

# The Pattern of Refractive Errors in Children of Dhaka City

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## Abstract

**Introduction:** Refractive errors are a very common problem for school-going children all over the world. In our country, a bulk of children are suffering from refractive error and its consequences. Proper attention to the matter is time-demanding. This study aimed to assess the pattern of refractive errors in children of Dhaka city.

**Methods:** This observational study was conducted at the Department of Ophthalmology, Combined Military Hospital, Dhaka, Bangladesh, from July 2020 to June 2021. School-going children were considered as the study population. A total of 2000 students were selected as study subjects by simple random sampling technique. The students under the study were tested vision from 6-meter distance with a standard Snellen vision chart. All data were collected using a pre-formed questionnaire. A descriptive analysis was done. Analysis of data was carried out by using MS Office tools.

**Result:** Refractive error was found in 16.25% of school-going children of Dhaka City. Among them myopia was 10.50%, hypermetropia was 02.75% and astigmatism was 03.00%. Myopia was the most common error found in all age groups (64.62%). An important observation was that 42.28% of the refractive error cases were undiagnosed previously. Among the previously diagnosed cases, 26.34% were not wearing their correcting glasses.

**Conclusion:** Refractive errors are quite common among the children of Dhaka City. School teachers, school health clinics, and doctors should take more care regarding the problem. Community mobilization, awareness, and early detection of childhood eye diseases, with effective referral mechanisms for accessing appropriate care, are crucially important to improve service delivery.

**Keywords:** Refractive error, Snellens chart, Myopia, Hypermetropia, Astigmatism

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## I. INTRODUCTION

Children of the 05-15 years age group constitute a major bulk of our population. Though there are so many health problems for children in our country, refractive error is not less important. Refractive error constitutes a major bulk of ophthalmic morbidity and complications. The total effect of refractive error on children, their families, and above all the country is not negligible. [1-3] For this reason, the early detection and prompt treatment of refractive error in children is very important. Refractive errors, such as myopia, hyperopia, and astigmatism, in children, produce retinal image blur and degradation of distance or near visual acuity or both. Hyperopia and anisometropia in children are associated with deficits in reading performance. [4] Vision 2020: The Right to Sight, a global initiative launched by a coalition of non-government organizations and the

World Health Organization (WHO), is to eliminate avoidable visual impairment and blindness on a global scale. [5]The World Health Organization estimates that 13 million children aged 5–15 years worldwide are visually impaired from uncorrected refractive error. School vision screening programs can identify and treat or refer children with refractive errors. [6] It is one of the most common causes of visual impairment around the world and the second leading cause of treatable blindness. [7]The Refractive Error Study in Children (RESC) reported that the prevalence of myopia was higher in China, compared to Nepal, Chile, India, South Africa, and Malaysia, consistent with other reports of high myopia rates among children of East Asian origin. [8] The presence of uncorrected refractive errors and an associated deficit in vision may be difficult to identify in young children. A vision deficit could be perceived by parents to be a problem with general development. [9]Visual impairment from uncorrected refractive errors can have immediate and long-term consequences in children and adults, such as lost educational and employment opportunities, lost economic gain for individuals, families, and societies, and impaired quality of life. Several factors are responsible for refractive errors remaining uncorrected: lack of awareness and recognition of the problem at the personal and family level, as well as at the community and public health level; non-availability of and/or inability to afford refractive services for testing; insufficient provision of affordable corrective lenses; and cultural disincentives to compliance. [10]A noteworthy finding of one study showed that even in economically advantaged societies, refractive errors can go undetected or uncorrected in children. [11]The school screening program is an effective way to detect the refractive error that causes the identification of visual impairment in school children. [12]

## **II. OBJECTIVE**

### **General Objective**

- To assess the pattern of refractive errors in children of Dhaka city.

### **Specific Objectives**

- To see the age and sex distribution among the study subjects.
- To observe the presenting features among the refractive error cases.
- To analyze the refractive errors in relation to age and sex.
- To know previously diagnosed and undiagnosed cases.

## **III. METHODS**

This observational study was conducted at the Department of Ophthalmology, Combined Military Hospital, Dhaka, Bangladesh, from July 2020 to June 2021. School-going children were considered as the study population. A total of 2000 students were selected as study subjects by simple random sampling technique as per inclusion and exclusion criteria.

