Original Research Article

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Prevalence of undetected refractive errors among school children: a cross sectional study in urban Etawah, India

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ABSTRACT

Background: Refractive error is the most common cause of blindness which can be corrected easily. Uncorrected refractive errors are responsible for about 19.7% of blindness in India. The aim and objectives of the study were to find out the prevalence of undetected refractive errors in school children and to find out associated factors related to it.

Methods: This was a cross sectional study in which school children studying in class 5th to 11th were included. Vision of all the children was checked by using Snellen's chart. The responses were recorded on a pre-designed and pre-tested questionnaire. Data entry was done in MS-EXCEL sheet and analysis was done by using SPSS-23.

Results: There are total 350 students out of which 200 (57%) are males and 150 (43%) are females. The undetected refractive error is present in 12% males and 15.3% females. Thus, 47 out of 350 (13.4%) of the children had prevalence of undetected refractive errors.

Conclusions: It is recommended that adequate preschool examination of the children be made mandatory as a part of the admission policy of all the schools. In addition, there should be periodic examination of the school children at least on annual basis.

Keywords: Undetected refractive error, Blindness, Snellen's chart

INTRODUCTION

The refractive error is an optical defect, intrinsic to the eye which prevents light from being brought to a single point focus on the retina, due to which normal vision is reduced. The diagnosis and treatment of refractive error is quite easy to reduce impaired vision. Still in India, refractive error is the second most common cause of patients to consult an ophthalmologist. At present, it is estimated that 153 million people globally over 5 years of age who have uncorrected refractive error, become visually impaired and out of them 8 million are blind. Although refractive errors cannot be prevented but can be treated. Under the National Society of Prevention of

Blindness, a survey was conducted in India in 1974 among children to assess the ocular conditions. It was found that 67.37% of the children had some form of eye disease and out of which refractive error was 18%.¹

Globally it is estimated that 2.3 billion people have refractive errors; out of which 1.8 billion have access to adequate eye examination and affordable corrections and 500 million people with uncorrected error causing either blindness or impaired vision (they are mostly belonging to developing countries).² The uncorrected refractive errors are responsible for about 19.7% of the blindness in India.³ The World Health Organization has launched a Global Initiative Vision 2020 in 1999 with the slogan "The Right to sight". The priority has been chosen on the

basis of the burden of blindness, feasibility and affordability of interventions to prevent and treat. It includes refractive errors while glaucoma and diabetic retinopathy are not included.⁴ It is seen that refractive errors are usually present in the childhood and continue in the adult life. 5-8 Unfortunately, they are not given much importance in our society and it is evident from the fact that there is no effective system of pre-school visual examination of children either in the government sector or in the private sector.9

The refractive errors have been associated with certain other various factors e.g. a positive family history of wearing glasses, close work or near activity such as prolonged study hours, watching computers or television etc. ¹⁰⁻¹⁴ Some studies also state that there is an association with genetic causes. ^{15,16} Still some suspect that there is an interplay between genetics and environmental factors described above. ¹⁷ This problem has been recognized as a public health problem in many countries and also in the Vision 2020 initiative. 18 So, it is high time that we have to recognize the situation as worthy of investment for the future generations. Hence, this study is conducted to determine the prevalence of undetected refractive errors among school children. Another objective is to determine the associated factors with the occurrence of these refractive errors such as family history, prolonged near work, etc.

Aim and objectives

- To find out the prevalence of undetected refractive errors in school children.
- To find out the associated factors related to it.

METHODS

It was a cross sectional study conducted from 1st November 2017 to 31st December 2017 in a government school upto 11th standard in urban Etawah district.

The sample size was calculated by taking the prevalence of refractive error (P) 14.7% and (L) 4% allowable error as follows:19

$$N = 4PQ/L^2$$
, where $P = 14.7\%$, $Q = 100 - P = 100 - 14 = 85.3$, $L = 4\% = 300$

Non- response rate of 10% was taken. Now sample size becomes 330. It was rounded off to 350. Hence, we have taken 350 students in our study. The school was selected by using simple random sampling technique. Study population consisted of school students of a selected school studying from class 5th to class 11th.

Inclusion criteria

All the students of all gender from class 5th to 11th in the selected school.

Exclusion criteria

Exclusion criteria were students studying below 5th class and those students who were already using glasses regularly were excluded from the study. However, any student who has prescribed glasses but had not used them regularly was not excluded; those who were absent on that day; not willing to participate in the study; didn't give consent were also excluded.

The school was screened for one week (six working days) and the students were examined by assessing the visual acuity from a Standard Snellen's Chart obtained from Ophthalmology department. The responses were recorded on a pre-designed and pre-tested questionnaire which was tested on 15% of the subjects in other school. Data was entered in Microsoft excel sheet and exported and analysed by using SPSS V-23.0, IBM Inc. Chicago, USA and chi-square test was applied. Ethical clearance was obtained from Institutional Ethical Committee, Uttar Pradesh University of Medical Sciences, Saifai, Etawah.

RESULTS

Demographic profile

It was observed that only 14% of the school children are more than 15 years of age (Table 1). The majority of the children belong to the age group 9-13 yrs. This constitutes >70% of the group. This is the vulnerable group that will face the impending perils of undetected reduction in vision resulting in reduction of working capacity and in many cases will lead to blindness or visual impairment which can be avoided. There are total 350 students out of which 200 (57%) are males and 150 (43%) are females. The undetected refractive error is present in 12% males and 15.3% females. Thus, 47 out of 350 (13.4%) of the children had prevalence of undetected refractive errors (Table 2).

