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PREVALENCE OF REFRACTIVE ERROR IN STUDENTS STUDYING IN PRIVATE SCHOOL IN HAYATABAD PESHAWAR

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ABSTRACT

Background: Visual impairment among students enrolled in schools for the visually impaired remains an important public health concern, particularly in developing countries where comprehensive ophthalmic assessment and rehabilitation services are limited. This study aimed to determine the prevalence of blindness and low vision among students attending the Government Institute for Visually Impaired Children, Peshawar, Khyber Pakhtunkhwa **Methods:** A descriptive cross-sectional study was conducted among 106 students using convenience sampling. Data were collected through a structured questionnaire and comprehensive visual assessment. Visual acuity was classified according to the World Health Organization (WHO) criteria into normal vision, moderate low vision, severe low vision, and blindness. Data were analyzed using SPSS version 25.0, and results were summarized using descriptive statistics. **Results:** Among the 106 participants, 70.8% were classified as blind, 13.2% had severe low vision, 10.4% had moderate low vision, and 5.7% had normal vision. Only 10.4% of students were using low vision devices despite 23.6% having residual vision. No improvement in visual acuity was observed with pinhole testing, indicating that visual impairment was primarily due to underlying ocular pathology rather than

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refractive error. More than half of the participants (52.8%) reported a family history of visual impairment. **Conclusion:** A considerable proportion of students enrolled in the blind school had usable residual vision or normal vision, highlighting deficiencies in admission screening and low vision assessment. Routine ophthalmic evaluation before school admission, timely provision of low vision rehabilitation services, and appropriate educational placement are essential to improve visual function, educational outcomes, and quality of life.

Keywords: Blindness; Low Vision; Visual Impairment; School for the Visually Impaired; Prevalence; WHO Classification; Peshawar; Pakistan; Low Vision Rehabilitation

INTRODUCTION:

Refractive error is one of the most common causes of visual impairment worldwide and occurs when light rays fail to focus accurately on the retina, resulting in blurred vision. The major types of refractive error include myopia, hyperopia, and astigmatism, all of which can adversely affect visual function, academic performance, and quality of life. Although refractive errors are easily diagnosed and effectively corrected with spectacles, contact lenses, or refractive surgery, they continue to represent a significant public health problem, particularly in developing countries where access to regular eye examinations remains limited.

School-aged children are particularly vulnerable because uncorrected refractive errors can impair learning ability, classroom participation, and cognitive development. Children attending religious schools often spend prolonged hours reading and performing near-vision tasks, which may increase the risk of developing refractive errors. Despite this potential risk, most epidemiological studies in Pakistan have focused on conventional schools, while students attending religious educational institutions have received comparatively little attention.

Globally, refractive error affects billions of individuals and remains the leading cause of avoidable visual impairment. The prevalence of myopia, hyperopia, and astigmatism varies across different populations, with increasing trends reported in both developed and developing countries. Studies from the United States, Europe, and South Asia have consistently identified myopia as the most prevalent refractive error, highlighting its growing public health significance among school-aged children.

In Pakistan, previous studies conducted in Lahore, Islamabad, Karachi, Lakki Marwat, Mangla, and Peshawar have reported refractive error prevalence ranging from approximately 5% to 33%, with myopia consistently identified as the predominant type, followed by astigmatism and hyperopia. Factors such as increasing age, prolonged near-work activities, excessive screen time, and positive family history have been associated with a higher risk of refractive error among schoolchildren. However, limited evidence is available regarding children studying in religious schools, where educational activities involve prolonged reading and close visual tasks. Determining the prevalence and pattern of refractive errors among students attending religious schools is essential for planning effective school eye health programs. Early

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identification and timely correction of refractive errors can improve academic achievement, reduce visual disability, and enhance the overall quality of life of affected children. The findings of this study may also support policymakers in implementing routine vision screening and appropriate referral services within school health programs.

Therefore, the present study was conducted to determine the prevalence of refractive error among students of a private religious school in Peshawar, Pakistan. The findings are expected to provide local epidemiological evidence that will assist educators, healthcare professionals, and policymakers in strengthening school-based eye care services and promoting early detection and management of refractive errors among schoolchildren.

