OPEN ACCESS ORIGNAL ARTICLE

VISUAL HEALTH IN CHILDREN: PREVALENCE AND TYPES OF REFRACTIVE ERRORS IN SCHOOL GOING CHILDREN'S.

Naz Ullah[1] Afzal Qadir[2], Aleena Khan[3]

ABSTRACT

BACKGROUND: Refractive errors are the most frequent cause of vision impairment in school-age children globally. Uncorrected refractive defects have long-term detrimental impacts on visual health, social integration, and academic achievement. Preventing needless morbidity requires early diagnosis and treatment. In many low-middle-income nations, including Pakistan, routine vision screening for school-age children is urgently needed, and there is little to no recent local data on the prevalence of refractive errors. **OBJECTIVE:** To determine the prevalence and types of refractive errors among school-going children and identify associated risk factors. **METHODS:** This cross-sectional study was performed at the Ophthalmology Department of Hayatabad Medical Complex, Peshawar, between July 2023 and June 2024. Total 1198 children aged 5-16 years were chosen from public and private schools by stratified random sampling. Snellen charts were used for visual acuity assessment, pinhole was performed and cycloplegic refraction was also tested. Age, gender, screen time, outdoor activity and spectacle use were documented. **RESULTS:** Mean age was 10.4 ± 2.9 years, with a male predominance 53.3%, the prevalence of refractive errors was 32.9%. The most prevalent refractive error was myopia (18.6%), astigmatism (10.0%), and hyperopia (4.3%). Refractive error was bilateral in 76.8% of the affected children. Prior to the study only 40.6% had worn spectacles despite having refractive errors, of whom only 39.3% were wearing spectacles regularly. **CONCLUSION:** This study reported a high burden of refractive error in school-going children of Peshawar, with a low rate of spectacle usage and compliance. Older age, more screen time, and urban residence were major risk factors.

KEY WORDS: refractive error, school going, children, spectacle, risk factors.

1. Associate Professor, Ophthalmology Department Hayatabad Medical Complex Peshawar.
2. Associate Professor, Paediatric Ophthalmology Hayatabad Medical Complex Peshawar.
3. Fellow Orbit and Oculoplastics, Hayatabad Medical Complex Peshawar Pakistan.

Corresponding Author: **Afzal Qadir** Associate Professor, Paediatric Ophthalmology Hayatabad Medical Complex Peshawar, Pakistan Email: drafzal744@yahoo.com

How to Cite This Article: Ullah N[1] Qadir A[2], Khan A[3] **VISUAL HEALTH IN CHILDREN: PREVALENCE AND TYPES OF REFRACTIVE ERRORS IN SCHOOL GOING CHILDREN'S.** J Peop Univ Med Health Sci. 2025:15(2), 175-180. http://doi.org/10.46536/jpumhs/2025/15.02.638

Received On 17 MARCH 2025, Accepted On 30 JUNE 2025, Published On 30 JUNE 2025.

INTRODUCTION

Vision impairment has a profound impact on children's education, social and psychological development. Refractive errors (REs) are some of the most prevalent eye conditions among school-aged children, and a major public health problem globally[1]. These conditions -- myopia, hyperopia, and astigmatism -- happen when the eye cannot properly focus light on the retina and vision is blurred. Uncorrected, refractive errors can result in poor school work, decreased quality of life, and even permanent visual disability [2,3].

Worldwide, it is estimated that 12.8 million children aged 5 to 15 years are visually impaired as a result of uncorrected refractive errors, the vast majority in low-

and middle-income countries[4]. The rise in use of digital products, reduced outdoor time and increasing academic pressure contribute to an increasing trend of myopia in school children, most evidently in urban areas [5]. New data suggest that rates of myopia are dramatically rising in East and Southeast Asia, with a predominance of >80% in some areas among adolescents[6].

Conversely, astigmatism and hyperopia are underdiagnosed visual abnormalities that can significantly affect young children's visual development and reading skills [7]. In certain situations, early identification through school screening might reverse or prevent vision deterioration by enabling early correction with glasses or other interventions. However, routine vision screening is lacking in many places, and children's adherence to wearing spectacles is frequently low[8].

In order to properly plan school health services and allocate resources for the provision of spectacle correction, it is necessary to know the prevalence and distribution of different types of refractive errors among school-age children. Furthermore, when developing public health measures, demographic factors such age, gender, socioeconomic position, and urban-rural variations should be considered as they may have an impact on the pattern of refractive errors[9].

This study aims to identify the types and prevalence of refraction errors in a school-aged population. The study will outline the scope and features of this problem in the hopes of giving educators and health care policymakers crucial information to create affordable, long-lasting school-based vision care programs that can improve kids' academic performance and general development.

