciences, Ranchi, a tertiary care institute, which being the state capital of Jharkhand state in eastern part of India receives patients from all over the state. The study was done from July 2015 to December 2016. The study was conducted under the aegis of declaration of Helsinki and permission to conduct the study was taken from Institutional Ethics Committee of RIMS, Ranchi.

A total of 12103 children under 16 years of age were included in this study. Comprehensive eye examination was done in every child. Best corrected visual acuities were recorded under standardized conditions with LogMar chart.<sup>10</sup> Children less than 3 years of age and those who cannot understand the 'E chart' were assessed for their ability to fix and follow the light at objects. Anterior segment examination was done with slit lamp bio-microscopy, intraocular pressure was measured with noncontact tonometer. Assessment of pupillary response was done and pupil was dilated with 1% cyclopentolate repeated three times at 5 minutes interval. In children less than 1 year, atropine 1% ointment was used. Retinoscopy with streak retinoscope was performed. Dilated posterior segment examination including fundus examination was done using direct and indirect ophthalmoscope.

The diagnosis was based on clinical examination and was assisted by sophisticated investigations like electroretinography, neuroimaging of the brain with CT scan and pathological tests. Photographic documentation was done for any anterior or posterior segment pathology.

#### Criteria for childhood blindness

A child is defined by UNICEF as an individual less than 16 year of age.

Blindness is defined by world health organization (WHO) as a corrected visual acuity less than 3/60 in the better eye or actual visual field of less than 10 degree.<sup>11</sup>

A person is referred as visually impaired when the vision in better eye is 6/60 to 3/60.

#### The visual impairment is further graded as

- A. *Low*: 6/9 to 6/60 in the better eye

- B. *Moderate*: 6/60 to 3/60 in the better eye

- C. *Severe*: 3/60 to perception to light in the better eye

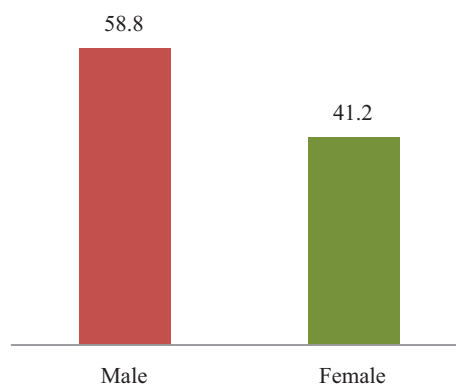
### STATISTICAL ANALYSIS

Microsoft office 2007 was used for the statistical analysis. Descriptive statistics like mean and percentages were used for the statistical analysis.

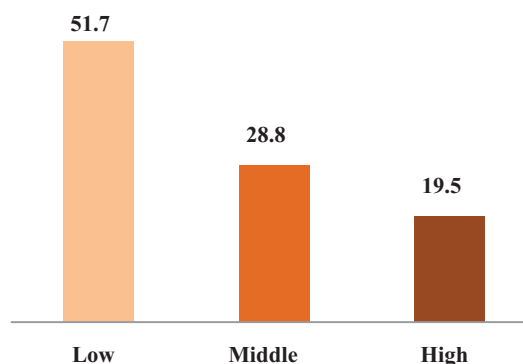
### RESULTS

A total of 48627 patients were examined in aforesaid period, out of which 12103(24.8%) were children. Boys (58.8%) outnumber the girls (41.7%) (Graph 1). About 51.7% children belong to low socio-economic group, while 28.8% and 19.5% were from middle and high socio economic group respectively (Graph 2). Majority of the children (60.7%) having visual impairment were from urban background (Graph 3).

