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Refractive Errors in Students Islamic Boarding School Islamic Association 31 Banjaran Bandung

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ABSTRACT

Background: Refractive errors are the most common disorders, covering all age groups including children. The purpose of this study was to determine the description of refractive errors and demographic characteristics that occur in students at the Islamic Boarding School Persatuan Islam 31 Banjaran, Bandung Regency.
Methods: This study used a cross-sectional study conducted from January to February 2024 at Pondok Pesantren Persatuan Islam 31 Banjaran, Bandung Regency. The sample was selected by total sampling. Subjects were examined using optotype snellen chart, students with visual acuity worse than 6/9 underwent further examination using refractometry, and correction using trial set lenses.
Result: The results showed that of the total 674 students who took part in the visual acuity examination, 173 students (25.67%) had visual impairment with refractive errors. Refractive errors were more common among female students (69.79%) than male students (31.21%). Refractive errors were more common in 14-15 year olds (21.38%) compared to other age groups. The most common types of refractive errors were myopia (45.67%), astigmatism (36.99%), myopic astigmatism (15.03%), and hyperopia (1.73%). In addition, there were also students suspected to have organic disorders (0.5%) who experienced lazy eye (amblyopia).
Conclusion: Early detection efforts of visual impairment need to be carried out by parents, school teachers, health workers and the government by conducting regular visual acuity screening and refractive error examinations at all levels of society, especially school-age children
Keywords: Refractive error ; distribution ; prevalence ; students

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Introduction

Refractive error (RE) is defined as a condition where the eye fails to focus parallel light rays on the retina which subsequently causes a decrease in visual acuity (VA).[1] According to data from the World Health Organization (WHO), at least 2.2 billion people experience near or near vision problems long distance. In at least 1 billion of them, vision problems can be prevented or have not yet been overcome. The main causes of visual impairment and blindness in the world are refractive errors and cataracts. It is estimated that globally only 36% of people with distance vision problems due to refractive errors and only 17% of people with vision problems due to cataracts have access to appropriate intervention.[2]

Refractive errors are one of the most common causes of visual impairment, accounting for 48.99% of all visual impairments.[3] Refractive errors in Indonesia are a serious concern, with a prevalence reaching around 55 million people or around 25% of the population in Indonesia. Indonesia.[4] The incidence of refractive errors continues to increase every year with cases of refractive error blindness reaching a prevalence of 1.5%.[5]

Refractive disorders can affect all ages, including children. There are around 13 million children aged 5-15 years who are reported to suffer from refractive errors in Southeast Asia. The prevalence of refractive errors in children in Indonesia is around 10% of the total number of children or around 6.6 million children with a low level of eyeglass correction, namely 12.5%.[6]

Based on the results of Riskesdas in 2013, the national incidence of severe low vision in Indonesia involved all age groups without the exception of school-age children, with a prevalence of elementary school (SD) children at 1.2%, junior high school (SMP) children at 0.4% and children High School (SMA) 0.3%. The household health survey in Indonesia found that 71% of disturbances in daily activities were caused by visual impairment, with 22.1% caused by refractive errors and 15% occurring in children aged 5-15 years, but the rate of glasses use is still low. low, namely 12.5%.[7] This proves that cases of refractive errors among school children require serious attention.6 Through Vision 2020, WHO and IAPB (International Agency for the Prevention of Blindness) emphasized that uncorrected refractive errors in children -children are one of the five priority issues that must be considered in developing countries.[8]

Refractive disorders in children will disrupt the sufferer's daily activities and have a negative impact on future generations. Children's brain development will be disrupted and the learning process will also be hampered, and their ability to absorb learning will decrease.[9]

Students are strategic targets for implementing health programs, because apart from their large numbers, they are also targets that are easy to reach because they are well organized. The lowest coverage of health services for students in West Java Province is in the Bandung Regency area at 6.3% at the elementary school or equivalent level, the second lowest at 57.5% at the SMP/MTS level, and 56.19% at the SMA/MA level.[10]

Based on data on disease patterns in hospital outpatients for children aged 5-14 years in Bandung Regency in 2020, there were 231 new cases of refractive errors with a diagnosis of astigmatism.[11] Then in 2022, as many as 257 children aged 5-14 years were diagnosed with astigmatism.[12]

