Original Article ISSN (O):2395-2822; ISSN (P):2395-2814

Pattern of Ocular Morbidity among Children Referred Through a National Screening Program in a Tertiary Hospital in Northern India.

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Received: October 2016
Accepted: November 2016

ABSTRACT

Background: The Rashtriya Bal Swasthya Karyakram (India) is directed towards achieving universal health coverage among children by early detection of diseases. Under the scheme, children are screened at the level of schools and community and are thereafter referred to tertiary centre. The purpose of study was to identify common causes of ocular morbidity in children screened and referred through this national screening program. **Methods:** Retrospective analysis of records of all children who presented to our centre with ocular problems over a period of one year (2015) was undertaken. Clinical diagnosis was recorded on a seven point scale based on major anatomical involvement. An analysis of causes of visual impairment was undertaken with a special emphasis on avoidable and treatable causes. **Results:** A total of 851 subjects presented with ocular problems (mean age 9.5±4.9 years); of them 819 were classified into seven major clinical groups and subgroups. Most common clinical group was that of strabismus (59.9%), followed by refractive errors (16.9%), lids related disorders (6.2%), orbit and adnexal developmental defects (4.6%), lenticular (3.3%), corneal and conjunctival (3.2%) and retinal disorders (2.1%). A total of 49.7% cases had avoidable or treatable causes of visual impairment. **Conclusion:** A national program with capacity to screen and ensure appropriate referral facilities resulted in intervention in many cases with avoidable and treatable causes of visual impairment. A varied pattern of ocular morbidity was found among the referred cases; our study could provide a platform for a target oriented approach towards planning and implementation of such screening programs.

Keywords: National Screening , Ocular Morbidity.

INTRODUCTION

Ocular disorders are among the most common disabilities to affect children. These diseases not only affect visual acuity, thus causing learning disabilities in children, but could also affect their personality, quality of life and overall socioeconomic status throughout life.[1,2] Literature analysis indicates that childhood blindness varies from 1.2 per 1000 children in very low income countries to 0.3 per 1000 children in high income countries.[3] As per the WHO 'vision 2020: The right to sight program', control of visual impairment and blindness in children is a global priority.[4]

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Timely screening for early diagnosis of eye and vision related problems are vital to reduce the incidence of avoidable childhood visual impairment. The Rashtriya Bal Swasthya Karyakram (RBSK) through National Rural Health mission (NRHM), India, is directed towards achieving universal health coverage among our children by early detection of diseases.[5] Under the scheme, comprehensive care is provided to all children in the community under the age of 18 years by screening them for the various disorders and referring them to the designated tertiary level institutions. Haryana, with 21 districts, is a state in the northern region of India and borders with Punjab and Himachal Pradesh to the north and Rajasthan to the west and south. Our institute is one of the nodal centres for referral and treatment of children screened under the RBSK scheme for the state of Haryana. Our study aims at identifying common causes of ocular morbidity in children identified through this program and referred to our centre in the first year of initiation of the program. Since all of these children have been screened at community level and are from government and government-aided schools, their morbidity profile directly reflects the pattern of undiagnosed and untreated causes of ocular morbidity in our underprivileged community.

Data on prevalence of childhood ocular morbidity and visual impairment is vital to set priorities and to plan various strategies. This is especially important in a developing nation like ours so as to prioritize the limited resources. There are very few hospital based studies on the pattern of ocular morbidity. We hope that our study will provide a platform to formulate further policies and programs in a target oriented manner for planning and implementation of such screening and management programs.

MATERIALS AND METHODS

The program The Rashtriya Bal Swasthya Karyakram (RBSK) has been aimed at early detection and treatment of 30 health conditions under the 4 D's (Defects at birth, Diseases, Deficiency conditions and Developmental delay) prevalent in children.[5] The implementation mechanism is as follows:

1) Screening: Each mobile health teams consist of two medical officers (one male and one female), one Auxiliary Nurse Midwifery (ANM) and 1 paramedic person trained for computerized data management. At least 3 mobile teams are recruited in each block to screen all children enrolled in government and government aided schools and those registered with Anganwadi centres over the state of Haryana. Besides this, newborn screening is undertaken at public health facilities and screening from birth to 6 weeks through ASHAs during home visit.
2) District Early intervention Centres (DEIC): An early intervention centre has been established at the district hospital (total 21 in Haryana) whose purpose is to provide referral support to children detected with various disorders during screening.
3) Tertiary institute: Children who require tertiary care are referred to tertiary centre along with a referral card mentioning preliminary observations of the DEIC team. Treatment is provided free of cost to the child and family and cost of the institute is reimbursed as per standard protocols.[6]

The tertiary centre: Since January 2014, our centre is functioning as one of the nodal centre for referral of children screened under the scheme who require tertiary care over the state of Haryana. The children referred under the scheme present to the institute with a referral card along with the DEIC details. The RBSK team at the centre consists of an Ophthalmologist (the nodal officer–author 1), Otorhinolaryngologist, Orthopedician, Pediatrician, a Pediatric surgeon, Plastic surgeon, dentist, computer operator and patient attendant. The concerned specialist provides medical and surgical expertise to the patient as per requirements.