### **Inclusion Criteria**

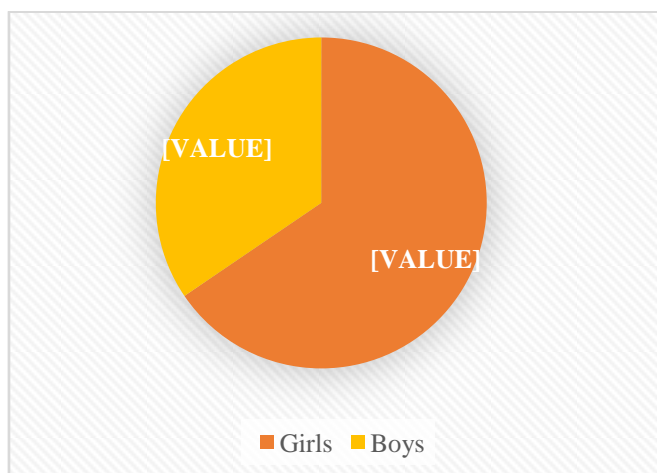
- Children requiring refractive error correction.
- Children of 5-15 years of age.
- Children who were willing to give consent.

### **Exclusion Criteria**

- Children above 15 years and below 5 years of age.
- Children who did not give consent to participate in the study.

Data were collected from 7 schools in Dhaka city. Children requiring refractive error correction were detected by screening tests of visual acuity and retinoscopy. The students under the study were tested vision from 6-meter distance with a standard Snellen vision chart. A gross eye examination was done by pen torch. Cover tests, motility tests, retinoscopy, and direct ophthalmoscopy were done. All data were collected using a pre-formed questionnaire. A descriptive analysis was done. Analysis of data was carried out by using MS Office tools. After analysis, the data were presented in tables and charts. Selected children were given eyeglass correction in CMH Dhaka. Ethical clearance was taken from the ethical committee of CMH Dhaka. Informed written consent was obtained from the participants.

IV. RESULTS

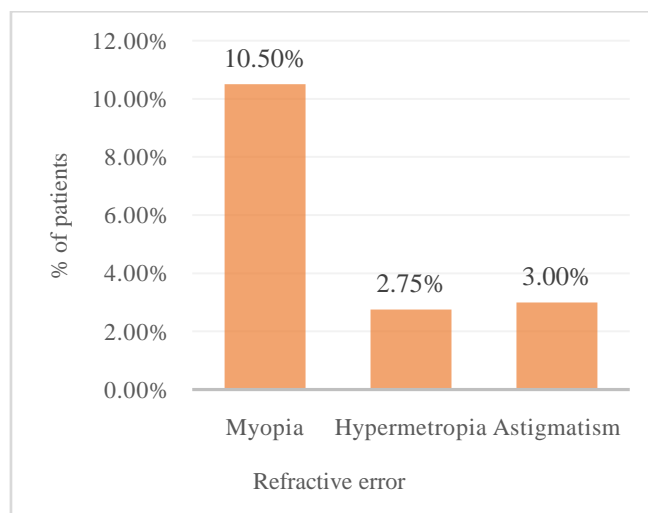


**Figure 1:** Distribution of examined subjects according to gender (N=2000)  
 Out of 2000 participants, 1310 (65.50%) were girls and 690(34.50%) were boys. [Figure 1]

**Table 1:** Percentage of refractive errors according to gender (N=2000)

| Girls |              |        | Boys |              |        | Total |              |        |
|-------|--------------|--------|------|--------------|--------|-------|--------------|--------|
| n     | No. of error | %      | n    | No. of error | %      | n     | No. of error | %      |
| 1310  | 220          | 16.79% | 690  | 105          | 15.22% | 2000  | 325          | 16.25% |

Refractive errors were found in 16.79% of the girls and 15.22% of the boys. Both sexes combined had an incidence of 16.25%. [Table 1]



**Figure 2:** Percentage of different types of refractive error (n=325)  
 In this series, 210 (10.50%) were Myopic, 55 (2.75%) were Hypermetropic and 60 (3.00%) were Astigmatic. [Figure 2]

**Table 2:** Percentage of different types of refractive error in relation to gender (N=2000)

| Sex   | Total number | Myopia      | Hypermetropia | Astigmatism |
|-------|--------------|-------------|---------------|-------------|
| Girls | 1310         | 143(10.91%) | 35(2.67%)     | 42(3.21%)   |
| Boy   | 690          | 67(9.71%)   | 20(2.90%)     | 18(2.61%)   |
| Total | 2000         | 210(10.50%) | 55(2.75%)     | 60(3.00%)   |

