**ORIGINAL ARTICLE**

# Prevalence and Patterns of Refractive Errors in School-Going Children Attending a Tertiary Eye Clinic

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## ABSTRACT

**Background:** Refractive errors are a leading cause of visual impairment in children, often going undetected in early years, especially in developing regions. If left uncorrected, they can significantly affect academic performance, social development, and visual outcomes, including the risk of amblyopia. Understanding their prevalence and patterns is essential for early intervention.
**Objective:** To determine the prevalence and patterns of refractive errors among school-going children attending a tertiary care hospital in Quetta.
**Methods:** This hospital-based, cross-sectional study was conducted from January to December 2019 at Helpers Eye Hospital / Bolan Medical College, Quetta. A total of 768 children aged 5–15 years were examined. Visual acuity testing, cycloplegic or non-cycloplegic refraction (based on age and clinical indication), and full ophthalmic examinations were performed. Refractive errors were classified as myopia (SE ≤ –0.50 D), hypermetropia (SE ≥ +2.00 D), and astigmatism (cylinder ≤ –0.75 D). Data were analyzed for prevalence, age and gender distribution.
**Results:** Refractive errors were identified in 436 (56.8%) of children. Myopia was the most prevalent (28.4%), followed by astigmatism (17.2%) and hypermetropia (11.2%). Myopia increased with age, particularly after 10 years, while hypermetropia was more common in younger children. Slight gender differences were noted, with females showing a higher prevalence of myopia and males a higher prevalence of astigmatism.
**Conclusion:** A significant proportion of school-going children had uncorrected refractive errors, with age-related trends in distribution. The high prevalence emphasizes the need for school-based vision screening programs and timely corrective measures to prevent long-term visual impairment and support academic development.
**Keywords:** Refractive errors, Myopia, Hypermetropia, Astigmatism, School children, Vision screening.

## INTRODUCTION

Refractive errors are a common cause of vision problems around the world, and they are especially important in children because they affect their learning, development, and quality of life. School-age children are particularly susceptible, as unaddressed refractive errors may result in suboptimal academic achievement, diminished social engagement, and potentially irreversible visual impairment, such as amblyopia, if not identified and treated promptly[1,2]. A significant number of children with refractive errors go undiagnosed and untreated, especially in low- and middle-income countries, even though they can be easily fixed with glasses or other optical aids.

There are a lot of different rates of refractive errors in children in different parts of the world. This is because of genetic, environmental, and socioeconomic factors. The increasing prevalence of refractive errors, especially myopia, among school-aged populations has been associated with urbanization, heightened near-work activities, and diminished outdoor exposure[3,4]. There has been a worldwide worry about the "myopia epidemic" in the last few years. Projections say that by 2050, almost half of the world's population may have myopia[5]. This makes it very important for public health to find and treat refractive errors in school-aged children as soon as possible.

Age and gender also affect the patterns of refractive errors like myopia, hyperopia, and astigmatism. Myopia usually gets worse as people get older, and it is more common in cities than in rural areas, probably because of differences in lifestyle[6]. Hyperopia, conversely, is more commonly seen in younger children and typically diminishes with age. Astigmatism may manifest either as an isolated condition or in conjunction with myopia or hyperopia, and its incidence fluctuates according to ethnic and genetic factors[7].

The World Health Organization (WHO) says that regular vision tests at school are a cheap way to find out if kids have refractive errors early on[8]. But in many developing countries, limited resources, not enough trained staff, and not enough access to eye care services make it hard to put these screening programs into action. Consequently, a significant number of children arrive at tertiary care facilities exhibiting advanced visual symptoms that could have been addressed earlier through straightforward corrective measures.

Tertiary eye clinics are mainly for treating more complicated eye problems, but they also provide important information about the burden and patterns of refractive errors in children who might not have been found otherwise. Data collected from these centres can indicate referral trends, assist in evaluating the severity and classification of refractive errors, and guide public health initiatives designed to enhance pediatric eye care services.

There is a need for updated and region-specific data to help with policy and intervention strategies because more and more people are worried about children's visual health and refractive errors are a major cause of avoidable visual impairment. While numerous studies have evaluated refractive errors in general pediatric populations, there is a paucity of research concentrating on children referred to tertiary care centres, which typically handle more complex or severe cases.
**Objective:** The aim of this study is to ascertain the prevalence and patterns of refractive errors in school-aged children attending a tertiary eye clinic, with the goal of identifying prevalent refractive conditions, demographic trends, and potential opportunities for early intervention.

