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Indian Journal of Clinical and Experimental Ophthalmology

Journal homepage: www.ijceo.org

Original Research Article

Preschool eye screening: A study in South India

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ARTICLE INFO

Article history:
Received 18-11-2021
Accepted 24-02-2022
Available online 29-06-2022

Keywords:
Ocular disorders
Preschool eye screening
Refractive errors
Strabismus

ABSTRACT

Purpose: To assess the prevalence of ocular disorders and visual disability in preschool children in Southern India and to know if preschool eye screening by ophthalmologist or ophthalmic officer is essential to be made mandatary program.

Materials and Methods: This is a preschool based prospective cross-sectional study which was adopted in 47 Anganwadi (preschool), which came under one Taluk in Karnataka Total of 1283 children were screened and examined by ophthalmologist and ophthalmic officer at general hospital, over a period of 2 months. All the children were divided into 2 groups, 0-3yrs and 3-6 years, who underwent a detailed eye examination. Children aged 3-6 yrs were also examined for refractive disorders. The pattern of refractive errors and ocular disorders etc. were studied by cross-sectional descriptive analysis of data and statistical analysis for age and gender.

Results: Among 1283 children examined, 757 were 0-3 yrs and 526 were 3-6 yrs, out of which 66 (5.2%) children with ocular disorders were detected. The commonest eye disorder in children of 3-6 yrs group was refractive error 24 (4.6%) commonest being myopia 11(2%). No statistically significant differences in the distribution of ocular disorders by age or gender were detected.

Conclusion: Screening of preschool children by an Ophthalmologist or an Ophthalmic officer detects ocular disorders and makes timely intervention possible and also prevents the development of permanent visual disability and thus prevents socioeconomic burden. A large-scale community-based preschool eye screening program in India identifies morbid eye conditions early, that are amenable to cure and prompt rehabilitation.

1. Introduction

India is a country of 1.3 billion people. Over 25% of them are school going children (6-14yrs).[1] In 2011, the total number of children in the age-group 0-6 years was reported as 158.79 million(12.2%). National program for control of blindness (NPCB) was initiated by Ministry of Health and Family Welfare, Government of India in the year 1976 and school eye screening program became the integral part of the NPCB since 1994. Vision screening is done only after enrolment to school. Preschool-age children constitute a particularly large and vulnerable group where uncorrected refractive errors will have an impact on learning capability and educational potential. Refractive error and amblyopia are commonest and treatable eye diseases (153 million, WHO 2006) in this age group. The early detection and treatment can effectively eliminate visual impairment.[2]

Emphasizing the need for preschool evaluation in USA,1998, the Maternal and Child Health Bureau (MCHB), Health Resources and Services Administration (HRSA), collaborated with the National Eye Institute (NEI), National Institutes of Health (NIH), and various national and state

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https://doi.org/10.18231/j.ijceo.2022.053

agencies to review research and policies related to vision screening in preschool-aged children. One major outcome of this task force discussion was a set of interim vision screening recommendations for preschool children. The recommendations were designed to detect amblyopia and amblyopiogenic factors using assessments of visual acuity and stereopsis. Vision-threatening eye problems, which include amblyopia, strabismus, and significant refractive error, are estimated to occur in 2% to 5% of preschool children.[3]

The vision screening in pre-school children identifies treatable eye conditions that are amenable to cure and rehabilitation. If vision screening is not undertaken before 6 yrs of age, amblyopia will set in and detected during enrollment in school, which may be too late for visual recovery. Limited improvement is usually noted in older children. Hence, importance has to be given for vision screening in pre-school children.[4] However screening is done under Rashtriya Bal Swasthya Karyakram (RBSK) as a part of general screening by general doctors or AYUSH doctors. Since ophthalmologist or ophthalmic officer are not included in screening ocular disorders may be missed.