Materials and Methods

A cross-sectional study was conducted over four months at Iqra Darul Quran Al Kareem Educational Complex, Hayatabad, Peshawar, Khyber Pakhtunkhwa, a private institution providing both religious and conventional education. The study aimed to determine the prevalence of refractive errors among schoolchildren. A sample size of 242 participants was calculated using Cochran's formula based on a previously reported refractive error prevalence of 17.3%, with a 95% confidence level and adjustment for non-response. Participants were selected using a simple random sampling technique. Students who were present on the day of examination and provided consent to participate were included, whereas those with ocular diseases other than refractive error or a history of ocular surgery were excluded. Data were collected using a structured questionnaire and comprehensive visual assessment, including unaided and aided visual acuity, family history of refractive error, spectacle use, and the presence of myopia, hyperopia, and astigmatism. The collected data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics, including frequencies, percentages, and means, were used to summarize the data. The prevalence of myopia, hyperopia, and astigmatism was calculated, and the Chi-square test was applied to determine the association between age groups and the different types of refractive errors. A p-value of <0.05 was considered statistically significant, and the findings were presented in tables and figures.

RESULTS

We conducted our study in a prominent and populous school of the province, Iqra Darul Quran Al Kareem educational complex Hayatabad, Peshawar. 300 children were counted for study out of which 242 were selected following widely used sample size suggesting statistical tool, Cochran's formula.

Distribution of students on basis of age group

Table I shows distribution of participants data based on different age groups. For this purpose, data was divided to four age groups; 5-8, 9-12, 13-16 and 17-20. It was observed that first group comprised of 58 (23.967%) members, second group comprised 96(39.66%) members, third group had 56(23.1%) members and fourth group consisted 32(13.22%) participants. It was noted that the highest number of members were found in the age group of 9-12 years with 39.66%. Most of the

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students of this age were from primary and middle standard.

Table 4.1: Distribution of students on basis of age group

Age group	Number	Percentage
5-8	58	23.967%
9-12	96	39.66%
13-16	56	23.1%
17-20	32	13.22%
Total	242	100%