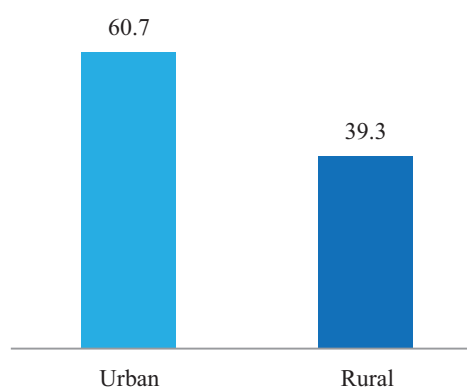
Present study revealed that 21.2% children were visually impaired. The incidence of childhood blindness was 1.71% (visual acuity in better eye <3/60), while 14.2% children had



Graph-1: Sex ratio (%)



Graph-2: Socio economic status (%)



Graph-3: Urban: rural background (%)

low grade of visual impairment (visual acuity between 6/9 to 6/60 in the better eye) and it was moderate in 5.2% of children (visual acuity between 6/60 to 3/60 in the better eye).

The majority of childhood blindness was due to retinal abnormalities (0.9%), followed by eyeball malformations (0.4%), corneal disease (0.2%), cataract (0.5%) and refractive error (0.12%) respectively.

Refractive error was the most common treatable cause of visual impairment (71.5%), as majority of them (99.5%) improved with appropriate visual corrections, only 0.12% of total screened children were bilaterally blind which were found to be due to amblyopia, squint, myopic, degenerative disease, cortical blindness and others. Childhood cataract was responsible for blindness in 7.7% of children, amongst which majority of them (92.8%) were not operated while rest were blind either due to post operative complications, aphakic, amblyopic or dense posterior capsular opacification.

Corneal disease, either due to corneal opacity, degeneration, staphyloma, was the second most common cause of visual impairment (12.4%). Retinal affection in the form of dystrophies, retinopathy of prematurity, retinoblastoma and others were responsible for 7% of visual impairment with a highest number of childhood blindness (57.7%). Eyeball malformations (Ankyloblepharon, microphthalmos) were responsible for 1.4% of visual impairment, with second highest in cases of bilateral blindness (0.4%).

After refractive error (71.56%), congenital and developmental defect of the eye occupies second in list of childhood blindness (13.4%). It was followed by malnutrition and vitamin A deficiency (5.6%), ocular injury (4.4%), infection of eye (2.1%) and hereditary factor (2.7%).

## DISCUSSION

Incidence or prevalence and causes of childhood blindness is usually obtained by population based survey. However large number of sample size is needed to have an accurate data. Thus it was perceived that the children coming from all regions of the state of Jharkhand in this tertiary care eye hospital seeking redressal of their eye problem may be taken as an indicator for prevalence of and cause of blindness in children.

The incidence of the childhood blindness in this eastern part of India was found to be 1.7% (best corrected visual acuity <3/60), while prevalence of visual impairment was 21.1%, Dorairaj et al<sup>7</sup> and Dandona and Dandona et al<sup>8</sup> in their population based survey found the prevalence of childhood blindness as 1.06/1000 and 1.7/1000 respectively. Vasudha kemmam et al<sup>9</sup> also found an incidence of 1.6/1000. The National average of prevalence of childhood blindness in India is 0.8/1000.<sup>12</sup> The higher rate of blindness may be attributed to poor healthcare delivery system, poor transport facility and belief of local population in getting delayed or no treatment and indigenous treatment by unqualified doctors.

There is marked regional variation in prevalence of visual impairment in India. This may be due to imbalance in social, economic and available healthcare infrastructure in different parts of the country. The prevalence of visual impairment in this study is found to be 21.1%, while the various writers reported incidence in the range of 15.41%<sup>13-17</sup> (Table 1)

The study done by Dandona and Dandona et al<sup>18</sup> showed female

to outnumber male in contrast to our study (Boys 58.8%), which can be due to higher number of male population in this region and also girls being less privileged in getting treatment.