MATERIAL AND METHODS

This descriptive cross-sectional study was conducted from July 2023 and June 2024 at the Department of Ophthalmology, HMC, Peshawar. The WHO sample size calculator was used to determine a sample size of 1198 children, assuming a 25% predicted prevalence, a 95% confidence level, a 5% margin of error, and an additional 10% for any dropouts or missing data. The study used a multistage stratified random sampling technique to choose representative samples from public and private schools in Peshawar's rural and urban areas.

Children who were between the ages of 5 and 16, enrolled in a formal school, and had the approval of their parents or guardians were included. Subjects with a history of ocular trauma or surgery, known ocular disorders (apart from refractive problems), and subjects who were uncooperative throughout the examination were also excluded. After the written informed consent from parents or legal guardians, and the agreement from patients aged seven or older, all children were subjected to a full ophthalmologic examination.

The Snellen chart was used to test visual acuity at a distance of six meters. Children with sub-normal eyesight received assistance with pinhole testing. For children under the age of twelve, or as needed, cycloplegic refraction with 1% cyclopentolate was performed. Subjective refraction was performed after retinoscopy. Similarly, an autorefractometer was used as a screening tool. To rule out any other ocular aetiology, fundoscopic and slit-lamp examinations were performed.

The three categories of refractive errors were astigmatism (cylindrical error > 0.75 diopters), hyperopia (≥ +2.00 diopters), and myopia (spherical equivalent (SE) ≤ –0.50 diopters). Age, sex, school type (public or private), home (rural or urban), parental education, screen time, exposure to the outdoors, history of spectacle usage, and compliance with spectacle use were additional characteristics recorded.

SPSS version 25.0 was used to record and evaluate the data. Descriptive statistics were used to express clinical and demographic features. The chi-square test

and independent sample t-tests were used to examine the relationship between refractive errors and risk factors; a p-value of ≤ 0.05 was deemed statistically significant. Prior to the study's commencement, the institutional review board of the hospital evaluated and approved the protocol.

RESULTS

The average age of the participants was 10.4 + 2.9 years. Of these, 639(53.3%) were male and 561(46.7%) were female. There were 731(61%) public schools versus 468(39%) in private institutions. Among them, 766(63.8%) lived in urban, and 433(36.2%) in rural areas. The average screen time was 2.9 ± 1.4 hours/day, the average outdoor activity time was 1.7 ± 0.8 hours/day. Influence of parental education 45.2% fathers and 37.1% mothers had education upto secondary level or above. Table-1

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS (N = 1200).

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	638	53.3%
	Female	560	46.7%
School Type	Public	731	61%
	Private	467	39%
Area of Residence	Urban	765	63.8%
	Rural	433	36.2%
Father's Education	≥ Secondary	541	45.2%
Mother's Education	≥ Secondary	444	37.1%
Mean ± SD			
Age (mean ± SD)			10.4 ± 2.9
Screen Time (hrs/day)			2.9 ± 1.4
Outdoor Activity (hrs/day)			1.7 ± 0.8

TABLE 2: DISTRIBUTION OF REFRACTIVE ERRORS.

Refractive Status	Frequency (n)	Percentage (%)
Subnormal VA	410	34.2%
Refractive Error	395	32.9%
- Myopia	223	18.6%
- Astigmatism	120	10%
- Hyperopia	52	4.3%

Out of 1198 children, 410 (34.2%) had subnormal unaided visual acuity (worse than 6/9 in either eye). After pinhole testing and refraction, 395 children (32.9%) were diagnosed with refractive errors. Among them, myopia was the most common 223(18.6%), followed by astigmatism 120(10%) and hyperopia52(4.3%). Table-2

Among the 395 refractive errors, 303(76.8%) had bilateral involvement, while 92(23.2%) had unilateral refractive errors. Figure-1

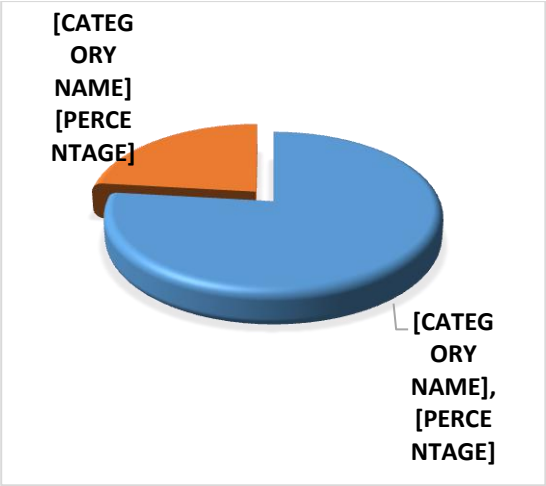

FIGURE-1: LATERALITY OF REFRACTIVE ERRORS.

