Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Special Issue [1]2022 : 375-381

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD

ORIGINAL ARTICLE **OPEN ACCESS**

Comparison of Ocular Morbidities among School Children in Rural and Tribal Areas of Salem District

R.Rajesh Kannan[1,*], K.Ezhilvendhan[2], B. Saravana Bhava[3]
[1]Associate Professor, Department of Ophthalmology,Vinayaka Missions Kirupana Variyar Medical College & Hospital, Vinayaka Missions Research Foundation to Be University, Salem, Tamil Nadu, India
[2]Professor, Department ofOphthalmology,Vinayaka Missions Kirupana Variyar Medical College & Hospital, Vinayaka Missions Research Foundation to Be University, Salem, Tamil Nadu, India
[3]Professor, Department ofOphthalmology,Vinayaka Missions Kirupana Variyar Medical College & Hospital, Vinayaka Missions Research Foundation to Be University, Salem, Tamil Nadu, India
Email:doctorrajeshkannan@gmail.com

ABSTRACT
India has an estimate of 3,20,000 blind children, more than any other country in the world. Even though this represents a small fraction of the total blindness, the control of blindness in children is one of the priority areas of the World Health Organization's (WHO) "Vision 2020 the right to sight" program. This is a global initiative, which was launched by WHO in 1999 to eliminate avoidable blindness worldwide by the Year 2020. Children adjust to poor eyesight by sitting near to the blackboard holding books closer to their eyes, squeezing eyes, and even avoiding work requiring visual concentration. This warrants early detection and treatment to prevent permanent disability. To assess and compare the prevalence of various onlar morbidities among school children in the age group of 5 - 16 years among rural and tribal populations in the Salem district. A community-based cross-sectional study was conducted for a period of 2-3 years among school children of age group 6 - 16 years. The data collection instrument was a pretested structured questionnaire. It was pretested in a randomly selected coeducational school which was not included in the study. Queries to children were asked in the local language, while information was filled in the English language by the principal investigator. The first part of the questionnaire dealt with information regarding the childlike age, sex, residential address, class in which studying and chief complaints related to eyes.Second part of the questionnaire included a detailed examination of the eye for diagnosing ocular morbidity and recording of vitamin A deficiency signs and their ocular manifestations. Ocular disorders were divided on the anatomical basis as disorders affecting conjunctiva, cornea, sclera, lens, uvea, retina, optic nerve, ocular muscles, nasolacrimal duct, lids, orbit, and refractive system. Visual acuity was measured at a distance of six meters using the Snellen E chart on presentation and was categorized as WHO classifications; >6/18, <6/18-6/24, <6/24-6/60, <6/60-3/60, and <3/60-NO PL. The overall prevalence of various types of ocular morbidity was 47.6% among tribal students and it was 37.4% among rural children. The most common abnormality found among children of both the tribal and rural areas was a refractive error, followed by conjunctivitis. blepharitis, Bitots spot, stye, and squint, and almost all these conditions were found to be slightly higher among the tribal children than the rural children and the difference was also found to be statistically significant. The prevalence of ocular morbidity was high among children and particularly among tribal children than the rural students. Refractive errors were the most common ocular disorders. School health programs should focus on the ocular health of children. Health education activities should be intensified in schools and also in the community regarding signs and symptoms of ocular disorders.
Keywords: Ocular Disorders, School Children, Snellen E, Refractive Error.

