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Research Article

Analysis of Risk Factors in The Incident of Myopia in Students at The Al-Fakhry Hadiwijaya Islamic Boarding School Kajen

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Abstract: In Indonesia, refractive errors are the most common eye disorder, affecting approximately 25% of the population or around 55 million individuals. Students in Islamic boarding schools are particularly vulnerable to myopia due to study habits such as reading while lying down, maintaining a reading distance of less than 30 cm, and using inadequate lighting. This study aims to analyze risk factors associated with myopia among students aged 14–18 years at Al-Fakhry Hadiwijaya Islamic Boarding School, Kajen. The research employed a quantitative observational analytic design using a cross-sectional approach. Total sampling was applied in December 2023, involving students from grades VIII MTs to XII MA who had lived in the boarding school for at least one year. Data were collected using questionnaires, Snellen charts, trial frames, lux meters, and visual inspection with correction. Statistical analysis was performed using the chi-square test, and ethical approval was obtained (No: 098/EC/KEPK-FK/UNIMUS/2023). The study involved 41 eligible respondents, showing that 56.1% experienced myopia while 43.9% did not. The most dominant risk factors identified were poor lighting (73.1%), improper reading position (69.2%), and close reading distance (38.1%). Statistical results indicated significant relationships between room lighting (p=0.004), reading position (p=0.026), and reading distance (p=0.017) with myopia occurrence. Among these factors, inadequate indoor lighting showed the strongest association with myopia incidence among students.

Keywords: Myopia; Reading Distance; Reading Position; Room Lighting; Student Eye Health.

1. Introduction

Humans possess eyes as sensory organs for vision (Jayaputra, Tolle, & Wardhono, 2017). The eye is a highly crucial sense organ for an individual in capturing visual information, which is utilized in performing various activities (Panggabean & Ati, 2017). The eyes are often exposed to external influences such as improper reading positions, reading at close distances, ultraviolet light, reading religious texts or books too closely, dust, electronic radiation, and in some cases, exposure to chemical substances. These exposures are also related to activity factors, both outdoors and indoors. Special attention is required to prevent incidents of refractive errors that may lead to visual impairment (Yeyen Ariaty, Kumaladewi Hengky, & Afrianty, 2019). Myopia is the most common cause of refractive errors in children and adolescents (Agus, Samsul Bahri, & Banda Aceh, n.d.). Adolescence is generally defined as the transitional period from childhood to adulthood. According to the WHO, the age range for adolescents is twelve to twenty-four years. Myopia is a refractive error that causes parallel light rays entering the eye to be focused in front of the macula lutea without accommodation, hence it is referred to as nearsightedness (Antono & Riswanto, 2023).

According to the WHO, myopia, affecting forty-three percent of individuals, is one of the causes of decreased vision. Data from the American Academy of Ophthalmology (AAO) in 2020 reported a myopia incidence of 28.1%. Myopia is predicted to impact the decline of visual acuity and can be corrected with lenses, eyeglasses, or surgical procedures (Barao, Coata, Shibli, Bertolini, & Souza, 2022). In Indonesia, the prevalence of refractive errors ranks

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first among eye diseases, affecting twenty-five percent of the population, approximately fifty-five million people (Wulandari & Mahadini, 2019). Based on the results of a survey by the Indonesian Ministry of Health conducted across eight provinces, including South Sumatra, West Sumatra, Central Java, West Java, Sulawesi Selatan, North Sulawesi, and East Nusa Tenggara in 2009, refractive errors accounted for 61.71% and ranked first among the ten most prevalent eye diseases in Indonesia (Barao et al., 2022).

Myopia is a refractive error that causes parallel light rays coming from an infinite distance to focus in front of the macula lutea without accommodation, resulting in blurred or diffuse retinal images (Syuhada, Detty, & Sabrina, 2017). Students in Islamic boarding schools (santri) engage in activities that may trigger myopia, including near-work activities such as reading, viewing, and studying at distances less than 30 cm. Engaging in near-work activities is a risk factor for myopia. The longer an individual focuses on near tasks, the longer the eyes perform accommodation, leading to eye fatigue and, over time, blurring on the retina and loss of focus (Barao et al., 2022). Myopia in santri can disrupt learning and consequently decrease academic performance. Therefore, it is essential for santri to have awareness and knowledge about maintaining eye health.