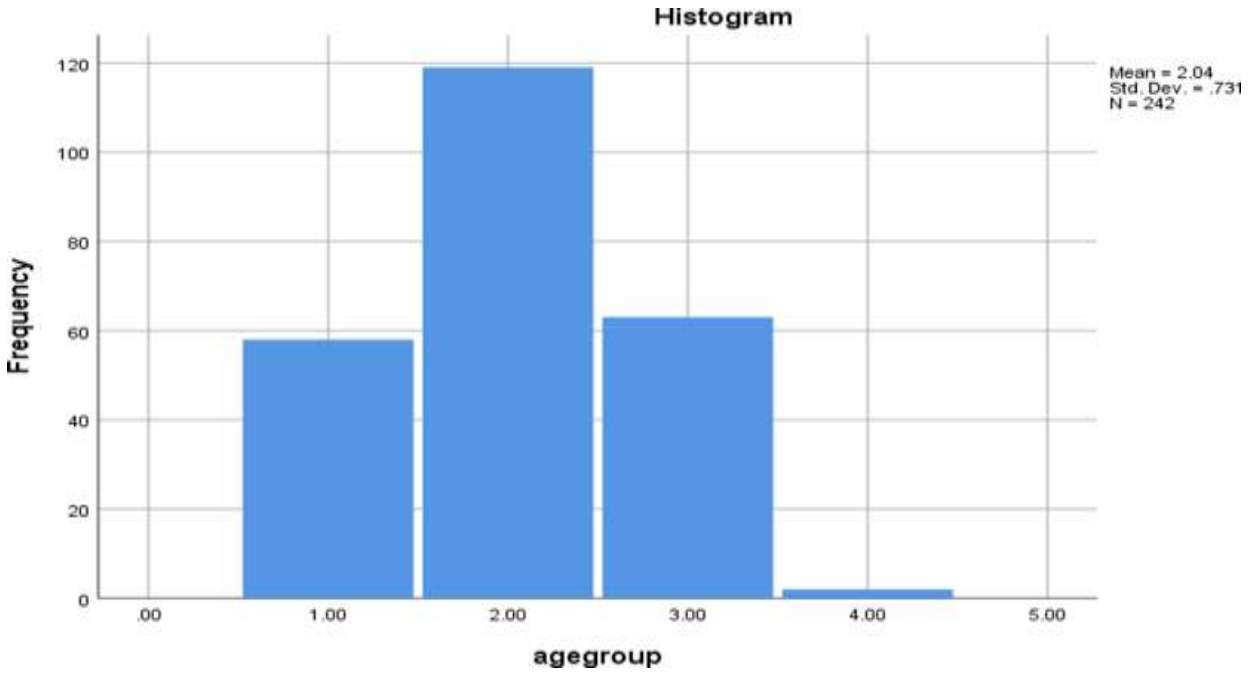

Figure 1: Distribution of students on basis of age group

Visual acuity unaided

Table II explains the frequency of visual acuity without use of any correctness measure (unaided). It was observed that visual acuities examined for both left and right eye yielded different range of values including 6/6, 6/8, 6/9, 6/12, 6/18, 6/24 and 6/60. Study outcomes also revealed that a large number of students who were examined showed 6/6 or normal visual acuity. In case of right eye O.D VA screening 209 students exhibited normal 6/6 acuity level while left eye examination came out to be 6/6 for 210 students. While rest of 33 students showed some kind of deviation from normal range of visual acuity. Right eye examination result of 6/9 was recorded for 8 persons while

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for 10 persons in case of left eye screening. Although there acuity was found less than normal threshold of 6/6 still according to WHO criteria cannot be considered significant visual defect. 13 students on right eye examination and 10 students on left eye screening showed results of 6/12 unaided visual acuity. WHO considers this range of results as mild complication? On Unaided visual acuity examination of both eyes, 6 and 7 students showed 6/18 acuity result. 6/24 VA was exhibited by 3 students O.D and 3 O.S, 6/8 bilateral visual acuity was recorded for 1 O.D, 1 O.S. furthermore visual acuity of 6/60 was noted down for 2 right eye and 1 left eye.

Table 4.2: Visual acuity unaided

Visual acuity	Right eye O.D	Left eye O. S
6/6	209	210
6/9	8	10
6/12	13	10
6/18	6	7
6/24	3	3
6/8	1	1
6/60	2	1
Total	242	242

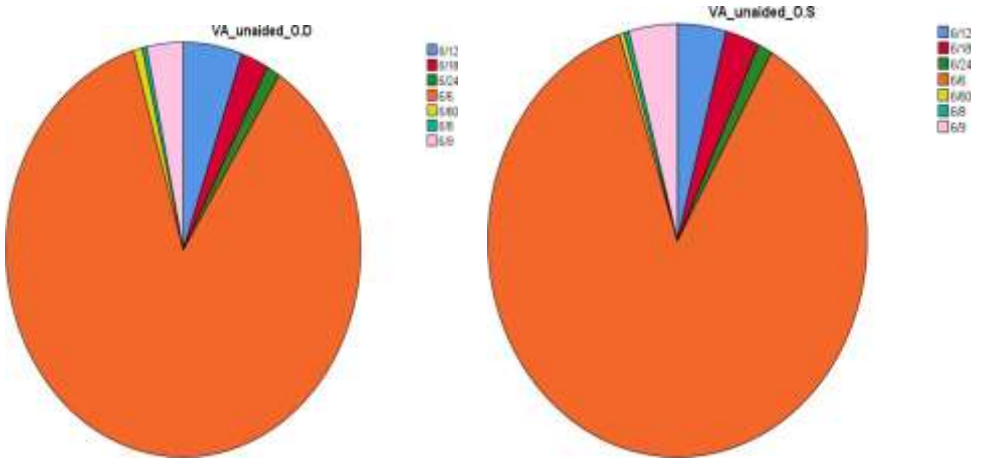

Figure 2: Visual acuity unaided

Visual acuity (aided) Aided visual acuity or the visual capability of included students with aid of corrective means such as eyeglasses, have been depicted in table III. Most of the students examined showed normal visual acuity for right and left eye

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(approx. 98%). Other miner bunch of students presented mild visual disability. One student's aided visual acuity O.D score was 6/8, while 2 had same score for left eye. Similarly, 6/9 for both were shown by 2 and 3students.