2. Materials and Methods

A preschool based prospective cross-sectional study was conducted and 47 Anganwadis (preschool) which come under one Taluk were selected by ophthalmologist at general hospital. Total children enrolled in all the 47 anganwadi were 2988 out of which 0-3yrs were 1939 and 3-6yrs were 1049, out of which only 1283 (43%) participated in the screening programme and they were called to general hospital and screened in batches over a period of 2 months. Necessary permissions were obtained from ICDS (Integrated Child Development Scheme) Officer and Administrative medical officer of the hospital. Anganwadi teachers explained the screening programme to the parents and consent was taken from the parents who were willing for screening of their children. All procedures followed in accordance with ethical standards. All children were divided into 2 groups based on age 0-3 yrs and 3-6 years. Each child was asked to come to nearby General hospital on scheduled day along with their parents or teacher and were examined. Refraction was done in 3-6 yrs age group children. All children underwent a detailed eye examination both anterior and posterior segment and refraction was done by ophthalmologist and ophthalmic officer.

The anterior segment examination was done with torch light and slit lamp. Children of 0-3 yrs group were examined for congenital and developmental eye disorders such as cataract, corneal opacities, congenital glaucoma, strabismus, retinopathy of prematurity and retinoblastoma. In 0-3 yrs group vision was assessed by preschool vision testing criteria observing whether the child follows light or not and whether child follows the object on moving it and identifies the familiar objects like pen or pencil. 3-6 yrs age group children were examined for visual acuity using Snellen's E chart and Snellen's Pictoral chart at a distance of 6 metre. Refractive status was determined by performing static retinoscopy at a working distance of 50 cm using streak retinoscope. Cycloplegic refraction was done and indirect ophthalmoscopy was performed for fundal evaluation in all children. Evaluation was done with the assistance of parents and guardians.

Myopia was considered as if the spherical equivalent ≥-0.50 D, hyperopia as ≥ +2.00 D in magnitude, astigmatism as ≥ 1.00 D, and anisometropia as spherical equivalent difference between the two eyes of at least 1.00 D. Post mydriatic test was done for all children with refractive errors.

Hirschberg test was performed at near, to detect ocular deviation and estimate the magnitude of deviation. Cover test with an occluder was performed on those children who had deviation. Binocularity was assessed using Worth 4 dot test.

ROPLAS test was done on those children who had complaints of recurrent watering in eyes by their parents. NLD obstruction was diagnosed in all who had regurgitation.

Treatment was administered to children with ocular disorders and spectacle corrections to those with refractive errors. As Taluka hospital had limited facilities Strabismus cases were referred to paediatric ophthalmologist for further management. Congenital cataract cases were referred to higher centre for cataract surgery. Nystagmus patients were referred for further evaluation. Out of the 10 children who complained of watering, 5 children who had Allergic conjunctivitis responded to topical treatment and those who had persisting watering underwent probing. Those with NLD obstruction were referred for further management. Six children with a suspicion of cortical blindness who were intellectually challenged were referred to psychiatrist and neurologist at Ramanagara district hospital where they were thoroughly examined and cortical blindness was confirmed.

The pattern of refractive errors, strabismus and ocular disorders etc. were studied by prospective cross-sectional descriptive analysis of data. Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented as Mean ± SD (Min-Max) and results on categorical measurements are presented in number (%). Significance is assessed at 5% level of significance. Chi-square/ Fisher exact test has been used to find the significance of study parameters on categorical scale between two or more groups, non-parametric setting for Qualitative data analysis. Fisher exact test used when cell samples are very small. P value below 0.05 was considered statistically significant. The statistical software namely SPSS 22.0, and R environment 57ver.3.2.2 were used for the analysis of the data. Both R and SPSS

are statistical software, categorical analysis (No, %) was performed by R and Dimensional (like Mean, SD) analysis performed by SPSS.[5] The results were not significant with respect to age and gender and intervention strategies may be planned accordingly.(Tables 2 and 4)

3. Results

A total of 1283 children from 47 anganwadi were examined. 625 of whom were male, 658 were female, 757 were 0-3yrs old and 526 were 3-6yrs.(Table 1) Totally 66(5.2%) children in both the groups were found to have ocular disorders. The commonest eye disorder was refractive error 24(4.6%) children in 3-6 yrs group commonest being myopia 11(2%). The commonest disorder in 0-3yrs was strabismus 12(1.6%) Among both the groups 20(1.6%) had stabismus, 3(0.2%) had congenital nystagmus, 3(0.2%) had congenital cataract, 5(0.4%) had Allergic conjunctivitis and 5(0.4%) NLD obstruction and 6(0.5%) children were intellectually challenged with decreased vision. (Figure 1)