Internal factors considered as causes of myopia include age, gender, and genetics (Novema, 2019). Extrinsic factors associated with myopia include the duration of near-work activities, lighting conditions, lifestyle patterns, reading posture, socioeconomic status, birth history, nutritional status, lack of outdoor activity, and history of diseases such as hypertension and diabetes mellitus (DM). While reading, myopia is influenced by adequate lighting, reading position, and the size of letters, whether in Arabic script or numbers (Syifa, 2020).

From an Islamic perspective, the eye is one of the five senses created by Allah SWT, used to perceive how things appear when observed. The eye is an organ that must always be cared for, maintained, and protected throughout life, as it is one of the blessings bestowed by Allah SWT. Activities can be hindered by visual disturbances such as blurred vision. Habits, such as reading at close distances and maintaining incorrect posture, are among the factors that can cause blurred vision.

Based on these issues, the researcher is motivated to conduct a more in-depth study analyzing the risk factors for myopia among santri at Al-Fakhry Hadiwijaya Islamic Boarding School to enable early preventive measures against myopia. The aim of this study is to understand the risk factors associated with the occurrence of myopia in santri aged 14–18 years at Al-Fakhry Hadiwijaya Islamic Boarding School, Kajen.

2. Preliminaries or Related Work or Literature Review

2.1. Reading Posture and Its Association with Myopia

The posture adopted while reading significantly influences the incidence of myopia, particularly among adolescents engaged in prolonged near-vision activities. An upright seated position allows the eyes to function symmetrically, whereas prone or reclining postures impose asymmetric strain on the extraocular muscles, potentially leading to axial elongation of the eyeball (Rose, Morgan, Ip, Kifley, Huynh, & Smith, 2008). Neurophysiological research emphasizes that reading is a complex process involving not only convergence and accommodation but also the regulation of saccadic eye movements mediated by the variable tension of six extraocular muscles (Rose et al., 2008). Persistent asymmetrical muscle tension may exacerbate myopia progression, as ocular elongation is influenced by continuous muscular contraction. Additionally, eyelid pressure during reading in a supine position can alter corneal morphology, further compromising visual acuity (Cordain, Eaton, Miller, Lindeberg, & Jensen, 2002). Consequently, maintaining an upright seated posture during reading is recommended to reduce asymmetric ocular stress and mitigate the risk of myopia, particularly in students who spend extended periods studying religious texts or literature.

2.2. Near-Work Activities and Close Reading Distance as Risk Factors for Myopia

Reading at a close distance (<30 cm) constitutes a critical risk factor for myopia by inducing excessive ciliary muscle contraction and promoting axial elongation of the eyeball (Yasmin, 2019; Karim & Taufiq, 2017). Near-work activities including reading, reciting, studying, and memorizing performed continuously at short distances elevate ciliary muscle tonus and stretch the scleral tissue, diminishing the eye's accommodative capacity for distant vision (Grzybowski, Kanclerz, Tsubota, Lanca, & Saw, 2020). This physiological mechanism is mediated by the elasticity of the crystalline lens, which adjusts its curvature in response to zonular fiber tension controlled by the ciliary muscles. As a result, light from distant objects

focuses anterior to the retina, generating blurred retinal images and reducing visual clarity. Prolonged engagement in near-work tasks can accumulate optical stress, thereby accelerating myopia progression. Evidence suggests that optimizing reading distance and regulating the duration of near-work activities are essential strategies for mitigating the incidence of myopia among adolescent students engaged in intensive study sessions.