The aim of the research is to know the description of refractive abnormalities that occur in students at Islamic Boarding School, Islamic Association 31 Banjaran, Bandung Regency, including demographic factors

Methods

This research is a cross-sectional study conducted from January to February 2024 at the Islamic Boarding School, Islamic Association 31 Banjaran, Bandung Regency, West Java, Indonesia. The subjects of this research were 550 Madrasah Tsanawiyah (MTs) students and 296 Madrasah Aliyah (MA) students, so the total sample size was 846 students. The research analysis was based on primary data from vision screening results and refractive error examination. This research was conducted by researchers and assisted by professional optometrists from the National Eye Center,

Cicendo Eye Hospital, Bandung and the Indonesia Melihat Nusantara Foundation.

The instrument used in this research was informed consent followed by a series of visual acuity screening activities and examination of refractive errors. Students with visual acuity screening results worse than 6/9 then underwent further refractometry examination without pupil dilation, and vision correction using a trial lens set with a Snellen chart optotype.

The operational definition in this study is that myopia is a refractive error with a spherical equivalent (SE) ≤ -0.50 dioptre sphere (DS), hyperopia with SE ≥ +0.50 DS and astigmatism with a cylindrical refractive error ≥ 0.50 dioptre cylinder (DC). The axis of astigmatism was not taken into account in this study. Diagnosis of refractive errors is based on examinations carried out on eyes with more severe refractive errors, which are defined as the eyes with the largest SE value. If only one eye has a refractive error, that eye is included in the study. The data obtained is processed using SPSS software and presented in table form.

Ethical approval was obtained from the Health Research Ethics Committee, Faculty of Public Health, Diponegoro University, Semarang with No: 91/EA/KEPK-FKM/2024. Research permission was obtained from the Public Health Office Bandung Regency and the school.

Result

Based on the results of research conducted at the Islamic Boarding School, Islamic Association 31 Banjaran, Bandung Regency, West Java, Indonesia, from a total sample of 846 students, 674 students provided informed consent to become research subjects.

Table 1 Demographic Characteristics of Students at Islamic Boarding School, Islamic Association 31 Banjaran, Bandung Regency, West Java, Indonesia with Visual Impairment

Variable	Emmetropia		Ametropia		Total	
	n	%	n	%	n	%
Sex						
Male	228	33,83	54	8,01	282	41,84
Female	273	40,50	119	17,66	392	58,16
Total	501	74,33	173	25,67	674	100
Age						
12 years	54	8,01	8	1,19	62	9,20
13 years	130	19,29	30	4,46	160	23,75
14 years	122	18,10	37	5,49	159	23,59
15 years	91	13,50	37	5,49	128	18,99
16 years	53	7,86	34	5,04	87	12,90
17 years	39	5,79	22	3,26	61	9,05
18 years	12	1,78	5	0,74	17	2,52
Total	**501**	**74,33**	**173**	**25,67**	**674**	**100**

Table 1 shows that visual impairment (ametropia) occurs more frequently in female students than male students, whereas according to age, visual impairment (ametropia) occurs more frequently in students in the 14-15 year age group.

Table 2 Demographic Characteristics of Students Islamic Boarding School, Islamic Association 31 Banjaran, Bandung Regency, West Java, Indonesia with Refractive Disorde

Variable	Myopia		Hyperopia		Astigmatism		Myopia Astigmatism		Suspected Organic Disorder		Total	
	n	%	n	%	n	%	n	%	n	%	n	%
Sex												
Male	22	12,72	1	0,58	23	13,29	8	4,62	0	0	54	31,21
Female	57	32,95	2	1,16	41	23,70	18	10,40	1	0,58	119	68,79
Total	79	45,67	3	1,74	64	36,99	26	15,02	1	0,58	173	100
Age												
12 years	3	1,73	1	0,58	0	0	4	2,31	0	0	8	4,62
13 years	16	9,25	1	0,58	10	5,78	2	1,16	1	0,58	30	17,35
14 years	19	10,98	0	0	14	8,09	4	2,31	0	0	37	21,38
15 years	15	8,67	1	0,58	15	8,67	6	3,46	0	0	37	21,38
16 years	16	9,25	0	0	12	6,94	6	3,46	0	0	34	19,65
17 years	9	5,20	0	0	11	6,36	2	1,16	0	0	22	12,72
18 years	1	0,58	0	0	2	1,16	2	1,16	0	0	5	2,90
Total	**79**	**45,66**	**3**	**1,74**	**64**	**37,00**	**26**	**15,02**	**1**	**0,58**	**173**	**100**

