RESEARCH ARTICLE

A COMPARATIVE STUDY OF ACADEMIC PERFORMANCE IN MYOPIC STUDENTS WITH AND WITHOUT VISION CORRECTION

Erfira[1*], Dini Febriandriani[2], Nida Farida[1], Fitria Mahrunnisa[3], Nur Bebi Ulfah Irawati[4], Luluk Hermawati[5], Muhammad Usman[6]

[1] Department of Ophthalmology, Faculty of Medicine, UIN Syarif Hidayatullah, Jakarta, Indonesia.
[2] Bachelor Degree of Medicine, Faculty of Medicine, UIN Syarif Hidayatullah, Jakarta, Indonesia.
[3] Department of Pediatry, Faculty of Medicine, UIN Syarif Hidayatullah, Jakarta, Indonesia.
[4] Department of Parasitology, Faculty of Medicine and Health Science, Universitas Sultan Ageng Tirtayasa, Banten, Indonesia.
[5] Department of Medical Biology, Faculty of Medicine and Health Science, Universitas Sultan Ageng Tirtayasa, Banten, Indonesia.
[6] Department of Ophthalmology, Peshawar Medical College, Pakistan.

*Corresponding Author : erfira@unijkt.ac.id

ABSTRACT

Background: The World Health Organization (WHO) reports that 285 million people worldwide are visually impaired, with 42% of cases due to uncorrected refractive errors. School-age children are highly vulnerable to refractive errors, with myopia (nearsightedness) being the most common. This study aims to compare the academic performance of patients with corrected and uncorrected myopia.

Methods: A cross-sectional analytic study of 5th-grade elementary school students with myopia in Jakarta during 2023. Data collected included the students' average mid-semester exam scores and their myopia status, determined by visual acuity examinations.

Results: Out of 106 respondents, 34% (36 people) had corrected myopia and 66% (70 people) had uncorrected myopia with 35 (33%) respondents having academic performance results below the passing grade. Bivariate analysis of the data using the Chi-square test yielded a p-value of 0.010 (p < 0.05).

Conclusion: There is a significant relationship between academic performance results and the incidence of myopia.

Keywords: Refractive error, myopia, vision, academic performance, school children

INTRODUCTION

Refractive disorders are common ocular disorders and represent a significant global public health concern. The most frequently encountered types include myopia, hypermetropia, astigmatism, and presbyopia.[1] According to the World Health Organization (WHO), uncorrected refractive errors account for approximately 42% of the 285 million cases of visual impairment worldwide.[2] In Indonesia, 24.72% of blindness cases are attributed to uncorrected refractive errors.[3] Vision plays a crucial role in daily activities, particularly in the learning process among students. Visual disturbances such as myopia can hinder activities like reading the blackboard, potentially leading to decreased academic performance.[3]

Myopia is a type of refractive disorder with a high prevalence that continues to increase each year. The World Health Organization (WHO) estimated that in 2020, approximately 2.6 billion people worldwide were affected by myopia, 312 million of whom were children and adolescents.[4,5,6] Myopia is caused by both genetic and environmental factors, such as frequent near work, insufficient outdoor activities, and excessive use of digital devices.[4,7,8] Management of myopia includes the use of corrective eyeglasses, orthokeratology (OK) contact lenses, and increased outdoor activities[9], with corrective eyeglasses being the most commonly used method to support the learning process in children with myopia.[3]

Academic performance is influenced by various intrinsic and extrinsic factors[10], one of which is the health of the visual sensory system. Uncorrected myopia can lead to blurred vision, which may hinder the visual learning process. Several studies have reported a significant association between myopia correction and children's academic performance.[1,3,11] Based on this premise, the researchers aim to conduct a study to compare the academic performance of students with myopia who use corrective measures and those who do not at Madrasah Ibtidaiyah Pembangunan, UIN Jakarta. The findings of this study are expected to provide evidence supporting the importance of timely myopia correction with eyeglasses in preventing academic underachievement among elementary school students.

