

Assessment of Knowledge Level about Amblyopia among Adolescents with Refractive Errors in Jember

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ABSTRACT

Introduction: Adolescent eye health is often overlooked, despite the long-term impact of conditions such as amblyopia if left undetected. Amblyopia is a visual disorder that occurs when one eye fails to achieve normal visual acuity, despite the absence of structural abnormalities. This condition is commonly associated with uncorrected refractive errors and may progress without noticeable symptoms. Adolescents with amblyopia may remain unaware of the problem due to gradual visual adaptation.

Aim: This study aimed to assess the level of knowledge about amblyopia among adolescents with refractive errors.

Method: A descriptive quantitative method with a cross-sectional design was used. A total of 53 adolescents aged 10–17 years were selected using purposive sampling at the Eye Polyclinic of Dr. Soebandi Regional Hospital, Jember. Data were collected through a structured, validated questionnaire.

Result: Results showed that the majority of respondents (62.3%) had low knowledge levels, while only a small proportion (11.3%) demonstrated high understanding. Limited awareness of risk factors and consequences of amblyopia emerged as a key finding.

Conclusion: Adolescents with refractive disorders exhibited insufficient knowledge of amblyopia, particularly regarding its general concepts, causes, and complications, underscoring the need for targeted eye health education to enhance awareness, facilitate early detection, and prevent long-term visual impairment.

Keywords: Adolenscents, Amblyopia, Eye Health Education, Knowledge, Refractive Errors

Introduction

Vision is an essential component in supporting the learning process and cognitive development, especially during childhood and adolescence. Visual impairment at this stage can lead to limited visual stimulation, which can lead to delayed intellectual development (Arini et al., 2025). One important disorder to be aware of is amblyopia. Early eye examinations serve as an effective preventative measure, as delayed detection can increase the risk of amblyopia (AlJarallah et al., 2024). Amblyopia, or lazy eye, is a developmental vision disorder caused by a lack of visual stimulation to the visual cortex in one or both eyes. The visual cortex, the brain's center for processing visual information, typically reaches maturity by the age of four, so impairment during this period can lead to permanent vision damage (Samir et al., 2023; Yoli Rahmadani et al., 2023). This condition can be triggered by various factors, such as refractive errors (myopia, hyperopia, and astigmatism), a history of premature birth, genetic factors, and other eye disorders such as ptosis, cataracts, or corneal opacities (Syahmalya et al., 2022).

Refractive errors are a major contributing factor to amblyopia because they disrupt the formation of sharp images on the retina, particularly during childhood visual development (Dzulkipli et al., 2024). In cases of anisometropia, the brain tends to ignore

visual input from the weaker eye due to the sharp difference in refractive power, thus hindering the development of visual function and triggering amblyopia (Irma et al., 2024). Therefore, early intervention for refractive errors is crucial to prevent permanent amblyopia. Although treatment is most effective in childhood, amblyopia can still be found in adolescents without prior diagnosis. In this age group, visual improvement is more limited, but therapies such as refractive correction, occlusion, and visual training can still provide benefits if implemented consistently (Brin et al., 2021).

A meta-analysis involving over 4.6 million children reported that the global prevalence of amblyopia in children is 1.36%. The highest prevalence was found in Europe (2.66%), followed by North America (1.95%) and Asia (1.16%), while the lowest was in Africa (0.38%). The incidence is higher in boys than in girls. This study emphasizes the importance of early detection and treatment of amblyopia as a global pediatric eye health problem (Budan et al., 2022). Previous studies have shown varying prevalence estimates in Saudi Arabia, including 1.3% in Jeddah, 3.9% in Al Qassim, and 1.85% in Abha (AlJarallah et al., 2024). According to previous research, the prevalence of amblyopia varies based on age, gender, and family history. The 5–9 age group showed the highest prevalence (52.8%), followed by the 10–14 age group (35.8%) and the 15–19 age group (11.3%). Based on gender, amblyopia cases were almost evenly distributed between girls (50.9%) and boys (49.1%) (Putri Yunan Chaerunnisya et al., 2022).