## MATERIALS AND METHODS

This research was a hospital-based, cross-sectional observational study performed at Helpers Eye Hospital / Bolan Medical College, Quetta, over one year, from January 1, 2019, to December 31, 2019. The target population comprised school-aged children, aged 5 to 15 years, who attended the ophthalmology outpatient department for vision assessment or were referred from other departments due to complaints of visual difficulties. The inclusion criteria consisted of children within the designated age range exhibiting suspected refractive errors. Children with a history of ocular trauma, previous ocular surgery, established ocular diseases such as cataract, glaucoma, or retinal disorders, or systemic illnesses impacting vision were excluded from the study.
When they arrived, each child had a thorough eye exam. Standard

age-appropriate charts were used to test visual acuity. Snellen or LogMAR charts were used for children who could read and write and were willing to work together. Picture charts or symbol-based charts like the Lea symbols were used for younger children. A thorough history was acquired, encompassing age, gender, grade level, presenting symptoms (such as blurred vision, headaches, or difficulty seeing the board), prior spectacle usage, and familial history of refractive errors.

The ocular examination encompassed the evaluation of extraocular movements, cover-uncover and alternate cover tests for strabismus detection, and anterior segment examination utilizing a slit lamp when deemed necessary. Fundus examination was conducted under mydriasis utilizing direct ophthalmoscopy or indirect techniques as required to exclude any posterior segment pathology that might simulate or exacerbate visual symptoms.

All children underwent objective refraction. Cycloplegic refraction was done with 1% cyclopentolate, which was put in twice at five-minute intervals, for kids under 8 years old or in cases where accommodative spasm was suspected. Retinoscopy or autorefractometry was conducted 30 minutes subsequent to the final drop. Older children underwent non-cycloplegic autorefraction, succeeded by subjective refinement. To find the spherical equivalent (SE), we added the sphere value to half of the cylinder power. We put refractive errors into three groups: myopia was SE ≤ –0.50 diopters (D), hyperopia was SE ≥ +2.00 D, and astigmatism was cylinder power ≤ –0.75 D. Anisometropia was identified when the disparity in spherical equivalent (SE) between the two eyes exceeded 1.00 D. Amblyopia was characterized by best-corrected visual acuity inferior to 6/12 in one or both eyes, absent any discernible pathology.

A structured data collection form was used to record all clinical and demographic information. Then, the data was put into a spreadsheet and looked at with regular statistical software. We used descriptive statistics to find the means, standard deviations, and proportions. Chi-square tests were used to look at the relationships between age, gender, and type of refractive error. A p-value of less than 0.05 was considered statistically significant.

The institutional ethics committee of the tertiary care hospital gave the study its ethical approval. The parents or guardians of all the participants gave their informed consent, and the children gave their assent when it was appropriate. Children diagnosed with refractive errors received suitable spectacle prescriptions and were advised on the significance of adherence and follow-up, particularly in instances requiring amblyopia treatment.

## RESULTS

The study examined 768 school-aged children, aged 5 to 15 years. Of these, 392 (51.0%) were men and 376 (49.0%) were women, which means that there were about 1.04 men for every woman. The average age of the people who took part was 10.3 years old, with a range of 2.8 years. The majority of the children examined were aged 10 to 12 years. Table 1 shows the demographic information about the people who took part in the study.

Of the 436 children examined, 56.8% had some kind of refractive error, while the other 332 (43.2%) did not show any significant refractive findings. The most common refractive error was myopia, which was found in 218 children (28.4%). Astigmatism was next, with 132 children (17.2%), and hypermetropia was last, with 86 children (11.2%). Table 2 shows how the different types of refractive errors found in the study population are spread out.

When refractive errors were analyzed according to age groups, myopia showed a marked increase in prevalence with increasing age, particularly after 10 years. Hypermetropia was more common in younger children aged 5–7 years, while astigmatism showed relatively uniform distribution across age groups. Table 3 illustrates the distribution of types of refractive errors by age group.

Gender-wise distribution of refractive errors revealed that myopia was slightly more prevalent in females (29.5%) than in males (27.3%). Astigmatism was more common among males, while hypermetropia showed no significant gender difference. These findings are summarized in Table 4.

Table 1: Demographic characteristics of the study participants (n = 768)

| Variable | Frequency (n) | Percentage (%) |
|---|---|---|
| Age Group (years) | | |
| 5–7 | 142 | 18.5 |
| 8–10 | 202 | 26.3 |
| 11–13 | 278 | 36.2 |
| 14–15 | 146 | 19.0 |
| | | |
| Gender | | |
| Male | 392 | 51.0 |
| Female | 376 | 49.0 |

Table 2: Distribution of refractive errors among participants (n = 768)

| Refractive Error Type | Frequency (n) | Percentage (%) |
|---|---|---|
| Myopia | 218 | 28.4 |
| Hypermetropia | 86 | 11.2 |
| Astigmatism | 132 | 17.2 |
| No Refractive Error | 332 | 43.2 |

Table 3: Distribution of refractive errors by age group

| Age Group (years) | Myopia (n, %) | Hypermetropia (n, %) | Astigmatism (n, %) |
|---|---|---|---|
| 5–7 | 18 (12.7%) | 34 (23.9%) | 22 (15.5%) |
| 8–10 | 54 (26.7%) | 22 (10.9%) | 34 (16.8%) |
| 11–13 | 94 (33.8%) | 18 (6.5%) | 54 (19.4%) |
| 14–15 | 52 (35.6%) | 12 (8.2%) | 22 (15.1%) |