METHODS

This is analytical research aimed at determining the comparison of academic performance between myopic students with and without vision correction at Madrasah Ibtidaiyah Pembangunan, UIN Jakarta. The study was conducted from November to December 2023 and involved a total of 106 respondents. The subjects were selected using a quota sampling method, which involves selecting samples from a population with specific characteristics until the required number is reached. The sample was selected based on predefined inclusion and exclusion criteria.

This study utilized secondary data in the form of average mid-semester exam scores provided by the school for respondents who were diagnosed with myopia based on the visual acuity examination results conducted by medical students and ophthalmologist using the Snellen chart. This myopic group was then divided into two groups: the corrected myopia group, where the respondents' visual acuity reached 6/6 with the spectacles they were currently wearing, and the uncorrected myopia group, if the respondents did not achieve 6/6 visual acuity with the spectacles or were not wearing spectacles at all. Academic performance was categorized into two groups: above the Minimum Competency Standard (MCS ≥ 80) and below the Minimum Competency Standard (MCS < 80). The accessible population in this study comprised all fifth-grade students of Madrasah Ibtidaiyah Pembangunan, UIN Jakarta, who agreed to participate as respondents.

Inclusion criteria included students who were willing to participate with parental or school consent, had been diagnosed with myopia with visual acuity less than 6/6 that improved with negative spherical lenses, and already did the mid-semester exams. The exclusion criteria included students with ocular diseases that could affect visual acuity (e.g., infections), myopic students who had undergone ocular surgery, and students who met the inclusion criteria in only one eye.

A total of 102 respondents met the inclusion and exclusion criteria and were included in the final analysis. Statistical analysis was conducted using SPSS software version 25. The collected data was processed using SPSS version 25 for Windows. Bivariate analysis was used to examine the relationship between independent and dependent variables using the Chi-Square test.[12]

ETHICAL APPROVAL

The researchers provided an informed consent form as documentation of the respondents' willingness to participate in this study, with approval obtained from their parents or legal guardians. This study received ethical approval from the Ethics Committee of the Faculty of Medicine, Syarif Hidayatullah State Islamic University Jakarta, under approval number E-001-16-10-23.

RESULTS

1. Prevalence of Myopia

Table 1. Prevalence of Myopia

Myopia Status	Numbers (n)	Percentage (%)
Corrected Myopia	36	34
Uncorrected Myopia	70	66
Total	106	100

The frequency distribution of myopia among students at Madrasah Ibtidaiyah Pembangunan, UIN Jakarta is presented in Table 1. Based on the primary data shown in Table 1, a total of 206 students were examined, of which 106 respondents were found to have myopia. Among them, 70 students (66%) had uncorrected myopia. These findings indicate that the prevalence of myopia among fifth-grade students at Madrasah Ibtidaiyah Pembangunan, UIN Jakarta for the academic year 2023/2024 is relatively high, affecting more than 50% of the total population examined.

2. Distribution of Students' Academic Performance

Table 2. Academic Performance of Students.

Academic Performance	Numbers (n)	Precentage (%)
Above MCS (³80)	71	67
Under MCS (<80)	35	33
Total	106	100

The academic performance data in this study were secondary data obtained from MI Pembangunan UIN Jakarta, based on the average midterm scores across 11 subjects. As shown in Table 2, of the 106 respondents, there were 35 students (33%) achieved scores under the Minimum Competency Standard (MCS ≥ 80).

3. Academic Performance of Students with Corrected and Uncorrected Myopia

**Table 3. Comparison of Academic Performance Between Students
with Corrected and Uncorrected Myopia**

		Academic Performance						p-Value
		Above MCS		Under MCS		Total		
		N	%	N	%	N	%	
Myopic status	Corrected	30	83.3	6	16.7	36	100	0.010
	Uncorrected	41	58.6	29	41.4	70	100	
	Total	71	67	35	33	106	100	

*MCS: Minimum Competency Criteria (average score ≥ 80)

Academic performance based on the incidence of corrected and uncorrected myopia is presented in Table 3. Out of a total of 106 research respondents, it was found that 67% achieved scores above the Minimum Competency Criteria (≥ 80), both among those with corrected and uncorrected myopia. However, 41.4% of respondents with uncorrected myopia scored below the MCS, which is still a relatively high number. Uncorrected myopia might be one of the factors affecting academic performance.