Table 3: Visual acuity (aided)

Visual acuity	Right eye O.D	Left eye O. S
6/6	238	237
6/8	1	2
6/9	2	3
6/12	1	Nil
Total	242	242

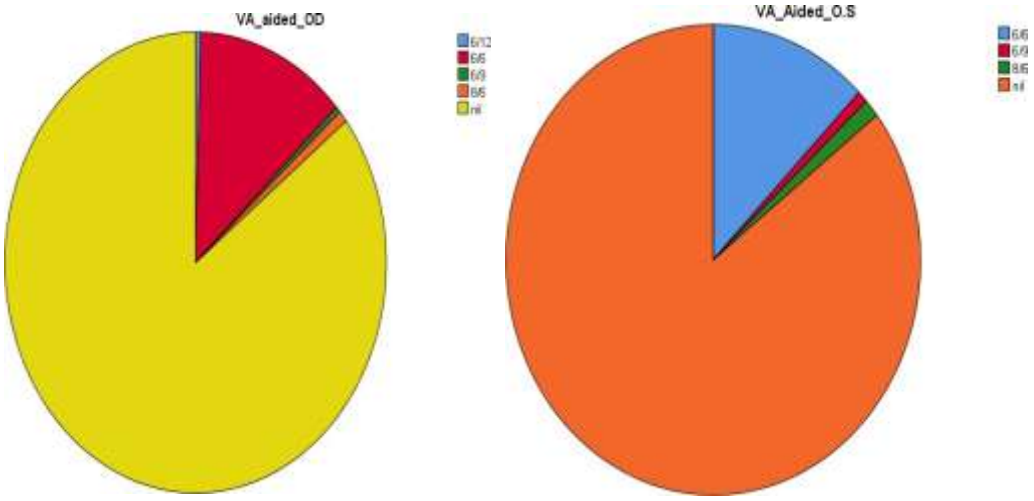

Figure 3: Visual acuity (aided)

Prevalence of refractive error

Refractive error analysis of 242 students showed that out of total observed students 35 students showed visual weakness of some kind. Which suggests that prevalence of refractive error in the study area is 14.46%. Study outcomes further elaborated that most prevalent visual impairment was Myopia. They comprised 25 students which is 10.3% of total refractive error incidence. Other type of refractive error which was repeated mostly after myopia was astigmatism with 3.3% prevalence. Least observable optic impairment in the study area was hyperopia with only 0.8% occurrence. Above outcomes indicated the presence of farsightedness more dominantly as compare to nearsightedness in the study area.

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Online ISSN 3007-3197
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http://amresearchreview.com/index.php/Journal/about

Table 4: Prevalence of refractive error

Refractive error type	Frequency	Percentage
Myopia	25	10.3%
Hyperopia	2	0.8%
Astigmatism	8	3.3%
Total refractive error	35	14.46%