Amongst 395 refractive error childrens 160(40.6%) had a prior history of spectacle use. Of these, 97(60.7%) reported regular compliance with spectacle wear, while 63(39.3%) were non-compliant. Table-3

TABLE 3: SPECTACLE USE AND COMPLIANCE AMONG CHILDREN WITH REFRACTIVE ERRORS N= 395)

Variable	Frequency (n)	Percentage (%)
Not Using Spectacles Before	235	59.4%
Previously Using Spectacles	160	40.6%
Compliant with Use	97	60.7%
Non-Compliant with Use	63	39.3%

Refractive errors were significantly more common among children aged ≥10 years ($p = 0.01$), children with ≥3 hours/day of screen time ($p = 0.003$), urban residents compared to rural ($p = 0.04$). No significant association was found with gender or parental education level ($p > 0.05$). Table-4

TABLE 4: RISK FACTOR ASSOCIATION WITH REFRACTIVE ERRORS

Risk Factor	Refractive Error (n, %)	p-value
Age ≥10 years	200 (43.2%)	0.01
Screen time ≥3 hrs/day	286 (48.1%)	0.003
Outdoor activity ≥2 hrs/day	97 (20.5%)	0.02
Gender (Male)	200 (33.0%)	0.78
Urban residence	229 (38.1%)	0.04
Father's education ≥Sec.	171 (31.6%)	0.66

DISCUSSION

In this study the percentage of any refractive error was 32.9%, suggesting that this category has a substantial burden of uncorrected visual impairment. Additionally, these findings are similar to those of regional studies conducted by Zeng et al [10], who observed a frequency of 30.5% among school-age children in Karachi, which is somewhat higher than the 27% reported by Sherwin et al [11]. With an 18.6% prevalence, myopia was the most common condition among all the youngsters in our research. This is consistent with the global increase in myopia among school-age children, which is particularly linked to changes in lifestyle, such as increased screen usage and decreased outside activities [12.] The study of Xiaong et al[13] from China also showed a consistent prevalence, with the incidence of myopia among children aged pre-16 being between 20-30%. Our study's findings that myopia is associated with more screen time and less time spent outside ($p = 0.003$ and $p = 0.02$, respectively) are in line with other research showing a link between children's exposure to digital devices and axial elongation or accommodation stress [14].

In our study, hyperopia (4.3%) was the third most prevalent condition, while astigmatism (10%) was the second most common. This distribution is in line with that of Hussnain et al [15], who found that school-age children in South-East Asia had comparable patterns of refractive error types. Although preschoolers are generally more likely to have hyperopia, our study participants' comparatively lower prevalence is likely caused by their age, as refractive development tends to reduce hyperopia rates beyond the early infancy years.

The results of Zubaida et al [16], who came to the conclusion that bilateral refractive errors have a greater impact on academic and functional performance, were supported by the interesting finding that around three quarters (76.8%) of children

with refractive problems had bilateral ocular involvement.

The spectacle coverage in our sample was poor, (40.6%) of children with refractive errors were already wearing glasses, and of those, 39.3% were non-adherent. Low compliance is common and has been reported in the South Asian groups and may be due to various reasons including cost, cosmetic reasons, peer pressure and poor parental understanding [17]. School-based and community education programmes are important interventions for increasing compliance and early correction.

Additionally, we found a statistically significant correlation between refractive errors and age ($p = 0.01$), with a higher prevalence in the age range ≥ 10 years. According to Taskeen et al [18], this tendency is explained by older children's increased near-work tasks and prolonged screen time. Additionally, there was a significant correlation ($p = 0.04$) between living in an urban area with refractive errors, which was in line with Tahir et al [19] results that urban children are more stressed academically and have less exposure to the outdoors.

Refractive errors were not significantly correlated with either gender or parental education. This finding is consistent with Faheem et al [20], who found that biological and environmental exposures often outweigh sociodemographic factors in the development of pediatric refractive error.

While the study provides valuable insights, it is limited by its cross-sectional design and its restriction to a single tertiary care center. The study did not assess axial length or corneal curvature, which could provide further understanding of refractive error pathophysiology. In addition, compliance with spectacle use was self-reported and may be subject to reporting bias.

CONCLUSION

The current study shows high prevalence of refractive errors in school going children of Peshawar with myopia being as its leading type. Various risk factors such as age, area of residence, and time spent on screen are strongly correlated to the prevalence of refractive error. The low rate of spectacles utilization with compliance in this setting highlights the importance of school-based screening programs and public awareness campaigns for parents, teachers, as well as the children themselves. Early detection and treatment of refractive error is important to enhance visual function, academic performance, and quality of life in children.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

FUNDING: The work was not financially supported by any organization. The entire expense was taken by the authors.

ACKNOWLEDGEMENTS: We are thankful to all who were involved in our study.