Table 2 shows that refractive errors were found to be higher in female students than in male students, while according to age, refractive errors were found to be higher in students aged 14-15 years

Table 3 Types of Refractive Errors in Islamic Boarding School Students, Islamic Association 31 Banjaran, Bandung Regency, West Java, Indonesia

Types of Refractive Errors	Total (n)	Percentage (%)
Myopia	79	45,67
Hyperopia	3	1,73
Astigmatism	64	36,99
Myopia Astigmatism	26	15,03
Suspected Organic Disorder	1	0,5
Total	173	100

Table 3 shows that the type of refractive error that often occurs among students at Islamic Boarding School 31 Banjaran, Bandung Regency is myopia (45.67%), followed by astigmatism (36.99%), myopia astigmatism (15.03%), and hyperopia. (1.73%). As for the suspected organic disorder, it was found that (0.5%) students had a lazy eye condition (amblyopia).

Table 4 History of use of corrective glasses among students at Islamic Boarding School, Islamic Association 31 Banjaran, Bandung Regency, West Java, Indonesia

Use of Glasses	Total (n)	Percentage (%)
Yes	38	21,97
No	135	78,03
Total	173	100

Table 4 shows that the majority of students with refractive errors do not use corrective glasses in carrying out daily activities, especially when studying at school.

Discussion

Refractive errors are the first cause of visual impairment according to the World Health Organization (WHO). Nineteen million children under 15 years of age are estimated to have visual impairment, 12 million of which are due

to refractive errors. More than 1 million of them experience lifelong blindness and require visual rehabilitation.[13]

In this study, it was found that 173 subjects had refractive errors (25.67%). Most of the students who experienced refractive errors were women (68.79%) compared to men (31.21%). These results are in accordance with the Refractive Error Study in Children (RESC) which was carried out in several countries including China, Chile, Nepal and India, showing that there are differences in the rates of refractive errors in boys and girls. This result is also similar to research conducted by Solange et al in Brazil in 2008 where there were more girls, namely 51.8%. Research conducted by Opubiri et al, Ratanna et al, and Czepita et al also stated that refractive errors are more common in women than men. This is also commensurate with the results of meta-analysis research by Pan et al. who found that refractive errors occurred more frequently in women compared to men.[14–18]

Based on age group, most students experienced refractive errors in the 14 year and 15 years age groups with the same value (21.38%) compared to other age groups. This is similar to the results of research by Richard S. Ratanna, et al in the period June 2010 – June 2012, showing that the 10-14 years age group was the age group with the most frequent refractive errors found, namely 64.41% and the least in the 1-4 years age group, namely 0.62 %.15 Refractive errors in children can cause vision problems and are one of the disorders that are easily treated, but currently there are many recorded cases of uncorrected refractive errors in children.[19,20] It is estimated that there are 12.8 million Children around the world aged 5-15 years suffer from uncorrected refractive errors.[20,21]

A study in Jordan reported that the type of refractive error that commonly occurs in school-aged children is myopia, followed by hypermetropia and astigmatism.[22] For comparison, this study shows that the type of refractive error that commonly occurs in students is myopia (45.67%), followed by astigmatism (36.99%), astigmatism myopia (15.03%), and hyperopia (1.73%). In this case, few types of hyperopia abnormalities were found, this could be caused by the type of examination and also the age of the samples involved in this study. Hyperopia occurs more often in young children aged less than 10 years. 22 Some other children can also experience mild hyperopia abnormalities, this may not be detectable through examination using a Snellen chart and anamnesis taken by an optometrist.