Among 1310 girls 143(10.91%) were myopic, 35(2.67%) were hypermetropic and 42(3.21%) were astigmatic. Among 690 boys 67(9.71%) were myopic, 20(2.90%) were hypermetropia and 18(2.61%) were astigmatic. Total myopia 210(10.50%), hypermetropia 55(2.75%) and astigmatism 60(3.00%). [Table 2]

**Table 3:** Percentage of different types of refractive errors at different age groups (n=325)

| The pattern of refractive error | 05-07 years | 08-10 years | 11-13 years | 14-15 years | Total         |
|---------------------------------|-------------|-------------|-------------|-------------|---------------|
| Myopia                          | 43 (13.23%) | 52(16.00%)  | 57(17.54%)  | 58(17.85%)  | 210(64.62%)   |
| Hypermetropia                   | 17(5.23%)   | 16(4.92%)   | 12 (3.69%)  | 10 (3.08%)  | 55(16.92%)    |
| Astigmatism                     | 19 (5.85%)  | 20 (6.15%)  | 14 (4.31%)  | 07 (2.15%)  | 60 (18.46%)   |
| Total                           | 79(24.31%)  | 88(27.08%)  | 83(25.54%)  | 75(23.08%)  | 325 (100.00%) |

Of 210 myopic cases, 43(13.23%) are 05-07 years age group, 52(16.00%) are 08-10 years age group, 57 (17.54%) are 11-13 years age group and 58 (17.85%) are 14-15 years age group. Out of 55 hypermetropic cases 17(5.23%) are 05-07 years age group, 16(4.92%) are 08-10 years age group, 12 (3.69%) are 11-13 years age group and 10(3.08%) are 14-15 years age group. Out of 60 astigmatic cases 19 (5.85%) are 05-07 years age group, 20(6.15%) are 08-10 years age group, 14(4.31%) are 11-13 years age group and 07(2.15%) are 14-15 years age group. Total 79(24.31%) are 05-07 years age group, 88(27.08%) are 08-10 years age group, 83(25.54%) are 11-13 years age group and 75(23.08%) are 14-15 years age group. [Table 3]

**Table 4:** Distribution of presenting features among the refractive error cases (n=325)

| Presenting features                    | Myopia n (%) | Hypermetropia n (%) | Astigmatism n (%) | n   | %        |
|--|--------------|---------------------|-------------------|-----|----------|
| Defective vision                       | 120 (57.14%) | 18 (32.72%)         | 12(20.00%)        | 150 | (46.15%) |
| Headache with/without pain in the eyes | 10 (4.96%)   | 30 (54.55%)         | 32 (53.33%)       | 72  | (22.15%) |
| Asymptomatic                           | 80 (38.10%)  | 07 (12.73%)         | 16 (26.67%)       | 103 | (31.69%) |
| Total                                  | 210          | 55                  | 60                | 325 | 100.00%  |

Among the complaints more common is defective vision in myopic cases 57.14%, headache with/without pain in the eyes more common in hypermetropic and astigmatic cases 54.55% & 53.33% cases respectively. [Table 4]

**Table 5:** Percentage of previously diagnosed and undiagnosed cases (n=325)

| Types of errors | n   | Previously undiagnosed (n) | %      | Previously diagnosed (n) | %      |
|-----------------|-----|----------------------------|--------|--------------------------|--------|
| Myopia          | 210 | 95                         | 42.29% | 115                      | 54.76% |
| Hypermetropia   | 55  | 20                         | 36.36% | 35                       | 63.64% |
| Astigmatism     | 60  | 24                         | 40.00% | 36                       | 60.00% |
| Total           | 325 | 139                        | 42.28% | 186                      | 57.23% |

Out of 325 refractive errors cases 139 (42.28%) were undiagnosed before. Of them myopic cases were 95 (42.29%), Hypermetropic cases were 20 (36.36%) and Astigmatic cases were 24 (40.00%). A total of 186 (57.23%) were diagnosed before. Of them myopic were 115 (54.76%), hypermetropic 35 (63.64%), and astigmatic 36 (60.00%). [Table 5]