Based on statistical analysis using the Chi-square test, the p-value was found to be 0.010 (p < 0.05). Statistically, this means that the null hypothesis (Ho) is rejected, indicating a significant relationship between corrected and uncorrected myopia with academic performance among students of MI Pembangunan UIN Jakarta for the 2023/2024 academic year.

DISCUSSION

Based on the incidence of myopia and academic performance among fifth-grade students at MI Pembangunan UIN Jakarta in the 2023/2024 academic year, a total of 106 respondents were identified as having either corrected or uncorrected myopia. However, it is noteworthy that among the students with uncorrected myopia, 58.6% achieved academic performance scores above the minimum competency standard (≥ 80). Nevertheless, 29 respondents (41.4%) from a total of 35 with uncorrected myopia still scored below the minimum standard (<80).

Uncorrected myopia in school-aged children can have several adverse effects, including decline in academic performance, reduced quality of life, and even psychological impacts such as stress and emotional disturbance.[13] A study conducted by Basri S et al. (2020) reported that among 197 students, 20.5% (41 students) were diagnosed with myopia, and none of them had received appropriate correction.[14] In addition, research by Aemsi Hayatillah (2011) among medical students at Syarif Hidayatullah State Islamic University, Jakarta, showed a relatively high prevalence of myopia, affecting 62.5% (60 individuals) of a total 96 respondents.[8]

A study conducted by Malda (2019) reported that 56.15% (146 students) with refractive disorders did not rank in the top 1–10 achievers, and 41.92% (109 students) of them did not receive academic performance recognition.[15] The difference in findings may be attributed to the different parameters used to assess academic performance. In Malda's study, academic performance was defined based on ranking, whereas the current study used a score-based threshold (MCS). Academic performance is influenced by both intrinsic and extrinsic factors,[16] including vision health. The next section presents a comparison of academic performance between students with corrected and uncorrected myopia

Based on the data from this study, academic performance showed a significant relationship with the incidence of corrected and uncorrected myopia, with a p-value of 0.010 (p < 0.05). This finding is consistent with previous studies conducted by Rumondor (2014), Kesowo (2017), and Malda M I (2019), which indicated a significant correlation between refractive errors and academic performance, with myopia being the most common refractive error.[1,15,17] Furthermore, a similar study by Pristiwatin D S (2013) in Surabaya also demonstrated a significant relationship between the use of corrective glasses in children with myopia and their academic performance.[3] The study indicated that school-aged children with myopia who consistently wore corrective glasses were more likely to achieve good quantitative academic performance.[3]

The use of corrective glasses with negative concave spherical lenses improves the visual focus in individuals with myopia by allowing images to fall precisely on the retina, thereby restoring normal vision.[3,8,18] A study conducted by Toledo et al. in Brazil (2010) stated that there is a relationship between visual acuity and academic performance.[19] The study found that visual impairments in early childhood can disrupt motor skills, cognitive development, and language abilities during the child's developmental stages.[19]

This study demonstrates a significant relationship between academic performance and both corrected and

uncorrected myopia. This finding is attributed to the critical role of the eyes as the primary sensory organ, which plays an essential part in growth, development, and the learning process most of which occurs through the visual system.[20] When a child's visual ability is suboptimal, they are more likely to experience demoralization, fatigue, and tend to avoid learning tasks that require good vision.[20] This aligns with the theory of connectionism developed by Thorndike, as cited in a book by Gintings (2010), which explains that there is a link between stimuli perceived by the senses and the resulting responses. These responses may yield positive or negative impacts on behavior and learning outcomes, which vary among students depending on other influencing factors, such as psychological, physiological, and environmental aspects.[15]

