A Case Study of Refractive Error on School-Going Children in the Selected Rural Area of Bangladesh

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Abstract

Refractive error is one of the most common causes of visual impairment around and it is quite common among school-going children. Children of age 04 years-15 years are a large number portions of the country in a rural area but few studies on such ground had been carried out previously. The aim of this case study was to find out the prevalence of refractive error and its associated factors among school-going children of age 04 years to 15 years. On the basis of 631 samples, the prevalence of refractive error was found 16%. Among the total study subject, more than 50% belong to the age group 7 years-9 years with mean age of 7.4 (± 3) years. Refractive error was significantly associated with gender (p=0.0037), duration of using smartphone (p=0.0113), the problem with headache (p=0.0001), and the problem with vomiting (p=0.0001). The majority of students were never examined for visual acuity, children should be examined at the time of entering school and when they are leaving, at least twice during their study period.

Keywords: Refractive error • Treatment facilities • Myopia • Durgapur upazila

Introduction

Refractive error is the second leading cause of treatable blindness and one of the significant causes of visual impairment [1]. To the preventable blindness, World Health Organization (WHO) has given first priority to refractive errors [2]. WHO given the strategies identified in their publication" Vision 2020 of a global initiative for the Elimination of Avoidable Blindness by 2020" [3], this severe information was presented as the obstacle to the effective national planning and the implementation of any eye care services. The global major challenge to work relentlessly to stops preventable blindness. The government and private sectors are both required to allocate more budgets to increase significantly the development of eye care services [4]. According to the WHO information before the one-decade refractive error was in Taiwan is 0.6%, Singapore is 0.5%, Indonesia is 2.2%, India is 4.3%, Malaysia is 0.3%, Bangladesh is 1.5% [5]. The refractive error was 0.5% responsible for economic blindness and 1.1% responsible for legal blindness (less than 6/60) [6]. In a study that was conducted in New Delhi, they found the refractive error was the cause in 81.7% of eyes with vision impairment [7]. The socio-economical loss due to childhood blindness is huge and human suffering is more. Including blind children, almost 80% of the global blind population lives in developing countries [8]. Bangladesh is one of the small developing countries and 40% of the estimated population is children [9]. As the healthcare facilities in the rural areas are inadequate in Bangladesh and under 15 year ages populations are at high risk in consideration with the refractive error. People are living in undervaluing are where the treatment facility is very low and may have a higher rate of visual problems. Khan et al. conduct a study on the refractive error among school-going children in rural areas of Bangladesh in 2004. In their study, 8.24% of boys and 9.01% of girls were selected from the study area, and recommend that this refractive error of this study is very much ignored [10]. Durgapur Upazila in Rajshahi district is one of the most populated Upazila and 96% of people are living in rural areas of that Upazila. Basically, the population of the Upazila is living in the poorest condition and they are facing problems getting medical and health facilities.

Although several studies have been conducted in the last decade in South Asian countries like India, Pakistan, and Bangladesh which could provide some scenario of such a problem in this region, but a little bit in lest developing country rural area like Bangladesh. The main objective of the study was to determine the prevalence of refractive errors and the associated factors among school-going children age 04 years to 15 years.

Material and Methods

This cross-sectional study was conducted to determine the prevalence of refractive error in school-going children. The sample size for the study was 630 which calculated using the appropriate formula with a 5% non-response error.

The data of 631 children age 04 years to 15 years have been collected from selected schools at Durgapur Upazila in Rajshahi District Bangladesh. Rajshahi District in Bangladesh consists of 9 Upazilas, Durgapur Upazila is one of them and the most populated Upazila of this district. The estimated population of the Upazila around 3,32,000 and among them 96% of people lives in rural areas. There are 74 primary and high schools for grade 1-10 classes' students. Firstly, Durgapur Upazila divided into 4 different locations with respect to their geographical locations. A complete list of all schools from primary to higher was collected and then four schools in each location were selected using a random digit table. All selected schools were visited to get the complete list of all students than subjects were selected by random sampling technique.