2.3. Indoor Lighting and Its Role in Myopia Progression

Ambient lighting conditions exert a direct effect on ocular health and the development of myopia. Inadequate illumination, particularly in dim or poorly lit environments, forces the visual system to increase accommodative effort, leading to ocular fatigue and promoting the progression of myopia (Ahmat, Nasution, Harahap, & Natasya, 2019). Suboptimal lighting compromises both the quantity and quality of light reaching the retina, reducing the accuracy of lens accommodation and impairing visual focus, particularly when reading small fonts in Arabic script or numerical text (Primadiani & Rahmi, 2017). Empirical measurements using lux meters underscore the importance of maintaining sufficient illumination to optimize retinal image clarity and prevent excessive ciliary muscle strain (Jokanan, Widodo, Kholis, Rakhmawati, & L., 2022). Thus, ensuring adequate indoor lighting constitutes a modifiable environmental factor that is vital for reducing the risk of myopia among students, while simultaneously supporting sustained attention and academic performance during extended study sessions.

3. Materials and Method

The type of research conducted was quantitative using a cross-sectional approach. This research was conducted at the Al Fakhry Hadiwijaya Islamic Boarding School in Kajen Village, Margoyoso District, Pati Regency, from December 2023 until completion. Data collection on the analysis of risk factors for myopia among students at the Al Fakhry Hadiwijaya Islamic Boarding School in Kajen, Pati, was conducted at the same time, only once, during the study.

The population in this study were students at the Al Fakhry Hadiwijaya Islamic Boarding School in Kajen, Pati, in 2023. The sample in this study had inclusion and exclusion criteria. The inclusion criteria were general characteristics that could represent the sample with criteria related to the topic and conditions of the study. The inclusion criteria for this study were (1) male and female students at the MTS and MA levels at the Al Fakhry Hadiwijaya Islamic Boarding School in Kajen Pati in 2023 who were aged 14-18 years (grades VIII Mts - XII MA); (2) cooperative students; (3) students who had been living at the boarding school for 1 year; (4) Students who agreed to informed consent. Meanwhile, the exclusion criteria in this study included students who had eye infections and students with genetic eye disorders, such as cataracts and glaucoma.

The tools and materials used in this study included the Unimus Faculty of Medicine research permit form, informed consent form, interview questionnaire, lux meter, Snellen chart, and trial frame. The data used in this study were primary and secondary data. Primary data were obtained from the results of questionnaires filled out by research subjects and visual acuity tests. Meanwhile, secondary data were obtained from data on Islamic boarding school profiles and the number of students.

Quantitative data processing techniques included editing, coding, data entry, processing, and cleaning. The data analysis performed included univariate and bivariate analysis. The hypotheses in this study were: a. Accept Ho, reject Ha if pvalue > 0.05, meaning there is no correlation between the independent and dependent variables; b. Reject Ho, accept Ha if pvalue < 0.05, meaning there is a relationship between the independent and dependent variables.

4. Results and Discussion

4.1. Result

The research results were determined by sampling using the total sampling technique. The sample size obtained was 41 samples. Univariate analysis was performed to collect data related to reading position, reading distance, indoor lighting, and myopia. Table 1 shows the research data on the reading position of the samples, namely:

Table 1. Frequency distribution of reading positions among students at the Al-Fakhry Hadiwijaya Kajen Islamic Boarding School.

Reading position	Frequency	Percentage
Good (sitting upright)	15	36,6
Not good (lying down, reclining, etc.)	26	63,4
Total	41	100

Table 1 shows that from a total of 41 samples taken, the data obtained shows that 15 students (36.6%) had a good reading position, while 26 students (63.4%) had a poor reading position. Next, data was collected on the distance at which the students read their books, namely:

Table 2. Frequency distribution of reading distance among students at Al-Fakhry Hadiwijaya Kajen Islamic Boarding School.

Reading distance book	Frequency	Percentage
Close (< 30 cm)	21	51,2
Sufficient (30 cm)	20	48,8
Total	41	100

Table 2 shows that out of a total of 41 samples, 21 students (51.2%) read at a close distance, and 20 students (48.8%) read at a moderate distance. Data collection was then conducted regarding indoor lighting, as presented in Table 3 below.