**Table 6:** Previously diagnosed cases were wearing & not wearing their refractive correction (n=325)

| Types of errors | Diagnosed cases (n) | Wearing refractive correction(continuous and occasional) (n) | %      | Not wearing refractive correction (n) | %      |
|-----------------|---------------------|--|--------|---------------------------------------|--------|
| Myopic          | 115                 | 85   | 73.91% | 30                                    | 26.09% |
| Hypermetropia   | 35                  | 28   | 80%    | 07                                    | 20%    |
| Astigmatism     | 36                  | 24   | 66.67% | 12                                    | 33.33% |
| Total           | 186                 | 137  | 73.66% | 49                                    | 26.34% |

Out of the total 186 previously diagnosed refractive error cases, 137 (73.66%) were wearing their refractive correction and 49 (26.34%) did not. [Table 6]

## V. DISCUSSION

In the study, the percentage of refractive errors is 16.25%. In previous studies carried out by Islam, M.T et al [13] the refractive error was found 16%. Kader A, et al [14] found the overall prevalence of refractive error was 9.20%. The prevalence of refractive error in Malaysia is 13.4% and in Singapur is 36.3% is comparable with this study. [15] But in one study conducted in Katmandu, Nepal the refractive error was found 8.60%. [16] In China, it is 12.8%<sup>8</sup>. In Uganda it was 11.6%. [17] Among the children with refractive errors, the percentage of refractive errors was found as myopia at 64.62%, hypermetropia at 16.92%, and astigmatism at 18.46%. Identical findings are seen in other studies in our country by Kadir SMU et al. [19] They found myopia at 50%, hypermetropia at 12.6%, and astigmatism at 37.4%. A significant difference was found in a study done in the southern area of Bangladesh by A. Raihan et al. [20] A considerably greater incidence of myopia (44.79%) occurs in Japan shown by Shrestha et al., [21] and 53% of Chinese students are found myopic in other studies. [16,17] In this study 64.62% of refractive error children were myopic. This observation is resemblance to the study in Bangladesh by Kadir SMU et al. [19] In some studies, it has been found that there was a higher prevalence of myopia among females than males. Some also show the male predominance of myopia. [19] However, in the present study, there was no significant difference in the prevalence of refractive error between boys and girls (Myopia in boys 9.71% & myopia in girls 10.91%). In this study the percentage of hypermetropia was 16.92% among the students with refractive errors, which is similar to Kadir, [19] who found hypermetropia at 12.6%. It was found that in the 5-7 years age group, refractive error was 24.31%, but in the 8-10 years age group, it was 27.08%. In another study, the highest percentage of refractive errors was found in the 8-10 years age group. [19] Similar results were found by A. Raihan et al. [20] The relative percentage of astigmatism in the present study was 18.46%. The finding correlates well with the study of Kadir et al [19], they got in as 37.4%. The defective vision was complained by 46.15% of the children having a refractive error. Among them 57.14% of them were myopic, 32.72% hypermetropic and 20% astigmatic. The study compared with another study with nearly similar results. [14,19,20] Among the refractive error children, 22.15% complained of headache. It was observed that 4.96% of them were myopic, 54.55% hypermetropic and 53.33% astigmatic. Completely asymptomatic children were 31.69%. Most of these asymptomatic cases were myopic (38.10%). These findings correlate well with the different observations at home [19,20] and abroad [15] except for the percentage of asymptomatic cases. In my study, the percentage of asymptomatic cases was much higher. General management of refractive error consisted of improvement of general physical and nervous state. The children were advised to maintain general health with an abundance of fresh air, exercise, and a balanced diet. This is very important because of improvement of general health is not less important than the provision of spectacles, particularly in children. In the case of myopia, advice was given regarding adequate illumination for close work, avoidance of undue ocular fatigue, and clarity of print for close work. Awareness building among the teachers, students, community leaders, and guardians can help evaluate the visual status and prevent the children's visual impairment. [22,23]

### Limitations of The Study

The study was conducted for a short duration and involved 7 schools in Dhaka city. So, the results may not represent the whole community.

## VI. CONCLUSION

Refractive error among children is quite common but at the same time very much neglected ophthalmological problem. To make people conscious of refractive error, health education should get the due importance. Knowledge about refractive error should be incorporated elaborately into the primary eye care programs, which is an integral part of primary health care.

## VII. RECOMMENDATION

Everyone in our society should have an idea about refractive error and its consequences; which is reversible and irreversible visual loss. Community awareness through TV, Radio, Cinema, Newspaper, and Posters may be considered. A single study about the refractive error is not at all adequate. Further study in this field is suggested. Ophthalmologists, government, and non-government organizations should come forward and collaborate to help children with refractive errors.

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**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the Institutional Ethics Committee

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