The study period was 1st February 2021 to 31st July 2021 with written ethical permission was obtained from Bangladesh Medical Research Council (BMRC), Bangladesh as well as verbal consent was obtained from teachers and study subject.

The information regarding age, gender, problems of the eye, vision, etc. were recorded and the color card and pinholes were also utilized. World Health Organization (WHO) criteria of visual acuity<6/18 were taken as visually impaired while<3/60 was taken as blindness [11]. Generally, the visual acuity of 6/12 does not affect school performance and hence is not considered as visually impaired in the current international literature. The screening procedures and related tools for this study developed by the PHeaRTS team as well as provide training to the staff that can perform the screening. Then they were received hands-on training from the ophthalmologist of the health Centre on how to perform refractive screening or vision screening for the school students. They collected data on knowledge of vision screening, eye diseases, and its care before the training. After the one-week training, the trainer collected the data to see the development of their capacity to perform more accurate standards as an eye nurse. The trained staff and teachers were performing the screening of refractive error in a team. Where 1 school teacher and one trainee work jointly.

Following variables were selected for the study, beside the socioeconomic and demographic factors; Fathers and mothers' occupations, joint or nuclear family status, have color identification problem or not, have any reading or watching problem or not, faces any headache or not, facing any problem of vomiting or not, facing any problem of squint eye or not and smartphone using status.

A pretest was conducted for the final preparing the questionnaire before the final implementation. Collect the information from the selected participant were face to face interview. After collecting data, it had been checked and verify to make sure that all study subjects are the answer to each item or not which one properly fulfill all questions of the questionnaire only those study subjects had been properly recorded for the data analysis. Statistical software SPSS version 16 used for data analysis.

Frequency tables were used to describe the distribution of the socio-educational characteristics of the study subjects. Chi-square test was used

to determine the association of the refractive error with respect to age, gender, father occupation, types of families, Body Mass Index (BMI), the problem with headache, and smartphone using status. And p-value<0.05 was considered significant.

Results

Socio-demographic and background characteristics of the study subjects

A total of 631 study subjects sincerely provided the information. Among them, 223 (35.34%) were less than 6 years, 317 (50.24%) from age 7 years to 9 years, and only 6(0.95%) were more than 12 years. Most of the study subject's father's occupation was farmer 231(36.61%), and daily labor 297(47.07%), as well as they, live in the joint family 442 (70.05%). Among the total study subject, only 423 (67.04%) study subjects were able to watch Television closely (<5 fits) and the rest of the others 208 (32.96%) were not able to watch Television closely. Total 197 (31.22%) study subjects were problems with headaches, and other study subjects are free from headaches 434(86.78%) as well as 25 study subjects were facing problems reading words on the blackboard (3.96%). Among all study subjects only 3(0.48%) study subjects were a color identification problem, there was a significant proportion of using smartphones, among all study subject 468(74.17%) study subjects were using the smartphone for watching movies or playing the game and only 163(25.83%) were free from the smartphone. And also, Table 1 shows among the study subject's consumption of majority (62.76%) were Underweight (BMI<18.5), but 41.5% were normal weight (BMI 18.5-24.9).

Table 1. Socio-demographic and background characteristics of the study subjects (n=631).

Characteristics	n	%
Age (years)		
≤ 6	223	35.34
7-9	317	50.24
10-12	85	13.47
12+	6	0.95
Gender		
Male	314	49.76
Female	317	50.24
Father's Occupation		
Farmer	231	36.61
Self-employed	35	5.55
Business	68	10.78
Daily labor	297	47.07
Others	231	36.61
Types of Families		
Nuclear family	189	29.95
Joint family	442	70.05
Able to watching Television closely (<5ft)		
Yes	423	67.04
No	208	32.96
Problem to reading word in the blackboard		
Yes	25	3.96
No	606	96.04
Color identification problem		
Yes	3	0.48
No	628	99.52
Have any problem with headache		
Yes	197	31.22
No	434	68.78
Have any problem with vomiting		
Yes	59	9.35
No	572	90.65
Have any problem to squint eye		
Yes	7	1.11
No	624	98.89
Used smartphone long time (>4 hours) for playing games or enjoying movies		
Yes	468	74.17
No	163	25.83
Played games in outdoor long time (>4 hours)		
Yes	345	54.68
No	286	45.32
Participant's Body Mass Index (BMI)		
Underweight (BMI<18.5)	396	62.76
Normal weight (BMI 18.5-24.9)	235	37.24
Age		
Mean ± SD	7.4 ± 3	

Prevalence of refractive error among the study subjects

The Figure 1 shows that among the study, subjects present the refractive error 16.0% and the rest 84.0% were a normal vision (Figure 1).

