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Original Article:

Prevalence of Ocular Morbidity Among School Adolescents of Gandhinagar District, Gujarat

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Abstract:
Objective: To study the prevalence of ocular morbidity (abnormal condition) and various factors affecting it among school attending adolescents. **Methods:** A cross-sectional study was conducted to study abnormal ocular conditions like refractive errors, vitamin A deficiency, conjunctivitis, trachoma, ocular trauma, blephritis, stye, color blindness and pterygium among school adolescents of 10-19 years age in rural and urban areas of Gandhinagar district from January to July, 2009. Systematic sampling was done to select 20 schools having 6th to 12th standard education including 12 schools from rural and 8 from urban areas. Six adolescents from each age year (10-19) were selected randomly to achieve sample size of 60 from each school. In total, 1206 adolescents including 691 boys and 515 girls were selected. Information was collected from selected adolescents by using proforma. Visual acuity was assessed using a Snellen's chart and all participants underwent an ophthalmic examination carried out by a trained doctor. **Results:** Prevalence of ocular morbidity among school adolescents was reported 13% (7.8% in boys, 5.6% in girls); with 5.2% have moderate visual impairment. Refractive error was most common ocular morbidity (40%) both among boys and girls. Almost 30% of boys and girls reported vitamin A deficiency in various forms of xerophthalmia. Prevalence of night blindness was 0.91% and of Bitot`s spot 1.74%. Various factors like, illiterate or lower parents' education, lower socio-economic class and malnutrition were significantly associated with ocular morbidity. **Conclusion:** Ocular morbidity in adolescents is mainly due to refractive error, moderate visual impairment and xerophthalmia.
Key Words: Adolescents; Ocular morbidity; Refractive error; Xerophthalmia; Malnutrition

Introduction:

Eyes are the most treasured organ of human beings. Much ocular morbidity (abnormal ocular conditions) originates in childhood and if undetected may result in severe ocular disabilities, in addition to affecting development, educational performance, social and employment opportunities. Ocular morbidities include refractive errors, vitamin A deficiency, conjunctivitis, trachoma, ocular trauma, blephritis, stye, color blindness and pterygium. The majority of blindness is either potentially preventable or curable. According to World Health Organization (WHO) statistics, there were 0.7 million of the world`s blind children living in South-East Asia region.[1] Blindness is one of the most significant social problems in India. A national survey on blindness 2001-02 showed that 7% of children aged 10-14 years have problems with their eye sight.[2] Considering the fact that 30% of India`s blind lose their sight before the age of 20 years, the importance of early detection and treatment of ocular morbidity and visual impairment in young children is obvious.[3] Refractive error, trachoma, conjunctivitis and malnutrition (vitamin A deficiency) are important causes of blindness among the younger age groups and all are avoidable and curable. VISION 2020: The Right to Sight is a global initiative launched by WHO in 1999 to eliminate avoidable blindness like cataract, xerophthalmia, refractive error, trachoma and other causes of childhood blindness by year 2020.[4]

Population based studies have estimated the prevalence for blindness as 1.25 per 1000 children in rural[5] and 0.53 in urban areas[6] in age group of 5-15 years. But population based data concerning the prevalence of visual impairment due to uncorrected refractive errors and ocular diseases in adolescents not readily available. Early detection through regular surveys helps in ensuring prompt treatment and prevention of serious complications such as corneal scarring from various ocular morbidities. The present study was conducted with the objective to study the prevalence of ocular morbidity and various factors affecting it among the school attending adolescents in Gandhinagar district, Gujarat.

Methods:

Selection of study population & sample size: A cross sectional study was conducted among adolescents studying from 6th to 12th standard in the age group 10-19 years. Rural and urban areas were selected for study from Kalol taluka of Gandhinagar district. The study was conducted from January, 2009 to July,

2009. A pilot study was conducted before starting the study in the Kalol town to estimate the prevalence of ocular morbidity. Total sample size was calculated of 1200 adolescents considering a 25% prevalence of ocular morbidity in the pilot study.