The high prevalence of myopia, hyperopia, and astigmatism among school-age children makes these three refractive errors a primary focus in amblyopia prevention efforts (Anita Fitria et al., 2023). All three are relatively easy to identify through a basic examination and can be treated with conservative approaches such as wearing glasses. However, low awareness among adolescents about the importance of eye examinations, as well as limited understanding of the symptoms and long-term impacts of amblyopia, means many cases go undetected early (Almutairi et al., 2022). This condition increases the risk of permanent vision impairment, which can impact academic achievement, daily activities, and psychological aspects such as anxiety, low self-esteem, and depression (Gitsels et al., 2020; Putri Yunan Chaerunnisya et al., 2022). Therefore, regular eye examinations are a crucial preventive measure for maintaining visual function and overall quality of life for adolescents.

This study was conducted to identify the level of knowledge regarding amblyopia among adolescents with refractive errors. This information is expected to provide an initial overview of the gap in eye health literacy among adolescents and serve as a basis for developing more effective and targeted educational programs. With increased knowledge, it is hoped that adolescents will be more aware of this preventable vision disorder and take appropriate action to maintain their eye health on an ongoing basis.

Method

Design

This study employed a quantitative descriptive design with a cross-sectional approach to assess adolescents' knowledge regarding amblyopia.

Setting and Time

The study was conducted at the Eye Clinic of Dr. Soebandi Regional General Hospital, Jember Regency, Indonesia, from December 2024 to June 2025.

Population, Sample, and Sampling

The target population consisted of adolescents with refractive disorders attending the Eye Clinic. A total of 53 adolescents aged 10–17 years participated in this study. Respondents were selected using a purposive sampling technique based on predetermined inclusion criteria. Adolescents who met the eligibility requirements and agreed to participate were included in the study.

The inclusion criteria were: (1) adolescents diagnosed with refractive disorders, including myopia, hyperopia, or astigmatism, confirmed through ophthalmological examination; (2) aged 10–18 years; (3) registered as outpatients at the Eye Clinic of Dr. Soebandi Regional General Hospital; and (4) willing to participate by providing informed consent approved by their parents or guardians and completing the questionnaire. The exclusion criteria included respondents who could not be contacted during the study period or those who withdrew from the study before completing the data collection process.

Instrument and Measurement Properties

Data were collected using a knowledge questionnaire adapted from previous research (Bashir, Taishan, Alghamdi, Alzahrani, Khan, et al., 2024). The questionnaire consisted of 23 items divided into four domains: general concepts of amblyopia, causes, complications, and treatment. The first item used a dichotomous response format (“Yes” or “No”), whereas the remaining items provided three response options (“Yes,” “No,” and “I do not know”). Each correct answer was assigned a score of 1, while incorrect or “I do not know” responses were scored 0. The total possible score ranged from 0 to 23, with higher scores indicating greater knowledge regarding amblyopia.

Before implementation, the instrument underwent validity and reliability testing among 37 adolescents with refractive disorders at Baladhika Husada Hospital, Jember. The validity test showed corrected item-total correlation coefficients ranging from 0.367 to 0.728, exceeding the minimum acceptable value of 0.361, with significance values ranging from 0.000 to 0.025 ($p < 0.05$), indicating that all 23 items were valid. Reliability testing demonstrated a Cronbach’s alpha coefficient of 0.820, indicating good internal consistency.

Data Collection Procedure

Prior to data collection, the researcher obtained approval from the Faculty of Nursing, University of Jember, and secured permission from the relevant authorities and the hospital administration. Eligible respondents were identified after undergoing refractive examinations at the Eye Clinic. The researcher explained the study objectives and procedures to respondents and their parents or guardians. After obtaining informed consent, respondents were asked to complete the questionnaire. Completed questionnaires were checked for completeness and consistency before being included in the analysis.

Data were collected from two sources. Primary data were obtained directly from respondents using a structured questionnaire assessing knowledge of amblyopia.

Secondary data were collected from medical records containing diagnoses of refractive disorders, including myopia, hyperopia, and astigmatism.

Data Analysis

Data processing included editing, coding, and tabulation. Editing was conducted to verify the completeness and accuracy of questionnaire responses. Coding involved assigning numerical codes to each variable according to the established coding framework. Subsequently, the data were organized into tables to facilitate analysis and interpretation.