The Pediatric Ophthalmology services: Those children who present with ocular diseases are registered in the Pediatric Ophthalmology Services of the institute and given a unique identification number. They are then attended by a dedicated team consisting of 2 ophthalmologists (Author 1 and 4) and 1 ophthalmic assistant. Full details of the child including the details of the referring DEIC are recorded and a complete ophthalmic examination is undertaken, which consists of:

- Unaided and aided (if required) visual acuity with test suitable for age of the child, documented uniocularly and binocularly
- Refractive error by retinoscopy under dilatation / cycloplegia as per requirement
- Torch light examination
- Ocular alignment by Hirshberg and/or cover/uncover/alternate cover test
- Extraocular movements
- Dilated direct and/or Indirect Ophthalmoscopy
- Slit lamp bio-microscopy for anterior segment examination
- Examination under anaesthesia if required

A Pediatric consultation is undertaken whenever required so as to identify any systemic disease and to identify children with special needs. Following detailed clinical examination, a clinical diagnosis is established and all details are documented in records; treatment is planned as required

The study protocol: A retrospective analysis of records of all children who presented under the scheme and were diagnosed with ocular disorders over a period of one year (January 2015 to December 2015) was undertaken following approval from the institutional ethical committee. Clinical diagnosis and all other relevant clinical details were noted from the files.

The World Health Organization (WHO) recommends that there should be standard methodology for reporting of cases of childhood blindness and this should be based on two criteria- anatomical site of the abnormality and underlying etiology.[7] A definite clinical diagnosis was thus established as per major anatomical involvement on a 7-point scale – Refractive error, Strabismus, Lenticular disorders, Corneal and conjunctival disorders, retinal disorders, lids related disorders and orbit and adnexal developmental defects. Those with multiple ocular diseases were classified by consideration of isolated major diagnostic criteria of the disease. For example: if a subject with bilateral cataract had strabismus, he was classified as a lenticular abnormality having associated ocular abnormalities. For this study, we have used the term ''Visual impairment'' for WHO's subnormal vision (visual acuity <6/9 to 6/18), low vision (visual acuity <6/18 to >3/60) and blindness (visual acuity ≤ 3/60). Diagnosis of visual impairment was established after allowing for a refractive adaptation of 6 weeks.

RESULTS

Subjects: A total of 851 children presented with ocular diseases in this duration; mean age was 9.5±4.9 years (range 0.5 to 18 years); 389 males and 462 females. Number of children in each age group is given in [Table 1]. District vise distribution of these 851 children is given in [Table 2]. Among them, 819 subjects could be classified into distinctive groups and subgroups; 32 subjects (including 23 cases of trauma and 9 cases of congenital nystagmus) could not be grouped into a particular anatomical category and were excluded. For further analysis in the study, 819 will be the number of included subjects.

Table 1: Number of children in different age groups

Age group (year)	n (%)
≤ 1	11 (1.3)
1 to <3	66 (7.8)
3 to <5	95 (11.2)
5 to <7	105 (12.3)
7 to <9	99 (11.6)
9 to <11	91 (10.7)
11 to <13	99 (11.6)
13 to <15	126 (14.8)
15 to 18	159 (18.7)
Total	851 (100)

Table 2: Referred cases from various DEIC

District	n
Ambala	33
Rewari	8
Karnal	46
Sonepat	251
Kurukshetra	6
Mahendragarh	15
Sirsa	7
Panipat	58
Jhajjar	220
Rohtak	94
Jind	53
Faridabad	6
Palwal	11
Hisar	1
Kaithal	42

Clinical abnormalities: Number of subjects in each clinical group and subgroup is given in [Table 3]. The most common group was that of strabismus accounting for about 60% of cases followed by refractive errors (16.9%). Among the subgroups, the most prevelant one was that of Infantile esotropia accounting for about 30% of total cases followed by Acquired exotropia (13.6%) and Infantile exotropia (8.6%). Mean age in the most common clinical groups and subgroups is given in [Table 4].