Distribution of refractive error by demographic characteristics (n=631)

Refractive error was significantly higher for females than the male

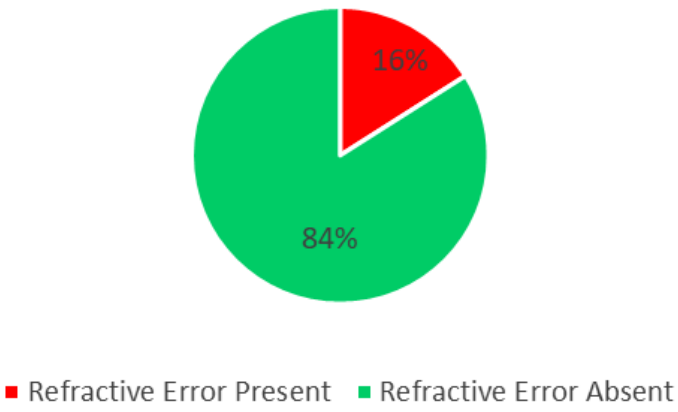

Figure 1. Prevalence of refractive error among the participants (n=631).

Table 2. Distribution of refractive error by demographic characteristics (n=631).

Characteristics	Refractive error		Chi-Square(df)	
	Present (%)	Absent (%)		
Age				
≤ 6	31(13.90)	192(86.10)	1.78(3)	0.6187^{ns}
7-9	52(16.40)	265(83.60)		
10-12	17(20.00)	68(80.00)		
12+	1(16.67)	5(83.33)		
Gender				
Male	38(11.84)	283(88.16)	8.44(1)	0.0037*
Female	63(20.32)	247(79.68)		
Types of Families				
Nuclear family	13(18.06)	59(81.94)	0.25(1)	0.6144^{ns}
Joint family	88(15.74)	471(84.26)		
Father's Occupation				
Farmer	23(15.23)	128(84.77)	3.58(4)	0.4653^{ns}
Self-employed	8(17.39)	38(82.61)		
Business	17(2.94)	561(97.06)		
Daily labor	47(14.83)	270(85.17)		
Others	6(13.33)	39(86.67)		
Participant's Body Mass Index (BMI)				
Underweight (BMI <18.5)	69(17.42)	327(82.58)	1.59(1)	0.20732^{ns}
Normal weight (BMI 18.5-24.9)	32(31.68)	203(86.38)		
Used smartphone long time (>4 hours) for playing games or enjoying movies)				
Yes	73(18.96)	312(81.04)	6.41(1)	0.0113*
No	28(11.38)	218(88.62)		
Have any problem with headache				
Yes	76(38.58)	121(61.42)	108.54(1)	0. 0001***
No	25(5.76)	409(94.24)		
Have any problem with vomiting				
Yes	24(40.68)	35(59.32)	29.46(1)	0. 0001***
No	77(13.46)	495(86.54)		

NOTE. Level of significance: *** for P<0.001, ** for P<0.01, * for P<0.05, ns for not significant.

Table 3. Factors for refractive error among school going children (n=631).