Table 4: Gender-wise distribution of refractive errors

| Refractive Error Type | Male (n = 392) | Female (n = 376) |
|---|---|---|
| Myopia | 107 (27.3%) | 111 (29.5%) |
| Hypermetropia | 44 (11.2%) | 42 (11.2%) |
| Astigmatism | 72 (18.4%) | 60 (16.0%) |

## DISCUSSION

This study assessed the prevalence and patterns of refractive errors in school-aged children at a tertiary care hospital in Quetta in 2019. A notable prevalence of refractive errors (56.8%) was identified in this population, underscoring the importance of addressing uncorrected refractive issues in school-aged children. In comparable studies conducted in similar clinical environments, the prevalence of refractive errors has varied from 40% to over 60%, corroborating the observation that visual disorders are prevalent among children seeking treatment at tertiary centres[9,10]. The elevated prevalence in our study may be ascribed to the likelihood that children attending tertiary care clinics exhibit symptoms or previously undiagnosed conditions.

The most common type of refractive error found was myopia, which affected 28.4% of the children who were looked at. This aligns with findings from other studies that identified myopia as the predominant refractive error among school-aged children[11,12]. The rising incidence of myopia has been linked to contemporary lifestyle factors, including extended near work and restricted outdoor engagement. A study observed a direct correlation between age and myopic shift, especially in children over 10 years old, which corresponds with the age trend identified in our research[13].

Hypermetropia was identified in 11.2% of the children, with a higher prevalence in the younger cohort (5–7 years). This concurs with previous research indicating that hyperopia is more common in early childhood and typically diminishes with age due to the natural process of emmetropization[14,15]. The percentage of hypermetropia in this study seems to be somewhat lower than that found in certain other clinic-based studies, potentially due to many instances of mild hyperopia remaining asymptomatic and undetected unless specifically screened for. Astigmatism was found in 17.2% of children, with a fairly even spread across age groups and a slight male bias. Other studies have similarly indicated that astigmatism is the second most prevalent or

coexisting refractive error among school children, frequently occurring in conjunction with myopia or hyperopia[16,17]. The disparity in the prevalence of astigmatism among studies may be attributable to variations in diagnostic criteria, utilized equipment, and ethnic or genetic predispositions.

The age-wise distribution in our study unequivocally demonstrated that the prevalence of myopia escalated with age, reaching its zenith in the 14–15-year cohort. Numerous studies have substantiated this trend, indicating that myopia advances with age during the school years, presumably due to heightened visual demands in academic settings[18]. Conversely, hypermetropia was more prevalent in younger children, illustrating the typical developmental trajectory of refractive errors in pediatric populations.

A gender-based analysis indicated that myopia was marginally more prevalent in females, whereas astigmatism was more frequently observed in males. While not statistically significant in this study, analogous gender patterns have been identified in other clinical investigations, indicating that hormonal, genetic, or behavioural factors may influence the gender distribution of refractive errors[19]. Some researchers have suggested that girls may participate in more near work activities, potentially explaining the elevated prevalence of myopia among female students.

Our results also show how important it is to find and fix refractive errors in children as soon as possible. A considerable proportion of the children assessed had never utilized spectacles previously, notwithstanding the presence of significant uncorrected refractive errors. Other studies have shown that delayed diagnosis can lead to poor school performance, low self-esteem, and a higher chance of getting amblyopia, especially in cases of uncorrected hyperopia or anisometropia[20]. These results underscore the necessity for vision screening programs in educational institutions to facilitate early identification and prompt intervention.

**Limitations:** This research possesses multiple constraints. Since the study was done in a hospital, the results can't be applied to all school-aged children because those who go to a tertiary care clinic are more likely to have more serious or symptomatic vision problems. The cross-sectional design also makes it hard to follow the changes in refractive errors over time. Cycloplegic refraction was utilized selectively, contingent upon age and suspicion of accommodation, potentially resulting in the underestimation of hyperopia in certain instances. Lastly, the study did not evaluate socioeconomic status, duration of near work, or outdoor activities, which are recognized risk factors for refractive development and progression.

## CONCLUSION

In summary, this study reveals a significant prevalence of refractive errors among school-aged children at a tertiary care hospital in Quetta, with myopia as the predominant condition, succeeded by astigmatism and hypermetropia. The results reveal distinct age-related patterns, indicating an increase in myopia among older children and a higher prevalence of hypermetropia in younger cohorts. There were only a few differences between the sexes, but it was noted that myopia was slightly more common in females. These results highlight the essential necessity for regular vision screening in school-aged children to facilitate the prompt identification and rectification of refractive errors, thereby averting long-term visual impairment and promoting improved academic and developmental outcomes.

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