Simple myopia was the most common type of refractive error accounting for 4.6%. Almost all the cases of myopia were in the range of −1.00 DS to <−3.00 DS. Astigmatism (myopic) accounted for 33% of the refractive error and with a range of −1.00 DC to −3.75 DC. Simple hypermetropia was the third common type of refractive error (13%), and all cases of hyperopia were in the range of +2.00 DS to <+6.00 DS. Astigmatism (hypermetropic) accounted for 8% of the refractive error with a range of+1.50 DC to +3.50DC. No mixed astigmatism was noted in this study. Out of the 20 Strabismus case detected, 9 were Alternate convergent strabismus(ACS), 8 were Esotropia, 2 were exotropia and 1 was hypertropia.(Figure 2)

4. Discussion

There are several reasons for childhood blindness. Many of the causes of blindness in children are either preventable or treatable if detected early. Uncorrected vision problems in children can worsen over time and result in permanent loss of vision. Many of the causes of childhood blindness are also associated with child mortality (e.g. premature birth, measles, congenital rubella, and meningitis). Thus, timely detection of these conditions can contribute to higher chances of child survival.[6] Vision screening of children is a valuable approach for the detection of potential visual disorders that may impact negatively on the overall development of a child. The specific test batteries, the age group to be screened, and the personnel administering the test all contribute to the overall outcome of the vision screening.[7]

RBSK is one of its kind program to improve the overall quality of life of children enabling all children achieve their full potential; and also provide comprehensive care to all the children in the community. This program involves

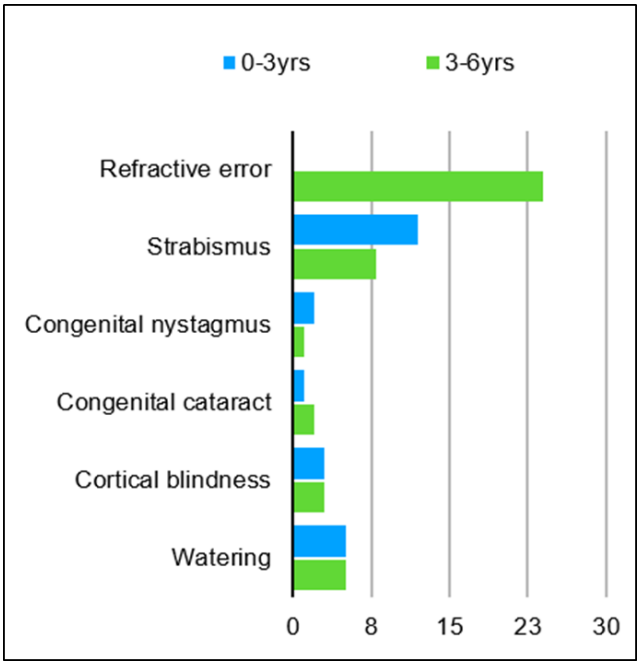

Fig. 1: Ocular morbidities

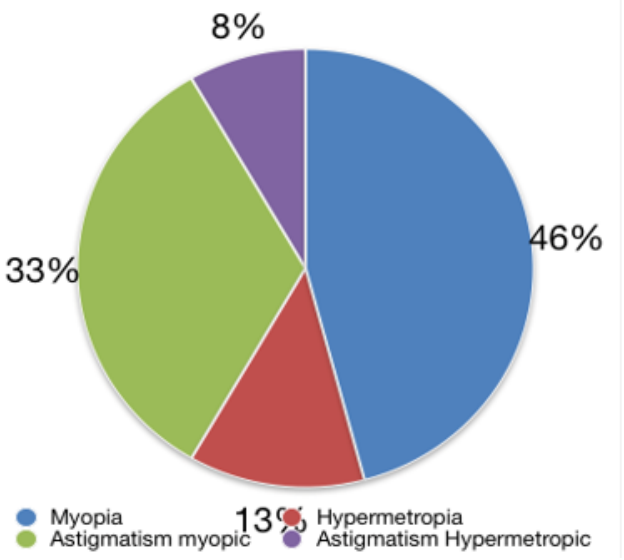

Fig. 2: Refractive error

screening of children from birth to 18 years of age for 4 Ds-Defects at birth, Diseases, Deficiencies and Development delays, spanning 32 common health conditions for early detection and free treatment and management, including surgeries at tertiary level. Children diagnosed with selected health conditions are provided early intervention services and follow-up care at the district level. These services are provided free of cost, thus helping their families reduce out of pocket expenditure incurred on the treatment.