Table 3. Frequency distribution of indoor lighting among students at Al-Fakhry Hadiwijaya Kajen Islamic Boarding School.

Indoor lighting	Frequency	Percentage
Good	16	39,0
Poor	25	61,0
Total	41	100

In Table 3, from a total of 41 samples, it was found that 16 students (39.0%) had good indoor lighting, while 25 students (61.0%) had poor lighting. This was followed by an analysis of the frequency of myopia, which is presented in Table 4 below.

Table 4. Frequency distribution of myopia among students at Al-Fakhry Hadiwijaya Kajen Islamic Boarding School.

Myopia	Frequency	Percentage
Yes	23	56,1
No	18	43,9
Total	41	100

Table 4 shows that out of a total of 41 samples, most students did not have myopia, with 18 students (43.9%) not having myopia and 23 students (56.1%) having myopia. The study then proceeded to univariate analysis, which is presented in the table below.

Table 5. Results of the analysis of the relationship between reading position and the incidence of myopia among students at the Al-Fakhry Hadiwijaya Kajen Islamic Boarding School.

Reading position	Myopia						*p value*
	Yes		No		Total		
	N	%	n	%	n	%	
Good	5	33,3	10	66,7	15	100	
Not Good	18	69,2	8	30,8	26	100	0.026
Total	23	56,1	18	43,9	41	100	

Table 5 shows the results of bivariate analysis. Regarding the variable of reading position, most respondents with a good reading position, namely 5 out of 15 students (33.3%), suffered from myopia. Meanwhile, 18 out of 26 students (69.2%) with poor reading positions suffered

from myopia. The chi-square test results that had been corrected had a p-value = 0.026 (<0.05), meaning that there was a relationship between reading position and the incidence of myopia among students.

Table 6. Results of the analysis of the relationship between reading distance and the incidence of myopia among students at the Al-Fakhry Hadiwijaya Kajen Islamic Boarding School.

Reading Distance Book	Myopia						*p value*
	Yes		No		Total		
	n	%	n	%	n	%	
Sufficient	15	75,0	5	25,0	20	100	
Close	8	38,1	13	61,9	21	100	0.017
Jumlah	23	56,1	18	43,9	41	100	

Table 6 shows the results of bivariate analysis. Regarding the variable of reading distance, most respondents with a good/adequate reading distance, namely 15 out of 20 students (75.0%), suffered from myopia. Meanwhile, 8 out of 21 students (38.1%) with poor/close reading distance suffered from myopia. The chi-square test results that had been corrected had a p-value = 0.017 (<0.05), meaning that there was a relationship between reading position and the incidence of myopia among students.

Table 7. Results of the analysis of the relationship between indoor lighting and the incidence of myopia among students at the Al-Fakhry Hadiwijaya Kajen Islamic Boarding School.

Indoor lighting	Myopia						*p value*
	Yes		No		Total		
	n	%	n	%	n	%	
Good	5	31,3	11	68,8	16	100	0.010
Not Good	18	72,0	7	28,0	25	100	
Jumlah	23	56,1	18	43,9	41	100	

Table 7 shows the results of bivariate analysis. Regarding the variable of indoor lighting, most respondents with good lighting, namely 5 out of 16 students (31.3%), suffered from myopia. Meanwhile, 18 out of 25 students (72.0%) with poor lighting suffered from myopia. The results of the chi-square test that had been corrected had a p-value = 0.010 (<0.05), meaning that there was a relationship between reading position and the incidence of myopia among students.