Table 1: Age wise distribution of undetected refractive error in school going children.

S. No.	Age group (in years)	Ref. error present		Ref. error absent		Total (%)	
		No.	%	No.	%	No.	%
1.	<15	40	13.2	261	86.8	301	100
2.	>15	7	14.2	42	85.8	49	100
	Total	47	13.4	303	86.5	350	100

^{*}row percentages are given

Table 2: Gender wise distribution of undetected refractive error in school going children.

S.No.	Gender	Ref. error present		Ref. error absent		Total	
		No.	%	No.	%	No.	%
1.	Male	24	12	176	88	200	100
2.	Female	23	15.3	127	84.7	150	100
	Total	47	13.4	303	86.5	350	100

^{*}row percentages are given

Table 3: Uncorrected visual acuity of undetected refractive error in school going children.

S. No.	N=350	Right eye		Left eye	Left eye		
		No.	%	No.	%		
1	Severe (<6/60)	0	0	0	0		
2	Moderate (6/24-6/36)	12	3.4	14	4		
3	Mild (6/12-6/18)	26	7.4	29	8.2		
4	Normal (6/6-6/9)	312	89	307	87.7		
	Total	350	100	350	100		

Table 4: Correlations with different factors.

S.No.	Category	N=350	Ref. error present No. (%)	Ref. error absent No. (%)	Total No. (%)	Chi-sq.	P value
1.	Family history	Yes	19 (27.9)	49 (72.1)	68 (100)	15.3	< 0.0001
		No	28 (9.9)	254 (90.1)	282 (100)	13.3	<0.0001
2.	Close watching tv ^a	Yes	20 (19.8)	81 (80.2)	101 (100)	4.96	0.026
		No	27 (10.8)	222 (89.2)	249 (100)	4.90	0.026
3.	Close study ^b	Yes	20 (27.7)	52 (27.7)	72 (100)	— 16.1	< 0.0001
		No	27 (10.8)	251 (89.2)	278 (100)	10.1	<0.0001
4.	Study in dim light ^c	Yes	16 (23.5)	52 (76.5)	68 (100)	7.41	0.006
		No	31 (10.9)	251 (89.1)	282 (100)	— 7.41	0.006

^a less than 10 feet for a standard 21" TV; ^b a cut-off point of 12 inches as minimum distance for reading; ^c less than 100 watts ambient light; Note- p<0.05 is significant.

The Table 3 showed that 12.2% of the students present with mild to moderate decrease in visual acuity (6/12 to 6/36). Majority of them were suffering from myopia.

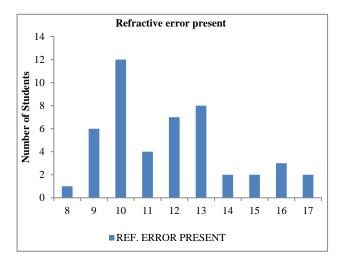


Figure 1: Age wise distribution of undetected refractive error in school going children.

Risk factor exposure associated profile

The Table 4 showed that 27.9% (19 out of 47) students who had refractive errors had a positive history of wearing glasses in their families and indicates a very strong relationship between refractive errors and heredity or familial factors. This table indicates very strong relationship between watching television closely (i.e. less than 10 feet for a standard 21'' TV) and refractive errors.

In this study we find a very strong relationship between close study and refractive errors. For our convenience we have defined a cut off point of 12 inches as minimum distance for reading. The table shows that there is strong correlation between studying in dim (less than 100 watts ambient light) and night light and refractive errors.

DISCUSSION

The aim of Vision 2020 Global Initiative of the World Health Organization is early recognition of avoidable causes of blindness and visual disability and its prompt treatment. It has identified that uncorrected refractive errors among children is major area where immediate action is needed. Thus, the impact of refractive errors on the individual and on the community cannot be ignored. School children are the most vulnerable group to the effects of reduced vision and its impacts on learning capability and educational potential. In addition the management of refractive errors is simple and the most effective eye care that can be provided by involving the community.

Mutti et al, in their study in Rawalpindi found that the prevalence of undetected refractive errors among the school children is 4.27%. ²⁰ Ali et al, in their study in Lahore found that 107 out of 540 (19.8%) of the children had refractive errors. Myopia was the most common refractive error being 43% (46/107) of the total. ²¹ Afghani et al in their study in Singapore found that the prevalence of refractive errors increased with increasing literacy standards as they are the most prevalent in medical students. ²² Seema et al in their study in Haryana observed a prevalence of 13.65% in children of 6-15 year age group. ²³

In present study, 47 out of 350 (13.4%) of the children had undetected refractive errors. Myopia was the most common refractive error. Out of 47, 35 having error in both eye, 3 in right eye only and 9 in left eye only respectively. This study showed that there is a significant association between a positive family history of wearing glasses, watching television closely, close study and studying in dim light.

CONCLUSION

It is recommended that adequate preschool examination of the children be made mandatory and part of the admission policy of all the schools. In addition, there should be periodic eye examination of the school children at least on annual basis.

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Institutional Ethics Committee

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