Received 27.02.2022 Revised 20.03.2022 Accepted 04.04.2022

INTRODUCTION

Visual impairment is a measurable loss of functional capability relative to the normal variation in healthy eyes or a psychophysical measurement that is outside the normal range [1]. According to the World Health Organization (WHO)visual impairment includes both low vision and blindness based on presenting visual acuity. Low vision includes moderate visual impairment and severe visual impairment based on presenting distant visual acuity (VA) [2]. Blindness is visual acuity of less than 3/60 based on presenting VA (ICD-10 categories 3, 4, and 5).These classifications of visual impairment by the WHO are commonly used in relevant situations in vision research. The WHO shows that about 285 million people in the world are visually impaired from various causes and of these, 39 million people are blind and 246 million have low vision [3]. The main cause of moderate and severe visual impairment is uncorrected

refractive errors, whereas cataract remains the leading cause of blindness in middle- and low-income countries. Eighty percent (80%) of all visual impairment can be prevented or cured. In 1999, the WHO and non-governmental organizations (NGOs) launched the Vision 2020: The Right to Sight, which is a global initiative for the elimination of avoidable blindness by the year 2020. Cataract, trachoma, onchocerciasis, childhood blindness, refractive errors, and low vision were identified as immediate priorities within the framework of Vision 2020 [4]. The choice of these anomalies was based on the burden of visual impairment they presented and the feasibility and affordability of intervention to prevent and treat them. Most people with visual impairment are elderly people aged 50 years and older, and children below the age of 15 years[5]. Diseases like cataract, strabismus, congenital nasolacrimal obstruction, refractive error, and allergic eye diseases are common ophthalmic conditions in the pediatric age group. Children adjust to poor eyesight by sitting near the blackboard, holding books closer eyes, squeezing eyes, and even avoiding work requiring visual concentration [6]. This warrants early detection and treatment to prevent permanent disability [7]. School eye health services are one of the important aspects of school health services in which children can be screened for diseases such as refractive error, squint, amblyopia, etc. The eye problems among children are much more prevalent among the tribal areas in India due to lack of awareness and access to the health system [8].

MATERIALS & METHODS

A community-based cross-sectional study was conducted on 1000 school children for a period of 2-3 years among school children of age group 6 - 16 years. School children of age group 5-16 years, from a government school at Attayampatti (rural field practicing area of our medical college) and a community school at Kombuthuki (tribal area) in Salem district. The data collection instrument was a pretested structured questionnaire. It was pretested in a randomly selected coeducational school which was not included in the study. Queries to children were asked in the local language, while information was filled in the English language by the principal investigator. The first part of the questionnaire dealt with information regarding the childlike age, sex, residential address, class in which studying and chief complaints related to eyes. Second part of the questionnaire included a detailed examination of the eye for diagnosing ocular morbidity and recording of vitamin A deficiency signs and their ocular manifestations. Ocular disorders were divided on the anatomical basis as disorders affecting conjunctiva, cornea, sclera, lens, uvea, retina, optic nerve, ocular muscles, nasolacrimal duct, lids, orbit, and refractive system. Visual acuity was measured at a distance of six meters using the Snellen E chart on presentation and was categorized as WHO classifications; >6/18, <6/18-6/24, <6/24-6/60, <6/60-3/60, and <3/60-NO PL.Inclusion criteria: All children in the age group of 5-16 years.Exclusion criteria: Children who were absent on the day of examination and those who did not give consent for the examination. Strabismus assessment was done using an occluder (cover uncover test). We only report one main diagnosis for each patient. The main diagnosis of Patients in the study represents the diagnosis, condition, problem, or other reason for the encounter/visit that is chiefly responsible for the outpatient services provided. For eye injuries, type of injury was classified according to Birmingham's Eye Trauma Terminology classification (BETTS) as closed globe injuries for contusions, lamellar lacerations, and superficial foreign body, while ruptures, penetrating, perforating, and intraocular foreign body laceration as open globe injury.Anterior segment examination was done with a slit lamp and torch. For suspected cases, posterior segment examination was performed after dilating pupil using a direct and indirect ophthalmoscope and fundus camera. Intraocular pressure was checked with an applanation tonometer. If the child had decreased vision the examiner sent him/her to a vision center/refraction clinic for refraction. The experienced optometrist undertook objective and subjective refraction and then rechecked with the correction to confirm if refractive error is the cause for the visual impairment.