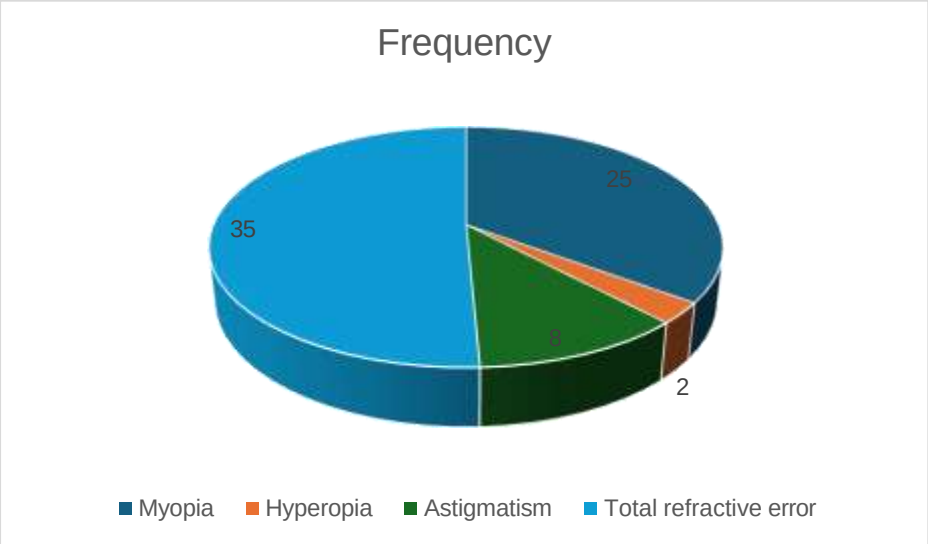

Figure 4: Prevalence of refractive error

Chi square showing relation between age group and Myopia

Study analysis also included chi- square analysis to explore the relationship between the age groups of students and prevalence of all three types of refractive error. Table V explains association between age group and myopia through chi- square test results. Table shows that first group (5-8) contains 2 myopic students, second group (9-12) has 9, third group (13-16) has 6 myopic students and fourth (17-20) contained 8 myopic cases. Calculated chi-square value was 10.503 with p-value 0.015. p-value is less than 0.05 which indicates that the result is statistically significant. On the basis of chi-square test analysis, it can be concluded that there exist a statistically significant association between age group and Myopia. Which means that incidence of Myopia in varying age groups is not a matter of chance or some random reason but it is the significant relationship between age and Myopia which explains that middle age students of age group have more tendency to acquire the refraction in visual ability.

Table 4.5: Chi square showing relation between age group and Myopia

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http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 2 (2026)

Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

Age group	Myopic	Non myopic	Chi square	Df	p- value
5-8	2	56	10.503	3	.015
9-12	9	87			
13-16	6	50			
17-20	8	24			

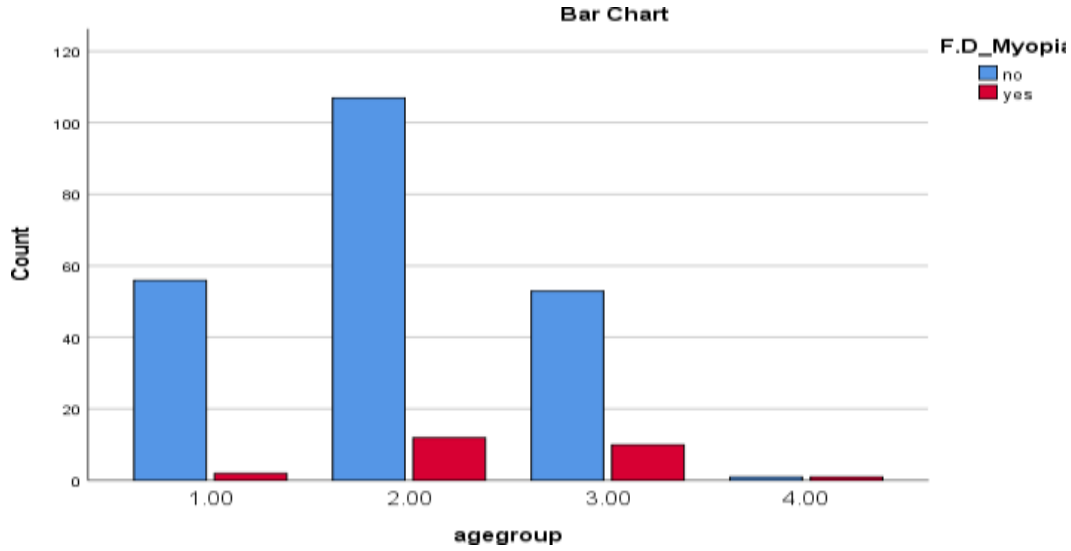

Figure 5: Chi square showing relation between age group and Myopia

Chi square showing relation between age group and Hyperopia

Table VI explains relationship between age group and hyperopia. It can be seen from the figures that chi-square estimated value is 3.90 while p-value is 0.273. As it can be seen that p-value in this case is more than .05 so no statistically significant relation exists between hyperopia and age group.