Table 1: Gender wise distribution of children

Sex	No. of Students (0-3) yrs	No. of Children (3-6) yrs	Total Children (0-6yrs)
Male	398	276	625
Female	359	250	658
Total	757	526	1283

Table 2: Ocular morbidities

Morbidities	0-3yrs		P value	3-6yrs		P value	Total
	Male	Female		Male	Female		
Squint	7(50%)	5(41.7%)	0.671	5(20%)	3(20%)	1.000	20(30.3%)
Nystagmus	1(7.1%)	1(8.3%)	1.000	1(4%)	0(0%)	1.000	3(4.5%)
Mental retardation	1(7.1%)	2(16.7%)	0.580	2(8%)	1(6.7%)	1.000	6(9.1%)
Watering -NLD obstruction	4(28.6%)	3(25%)	1.000	1(4%)	2(13.3%)	0.545	10(15.2%)
Refractive error	0(0%)	0(0%)	1.000	15(60%)	9(60%)	1.000	24(36.4%)
Congenital cataract	1(7.1%)	1(8.3%)	1.000	1(4%)	0(0%)	1.000	3(4.5%)
Total	14(100%)	12(100%)	-	25(100%)	15(100%)	-	66(100%)

Table 3: Refractive error

Refractive Error	Male	Female	Total
Myopia	8(53.3%)	3(33.3%)	11(45.8%)
Hypermetropia	2(13.3%)	1(11.1%)	3(12.5%)
Astigmatism myopic	4(26.7%)	4(44.4%)	8(33.3%)
Astigmatism Hypermetropic	1(6.7%)	1(11.1%)	2(8.3%)
Total	15(100%)	9(100%)	24(100%)

P=0.796, Not Significant, Fisher Exact Test

Table 4: Strabismus

Strabismus	Male		Female		Total
	0-3yrs	3-6yrs	0-3yrs	3-6yrs	
Exotrpia	1(14.3%)	0(0%)	1(20%)	0(0%)	2(10%)
Hypertropia	1(14.3%)	0(0%)	0(0%)	0(0%)	1(5%)
Alternate convergent strabismus	3(42.9%)	2(40%)	2(40%)	2(66.7%)	9(45%)
Esotropia	2(28.6%)	3(60%)	2(40%)	1(33.3%)	8(40%)
Total	7(100%)	5(100%)	5(100%)	3(100%)	20(100%)
P value(Chi-Square/Fisher Exact Test)	1.000		1.000		

To facilitate screening of children, there is a strong convergence with the ministry of women and child development for screening children the age group 0 – 6 years enrolled at Anganwadi centres and with the ministry of human resource development for screening the children enrolled in government and government aided schools. The newborn is screened for birth defects in health facilities by the doctors at health facilities and during the home visit by ASHA (peripheral health worker).(https://rbsk.gov.in/rbsklive)

Outreach screening will be done by dedicated Mobile Health teams for 6 weeks to 6 years at anganwadis centres and 6-18 years children at school.

Screening is done by general doctors or AYUSH doctors, hence ocular disorders may be missed. Even though RBSK program exists screening for ocular disorders needs specific trained doctors like ophthalmologist or ophthalmic officers.