Knowledge scores were converted into percentages using the following formula: Knowledge Score (%) = (Obtained Score / Maximum Score) × 100. Based on the percentage score, respondents' knowledge levels were categorized as follows: low (<55%), moderate (56–75%), and high (76–100%). Data were analyzed using univariate statistical analysis. Descriptive statistics, including frequencies and percentages, were calculated to describe respondents' demographic characteristics and knowledge levels regarding amblyopia. The findings were presented in tables and narrative descriptions.

Ethical Declaration

This study received ethical approval from the Health Research Ethics Commission of the Faculty of Nursing, University of Jember, under approval number 251/UN25.1.14/KEPK/2025. Participation was voluntary, and informed consent was obtained from all respondents and/or their parents or guardians before data collection. Confidentiality and anonymity of participants were maintained throughout the research process.

Result

Table 1 presents the demographic and clinical characteristics of the respondents. The median age was 16 years, with an age range of 10–17 years, indicating that most participants were in late adolescence. The majority of respondents were female (58.5%), while males accounted for 41.5% of the sample. Most respondents were senior high school students (66.0%), followed by junior high school students (22.6%) and elementary school students (11.3%).

Regarding family history, 69.8% of respondents reported having relatives with a history of eye disease. In terms of refractive disorders, myopia was the most prevalent condition (75.5%), followed by astigmatism (18.9%), combined myopia and astigmatism (3.8%), and hyperopia (1.9%). These findings indicate that myopia was the predominant refractive disorder among adolescents attending the Eye Clinic of Dr. Soebandi Regional General Hospital.

Table 1. Demographic and Clinical Characteristics of Respondents (N = 53)

Variable	Frequency (n)	Percentage (%)
Age (years)		
Median	16	-
Minimum–Maximum	10–17	-
Gender		
Male	22	41.5

Female	31	58.5
Educational Level		
Elementary School	6	11.3
Junior High School	12	22.6
Senior High School	35	66.0
Family History of Eye Disease		
Yes	37	69.8
No	16	30.2
Type of Refractive Disorder		
Myopia	40	75.5
Hyperopia	1	1.9
Astigmatism	10	18.9
Myopia and Astigmatism	2	3.8

As presented in Table 2, most respondents demonstrated a low level of knowledge regarding amblyopia, accounting for 33 respondents (62.3%). Fourteen respondents (26.4%) had a moderate level of knowledge, whereas only six respondents (11.3%) exhibited a high level of knowledge. These findings indicate that awareness and understanding of amblyopia among adolescents with refractive disorders remain generally inadequate.

Table 2. Frequency and Percentage Distribution of Adolescents' Knowledge Levels Regarding Amblyopia

Knowledge Level	Frequency (n)	Percentage (%)
Low (<55%)	33	62.3
Moderate (56–75%)	14	26.4
High (76–100%)	6	11.3
Total	53	100.0

Table 3 indicates that more than half of the respondents (56.6%) had a low level of general knowledge regarding amblyopia. Meanwhile, 30.2% demonstrated a moderate level of knowledge, and only 13.2% achieved a high level of knowledge. These findings suggest that adolescents with refractive disorders have a limited understanding of the basic concepts, characteristics, and importance of early detection of amblyopia.

Table 3. Knowledge Level Regarding Amblyopia: General Knowledge Indicator

Knowledge Level	Frequency (n)	Percentage (%)
Low (<55%)	30	56.6
Moderate (56–75%)	16	30.2
High (76–100%)	7	13.2
Total	53	100.0

As shown in Table 4, the majority of respondents (64.2%) had a low level of knowledge regarding the causes of amblyopia. Fourteen respondents (26.4%) demonstrated a moderate level of knowledge, while only five respondents (9.4%) had a high level of knowledge. This finding indicates insufficient understanding among adolescents regarding the etiological factors contributing to amblyopia.

Table 4. Knowledge Level Regarding Amblyopia: Causes Indicator

Knowledge Level	Frequency (n)	Percentage (%)
Low (<55%)	34	64.2
Moderate (56–75%)	14	26.4
High (76–100%)	5	9.4
Total	53	100.0

Table 5 shows that most respondents (64.2%) had a low level of knowledge regarding the complications of amblyopia. A moderate level of knowledge was observed among 20.8% of respondents, whereas 15.1% demonstrated a high level of knowledge. These findings suggest that adolescents generally lack adequate awareness of the potential consequences and long-term complications associated with untreated amblyopia.