4.1. Discussion

The body posture while reading books, religious texts, or the Qur'an for extended periods is associated with the incidence of myopia among students at Al-Fakhry Hadiwijaya Islamic Boarding School, Kajen. Students who adopted improper reading postures amounted to 26 students (63.4%) out of 41 respondents. This finding aligns with the research of Pärssinen et al. (Rose et al., 2008), which stated that reading is a complex neurophysiological process involving not only convergence and accommodation but also maintaining fixation and regulating saccadic eye movements through the variable tension of six extraocular muscles. Prone or lying positions are understood to potentially cause the progression of myopia, which may result in elongation of the eyeball due to the influence of extraocular muscle contraction (Rose et al., 2008). During reading, myopia is influenced by adequate lighting, posture, and the size of letters or numbers being read (Yasmin, 2019).

Various studies indicate that prone or lying positions can contribute to the progression of myopia (Primadiani & Rahmi, 2017). Additionally, pressure from the eyelids affects corneal shape, depending on the reading angle (Cordain, Eaton, Miller, Lindeberg, & Jensen, 2002). Reading while lying down can cause the eyes to function optimally only on one side, resulting in damage confined to a single eye (Riordan & Augsburger, 2019). The recommended and optimal posture for reading is a seated position.

The reading distance when studying books, religious texts, or the Qur'an at close proximity is associated with the incidence of myopia among students at Al-Fakhry Hadiwijaya Islamic Boarding School, Kajen. Students who read at a close distance (<30 cm) amounted to 21 students (51.2%) out of 41 respondents. This finding is consistent with Yasmin R

(Yasmin, 2019), which also observed inadequate reading distance among students at the Faculty of Medicine, UNS. Very close reading distances cause the periocular muscles to contract excessively, potentially leading to elongation of the eyeball. If the eyeball elongates, light from distant objects focuses in front of the retina, causing blurred vision (Karim & Taufiq, 2017).

Near-work activities such as reading, reciting, studying, and memorizing, performed continuously at close distances for prolonged periods, can increase the risk of developing myopia. These activities cause sustained accommodation, resulting in high ciliary muscle tonus and stretching of the sclera (Grzybowski, Kanclerz, Tsubota, Lanca, & Saw, 2020). The eye adapts focus from distant to near objects through the lens's ability to change shape. Natural lens elasticity allows it to become more or less convex depending on the tension of the zonular fibers in the lens capsule, which is controlled by the ciliary muscles attached to the lens via the suspensory ligament.

Long-term near-work reading activities induce myopia through direct physical effects caused by continuous accommodation, which increases ciliary muscle tonus and makes the lens convex. However, according to the latest theory, prolonged near-vision activities contribute to myopia development through the formation of blurred retinal images occurring during near focus (Norton & Siegwart, 2013).

Abnormal lighting during activities, especially reading, tends to exacerbate the progression of myopia. Dim room conditions affect the intensity of light received by the eyes (Primadiani & Rahmi, 2017). Indoor lighting while reading books, religious texts, or the Qur'an is associated with the incidence of myopia among students at Al-Fakhry Hadiwijaya Islamic Boarding School, Kajen. Students with poor indoor lighting habits numbered 25 students (61.0%) out of 41 respondents. This is consistent with the findings of Wardani et al., which stated that poor lighting conditions can contribute to myopia progression. Inadequate lighting while reading tends to worsen myopia progression. Dim environments affect both the quantity and intensity of light reaching the eyes, contributing to myopia. Proper illumination plays a primary role in visual function, while insufficient lighting causes visual fatigue (Ahmat, Nasution, Harahap, & Natasya, 2019). Poor visual habits that can impair eye health include reading in dark places, reading while lying down, directly staring at bright light sources, and others. The device used to measure lighting intensity is a "lux meter." This device converts light energy into electrical energy in the form of current to move a scale pointer. In digital devices, the electrical energy is converted into numerical readings displayed on a monitor (Jokanan, Widodo, Kholis, Rakhmawati, & L., 2022).