AUTHORS' CONTRIBUTIONS:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

CONFLICT OF INTEREST: No competing interest declared

REFERENCES

1. Abbas H, Awais M, Naimat K. Prevalence and pattern of refractive errors in school-going children of Mangla Cantonment. Pakistan Armed Forces Med J. 2019;69(5):1125–28 (pafmj.org)
2. Iqbal F, Khalil I, Zahid M. Prevalence of refractive errors in school going children in district Faisalabad, Pakistan. Adv Ophthalmol Vis Syst. 2020;10(1):4–6 (medcraveonline.com)
3. Gilal IA, Khanzada MA, Mirza AA, et al. Magnitude of prevalence of refractive errors in school-age children: a cross-sectional study (Hyderabad, Sindh). J Pharm Res Int. 2022;34(25B):14–21 (journaljpri.com)

4. Bilal A, Sattar M, Khan M. Frequency of refractive error in school going children with headache and eye strain. Pak Biomed J. 2022;5(8):31–35 (pakistanbmj.com)
5. Rimayanti U, Hasan NA, Jamaluddin SRW, et al. Visual acuity and refractive errors in toddlers in Makassar and Gowa, Indonesia. Pak J Ophthalmol. 2025;41(1):– (pjo.org.pk)
6. Ghafoor U, Fazal M, Asghar A, et al. Correlation of myopia with use of smartphones and outdoor activities. BMC J Med Sci. 2023;3(2):85–89 (bmcjms.org)
7. Imtiaz HS, Sharjeel M, Malik IQ. Correlation of myopia with smartphone use and outdoor activity. Pak J Ophthalmol. 2020;36(4) (pjo.org.pk)
8. Kusumawardhany et al. (2024). Digital screen time and myopia: dose–response meta-analysis. JAMA Netw Open (jamanetwork.com)
9. Singh et al. (2019). Smartphone/video-game use linked to myopia in Indian schoolchildren. JAMA Netw Open cohort (jamanetwork.com)
10. Zeng et al. (2024). Cohort study linking ≥2 h/d screen time to myopia incidence in China. JAMA Netw Open (jamanetwork.com)
11. Sherwin JC, Reacher MH, Keogh RH, et al. (2011). Outdoor light exposure and myopia: systematic review/meta-analysis. Ophthalmology sources (pmc.ncbi.nlm.nih.gov)
12. Kainat Saleem, Parus Saleem & Arif Rabbani. Prevalence of Refractive Error in Government Primary School Children of Shaheed Benazirabad. J Peoples Univ Med & Health Sci. 2018;8(3):162–167 (publication.pumhs.edu.pk)
13. Xiong S, Sankaridurg P, Naduvilath T, et al. (2015). Outdoor exposure interventions in schoolchildren: systematic review & meta-analysis. Ophthalmology sources (pakistanbmj.com)
14. Saleem B, Ullah N, Hussain H, Ayub A, Khan MH. Prevalence of Refractive Errors Among the Children of Special Education Complex, Peshawar. J Gandhara Med Dent Sci. 2019;5(2):28–32 (jgmds.org.pk)
15. Hussnain Abbas, Muhammad Awais & Khalid Naimat. Prevalence and Pattern of Refractive Errors in School-Going Children of Mangla Cantonment. Pak Armed Forces Med J. 2019;69(5):1125–28 (pafmj.org)
16. Zubaida Sirang, Kashmira Nanji, Irfan Jeeva, Zohra Khan & Hasan Kazmi. Types of Refractive Errors in Northern Pakistan: A Hospital-Based Survey. Ophthalmol J. 2019;4:86–91 (journals.viamedica.pl)
17. Fatima Iqbal, Iqra Khalil & Mawra Zahid. Prevalence of Refractive Errors in School-Going Children in District Faisalabad, Pakistan. Adv Ophthalmol Vis Syst. 2020;10(1):4–6 (medcraveonline.com)
18. Taskeen Zahra, Intzar Hussain, Shahmun Munawar, Shahbaz Baig & Noreen Maqbool Bokhari. Prevalence of Refractive Errors and Related Factors Among Madrassa Students in District Sialkot. Prof Med J. 2020;27(1):… (theprofesional.com)
19. Tahir Mahmood Khan, Zahid Mahmood & M. Anwer Awan (et al.). Prevalence of Refractive Errors in Children of Parents with Consanguinity, in an Eye Camp in a Rural Area. Pak J Med Health Sci. 2024;17(12):112 (pjmhsonline.com)
20. Faheem Ullah, Naheed Mahsood, Saadullah Afridi & Zia ur Rehman. Prevalence of Refractive Error and Strabismus in Primary School Children of Tehsil Lakki Marwat, KPK. J Gandhara Med Dent Sci. 2020;7(1):11–21 (jgmds.org.pk)