Table 5. Knowledge Level Regarding Amblyopia: Complications Indicator

Knowledge Level	Frequency (n)	Percentage (%)
Low (<55%)	34	64.2
Moderate (56–75%)	11	20.8
High (76–100%)	8	15.1
Total	53	100.0

Table 6 demonstrates that knowledge regarding amblyopia treatment was relatively better compared to other indicators. Although 37.7% of respondents were categorized as having low knowledge, 28.3% had moderate knowledge, and 34.0% had high knowledge regarding treatment options. This finding suggests that adolescents with refractive disorders are more familiar with treatment-related aspects of amblyopia than with its general concepts, causes, or complications.

Table 6. Knowledge Level Regarding Amblyopia: Treatment Indicator

Knowledge Level	Frequency (n)	Percentage (%)
Low (<55%)	20	37.7
Moderate (56–75%)	15	28.3
High (76–100%)	18	34.0
Total	53	100.0

Discussion

The findings revealed that more than half of adolescents with refractive errors attending the Ophthalmology Clinic of RSD dr. Soebandi Jember demonstrated a low level of general knowledge regarding amblyopia (56.6%), while 30.2% and 13.2% exhibited moderate and high levels of knowledge, respectively. This finding suggests that most participants lacked adequate understanding of fundamental aspects of amblyopia, including its definition, causes, symptoms, and the importance of early detection and treatment. Insufficient knowledge of amblyopia may contribute to delayed diagnosis and increase the risk of long-term visual impairment, particularly because the condition is often asymptomatic during its early stages (Alatawi et al., 2021). From a public health perspective, limited awareness represents a significant barrier to effective prevention and timely intervention. Therefore, these findings highlight the need for targeted educational strategies to improve visual health literacy among adolescents.

The present findings are consistent with previous studies reporting limited public awareness of amblyopia. A growing body of evidence suggests that knowledge regarding the definition, risk factors, and management of amblyopia remains inadequate across different populations (Aldihan et al., 2024; AlRashidi et al., 2022). The consistency of these findings across diverse cultural and demographic settings suggests that insufficient eye-health literacy may represent a global challenge rather than an isolated local issue. Previous research has identified several contributing factors, including limited integration of eye-health education into school curricula, insufficient public awareness campaigns, and inadequate family involvement in health education (Almutairi et al., 2022). Consequently, future interventions should emphasize structured educational programs involving schools, healthcare professionals, parents, and digital platforms to improve adolescents' understanding of amblyopia and promote preventive visual health behaviors.

The results further demonstrated that knowledge regarding the causes of amblyopia was particularly limited, with 64.2% of respondents classified as having low knowledge, 26.4% moderate knowledge, and only 9.4% high knowledge. This finding indicates a substantial lack of understanding regarding major etiological factors such as strabismus, uncorrected refractive errors, including anisometropia, and visual deprivation conditions such as congenital cataracts or ptosis. Knowledge of these risk factors is crucial because early recognition and management can substantially reduce the likelihood of permanent visual deficits. Previous evidence has identified anisometropia as the leading cause of unilateral amblyopia among school-aged children, accounting for approximately 69% of cases and highlighting the substantial contribution of uncorrected refractive errors to amblyopia development (Wu & Wang, 2024). The current findings, therefore, suggest that inadequate visual health literacy may hinder effective prevention efforts at the community level.

Consistent findings from earlier investigations have revealed limited awareness of amblyopia among parents and caregivers. Only a small proportion of parents were reported to recognize the importance of amblyopia treatment before the age of 10 years, while just over half had previously heard of amblyopia or "lazy eye" (AlJarallah et al., 2024). These findings indicate that knowledge deficits are not limited to adolescents but are also evident among adults who play a critical role in children's health education and healthcare decision-making. The low level of knowledge observed in this study may be associated with the absence of routine school-based vision screening programs, limited eye-health education within primary healthcare services, and a lack of age-appropriate educational resources. Strengthening school-based educational initiatives, providing training for teachers and parents, and developing engaging visual educational materials may therefore improve awareness of amblyopia risk factors and support earlier detection.