In East Asia, the prevalence of myopia is already high, the prevalence of myopia in children aged 14 to 16 years living in urban areas continued to increase from around 56.0% to 65.5% between 2006 and 2015.[23] Systematic analysis of 22 studies on myopia prevalence in Chinese children and adolescents found that the prevalence continued to increase between 2000 and 2015 from 25.7% (before 2001), to around 39% (2001–2010) and then to 46.1% (2011–2015).[24] Although East Asian countries have the highest prevalence, increases in nearsightedness are also occurring in other regions of the world. In Australia, a cross-sectional study of children aged 12 years reported prevalence increasing from 11.5% in 2006 to 18.9% in 2011.[25] In Northern Ireland, the prevalence in children aged 12 years increased from 17.7% in 2007 to 22.8% in 2017. Similarly, prevalence increased from 7.4% to 13.1% between 2001 and 2014 in New Delhi in children aged 5 to 15 years[26,27], and 21.1% 4 years later, a sharp increase in myopia.[28]

Worldwide, one-fifth of blindness is caused by refractive errors, primarily myopia.[29] Myopia (defined as spherical equivalent refraction ≤ -0.50 diopter [D]) is a global public health problem and an under-recognized chronic condition affecting nearly 30% of the world's population.[30] Myopia impacts a person's early life, causing disability due to poor vision, and lasts a lifetime. Depending on the individual's age, magnitude of myopia, and geographic conditions (e.g. urban versus remote/rural), this can have severe socio-economic consequences on the individual and, consequently, on society as a whole. It seems inevitable that the proportion of people affected by myopia will increase in the coming decades. Projections estimate that 50% of the global population will be affected by myopia by 2050, 10% of whom will suffer from high myopia. 32 Because myopia, especially high myopia, is associated

with a significant risk of complications leading to blindness and visual impairment, the global burden of myopia is likely to increase.[31]

The majority of students (78.03%) who experience refractive errors do not use glasses vision rehabilitation equipment in carrying out daily activities, especially when studying at school, while the rest already use corrective glasses, but some require adjustments to corrective glasses according to the results of the latest examination. From these data it can be concluded that students do not fully know, understand and are aware of the visual problems that occur in their eyes, and do not have awareness of routine eye health checks that must be carried out periodically. This has become a matter of concern for health practitioners, especially Optometrists and Ophthalmologists, regarding early detection efforts which must be carried out evenly and comprehensively at all levels of society, which of course requires the role and cooperation of parents, schools and the government in efforts to overcome vision problems.

Early detection of visual impairment, in this case visual acuity screening, needs to be carried out regularly by students, therefore schools need to improve their student health unit programs. This is important to increase awareness of eye diseases that occur in the community by focusing on early detection of vision problems, refractive errors, as well as referral procedures that need to be carried out to health service facilities.

The limitation of this study is that visual acuity screening and examination of refractive errors were only carried out on Madrasah Tsanawiyah (MTs) and Madrasah Aliyah (MA) students, so it had low sensitivity in detecting children with hyperopic refractive errors. In addition, the sample in this study was limited to only one educational institution. For further research, it is recommended that the sensitivity of the screening examination be increased by using other types of visual acuity screening to detect refractive errors. The sample in research can be expanded to a wider population group either in terms of age or carried out at different educational institutions. In this way, it is hoped that the government's efforts in early detection of visual impairment in school-age children can be handled well, evenly and comprehensively at all levels of society.

Conclusions

The results of this study showed that 25.67% of students at the Islamic Boarding School, Islamic Association 31 Banjaran, Bandung Regency had refractive errors. Mostly it occurs in female students, and students in the 14-15 year age group. The type of refractive error that occurs more often in students is myopia, followed by astigmatism, myopia astigmatism, and hyperopia. Then the majority of 78.03% of students do not use vision rehabilitation devices such as corrective glasses in carrying out their daily activities. Based on the results of this research, good cooperation is needed between health workers, school teachers, health facilities and public health office in efforts to overcome visual impairment due to refractive errors by carrying out early detection of visual impairment including screening for visual acuity and examining refractive errors in school-aged children. This is important to do early, because if left without proper prevention and treatment efforts it will cause a decrease in learning achievement, reduce self-confidence, and have a negative impact on the quality of life of students in carrying out their daily activities.

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