***Sampling method*:** A systematic sampling method was used to select the study population. The village and town wise information was collected from district and taluka panchayats. There were in total 69 villages and one town in the Kalol taluka with population of 3, 10, 081 as per 2001 census.[7] Kalol taluka has a total of 184 schools including primary, secondary and higher secondary education. Every 9th school was selected and 60 adolescents were examined to achieve the desired sample size. In total 20 schools were selected including 12 from rural areas and 8 from Kalol town as per population proportionate to size method to get adequate representation from each standard and area. Six adolescents from each age year (10-19) were selected randomly to achieve a sample size of 60 from each school. In total 1206 adolescents including 691 boys and 515 girls were selected from 20 schools studying in 6th to 12th standard.

***Training & Survey technique*:** Training for identification of various ocular morbidity conditions and the use of a Snellen's chart was conducted at a local institute. The trained doctor was assessed for eye examination by an ophthalmologist in the field during pilot study. The principles of identified schools were informed telephonically before the visit to respective schools. In total two visits were made to each school. During the first visit, study subjects were selected as per the sample size for their ophthalmic examination at school level. Study subjects were selected from those who were present on that day. Body mass index for adolescents based on percentile developed by Agarwal KN [8] et al was used to determine the nutritional status and its effect on occurrence of ocular morbidity. According to that criteria, adolescents classified as (1) Underweight- <5th percentile of BMI, (2) Normal weight- ≥5th to <85th percentile of BMI, (3) Overweight- ≥85th to <95th percentile of BMI, and (4) Obese- ≥95th percentile of BMI.

A predesigned and pretested proforma was given to study participants to be completed at home by their parents/guardians regarding their socio-demographic status and previous ocular history (previous eye examinations or injuries). An Ophthalmic examination was carried by a trained doctor investigating any signs of ocular morbidity with torchlight. All participants were assessed including those not wearing or wearing glasses for refractive error correction. A Snellen chart and refractive glasses were used to assess the visual acuity of study participants at a distance of six meters. If participant was not able to read a line up to 6/18 without any refractive error correction, then we underwent for further evaluation. Moderate visual impairment was defined by the WHO as a presenting visual acuity < 6/18 but ≥ 6/60 in the better eye. [9] Those study participants with visual acuity 6/18 requiring further management or having some ocular abnormal condition were referred to the district hospital for further investigation and management. Ishihara's isochromatic chart was used to identify the cases of red-green color blindness. A second visit to same school was made on the next day for collection of the given proforma. Modified Prasad`s classification was used to calculate socio-economic class.[10]

***Data analysis*:** All the data were entered in MS excel 2007 and analyzed by using Epi Info software, version 3.5.1. Appropriate statistical test like chi-square or Fischer's tests were applied to detect any significant association at 95% Confidence Interval (CI) was there or not.

Results:

The present study was conducted among school adolescents aged 10-19 years in Gandhinagar district. In total, 1206 students were examined including 57.3% boys and 42.7% girls (Table 1). Among study participants, 58% were residing in a rural area, and 55% have nuclear family. Only 5% of fathers and 17.5% of mothers were illiterate. The majority of fathers (65.9%) were engaged in unskilled work. Almost 50% of families belonged to lower (IV & V) social class as per modified Prasad`s classification. The prevalence of ocular morbidity among school adolescents was reported 13% (7.8% in boys, 5.6% in girls) having at least one abnormal ocular condition; with 5.2% have moderate visual impairment. Body mass index was measured and 15.2% adolescents found overweight/obese and 5.2% underweight.

Table 1: Socio-demographic characteristics of school going adolescents aged 10-19 years in Gandhinagar district

Variables	No. (n=1206)	Percentage (%)
Sex		
Boys	691	57.3
Girls	515	42.7
Paternal Education		
Illiterate	57	4.7
Primary	190	15.8
Secondary	428	35.5
Higher secondary	245	20.3
Graduate & more	286	23.7
Maternal Education		
Illiterate	211	17.5
Primary	382	31.7
Secondary	345	28.6
Higher secondary	139	11.5
Graduate & more	129	10.7
Paternal Occupation		
Unemployed	23	1.9
Unskilled	795	65.9
Semi-skilled	147	12.2
Skilled	241	20.0
Socio-economic status		
Class I	73	6.1
Class II	253	21.0
Class III	281	23.3
Class IV	387	32.1
Class V	212	17.6
Ocular morbidity		
Yes	157	13.0
No	1049	87.0
Moderate visual impairment		
Yes	63	5.2
No	1143	94.8
Sex wise ocular morbidity		
Boys	89	7.8
Girls	68	5.6
Body Mass Index (BMI)		
Underweight	64	5.2
Normal weight	957	79.4
Overweight	121	10.0
Obese	64	5.2

Table 2 shows sex wise distribution of ocular morbidity among school adolescents. Refractive error was the most common ocular morbidity (40%) both among boys and girls. A positive family history of refractive error was reported in half of the patients with moderate visual impairment. Almost 30% of boys and girls reported vitamin A deficiency in various forms of xerophthalmia. Few adolescents reported other abnormal ocular conditions like blephritis (5.7%), stye (5.1%), pterygium (5.1%), conjunctivitis (3.8%), injury (3.1%) and trachoma (2.5%).