Knowledge regarding the complications of amblyopia was similarly low, with 64.2% of respondents categorized as having poor knowledge, 20.8% moderate knowledge, and only 15.1% high knowledge. These findings indicate that most adolescents were unaware that untreated amblyopia may result in long-term consequences, including impaired depth perception, permanently reduced visual acuity, and deficits in binocular visual function.

Such complications may extend beyond visual performance and adversely affect academic achievement, motor coordination, psychosocial development, and future occupational opportunities (Gitsels et al., 2020). Given that amblyopia frequently develops without obvious symptoms, inadequate awareness of its consequences may reduce the likelihood of seeking timely eye examinations and treatment.

The present findings align with previous evidence demonstrating limited public understanding of amblyopia-related complications. Previous studies have consistently reported poor awareness of amblyopia-related complications among parents and caregivers, with only a small proportion demonstrating adequate knowledge and more than half exhibiting insufficient understanding of the condition (Abuallut et al., 2023). Consistent evidence from different populations has further highlighted persistent gaps in public awareness regarding the visual and social consequences of amblyopia (Almutairi et al., 2022; Bashir, Taishan, Alghamdi, Alzahrani, & Khan, 2024). The persistence of this knowledge gap may reflect limited emphasis on amblyopia complications within school health programs and primary healthcare education. Furthermore, educational materials may not adequately address the informational needs of adolescents. Integrating amblyopia-related content into school health curricula and developing age-appropriate educational resources may therefore enhance awareness and encourage preventive behaviors among young people.

In contrast to the other knowledge domains, respondents demonstrated relatively better knowledge regarding amblyopia treatment and management. Approximately one-third of participants (34.0%) were categorized as having high knowledge, while 28.3% and 37.7% exhibited moderate and low knowledge levels, respectively. This pattern suggests that a proportion of adolescents were familiar with common treatment approaches, including corrective spectacles, occlusion therapy, and visual training exercises. Greater awareness of treatment options may be attributable to increasing exposure to information from healthcare professionals, family members, and digital media platforms. The growing accessibility of online health information and adolescents' frequent engagement with digital technologies may have contributed to improved knowledge in this domain (Rahman et al., 2023).

These findings are supported by recent evidence highlighting advances in amblyopia management. Contemporary amblyopia treatment increasingly incorporates digital interventions, including binocular video games, dichoptic training, and virtual reality applications, which provide engaging methods for stimulating visual function (Alrasheed & Aldakhil, 2024). Furthermore, emerging evidence indicates that these innovative approaches can improve visual acuity and enhance neural plasticity among children and adolescents with amblyopia (Lan et al., 2024; Molina-Martín et al., 2023). Nevertheless, knowledge alone may not guarantee treatment adherence. Therefore, comprehensive educational interventions involving schools, families, healthcare providers, and technology-based learning platforms are needed to enhance treatment adherence and optimize visual outcomes among adolescents with amblyopia.

Conclusion

Most adolescents with refractive disorders attending the Eye Clinic of Dr. Soebandi Regional General Hospital demonstrated a low level of knowledge regarding amblyopia, particularly concerning its general concepts, causes, and complications. Although knowledge of treatment options was relatively better, overall awareness remained insufficient. These findings highlight the need for targeted eye health education involving schools, families, and healthcare providers to improve awareness, promote early detection, and prevent long-term visual impairment. Future studies should investigate factors influencing amblyopia knowledge and treatment adherence, including family support, social influences, and digital media utilization.

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Conflict of Interest

None.

Author Contributions

A.D.Y. contributed to the study conception and design, data collection, data analysis, interpretation of findings, and manuscript drafting. S. contributed to the study design, supervision of the research process, interpretation of data, and critical revision of the manuscript. R.A.Y. contributed to the study conceptualization, methodology development, supervision, data interpretation, and critical review and editing of the manuscript. All authors reviewed, approved, and agreed to the final version of the manuscript.

Data Availability Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request. Due to ethical and privacy considerations, the data are not publicly available as they contain information that could potentially compromise the confidentiality of the participants.

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