Poor vision may result from genetic factors as well as various environmental influences, such as near-work activities, the amount of time spent reading, writing, and completing school assignments.[21,22] Poor vision is essentially a sensory system disorder that can progress from mild impairment to one of the preventable causes of blindness in adults.[19] School-aged children are particularly vulnerable to refractive errors, with myopia being the most common.[21] Visual impairment among school children may occur due to prolonged exposure to academic tasks that require sustained visual input and long hours spent indoors.[21] Studies examining academic workload indicate that students spend nearly 70% of their daily school time engaged in academic activities that demand visual input.[21,23,24] The majority of vision problems are due to uncorrected refractive errors, particularly myopia, which can be effectively managed through appropriate use of corrective eyeglasses.[21] However, a lack of awareness among students and parents regarding eye health has led to many cases of uncorrected visual impairment in children. Several studies have reported that uncorrected refractive errors may lead to blurred vision, shadowing, headaches, and asthenopia, all of which can negatively impact children's visual performance during learning processes and academic-related activities.[21]

An effective learning process is enabled by clear vision, which allows students to read the whiteboard accurately and prevents misinterpretation of information. Achieving this visual clarity depends on an optimally functioning visual system, spanning from the cornea to the macula lutea.[3]

CONCLUSION

The study found a statistically significant relationship between myopia status (corrected vs. uncorrected) and academic performance among 5th-grade students in Jakarta, with a p-value of 0.010. Specifically, the findings suggest that uncorrected myopia is associated with a higher likelihood of achieving academic scores below the passing grade compared to corrected myopia. This relationship underscores the critical role of vision health as an intrinsic factor influencing a student's learning outcomes. The research emphasizes that, while performance is multifactorial, maintaining optimal visual acuity, often using corrective lenses, is essential for minimizing visual barriers that can impede a student's success in activities like reading the blackboard and completing academic tasks.

STRENGTHS AND LIMITATION

The primary strength of this research lies in its objective measurement of the key variable: myopia status. The study employed primary data collection through a direct visual acuity examination using the Snellen chart performed by the researchers, ensuring a reliable, clinically determined classification of students into corrected and uncorrected myopia groups. Furthermore, the study efficiently found a statistically significant association between myopia status and academic performance (p=0.010), establishing a strong link within this specific student population. The use of a cross-sectional design also made the study quick and resource-efficient to execute.

The study faces several limitations. The simultaneous data collection means it can only show an association, not causality. Additionally, its findings have limited generalizability because the sample was restricted to 5th-grade students at one Jakarta school. Other things are that the analysis did not account for major confounding variables (e.g., socioeconomic status, study habits), and the mid-semester exam scores used may not fully capture long-term learning ability.

CONFLICT OF INTEREST

There is no conflict of interest in this study.

DECLARATION OF USING AI

The authors affirm that artificial intelligence (AI) tools were used to assist in the writing process solely for language enhancement purposes, such as grammar checking, paraphrasing, and improving clarity. No AI tools were employed to generate original content, conduct data analysis, or interpret research findings. The authors take full responsibility for the content, interpretations, and conclusions presented in this manuscript.

REFERENCES

1.　Rumondor NE, Rares LM. Hubungan kelainan refraksi dengan prestasi belajar anak di SMP Kristen Eben Haezar 2 Manado. Manado; 2014. p.1-3.

2. Pramesti N. Pembaruan informasi terkini dan panduan tentang pengelolaan miopia. J Ilm Kesehatan Sandi Husada. 2022;11(1):242–6. doi:10.35816/jiskh. v11i1.744

3. Pristiwatin DS, Widyawati IY, Wahyuni ED, et al. Penggunaan kaca mata koreksi pada anak usia sekolah dengan miopia terhadap prestasi belajar di SDN Pacar Keling VI Surabaya. Surabaya; 2019.

4. Musiana, Nurhayati, Sunarsih. Faktor risiko yang berhubungan dengan kejadian miopia pada anak usia sekolah. Tanjungkarang; 2019.