Table 3: Number of children in each clinical group* and subgroup

Group no.	Clinical group (n; %) Mean age	Subgroups
Group-1	Refractive errors (n= 144; 16.9%) Mean age: 12.85±3.30 years	Myopia (n=54; 6.3%) Hypermetropia (n=16; 1.9%) Astigmatism and mixed (n=7; 0.8%) Anisometropia (n=67; 7.9%)
Group-2	Strabismus (n=510; 59.9%) Mean age: 8.85±4.89 years	Infantile Esotropia (n=249; 29.3%) Infantile Exotropia (n=73; 8.6%) Acquired Esotropia (n=35; 4.1%) Acquired Exotropia (including IXT) (n=116; 13.6%) Congenital syndromes (n=26; 3.0%) Consecutive / Residual (n=4; 0.5%) Paralytic (n=4; 0.5%) Miscellaneous (n=3; 0.3%)
Group-3	Lenticular disorders (n=28; 3.3 %) Mean age: 10.80±4.19 years	Cataract (n=18; 2.1%) Pseudophakia (n=9; 1.1%) Aphakia (n=1; 0.1%)
Group-4	Corneal and conjunctival disorders (n=27; 3.2%) Mean age: 10.19±4.68	Corneal opacity (n=5; 0.6%) Pterygium (n=3; 0.4%) Limbal dermoid (n=17; 2.0%) Lipodermoid (n=2; 0.2%)
Group-5	Retinal disorders (n=18; 2.1%) Mean age: 6.03±5.05 years	Congenital retinal disorders (including RP) (n=14; 1.7%) Macular scar (n=2; 0.2%) Optic atrophy (n=2; 0.2%)
Group-6	Lids (n=53; 6.2%) Mean age: 8.16±4.37 years	Congenital simple ptosis (n=46; 5.4%) Complicated ptosis (n=6; 0.7%) Miscellaneous (n=1; 0.12%)
Group-7	Orbit and adnexal developmental defects (n=39; 4.6%) Mean age: 6.17±4.48 years	Congenital microphthalmos (n=29; 3.4%) Congenital anophthalmos(n=3; 0.4%) Congenital NLDO (n=7; 0.8%)

*Total n=819, 32 subjects (including 23 cases of trauma and 9 cases of congenital nystagmus) could not be grouped into a particular anatomical category and were excluded.

Table 4: Mean age in the most prevalent clinical subgroups.

Clinical subgroup	Mean age±SD (years)
Infantile Esotropia (29.3%)	7.15±4.47
Acquired Exotropia (13.6%)	9.23±2.21
Infantile Exotropia (8.6%)	7.96±4.71
Anisometropia (7.9%)	11.27±3.20
Myopia (6.3%)	9.46±2.10
Congenital Simple ptosis (5.4%)	8.34±3.31

Vision abnormalities: Visual acuity status was documented in the 819 children in whom definite clinical diagnosis was available. Visual acuity status in each group is given in [Table 5]. In 16 children visual acuity was not documented but the examining ophthalmologist had labeled 9 children with infantile strabismus as normal visual acuity based on retinoscopy reading and by ruling out amblyopia by alternate fixation; another 6 children with bilateral cataract and 1 with bilateral aphakia also were not documented for visual acuity but clinically presence of nystagmus and absence of fixation had put them in the category of binocular visual impairment. Overall visual impairment was 50.9% (436/819) [Table 5]; the most common causes for visual impairment were lenticular, retinal and orbital developmental disorders accounting for 100% of visual impairment. Excluding the retinal and orbital developmental defects, the rate of avoidable and /or treatable visual impairment was 49.7% (379/762).

Table-5: Visual acuity status in each clinical group

	Clinical group	Total N=819	Normal visual acuity Aided / Unaided	Subnormal visual acuity / Visual Impairment / Low vision: Uniocular	Binocular	Visual impairment Total N (%)
Group-1	Refractive errors	144	31	88	25	113 (78.5%)
Group-2	Strabismus	510	306*	171	33	204 (40.0%)
Group-3	Lenticular disorders	28	0	11	17#	28 (100%)
Group-4	Corneal and conjunctival disorders	27	9	18	0	18 (66.7%)
Group-5	Retinal disorders	18	0	4	14	18 (100%)
Group-6	Lids related disorders	53	37	12	4	16 (30.2%)
Group-7	Orbit and adnexal developmental defects	39	0	33	6	39 (100%)

Total n=436

- Total visual impairment (uniocular and binocular): 436/819 (53.2%)
- Excluding group-5 and group-6, total avoidable and treatable visual impairment: 379/762 (49.7%)

**Includes 9 children less than 1 year in which visual acuity could not be documented but look alternating on fixation.*

 # Includes 6 children with bilateral cataract and 1 with aphakia where visual acuity was not documented but presence of nystagmus and absence of fixation had put them in category of binocular visual impairment.