Table 2: Sex wise distribution of ocular morbidity among school going adolescents of Gandhinagar district			
Ocular morbidity	**Boys (%) (n=89)**	**Girls (%) (n=68)**	**Total (%) (n=157)**
Refractive errors	36 (40.4)	27 (39.7)	63 (40.1)
Color blindness	7 (7.9)	1 (1.5)	8 (5.1)
Vitamin A deficiency	26 (29.2)	20 (29.4)	46 (29.3)
Trachoma	1 (1.1)	3 (4.4)	4 (2.5)
Conjunctivitis	2 (2.2)	4 (5.9)	6 (3.8)
Stye	5 (5.6)	3 (4.4)	8 (5.1)
Pterygium	3 (3.3)	5 (7.5)	8 (5.1)
Injury	4 (4.4)	1 (1.5)	5 (3.1)
Blephritis	5 (5.6)	4 (5.9)	9 (5.7)

As per WHO standards of prevalence of night blindness >1% and of Bitot's spot, >0.5% considered as public health problem among preschool and school children. The prevalence of night blindness was 0.91% and of Bitot's spot, 1.74% (Table 3) in present study. A statistically significant association was found between consumption of dark green leafy vegetables (χ^2=3.89, p=0.04) and animal origin food ≤ 3 times per week and > 3 times per week (χ^2=44, p=0.00) among adolescents showing vitamin A deficiency (n=46).

Table 3: Prevalence of Xerophthalmia among school adolescents of Gandhinagar district and its comparison with WHO standards[11]			
Vitamin A deficiency	**Total no. (n=46)**	**Prevalence (%) observed in present study**	**Prevalence (%) as per WHO standards***
Night blindness	11	0.91	>1.0
Bitot's Spot	21	1.74	>0.5
Conjuctival xerosis	24	1.99	-
Corneal xerosis/ scarring	0	0	-
Keratomalacia	0	0	-
*Prevalence more than WHO standards will be considered as public health problem			

Various factors like type of family-nuclear or joint, number of siblings, paternal education, maternal education, parents occupational status-whether both parents working or father only working, social class as upper & middle (I, II & III) or lower (IV & V), and nutritional status- normal weight or malnourished (underweight, overweight, or obese) were assessed to determine any association with ocular morbidity among adolescents (Table 4).

No statistical significance (χ^2=1.64, p=0.20) was found for school adolescents residing in nuclear or joint family. Similarly no association (χ^2=0.15, p=0.69) was found between ocular mortality and number of siblings two or more than two. Education of parents affects the occurrence of ocular morbidity. Either illiterate or lower education (only up to primary level) of father (χ^2=17.71, p=0.00) and mother (χ^2=5.1, p=0.00) was significantly associated with occurrence of ocular morbidity. No association (χ^2=3.65, p=0.05) was found for parents working status (both parents working or father only working) and ocular morbidity. Significant number (χ^2=6.57, p=0.01) of ocular morbidity was reported among lower socio-economic adolescents (class IV & V). Ocular morbidities were significantly (χ^2=66.5, p=0.00) associated with malnutrition (underweight, overweight or obese).

Table 4: Factors affecting ocular morbidity among school going adolescents of Gandhinagar district				
Variables	**Yes (%) (n=157)**	**Total (n=1206)**	**χ^2 test value**	**p value**
Type of family				
Nuclear	79 (50.3)	664	1.64	0.02
Joint	78 (49.7)	542		
No. of siblings				
≤ 2	86 (54.8)	643	0.15	0.69
> 2	71 (45.2)	563		
Paternal education				
Illiterate	26 (16.6)	57	17.71	0.00
Primary	26 (16.6)	190		
Secondary	38 (24.2)	428		
Higher secondary	33 (21.0)	245		
Graduate & more	34 (21.7)	286		
Maternal Education				
Illiterate	31 (19.7)	211	5.1	0.02
Primary	33 (21.0)	382		
Secondary	37 (23.6)	345		
Higher secondary	30 (19.1)	139		
Graduate & more	26 (16.6)	129		
Parents occupational status				
Both parents working	14 (8.9)	68	3.65	0.05
Father only working	143 (91.1)	1138		
Social class				
I, II & III	94 (59.9)	607	6.57	0.01
IV & V	63 (40.1)	599		
Nutritional status				
Underweight	24 (15.3)	64	66.5	0.00
Overweight	40 (25.5)	121		
Obese	7 (4.4)	64		
Normal weight	86 (54.8)	957		