5. Supit F. Miopia: epidemiologi dan faktor risiko. Cermin Dunia Kedokteran. 2021;9(2):e144–60. doi:10.1016/S2214109X(20)30489-7

6. Bourne RRA, Steinmetz JD, Saylan M, et al. Causes of blindness and vision impairment in 2020 and trends over 30 years, and prevalence of avoidable blindness in relation to VISION 2020: the Right to Sight: an analysis for the Global Burden of Disease Study. Lancet Glob Health. 2021;9(2):e144–60. doi:10.1016/S2214109X(20)30489-7

7. Primadiani IS, Rahmi FL, Ilmu SP, et al. Faktor-faktor yang mempengaruhi progresivitas miopia pada mahasiswa kedokteran. 2017;6(4):1505–17.

8. Hayatillah A. Prevalensi miopia dan faktor-faktor yang mempengaruhinya pada mahasiswa Program Studi Pendidikan Dokter UIN Syarif Hidayatullah Jakarta tahun 2011. Tangerang Selatan; 2011.

9. Dinari NA. Miopia: etiologi dan terapi. Cermin Dunia Kedokteran. 2022 Oct 3;49(10):556. doi:10.55175/ cdk.v49i10.2069

10. Subini N. Psikologi pembelajaran. Yogyakarta: Mentari Pustaka; 2012. ISBN: 9786028231695.

11. Prahantyo R. Hubungan miopia terhadap prestasi belajar pada anak usia sekolah dasar. Yogyakarta; 2017.

12. Dahlan S. Besar sampel dan cara pengambilan sampel dalam penelitian kedokteran dan kesehatan. Ed. 3.; 2009.

13. Tarigan JH, Syauqie M, Utama BI. Hubungan miopia dengan skor IQ (Intelligence Quotient) pada siswa SMP Negeri 1 Kota Padang. J Ilmu Kesehatan Indonesia. 2021;2(1):138–42. doi:10.25077/ jikesi.v2i1.289

14. Basri S, Pamungkas SR, Arifian F. Prevalensi kejadian miopia yang tidak dikoreksi pada siswa MTSS Ulumul Quran Banda Aceh. J Kedokteran Nanggroe Medika. 2020;3(4).

15. Malda MI. Hubungan antara kelainan refraksi dengan prestasi belajar siswa/i Sekolah Dasar Negeri di Kecamatan Serengan Kota Surakarta. Surakarta: Universitas Negeri Surakarta; 201916.

16. Ginting A. Esensi praktis: belajar praktis dan pembelajaran. Bandung: Humaniora; 2010.

17. Kesowo P. Hubungan miopia dengan prestasi belajar mahasiswa. Yogyakarta; 2017.

18. Riordan-Eva P, Whitcher J, Vaughan D, et al. Vaughan & Asbury's General Ophthalmology. New York: Lange Medical Books/McGraw-Hill Medical Pub. Division; 2008.

19. Mamoré R, Cumani Toledo C, Garcia Paiva P, et al. Early detection of visual impairment and its relation to academic performance. 2010.

20. Basch CE. Vision and the achievement gap among urban minority youth. J Sch Health. 2011; 81(10):599–605. doi:10.1111/j.1746-1561.2011. 00633.x

21. Wang S, Hao X, Ma X, et al. Associations between poor vision, vision-related behaviors and mathematics achievement in Chinese students from the CNAEQ-PEH 2015. Int J Environ Res Public Health. 2020;17(22):1–19. doi:10.3390/ijerph17228561

22. Farhana A. Gambaran angka kejadian miopia dalam keluarga penderita miopia dan non-miopia pada mahasiswa Fakultas Kedokteran UIN Syarif Hidayatullah Jakarta angkatan 2020 [Bachelor's thesis]. Jakarta: UIN Syarif Hidayatullah Jakarta; 2020.

23. Khairunnisa SAZ. Hubungan tingkat pengetahuan kesehatan mata terhadap perilaku penggunaan gawai pelajar SD MP UIN Syarif Hidayatullah Jakarta tahun 2023 [Bachelor's thesis]. Jakarta: UIN Syarif Hidayatullah; 2023.

24. Nuryasin MF. Prevalensi computer vision syndrome pada siswa SMA Islam Al-Azhar 3 Pusat Jakarta selama masa pandemi COVID-19 dan faktor-faktor penyebabnya [Bachelor's thesis]. Jakarta: Fakultas Kedokteran UIN Syarif Hidayatullah; 2022.