STATISTICAL ANALYSIS

Statistical analysis was performed with Statistical Package for the Social Sciences (SPSS) version 21. Mean and standard deviation was derived for all the parametric variables. Proportions were used to present the results. The Chi-square test was used to test the significance between the proportions at a 95% confidence interval.

RESULT

TABLE 1: AGE-WISE DISTRIBUTION OF THE STUDY POPULATION

Age group	Trible students		Rural students		P-value
	Frequency	Percentage	Frequency	Percentage	
5 – 6	30	6%	28	5.6%	0.726
7 – 8	105	21%	108	21.6%	
9 – 10	85	17%	94	18.8%	
11 – 12	119	23.8%	113	22.6%	
13 – 14	108	21.6%	103	20.6%	
15 – 16	53	10.6%	54	10.8%	
Total	500	100%	500	100%	
Mean + SD	10.9 + 2.8		11.1 + 2.7		

Table1 shows the age-wise distribution of the study subjects. It is seen from the table that the majority of the children were in the age group between 11 and 14 years. The mean age among the tribal children was 10.9 years and for rural children, it was 11.1 years and there was no statistically significant difference between the rural and tribal children in the age group. P-value derived by applying student T-test. gender-wise distribution of the study subjects. It is seen from the table the males (65%) outnumbered the females (35%) both in rural and tribal populations. There was no statistically significant difference among the rural and the tribal children concerning the gender distribution.

TABLE 2: DISTRIBUTION OF THE STUDY SUBJECTS BASED ON THEIR COMPLAINTS

Presenting Complaints	Tribal Students		Rural Students		P-value
	Frequency	Percentage	Frequency	Percentage	
Watering Of eyes	33	6.6%	28	5.6%	0.0376
Defective Vision	50	10%	41	8.2%	
Headache	73	14.6%	54	10.8%	
Headache, Watering and defective Vision	165	33%	146	29.2%	
Nil com plaints	179	35.8%	231	46.2%	
Total	500	100%	500	100%	

Table 2 shows the distribution of the study subjects based on their complaints related to the eye. It is seen from the table that the most common said complaints were more common among tribal children than the rural complaints were headache, defective vision, and watering of eyes. The about children and the difference was found to be statistically significant (p<.05)

TABLE 3: DISTRIBUTION OF THE STUDY SUBJECTS BASED ON THEIR VISUALACUITY OF BOTH EYES.

Visual acuity	Tribal students		Rural students		P-value
	Rteye(%)	**Lt eye(%)**	**Rteye(%)**	**Lt eye(%)**	
6/6	296 (59.2%)	318 (63.6%)	336 (67.2%)	359 (71.8%)	**0.0162**
6/9	147 (29.4%)	121 (24.2%)	125 (25%)	99 (19.8%)	
6/12	52 (10.4%)	56 (11.2%)	38 (7.6%)	41 (8.2%)	
6/18	5 (1%)	5 (1%)	1 (0.2%)	1 (0.2%)	
Total	500 (100%)	500 (100%)	500 (100%)	500 (100%)	

Table 3 shows the distribution of the study subjects based on their visual acuity of both eyes. It is seen from the table that the majority of the children in both groups had a visual acuity of 6/6. Defective vision with a visual acuity of6/9, 6/12, and 6/18 was more common among tribal children than the rural children and the difference was found to be statistically significant (p<.05).

TABLE 4: DISTRIBUTION OF THE STUDY SUBJECT BASED ON THEIR PINHOLE IMPROVEMENT OF BOTH EYES

PHI	Tribal students		Rural students		P-value
	Rt eye %	Lt eye%	Rt eye %	Lt eye %	
6/6	316(63.2)	332(66.4%)	346(69.2%)	370(74%)	0.0217
6/9	136(27.2%)	116(23.2%)	128(25.6%)	99(19.8%)	
6/12	45(9%)	49(9.8%)	25(5%)	30(6%)	
6/18	3(0.6%)	3(0.6%)	1(0.2%)	1(0.2%)	
Total	500(100%)	500(100%)	500(100%)	500(100%)	

P-value Derived by applying chi-square test

Table 4 shows the distribution of the study subjects based on their pinhole improvement of both eyes. It is seen from the table that there is an improvement in the refraction after PINHOLE TEST and it is more in rural children than tribal children and the difference was found to be statistically significant (p<.05).