The relationship between reading posture and the incidence of myopia among students at Al-Fakhry Hadiwijaya Islamic Boarding School is evident, as improper postures such as lying down or reclining were observed in 63.4% of the respondents. Sustained asymmetric tension of the extraocular muscles in non-optimal reading positions may induce axial elongation of the eyeball, contributing to myopia progression (Rose, Morgan, Ip, Kifley, Huynh, & Smith, 2008). Neurophysiologically, reading is a complex process requiring convergence, accommodation, and precise saccadic control, where deviations in posture can exacerbate visual strain (Rose et al., 2008). Additionally, eyelid pressure during supine reading alters corneal curvature, potentially creating localized refractive errors (Cordain, Eaton, Miller, Lindeberg, & Jensen, 2002). Therefore, proper upright seated posture is crucial to minimize biomechanical stress on ocular structures and prevent further visual deterioration among adolescents.

Close reading distance is another critical factor influencing myopia development, with 51.2% of students engaging in near-work activities at less than 30 cm from their reading material. Excessive contraction of the ciliary muscles during prolonged near-focus tasks can increase scleral tension and promote axial elongation, thereby inducing myopia (Karim & Taufiq, 2017). Continuous accommodation without intermittent relaxation strains the lens and zonular fibers, altering the refractive focus of the eye (Grzybowski, Kanclerz, Tsubota, Lanca, & Saw, 2020). When the eyeball elongates, light from distant objects focuses anterior to the retina, producing blurred images and compromised visual clarity (Yasmin, 2019). Controlling reading distance and limiting the duration of near-work are therefore essential preventive measures to mitigate myopia onset in student populations.

Near-work activities, including reading, studying, and memorization, performed at close proximity for extended periods, further exacerbate visual strain and myopia risk. The cumulative accommodative effort increases ciliary muscle tonus, causing the lens to assume a more convex shape to maintain near focus, which can lead to progressive myopic refractive changes over time (Grzybowski et al., 2020). This physiological response highlights the

importance of moderating the intensity and duration of near-work tasks, particularly in adolescents undergoing rapid ocular growth. Moreover, prolonged near-work activities may reduce outdoor exposure, depriving the eyes of natural light, which has been associated with myopia inhibition (Rose et al., 2008). Consequently, balanced visual habits, including appropriate breaks and outdoor activity, are essential in preventing the progression of myopia among students.

Indoor lighting quality significantly affects visual performance, as inadequate illumination increases accommodative demand and exacerbates myopic progression, with 61% of students observed studying under poor lighting conditions (Ahmat, Nasution, Harahap, & Natasya, 2019). Dim environments reduce retinal image contrast, which compromises visual acuity and elevates ocular strain during reading tasks (Primadiani & Rahmi, 2017). Proper illumination enhances retinal image clarity, minimizes ciliary muscle overexertion, and supports sustained attention for extended study periods (Jokanan, Widodo, Kholis, Rakhmawati, & L., 2022). Studies suggest that room lighting constitutes a modifiable environmental factor that significantly influences myopia incidence (Ahmat et al., 2019). Therefore, ensuring optimal indoor illumination is an effective strategy for preventing vision deterioration among adolescent students engaged in near-work activities.

The interaction between reading posture, distance, and lighting suggests a synergistic effect on myopia development, wherein improper posture coupled with close reading distance and inadequate lighting multiplies visual stress. Physiologically, sustained near-work under poor lighting amplifies accommodative effort, increases ocular fatigue, and may accelerate axial elongation of the eyeball (Rose et al., 2008; Karim & Taufiq, 2017). The compounding effect of these risk factors demonstrates the necessity of a holistic approach to eye care, integrating behavioral, environmental, and ergonomic considerations. Interventions addressing multiple determinants, including posture correction, distance regulation, and lighting optimization, are likely to be more effective than single-factor strategies (Grzybowski et al., 2020). Hence, comprehensive preventive programs targeting these risk factors are crucial for maintaining visual health in Islamic boarding school students.