Factors	Unadjusted OR	CI (95%)		P value	Adjusted OR	CI (95%)		P value
		Lower	Upper			Lower	Upper	
Gender								
Male	7.284	3.095	17.141	0	4.776	1.508	15.127	0.008**
Female	Reference	--	--	--	Reference	--	--	--
Used smartphone long time (>4 hours) for playing games /enjoying movies								
Yes	4.21	1.216	9.212	0.048	4.52	1.31	10.217	0.049**
No	Reference	--	--	--	Reference	--	--	--
Have any problem with headache								
Yes	15.49	6.113	39.249	0	11.004	3.211	37.707	0.000***
No	Reference	--	--	--	Reference	--	--	--
Have any problem with vomiting								
Yes	7.532	1.016	55.802	0.04	9.825	1.13	85.367	0.038**
No	Reference	--	--	--	Reference	--	--	--

NOTE. Level of significance: *** for P < 0.001, ** for P < 0.01, * for P < 0.05, ns for not significant.

student (20.32%, p<0.05). Study subjects who used long-duration smartphones (>4 hours) for playing games or enjoying movies had a higher prevalence of refractive error (18.96%, p<0.05). Problem with headache students had a significantly higher prevalence of refractive error than the student who was free from headache (38.58%, p<0.001). Also, the student who had the vomiting problem higher prevalence of refractive error than the student who was free from vomiting (40.68%, p<0.001) (Table 2).

Risk factor for refractive error among school going children

To identify factors that affected the prevalence of refractive error among school-going children, a binomial logistic regression analysis was used. The dependent variable was refractive error status; independent variable including gender, smartphone using a status for playing games or enjoying movies, the problem with headache status, the status of vomiting problem.

Results show that female students (OR=7.284, p<0.05) had a higher likelihood of having refractive error than male children. The likelihood of refractive error 4.5 times higher among the children who used smartphones long time (>4 hours) for playing games /enjoying movies (OR=4.52, p< 0.05). Children who were faces problem with headache (OR=11.004, p<0.01) had more than 11 times higher risk of having refractive error than who were. The chance of having refractive error was associated with the problem with vomiting (OR=9.825, p<0.05) (Table 3).

Discussion

The main objective of this study was to determine the prevalence of refractive errors as well as find out the factors which are associated with the refractive errors, among the school-going children (age 04 years to 15 years) in the rural area. In the present study, the prevalence of refractive error was found at 16% and the criteria for legal blindness was 6/60 as recommended by Md. A. Kader that study was conducted for finding the refractive errors on School going children in north west zone of Bangladesh [10]. In their study result, they found the overall prevalence of refractive error was 9.20%.The prevalence of refractive error in Malaysia is lower 13.4% but in Singapur is higher 36.3% is comparable with this study [11]. In Uganda it was 11.6 % which corresponds to the present study, the exact cause was not mentioned, it might be due to limitation of representativeness [12]. Regarding the refractive error could be compared with Nepal 2.2% and rural India 2.8% that is recent. Is also agreement with Nepal study was an ocular refractive error in the prevalence of refractive error ocular morbidity in school children in Kathmandu 11% [13].

The prevalence of refractive error was scientifically higher with female than male. In table 3. refractive error 4.5 times higher among the children who used smartphones long time (>4 hours) for playing games /enjoying movies. Children have headache, vomiting problem, higher chance to be having refractive error. In Egypt, the prevalence of refractive error was 22.1 and this amount rising due to socio-economical conditions like age, gender, and positive family history. Most important is that the complexity of refractive error is easily preventable and treatable if diagnosis and treatment was be done in proper time.

Conclusion

The refractive error is the major health concern in our country of school-going children in our country but most of the guardians and students are not conscious such this major problem. Parents of the student should be taken consulted with an ophthalmologist for children who complained about any eye problem and the refractive error knowledge should be incorporated in the primary eye care program. In this context, leaflets, posters, radio, television, and newspapers may play an essential role in increasing the student's, teacher, and parents' consciousness. As the study was done among the children of the rural areas and the urban areas was not covered, so to find out the real complete picture for the refractive error among rural and urban areas further study is needed. But it could be concluded that the refractive error is one of the most common causes of visual impairment and has a relationship with female sex, smartphone using time, the problem with headache, and the problem with vomiting, but no association was found with age, family's types, father's occupation, participant's body mass index (BMI) and other risk factors. The majority of students were never examined for visual acuity. So, it could be recommended that children should be examined at the time of entering school and when they are leaving, at least twice during their study period.

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

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