TABLE 5: DISTRIBUTION OF THE STUDY SUBJECT BASED ON THE TYPE OF REFRACTIVE ERROR

Refractive Error	Tribal students		Rural students		P-value
	Rt eye %	**Lt eye %**	**Rt eye %**	**Lt eye %**	
Myopia	166(33.2%)	157(31.4%)	132(26.4%)	128(25.6%)	0.0296
Astigmatism	24 (4.8%)	20 (4%)	18 (3.6%)	16 (3.2%)	
Hypermetropia	15 (3%)	13 (2.6%)	9 (1.8%)	6 (1.2%)	
Amblyopia	21(4.2%)	20 (4%)	16 (3.2%)	15 (3%)	
Normal	274(54.8%)	290(58%)	325(65%)	335(67%)	
Total	500(100%)	500(100%)	500(100%)	500(100%)	

Table 5 shows the distribution of the study subjects based on the type of refractive error. It is seen from the table that more than 50% of the study subjects had normal refraction. The most common refractive error among them was found to be myopia, followed by astigmatism, amblyopia, and hypermetropia. All these conditions were found to be slightly higher in the tribal group than the rural group children and the difference was found to be statistically significant (p<.05).

TABLE 6: DISTRIBUTION OF THE STUDY SUBJECTS BASED ON THE ABNORMALITIES OF THE LIDS

Lid Abnormality	Tribled Students		Rural students		P-value
	Rt eye %	**Lt eye %**	**Rt eye %**	**Lt eye%**	
Blepharitis	32I(6.4%)	32(6.4%)	18(3.6%)	18(3.6%)	0.0412
Stye	18 (3.6%)	10 (2%)	11 (2.2%)	9 (1.8%)	
Normal	350(70%)	358(71.6%)	371(74.2%)	373(74.6%)	
Total	500(100%)	500(100%)	500(100%)	500(100%)	

Table 6 shows the distribution of the study subjects based on the abnormalities of the lids. It is inferred from the table that the most common abnormality of the lid was blepharitis followed by stye and it is slightly higher among the students of the tribal region when compared to a rural area and the difference was found to be statistically significant (p<.05).

TABLE7:DISTRIBUTION OF THE STUDY SUBJECT BASED ON THE ABNORMALITIES OF THE CONJUNCTIVA

Conjunctiva Abnormality	Trible student		Rural student		P-value
	Rt eye %	**Lt eye %**	**Rt eye %**	**Lt eye %**	
Allergic Conjunctivitis	66 (13.2%)	66 (13.2%)	32 (6.4%)	32 (6.4%)	0.0319
Bitots spot	16 (3.2%)	16 (3.2%)	7 (1.4%)	7 (1.4%)	
Normal	418 (83.6%)	418 (83.6%)	461 (92.2%)	461 (92.2%)	
Total	500 (100%)	500 (100%)	500 (100%)	500 (100%)	

Table7 shows the distribution of the study subjects based on the abnormalities of the conjunctiva. The most common conjunctiva abnormality found among the children was allergic conjunctivitis followed by Bitots spot and both these conditions were higher in the tribal children than the rural children and the difference was found to be statistically significant (p<.05).