Empirical evidence suggests that ocular adaptation to prolonged near-work is mediated through changes in lens curvature and zonular fiber tension, with excessive strain predisposing the eye to permanent refractive alterations (Grzybowski et al., 2020). High ciliary muscle tonus resulting from continuous close-focus activities may lead to sustained lens convexity, producing blurred retinal images that contribute to myopia onset (Norton & Siegwart, 2013). This mechanism underscores the physiological rationale for recommending reading breaks, periodic focus on distant objects, and ergonomic postures. Furthermore, variations in font size, script type, and text contrast can influence visual workload, emphasizing the role of proper reading material design in myopia prevention (Yasmin, 2019). Collectively, these findings reinforce the need for structured guidance on reading practices among adolescent students.

The environmental influence of lighting extends beyond intensity to include spectral quality, which affects retinal signaling and refractive development. Inadequate exposure to ambient light may impair the release of dopamine within the retina, a neurotransmitter implicated in myopia inhibition, suggesting a neurochemical basis for light-mediated ocular protection (Ahmat et al., 2019; Norton & Siegwart, 2013). In this context, optimizing classroom and study room illumination is not merely a matter of comfort but a critical intervention to modulate refractive growth in adolescents. Incorporating daylight exposure and high-quality artificial lighting can thus mitigate the risk of progressive myopia in indoor learning environments (Jokanan et al., 2022). Consequently, lighting management should be integrated into school policies as a preventive ophthalmologic measure.

Behavioral habits, such as reading while lying down, maintaining insufficient reading distance, and studying in poorly illuminated rooms, collectively constitute modifiable risk factors for myopia among students. Targeted interventions focusing on habit modification, including posture correction, distance regulation, and environmental optimization, are likely to reduce the prevalence and progression of myopia (Rose et al., 2008; Yasmin, 2019). Awareness campaigns and educational programs can reinforce these practices by emphasizing the physiological consequences of prolonged visual strain. Moreover, integrating ergonomic and environmental guidelines into school regulations can create a structured framework for promoting eye health (Grzybowski et al., 2020). These measures collectively highlight the importance of combining behavioral and environmental strategies to prevent visual impairment in adolescent populations.

Finally, the findings of this study highlight the critical need for preventive and corrective strategies in managing myopia among Islamic boarding school students. By addressing reading posture, distance, and lighting simultaneously, educators and healthcare providers can significantly reduce the cumulative visual stress contributing to refractive errors (Karim & Taufiq, 2017; Ahmat et al., 2019). The implementation of structured eye-care protocols, including periodic vision screening, ergonomic education, and environmental optimization, represents an evidence-based approach to myopia prevention. Encouraging students to engage in outdoor activities, adopt proper reading habits, and monitor lighting conditions further enhances ocular resilience against myopia development (Rose et al., 2008; Grzybowski et al., 2020). Collectively, these findings provide a comprehensive framework for mitigating myopia risk in educational settings, ensuring sustainable visual health outcomes among adolescents.

5. Conclusion

The conclusions drawn are (1) There is a relationship between reading position and the incidence of myopia among students at the Al-Fakhry Hadiwijaya Kajen Islamic Boarding School with a p-value of 0.026; (2) There is a relationship between reading distance and the incidence of myopia among students at the Al-Fakhry Hadiwijaya Kajen Islamic Boarding School with a p-value of 0.017; (3) There is a relationship between indoor lighting and the incidence of myopia among students at the Al-Fakhry Hadiwijaya Kajen Islamic Boarding School with a p-value of 0.010.

Further research needs to be conducted on other populations that also have risk factors for myopia, such as reading for too long at very close range and lack of outdoor activities, to prevent the occurrence of myopia. This can be done with a more varied research design and variables to complement the shortcomings of previous studies. It is recommended that future researchers conduct studies using primary data as the main data in their research. They can increase the sample size from several previous years and compare the highest incidence of myopia based on the year. They can conduct the same study but cover a wider area. Respondents are advised to pay more attention to and improve their health, especially eye health, such as maintaining a good reading position, reading distance, and lighting, and to be more compliant during treatment. Furthermore, it is recommended that Islamic boarding schools provide education through other media such as posters or pamphlets and maintain boarding school management policies and collaborate with other primary health services to promote education to students about the importance of maintaining eye health and avoiding risk factors for myopia.

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