Discussion:

Although vision is very important to people of all ages, it is more so in children and adolescents as it has a key role in their mental, physical and psychological development. Most of adult blindness is easily treatable and preventable; however, if it is not detected and prevented in time it may lead to a permanent disability. Few reports exist regarding population based data of the prevalence of ocular morbidity or visual impairment among adolescents. The information gathered in the present study is vital for planning appropriate eye care programs to reduce the burden of visual impairment in the younger population. The present study was conducted to determine the prevalence of ocular morbidity among the adolescents.

The prevalence of ocular morbidity among boys (7.8%) was slightly higher than in girls (5.6%). Urmil AC et al [12] reported an even higher prevalence of ocular morbidity for boys (38.5%) and girls (28.6%) in school children in Pune during 1988. Similar findings were reported by Kumar D et al [13] in their study at Lucknow. The present study reported ocular morbidity in 13% school adolescents, which were lower then other studies reported in Lucknow, India[13] and in neighboring country Nepal.[14] Lower prevalence of ocular morbidity in current study compare to previous studies may be due to improved living conditions compare to past, with better availability of health services. Moderate visual impairment prevalence was 5.2% reported in current study, similar to Pune[12] and Lucknow.[13] The age trend in the prevalence rate was in conformity with the Datta A et al[15] study, higher in the age group 10-11 years. Prevalence of moderate visual impairment was significantly higher among those who had family history of refractive errors.

Xerophthalmia was reported in 3.8% of school adolescents including night blindness, Bitot`s spot and conjuctival xerosis. A nine percent prevalence of xerophthalmia was reported in Cal-

cutta Corporation[15] and 4% in Delhi[16] among primary school children. Vitamin A deficiency leads to xerophthalmia. To reduce the prevalence of xerophthalmia, Government of India has introduced the National programme for prophylaxis against blindness in children caused due to vitamin A deficiency under Reproductive and Child Health (RCH) programme.[17] The prevalence of night blindness (0.91%) does not exceed WHO standards but the prevalence of Bitot`s spot (1.74%) suggests a public health problem of vitamin A deficiency as per the WHO criteria.[10] WHO report has stated that conjuctival xerosis is not recommended for community diagnosis.[18] The highest numbers of xerophthalmia cases were observed in the age group 10-11 years (12.6%) and lowest in 16-17 years (1.3%). Urmil AC et al [12] reported a higher prevalence of vitamin A deficiency in boys (17%) and girls (9.7%) compare to these study.

Among 1206 children, 45% adolescents were malnourished with 25.5% of these children being overweight (25.5%). A significant association was found between malnourished children and ocular morbidity. There was significant association found between parents` education and development of ocular morbidity. High prevalence of ocular morbidity was reported in adolescents whose parents were illiterate or less education and in adolescents with both parents working. Ahmed F et al[19] have reported similar observations in their study among school adolescents.

Significant difference was observed between lower social class and ocular morbidity. This may be due to better economic stability of medium and higher class which ultimately leads to improved nutrition and hygiene of the adolescents. The proportion of children with vitamin A deficiency was highest among lower socio-economic class, as observed by other authors.[20,21] Significant number of adolescents with vitamin A deficiency were consuming green leafy vegetables and animal origin foods up to 3 times per week only. Dietary deficiency of vitamin A leads to development of xerophthalmia in those children taking insufficient green leafy vegetables and food of animal origin as reported by other studies.[19,22] A limitation of the present study is that adolescents were selected from schools only.

Conclusions:

The main causes of ocular morbidity in adolescence are refractive error, moderate visual impairment and xerophthalmia. These results and findings underline the magnitude and severity of ocular morbidity in an age group that policy makers do not usually consider to be at risk in this respect.

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