TABLE 8:DISTRIBUTION OF THE STUDY SUBJECTS BASED ON THEIR FINDINGS OF CORNEA, AC, IRIS, PUPIL, LENS, AND FUNDUS

Parts of the eye	Trible students (both eyes)		Rural students (both eyes)		P-value
	Normal	**Abnormal**	**Normal**	**Abnormal**	
Cornea	500(100%)	0	500(100%)	0	1.000
AC	500(100%)	0	500(100%)	0	
Iris	500(100%)	0	500(100%)	0	
Pupil	500(100%)	0	500(100%)	0	
Lens	500(100%)	0	500(100%)	0	
Fundus	500(100%)	0	500(100%)	0	

P-value derived by applying chi-square test

Table 8 shows the distribution of the study subjects based on their findings of the cornea, AC, Iris, Pupil, lens, and fundus. It is seen from the table nochildren had any abnormality related to the cornea, lens, AC, iris, pupil, and fundus both the rural and tribal children.

TABLE 9: DISTRIBUTION OF THE STUDY SUBJECTS BASED ON THE FINDINGS OF THE EXTRA-OCULAR MOVEMENTS.

EOM	Trible students		Rural Students		P Value
	Rt eye %	**Lt eye %**	**Rt eye %**	**Lt eye %**	
Squint	14 (2.8%)	10 (2%)	4 (0.8%)	2 (0.4%)	0.0486
Normal	486(97.8%)	490 (98%)	496(99.2%)	498(99.6%)	
Total	500(100%)	500(100%)	500(100%)	500(100%)	

Table 9 shows the distribution of the study subjects based on the findings of the extra-ocular movements. It is seen from the table that squint was present in about 1% of the rural children and 3% of the tribal children and the difference was found to be statistically significant ($p<.05$).

TABLE 10: COMPARISION OF THE PREVALENCE OF VARIOUSOCULAR MORBIDITIES BETWEEN TRIBAL AND RURAL CHILDREN

Ocular morbidities	Tribal children	Rural children	P value
Myopia	166 (33.2%)	132 (26.4%)	0.0316
Astigmatism	24 (4.8%)	18 (3.6%)	0.0419
Hypermetropia	15 (3%)	9 (1.8%)	0.0404
Amblyopia	24 (4.8%)	18 (3.6%)	0.0218
Allergic Conjunctivitis	66 (13.2%)	32 (6.4%)	0.001
Bitots spot	16 (3.2%)	7 (1.4%)	0.001
Blephartits	32 (6.4%)	18 (3.6%)	0.0271
Stye	18 (3.6%)	11 (2.2%)	0.0421
Squint	14 (2.8%)	4 (0.8%)	0.001
Total(over all morbidity)	238 (47.6%)	187 (37.4%)	0.001

Table10 shows the comparison of the prevalence of various ocular morbidities between tribal and rural children. It is seen from the table that the most common abnormality found among children of both the tribal and rural areas was a refractive error, followed by allergic conjunctivitis, blepharitis, bitotsspot, stye, and squint and almost all these conditions were found to be slightly higher among the tribal children than the rural children and the difference was also found to be statistically significant. The reasons for more visual morbidities in the tribal region would be lack of awareness about the illness, poor educational qualification of parents, poor access to the health system, consanguineous marriage between parents, poor personal hygiene, and their very poor socio-economic status. In our study, we were not able to derive the causal association for all these factors as many children at young age was not able to answer the questions related to these factors.

DISCUSSION

Visual impairment is a worldwide problem that has a significant socioeconomic impact. Childhood blindness is a priority area because of the number of years of blindness that ensues. Data on the prevalence and causes of blindness and severe visual impairment in children are needed for planning and evaluating preventive and curative services for children, including planning special education and low