Table 4.6: Chi-square showing relation between age group and Hyperopia

Age group	Hyperopic	Non Hyperopic	Chi square	Df	p- value
5-8	1	57	3.90	3	0.273
9-12	0	96			
13-16	0	56			

Annual Methodological Archive Research Review
http://amresearchreview.com/index.php/Journal/about
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Online ISSN 3007-3197
Print ISSN 3007-3189

http://amresearchreview.com/index.php/Journal/about

17-20	1	31			

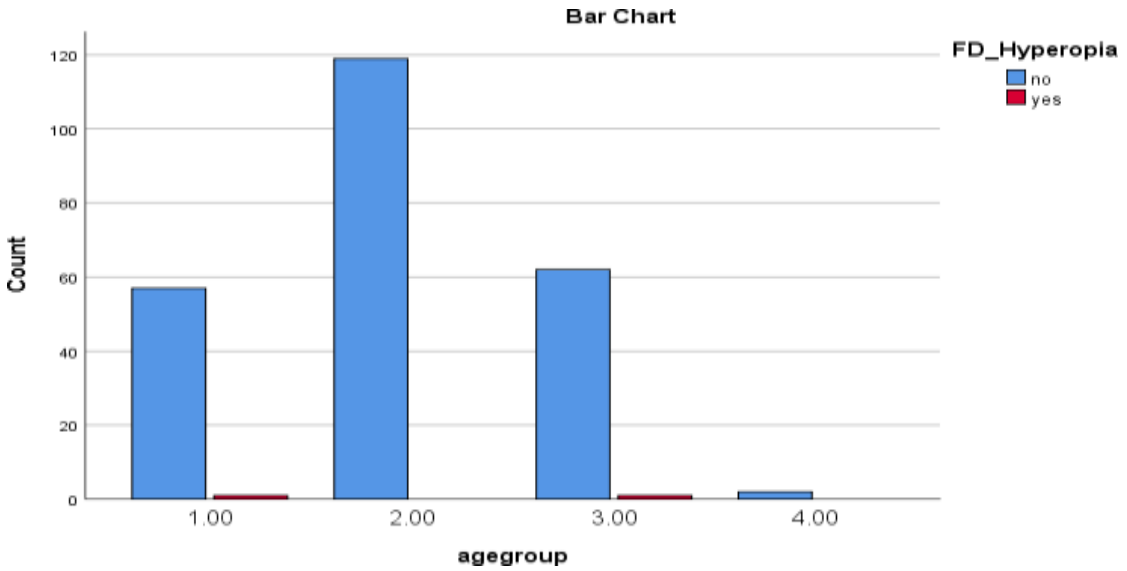

Figure 6: Chi-square showing relation between age group and Hyperopia

Chi square showing relation between age group and astigmatism

Astigmatism chi-square test details (Table VII) shows highest number of astigmatic students exists in the age group of 9-12 years followed by age group of 5to 8 years. But according to the test outcomes (p=.889 >.05) it can be concluded that no significant association can be traced in prevalence of astigmatism and age-group. Table VII exhibits Chi-square score conducted to unleash the relationship between different groups of students on the basis of age and astigmatism. Outcomes of the experiment indicated that most astigmatic students were found in the age group of 9 to 12 years succeeded by age group of 5 to 8 years old. So, study results clearly depicts that prevalence of astigmatism was more observable during middle years of childhood rather than early age group or adult students. Chi-Square numeric of p=.889 was greater than level of decided significance i.e., 0.05. Which clearly interprets that investigated age differential of astigmatism was not statistically considerable. So, this shows that frequent observable astigmatism among 9–12-year-old were due to some random reason rather than specifically due to age. Conclusion of experiment can be stated that no statistically acceptable relationship exists between age group and astigmatism prevalence in study area.