Associated abnormalities: Among the 819 children, 4.9% (n=40) had systemic associations in form of cerebral palsy (n=27), microcepahaly (n=7), Down's syndrome (n=4) and others (n=2). Sixty two children (7.6%) had other associated ocular abnormalities. Only 23 children (2.8%) had undertaken prior consultation with an ophthalmologist.

DISCUSSION

The causes of ocular morbidity and visual impairment vary across different geographical regions as they have different environmental, socioeconomic and ethnic variables. Data on prevalence of different causes of ocular morbidity from a particular region is a pre-requisite for planning preventive and curative services. There are very few hospital based studies on childhood ocular morbidity. Biswas J et al. analysed the pattern of ocular morbidity in a tertiary eye care hospital in West Bengal, India and observed that refractive errors, allergic conjunctivitis and infections of the eye are important causes of childhood ocular morbidity.[8] They emphasized that school eye screening programme should be strengthened so that visual impairment due to refractive errors could be reduced. Overall it has been reported that 21% to 25% of patients attending the ophthalmology outpatient department in India have refractive errors.[9] Demissie BS et al. analysed the pattern of ocular morbidity in children visiting a tertiary hospital in South Western Ethiopia and concluded that 97% of ocular morbidity was preventable; Infectious ocular diseases constituted the major reason of visits to the tertiary hospital in their study.[10] Santos-Bueso E et al analysed causes of childhood blindness in a developing and an underdeveloped country and concluded that causes of blindness depend on the human development index of the populations under study.[11]

In contrast to other hospital based studies, we found an unusually high incidence of strabismus (n=510; 59.9%). This could be attributed to the fact that the program is targeted towards screening of disabilities and their management at tertiary level. Other minor clinical conditions like refractive errors, conjunctivitis, vitamin A deficiency could have been taken care at primary and secondary level, thus leading to referral of only those conditions which require tertiary care. Demissie B et al. observed that 91% of children at tertiary level were seen and treated for minor ocular problems.[10]They suggested that ophthalmic services in district hospitals should handle simple clinical cases so that referral hospitals could focus on serious child care problems. Such programs like RBSK with capacity to screen and ensure appropriate referral of eye conditions that require special care had overcome this barrier, thus ensuring only those conditions, which require special care being referred to the tertiary centre.

As compared to other studies, number of cases with refractive errors was less but there were a disproportionately increased number of subjects with anisometropia (67/144; 46.5%). Approximately 2/3rd of cases (88 uniocular, 25 binocular; 113/144; 78.5%) with refractive error already had visual impairment; most obvioue cause being amblyopia (n=67), other probable obvious causes being delay in refractive adaptation especially with high correction. These again were the cases, which actually required expert tertiary care.

Total percentage of subjects with visual impairment was 53.2% (436/819); 49.7% (379/762) had avoidable and treatable causes of visual impairment. In our community, ignorance and misconceptions regarding the appropriate age of intervention could account for delay in initiation of treatment. A timely intervention in such cases could have prevented visual loss. Forty percent (204/510) of subjects with strabismus had uniocular/binocular visual impairment. The most apparent causes for visual impairment in such cases could have been anisometropic and/or strabismic amblyopia and is again an important cause among avoidable and treatable causes of visual loss. Single subgroup which constituted about 1/3rd of total cases i.e. infantile esotropia (n=249; 29.3%) had an average age of presentation of 7.14±4.47 years, much higher than the appropriate age of intervention. This also hold true for infantile exotropia where also the mean age of presentation was much higher than appropriate age of treatment. It has been well accepted that an appropriate age of intervention in subjects with strabismus is vital to have a good visual prognosis and this delay in presentation could account for development of amblyopia and thereafter-visual impairment.

District vise distribution shows that though the program was initiated over the whole state, only a few districts were responsible for the majority of referral [Table 2]. A probable explanation to this could be the fact that our institute is situated in a rural area thus making accessibility a definite concern; however, since the DEIC does make arrangements for the initial transport of the patients, this barrier has been overcome to a large extent. However, accessibility could have accounted for a different choice of referral centre on behalf of the DEIC.

Our study has its own strengths and limitations. We have analyzed the morbidity profile of children who were referred to a tertiary centre during one year of a national screening program. Despite of their clinical condition, these children have not presented to the centre on themselves; it’s the mobile team, which is responsible for their screening and ensuring their referral. Their morbidity pattern thus actually represents the picture of undiagnosed and under diagnosed ophthalmic problems in our community, which truly require intervention. Once the patients with strabismus aligned well after surgery reach back to the community might lead to increased awareness of the fact that the disease is treatable and certain misconceptions may be overcome and an increased number of such children may present themselves for treatment.