vision services [9][10]. Because 30% of India's blind lose their eyesight before the age of 20 years and many of them are under five when they become blind, the importance of early detection and treatment of ocular disease and visual impairment among young children is obvious [11][12]. Population-based data concerning the prevalence of ocular morbidity among children are not readily available for India. In the present study, refractive errors were the most common disorders seen which was encountered in 40% among tribal students and 30% among rural students, and the difference was also found to be statistically significant. Higher prevalence of conjunctivitis in tribal children compared to rural. children, as observed in this study, could be because many of the students in tribal schools belong to much lower socioeconomic status and are more likely to have poor personal hygiene [13]. Poor vision in childhood affects performance in school or at work and has a negative influence on the future life of a child. Moreover, the planning of the youth's career is much dependent on visual acuity, especially in jobs for the navy, military, railways, and aviation. Refractive errors are the most common reasons for the outpatient visit to an ophthalmic surgeon or an ophthalmic assistant [14]. The overall incidence has been reported to vary between 21% and 25% of patients attending eye outpatient departments in India. A similar prevalence of refractive errors has been observed among children of 12-17 years in Ahmedabad city. From South India, a higher (32%) prevalence rate of refractive errors among school children of age 3-18 years as compared to the present study was observed, because of a higher case detection rate in that study by an optometrist [15]. A different study population (children who attended eye care centers in the last 18 months) in their study may explain this. Children are less likely to attend eye care centers for color blindness. However, in our study, no children had complaint of color blindness. Vitamin A deficiency up to an extent of 5.4-9% in 4 to 16 years has been reported from Rajasthan and Kolkata respectively as compared to 3.2% in the tribal area and 1.4% in a rural area in the present study. This can be explained by lower socioeconomic status associated with an unhealthy dietary pattern which is more common in tribal areas than the rural areas [16]. Variation in the prevalence of conjunctivitis can be explained by the difference in socioeconomic status, personal hygiene of children, and seasonal variations of occurrence of conjunctivitis. In the present study, the prevalence of allergic conjunctivitis was 13.4% in tribal children and 6,2% in rural students.A low prevalence of congenital disorders was found in other studies from 17.7 Whereas in our study no children were found to be with any congenital India abnormalities. The reason might be in those areas there are schools for special children and so those children might be admitted in those schools [17]. Very marginal difference in the prevalence of ocular diseases among males and females in the present study is comparable to results of the study by Sehgal et al., in Delhi (males 46.1% and females 48.3%) [18]. Prevalence of vitamin A deficiency was found to be more among males as compared to females in this study contrary to the results of other studies. 78,30This difference was more appreciable with the prevalence of night blindness. However, being subjective, the symptom of night blindness cannot be relied upon completely.In almost all studies conducted in India, the prevalence of ocular morbidity decreased with age, the results of our study also confirmed this finding in an urban North Indian hilly area [19].The results of the study strongly suggest that screening of school children for ocular problems should be done at regular intervals and it should be one of the prime components of the School Health Program. For this, school teachers should be oriented and trained in identifying common eye problems among school children so that these children can be referred for prompt treatment [20]. They should also impart awareness regarding ocular hygiene among school children. In this manner, the incidence of preventable causes of blindness among school children will be minimized. Identification of color vision defects with concurrent vocational counseling should also be done at the earliest in schoolchildren to save the child from frustration later on and help him to choose a suitable vocation[21][22].

CONCLUSION

The studies conducted so far in India related to childhood ocular morbidity were either done in an urban area or rural area and no studies were conducted in tribal areas and this study is the first of its kind comparing the ocular morbidity between rural and tribal areas. The prevalence of ocular morbidity was high among children and particularly among tribal children than the rural students. Refractive errors were the most common ocular disorders. School health programs should focus on the ocular health of children. Health education activities should be intensified in schools and also in the community regarding signs and symptoms of ocular disorders. Finally, the aim of all blindness control programs should be to propagate awareness in the masses of eye care and to teach the essentials of ocular hygiene and eye healthcare.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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CITATION OF THIS ARTICLE

R.Rajesh Kannan, K.Ezhilvendhan, B. Saravana Bhava. Comparison of Ocular Morbidities among School Children in Rural and Tribal Areas of Salem District. Bull. Env.Pharmacol. Life Sci., Spl Issue [1] 2022 : 375-381