Table 4.7: Chi-square showing relationship between age group and astigmatism

Age group	Astigmatism	Non astigmatic	Chi square	Df	p- value

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http://amresearchreview.com/index.php/Journal/about
Volume 4, Issue 2 (2026)

Online ISSN 3007-3197
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http://amresearchreview.com/index.php/Journal/about

5-8	2	56	.634	3	.889
9-12	4	92			
13-16	1	56			
17-20	1	32			

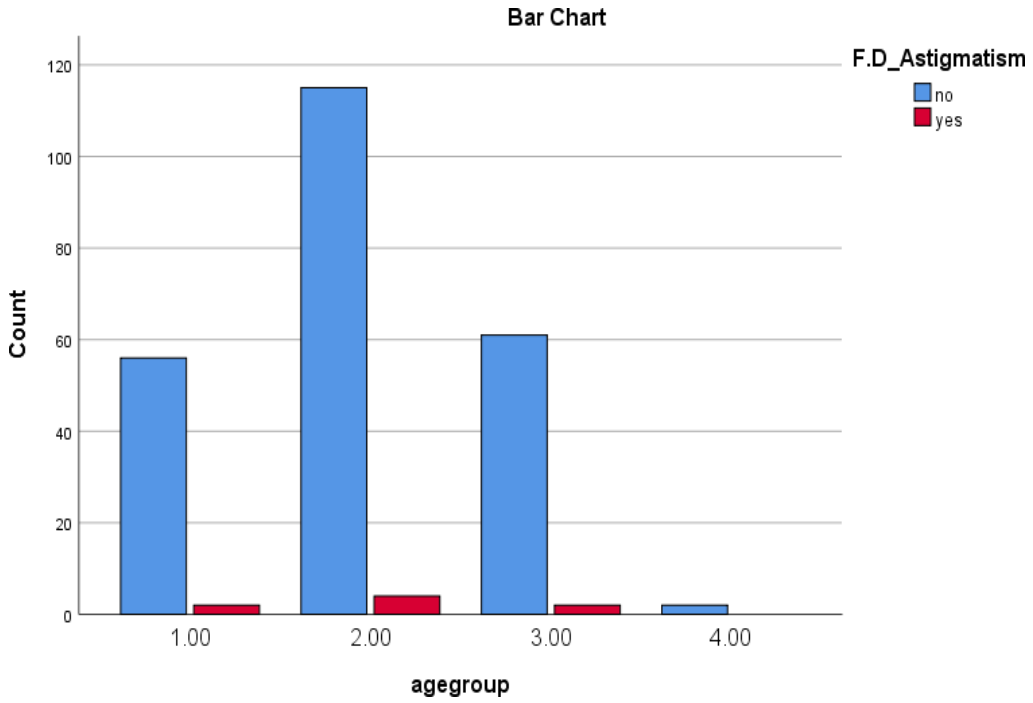

Figure 4.7: Chi-square showing relationship between age group and astigmatism

Overall, it can be stated that in the study 242 students from Iqra Darul Quran School system, were examined to detect the prevalence of refractive error and its types. First all students' distributions were made on the basis of different age groups. Which indicated that largest number of participants belonged to group 9-12 aged. Seconded by age group of 5-8 while lowest number was found in age group 17-20 years. Visual acuity assessment unaided for left and right eye indicated larger proportion of students with normal to mild and in some cases severe complication while number reduced on aided examination indicating

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Volume 4, Issue 2 (2026)

Online ISSN 3007-3197
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http://amresearchreview.com/index.php/Journal/about

corrective refractive error.
Overall, refractive error prevalence was 14.46% with Myopia accounting for 10.3%, hyperopia 0.8% and astigmatism to be 3.3%. Chi-Square analysis indicated significant association between age group and Myopia while astigmatism and hyperopia showed no significant relationship.

DISCUSSION:

It has been widely accepted worldwide that refractive error can lead to severe a consequence if not given due attention. It has also been observed to influence the intellectual growth among students. Refractive errors have been discussed under various categories such as Myopia, Hyperopia and astigmatism. Myopia or nearsightedness is a condition in which parallel rays of light are focused in front of retina instead on retina, resulting in blurred vision of distant objects [15,16]. In case of hyperopia image of distant object is portrayed behind retina resulting in blurred or unclear vision of near objects. Astigmatism is all distant distorted vision impairment caused due to changes in corneal curvature. Current study also carried out a cross sectional analysis of Refractive error prevalence in the study area [17,18].