We agree that there are certain limitations. Since the hospital team was not involved with screening, we cannot comment reliably about the quality of screening undertaken. Dandona et. al. have emphasized that vision screening in children should be undertaken only by adequately trained personnel who can perform refraction of reasonable quality in children with vision impairment. They also emphasized that all school aged children should be included rather than just school attending children because many of the children in developing nations do not attend school.[12] Also since a lot simple clinical conditions were taken care of at the primary and secondary level, details of which are not available to us, our data does not truly reflect the prevalence of diseases in the community level. Moreover, the program is in its initial stage and we at this stage are not aware of the exact population that has been completely screened and referral totally completed. This will take longer once screening of the whole state will be complete and referral process of all cases will be undertaken.

A large number of causes of childhood ocular morbidity are preventable and treatable and a timely screening coupled with appropriate intervention could improve their visual prognosis and lead to improvement in the socioeconomic health of the country. The study is the first of its kind giving a broad spectrum of the eye diseases thus indicating which aspects of ocular morbidities in children require more attention so as the available resources could be utilized more economically and efficiently. We hope that our data will provide a platform to formulate further policies and programs and to strengthen the ongoing programs so that as the program continues it will be able to target children with diseases at a much younger age.

REFERENCES

1. Gilbert C, Jugnoo SR, Graham EQ. Visual impairment and blindness in children. In Gordon JJ, Darwin CM, Robert AW, Sheila KW eds. The Epidemiology of Eye Diseases. 2nd ed. Arnold, London. 2003: 260-183.
2. Pizzarello L, Tilp M, Tiezzi L, Vaughn R, McCarthy J. A new school-based program to provide eyeglasses: childsight. J AAPOS. 1998 Dec;2(6):372-4.
3. Gilbert C. Changing challenges in the control of blindness in children. Eye (Lond). 2007 Oct; 21(10):1338-43.
4. World Health Organization. Programme for the prevention of blindness and Deafness, and International Agency for Prevention of Blindness. Geneva: WHO; 2000. Contract No. (WHO/PBL/00.77).
5. Operational guidelines Rashtriya Bal Swasthya Karyakram (RBSK). Child Health Screening and Early Intervention Services under NRHM. http://nrhm.gov.in/images/pdf/programmes/RBSK/Operational_Guidelines/RBSK.pdf. Last accessed online on May 30, 2015.
6. Procedures and model costing for surgeries Rashtriya Bal Swasthya Karyakram. http://nrhm.gov.in/images/pdf/programmes/RBSK/Resource_Documents/RBSK_Procedures_and_Model_costing.pdf. Last accessed online on May 30, 2015.
7. Gilbert CE, Foster A, Negrel D et al. Childhood blindness: a new form for recording causes of visual loss in children. Bull World Health Organ 1993; 71: 485-9.
8. Biswas J, Saha I, Das D, Bandyopadhyay S, Ray B, Biswas G. Ocular morbidity among children at a tertiary eye care hospital in Kolkata, West Bengal. Indian J Public Health. 2012; 56(4):293-6.
9. Goswami A, Ahmed E, Saha PL, Roy IS. An epidemiological pattern of cases of refractive errors. J Indian Med Assoc. 1979;72(10):227-8.
10. Demissie BS, Demissie ES. Patterns of eye diseases in children visiting a tertiary teaching hospital: South-western Ethiopia. Ethiop J Health Sci. 2014;24(1):69-74.
11. Santos-Bueso E, Dorronzoro-Ramírez E, Gegúndez-Fernández JA, Vinuesa-Silva JM, Vinuesa-Silva I, García-Sánchez J. Causes of childhood blindness in a developing country and an underdeveloped country. J Fr Ophtalmol. 2015; 38(5):427-30.
12. Dandona R, Dandona L, Srinivas M, Sahare P, Narsaiah S, Muñoz SR, Pokharel GP, Ellwein LB. Refractive error in children in a rural population in India. Invest Ophthalmol Vis Sci. 2002;43(3):615-22

How to cite this article: Sethi S, Aggarwal R, Reddy VS, Dabas R. Pattern of Ocular Morbidity among Children Referred Through a National Screening Program in a Tertiary Hospital in Northern India. Ann. Int. Med. Den. Res. 2017; 3(1):OT03-OT08.

Source of Support: Nil, **Conflict of Interest:** None declared