Retinal disorders, was the major cause of childhood blindness (7%), which account for highest incidence (57.6%) of bilateral blindness (0.9% of the total screened population). Pavagada Pediatric Eye Disease Study-1, done by Vasudha Kemmam et al<sup>9</sup> found retinal disease in 23% while Dandona et al<sup>8</sup> and Dorairaj et al<sup>7</sup> reported incidence of 16.7% and 14.3% respectively. Retinal dystrophy and retinopathy of prematurity was the leading causative factor. Retinal dystrophy with an autosomal recessive inheritance pattern is the most severe cause of childhood blindness at an early stage.<sup>19</sup> The presence of autosomal recessive retinal dystrophy can be explained by the presence of consanguineous marriage.<sup>20-21</sup> The association between consanguinity and recessive inheritance is well known and has been described as early as 1902.<sup>22</sup>

Congenital anomalies of globe either due to anophthalmos or microphthalmos are found to be responsible for 17.8% of bilateral blindness. V Kemmam et al<sup>10</sup> reported 11.11% of blindness in children due to whole globe anomalies, while Dandona and Dandona et al<sup>9</sup>, found 16.7%, Patel et al 19.2%, Gao et al 22.4% respectively.<sup>13-14</sup>

Corneal abnormalities (12.4%) constitute the second largest group of visual impairment, responsible for 11.5% (0.5% of total screened children) of bilateral blindness in children. It was surprising to note that ocular trauma and infection are the leading cause following vitamin A deficiency and malnutrition. This can be due to higher incidence of measles and infection not properly treated in early stage, use of harmful traditional medicines and being an industrial belt with a major tribal population, injury is a very common occurrence. Further due to Government of India sponsored vitamin A supplement programme there is marked decrease in vitamin A deficiency abnormalities specially blindness.<sup>23</sup>

Childhood cataract either due to infections (Rubella), hereditary<sup>24</sup> or traumatic aetiology constitutes 7.7% of childhood blindness and was responsible for 6.4% (0.12% of total screened children) of bilateral blindness. The infectious etiology can be explained by poor immunization of women in reproductive age group against Rubella. Studies of different group in India indicate that Rubella was found to be susceptible in 15-38.7% of adolescent and child bearing age in India.<sup>25</sup> The genetic etiology can be explained by high rate of consanguineous marriage in the region<sup>20,21,26</sup> and also due to less number of pediatric cataracts, surgeon and other para ophthalmic personnel responsible for childhood cataract management follow up and rehabilitation of

Study	Prevalence of Visual impairment
Present Study (2016)	21.1%
Patel et al (2011) <sup>13</sup>	19.7%
Gao et al (2011) <sup>14</sup>	19.2%
Bhattacharjee et al (2006) <sup>15</sup>	36.1%
Dorairaj et al (2008) <sup>7</sup>	35.7%
Gogate et al (2007) <sup>16</sup>	41.3%
Dandona and Dandona et al (2003) <sup>18</sup>	16.7%
Titilal et al (2003) <sup>17</sup>	27.4%

**Table-1:** Prevalence of Visual impairment

childhood cataract.

Refractive error (71.5%) was the most common treatable cause of visual impairment, which was responsible for only 5.9% (less than 0.1% of total screened children) of bilateral childhood blindness.

In this series, 83.7% of childhood blindness was due to avoidable causes, of which injury was the leading cause (5.6%) followed by vitamin A deficiency and malnutrition (4.4%) ocular trauma was by far the most common cause of avoidable blindness in this region, as it is a major industrial and tribal area with dense forest. Attack by wild animal was found to be the major cause of ocular trauma. Congenital and developmental anomaly was the major cause (13.7%) of non-avoidable blindness, followed by hereditary disorders (2.7%).

### Limitations

As it is a hospital based study, therefore it only provides a rough estimate of incidence and causes of childhood blindness in the eastern belt of India. However a larger population based survey is required to know the accurate incidence and pattern of childhood blindness.

### CONCLUSION

The following measures are being suggested to improve the visual status of children to lower the incidence of childhood blindness.

Regular school health check up and population study to identify the cause and changing pattern of childhood blindness, which can be a major step in planning for its prevention and cure. Since a major cause of childhood blindness is due to refractive error requiring free distribution of spectacles and other vision increasing apparatus. As congenital cataract is most important treatable cause so early surgery should be planned and long term follow up is needed. Appropriate rehabilitation and low vision services should be provided. Specialized paediatric ophthalmic units should be established at district headquarters. Improvement in adequate healthcare delivery system to refer patient early from PHC level to tertiary care level.

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