Numerous professional organizations endorse timely assessment of vision for the early detection and treatment of eye and vision problems, including the American Academy of Ophthalmology (AAO), American Academy of Pediatrics (AAP), American Association for Pediatric Ophthalmology and Strabismus (AAPOS), and the American Optometric Association (AOA).[8] In a joint policy statement the AAP recommended that physical inspection of eye functioning and overall eye health begin at birth and that "objective evaluation" of acuity be initiated by 3 years of age.[9]

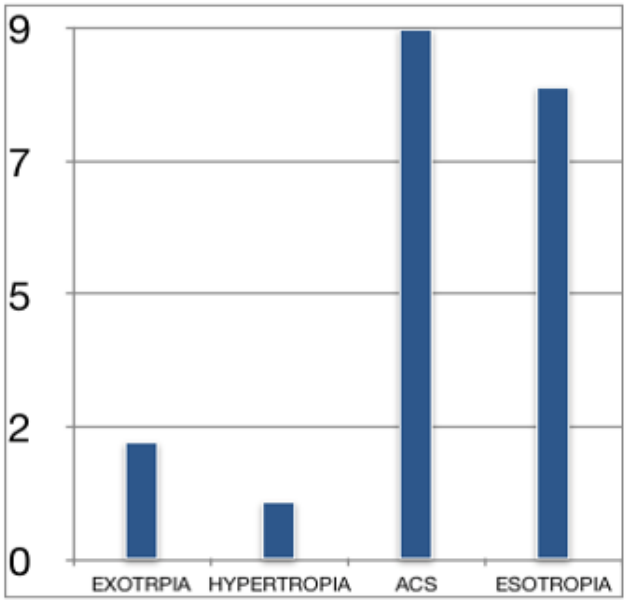

Fig. 3: Strabismus

Refractive error and Strabismus are most common causes of Amblyopia in school children.[10] Amblyopia is one of the commonest causes of childhood and adult visual impairment with prevalence varying between 0.2% &12% depending on the subsets of population studied.[11] The cause of Amblyopia include Strabismus, Anisometropia, high Refractive errors and Opacities of ocular media or a combination of two or more etiologies in the same patient. The upper limit of critical time when children are most vulnerable to amblyopic disorders is around 8yrs.[12] Visual loss due to amblyopia can be permanent if corrective measures are not taken in time. Lack of community or pre school vision screening was the main cause to pick up amblyopic children for timely management of late presentations and significant visual impairment associated with the condition.[13] Parents may not be aware to identify visual disabilities in young children which emphasise the need of early screening.

Vision-threatening eye problems, which include amblyopia, strabismus, and significant refractive error, are estimated to occur in 2% to 5% of preschool children as per task force USA(1998). Our study had 5.2%, a similar prevalence of ocular disorders. In our study Refractive error was found to be 4.6% among preschool children which is treatable. Strabismus was next commonest with 1.6% which is one more important condition leading to amblyopia. This finding is also similar to those reported by local studies on Nigerian children irrespective of the studied age group. There are little or no variations in the prevalence of visual impairment among preschool children in different regions of the world. In the developing world, the prevalence of visual impairment was between 4.5% and 5.46%,[14] while in the developed world prevalence was between 4.3% and 6.4%. Internationally, lower prevalence of refractive errors (2.7-5.8%) has been reported among children of age 5-15 years from Africa, Finland, Chile and Nepal. These differences may be explained by the different diagnostic criteria used by different authors, racial or ethnic variations in the prevalence of refractive errors, different lifestyles or living conditions.[15]

Therefore, greater attention needs to be paid to screening of preschool children in the study population and India as a whole to prevent interference with the learning skills of young children and to prevent permanent visual impairment from amblyopia. Regular, periodical vision screening at preschool entry would assist in early detection of uncorrected refractive error, strabismus and other disorders.

Limitation in our study was that it was done at General hospital and not at Anganwadi. Also, among 2988 children enrolled in anganwadi 1705(57%) children missed screening as they did not want to come to hospital with their parents. So screening at preschool by trained ophthalmic officer would help in identifying many children with ocular disorders and then referring them to nearby ophthalmologist.

5. Conclusion

Screening preschool children detects ocular disorders and makes timely intervention possible. Thus, it plays a major role in preventing development of permanent visual disability and socioeconomic burden. A large-scale community-based preschool eye screening program in India by ophthalmologist or ophthalmic officer identifies morbid eye conditions early that are amenable to cure and prompt rehabilitation.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare no conflict of interest.

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Cite this article: Tumbadi KL, Nagaraj KB. Preschool eye screening: A study in South India. *Indian J Clin Exp Ophthalmol* 2022;8(2):265-270.