A total of 242 participants which included students from primary class to high were examined to assess the evidence of refractive error prevalence in the study area. Sample size was selected using commonly used formula for cross sectional studies namely Cochran's sample size formula. Previously many cross-sectional studies such as by Alem and Gebru, 2021, Bista et al 2023, Bakar et al 2019 and Bastra et al 2022 etc. all used Cochran's formula for sample size selection [19,20].

Unaided visual acuity outcomes of the current study suggested that most of the students showed normal visual abilities. Normal range 6/6 was exhibited by almost (85.54%) in both eyes' examination of the participants. Still there was significant evidence (14.46%) of refractive error of different types based on different visual acuity values for one or both eyes [21,22].

These findings are in coherence with previous work done by many authors in different regions of the world. For instance, in a study by Sethi et al 2008 in their study conducted in Khyber teaching Hospital reported that 87.2% showed no refractive error in their unaided visual acuity while 12.8% visual impairment was due to some refractive error. Mohmand et al 2022 in their study at Hayatabad complex Peshawar also found 77% were emmetropic or having no unaided visual acuity while 23% exhibited different types of refractive error. Saleem et al 2019 also found while studying refractive error in Special educational complex [23,24].

Peshawar that 82.7% among included students were without any defect while rest 17.3% had some kind of refraction issues. Main findings of our study elaborated that total occurrence of Refractive error in study area was 14.46%. Out of total refractive error cases Myopia was observed among 10.3% students, hyperopia by 0.8% and astigmatism by 3.3%. Study outcomes indicated that highest prevalent refractive impairment was Myopia among school going kids in the study area. Most affected age group was observed to be 9-12. Other most observed was astigmatism followed by hyperopia. These finding are also in line with previous studies. Other studies from

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Print ISSN 3007-3189
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the same study area Peshawar also persistently have been reporting refractive error to be the leading cause of visual defects among school going children and adults [25,26]. Major categories including Myopia, hyperopia and astigmatism. Hayatabad Medical Complex, Peshawar based study by Mohmand et al, 2022 while analyzing refractive error among children of age group 11-16 years observed that 23% was total refractive error occurrence in the study area. Similar to our findings they also reported Myopia to be the most prevalent with 36.98% but contrary to our finding their following refractive error was hyperopia at 32.87 % level while astigmatism was their least observed disorder unlike our study outcomes [27,28].

Another study by Naz et al 2025 conducted at Ophthalmology department of Hayatabad Medical complex, Peshawar revealed total refractive error incidence of 32.9%. Similar to our results Myopia was most common (18.6%), succeeded by astigmatism (10.0%) and Hyperopia the least frequent one (4.3%). In our analysis we also examined relationship between occurrence of Myopia, Hyperopia and astigmatism and age group. For this purpose, Chi-Square analysis was conducted. Results of chi square test suggested that relationship between age onset and myopia was statistically significant while other remaining types, astigmatism and hyperopia showed no significant signs. Similar association patterns were assessed by Sharif et al 2026 among children living in orphanage in Peshawar. But unlike our study they did not find any evidence of association between age group and refractive error of any type. Abbas et al 2019 did observe association between age and refractive error. Like our findings he also described 10 years old to suffer more from myopia [29,30].

CONCLUSION:

On the basis of above discussion this can be concluded that refractive error is consistently observed ocular impairment. Most of the studies including our study confirmed that Myopia is among most widely reported refractive error, followed by astigmatism and hyperopia. This trend has been confirmed by many studies conducted in Peshawar. Age onset also have been confirmed by many studies to influence at least some type of refractive error. The relationship between age refractive error was also important finding of this study. Chi-square analysis demonstrated that refractive error distribution varied across different age groups, particularly myopia which showed greater frequency among age group 9-12 years. However other types of refractive errors such as astigmatism and hyperopia both had shown insignificant relation with age group. This indicated that the observed cases in different age group were due to some random chance rather than particularly age differentials. Furthermore, it can be concluded that refractive error should not remain an unnoticed common ocular disorder. As it has been proved to influence academic performance of students, social and economic life of societies.

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