



## Assessing Visual Health Awareness: Knowledge, Attitude, and Behavior Towards Refractive Errors at SMP Harapan 2 Medan

Rafi Anggia Hogantara Tambunan<sup>1</sup> , Fauzan Azmi Hasti Habibi Samosir\*<sup>2</sup> ,  
Ramadhan Bestari<sup>1</sup>, Ichwan Alamsyah Lubis<sup>1</sup>, Dody Firmanda<sup>1</sup>, Ahmad Rauf Tondi  
Tambunan<sup>3</sup>

<sup>1</sup>Faculty of Medicine, Universitas Islam Sumatera Utara, Indonesia

<sup>2</sup>Wates Husada Hospital, Gresik, East Java, Indonesia

<sup>3</sup>Faculty of Medicine, Universitas Sumatera Utara, Indonesia

\*Corresponding Author: [fazfaz.win@gmail.com](mailto:fazfaz.win@gmail.com)

### ARTICLE INFO

#### Article history:

Received 3 June 2026

Revised 3 August 2026

Accepted 3 August 2026

Available online 28 August 2026

E-ISSN: 2686-0864

P-ISSN: 2088-8686

#### How to cite:

Tambunan RAH, Samosir FAHH, Bestari R, Lubis IA, Firmanda D, Tambunan ART. Assessing Visual Health Awareness- Knowledge, Attitude, and Behavior Towards Refractive Errors at SMP Harapan 2 Medan-R-1. SCRIPTA SCORE Sci Med J. 2026 Aug 28;8(1):001-008

### ABSTRACT

**Background:** Uncorrected refractive errors are a leading cause of visual impairment globally, significantly impacting students' learning capacity and academic performance. Junior high school students are particularly vulnerable to this condition due to increasing digital device usage and prolonged screen time.

**Objective:** This study aimed to investigate the relationship between the level of knowledge, attitudes, and behaviors regarding eye health and the prevalence of refractive errors among students at SMP Harapan 2 Medan. **Methods:** This analytical observational study utilized a cross-sectional design. A total sampling technique was employed, involving all students at SMP Harapan 2 Medan. Data were collected through validated questionnaires and visual acuity examinations. Statistical analysis was performed using Somers' D bivariate test to evaluate the correlations between variables. The study received institutional ethical approval. **Results:** Among the 50 respondents, the majority demonstrated good levels of knowledge (66.0%) and positive attitudes (70.0%) toward refractive errors. However, only 38.0% exhibited good health behaviors, while 54.0% displayed moderate behavioral patterns. Statistical analysis revealed significant associations between refractive errors and students' knowledge levels ( $p = 0.020$ ), attitudes ( $p = 0.032$ ), and behaviors ( $p = 0.001$ ). **Conclusion:** There are statistically significant associations between the levels of knowledge, attitudes, and behaviors and the prevalence of refractive errors among students at SMP Harapan 2 Medan. These findings underscore the importance of targeted educational interventions to improve health-seeking behaviors and mitigate the progression of refractive errors in adolescent populations.

**Keyword:** Attitude, behavior, knowledge, junior high school students, and Refractive error

### ABSTRAK

**Latar Belakang :** Kelainan refraksi yang tidak terkoreksi merupakan penyebab utama gangguan penglihatan di tingkat global dan dapat berdampak serius pada kemampuan belajar serta prestasi akademik siswa. Siswa Sekolah Menengah Pertama (SMP) sangat rentan terhadap kondisi ini akibat peningkatan penggunaan perangkat digital dan durasi waktu layar yang tinggi. **Tujuan:** Penelitian ini bertujuan untuk mengetahui hubungan antara tingkat pengetahuan, sikap, dan perilaku siswa di SMP Harapan 2 Medan. **Metode:** Penelitian ini menggunakan desain observasional analitik dengan pendekatan cross-sectional. Penelitian ini menggunakan teknik total sampling yang dilakukan pada siswa di SMP Harapan 2 Medan. Data dikumpulkan melalui kuesioner dan pemeriksaan tajam penglihatan (visus), kemudian dianalisis menggunakan uji statistik bivariat Somers' D untuk mengevaluasi hubungan antar variabel. Penelitian ini telah mendapatkan izin etik. **Hasil:** Dari total 50 responden, ditemukan bahwa



This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International

<https://doi.org/10.32734/scripta.v8i1.25833>

mayoritas siswa memiliki tingkat pengetahuan yang baik (66,0%) dan sikap yang baik (70,0%) terhadap kelainan refraksi. Namun, hanya 38,0% siswa yang menunjukkan perilaku yang baik, sementara 54,0% memiliki perilaku yang cukup. Hasil uji statistik menunjukkan adanya hubungan yang signifikan antara tingkat pengetahuan siswa dengan kelainan refraksi mata ( $p = 0,020$ ). Hubungan yang signifikan juga ditemukan antara tingkat sikap dengan kelainan refraksi mata ( $p = 0,032$ ). Selain itu, terdapat hubungan yang kuat antara tingkat perilaku siswa dengan kelainan refraksi mata ( $p = 0,001$ ). **Kesimpulan:** Terdapat hubungan yang signifikan secara statistik antara tingkat pengetahuan, sikap, dan perilaku siswa di SMP Harapan 2 Medan dengan prevalensi kelainan refraksi mata.

**Kata kunci:** Kelainan refraksi, pengetahuan, perilaku, sikap, dan siswa sekolah menengah pertama.

## 1. Introduction

Visual impairment constitutes a significant global health challenge, with uncorrected refractive errors, cataracts, and glaucoma serving as the primary etiologies.<sup>[1]</sup> Refractive errors occur when the eye is unable to focus light directly onto the retina. If left unaddressed, these conditions can lead to low vision or even permanent blindness. Data indicate that a specific percentage of these impairments have undetermined causes or may even originate in early childhood.<sup>[2]</sup> This issue is particularly crucial as it directly impacts children's learning capabilities and academic performance, given that the prevalence of ocular diseases tends to be higher among school-aged populations.

Statistically, the global burden of visual impairment is substantial, particularly in developing countries where nine out of ten affected individuals reside. The World Health Organization (WHO) has recorded millions of cases of blindness, despite the fact that approximately 80% of these instances with cataracts being the leading contributor are preventable or treatable.<sup>[3]</sup> Long-term projections present a concerning outlook, with the number of individuals suffering from bilateral vision loss expected to nearly triple by 2050 compared to 2015 data. This trend necessitates specialized attention toward managing visual function to preserve the quality of life for the global population.<sup>[4]</sup>

At the regional level, Southeast Asia faces a profound challenge, with a significant prevalence of myopia and hypermetropia among its inhabitants.<sup>[5]</sup> Indonesia currently holds the highest blindness rate among ASEAN member states. According to national data, the highest prevalence of blindness is distributed across regions such as Gorontalo, East Nusa Tenggara, and South Sulawesi. This condition affects populations aged six and older, indicating that eye health interventions must be strengthened uniformly across all provinces to reduce the incidence of visual impairment.<sup>[6]</sup>

Knowledge plays a vital role in shaping attitudes and preventive actions through the early detection of visual disorders; adequate understanding enables students to minimize complications arising from environmental factors, particularly amidst the high frequency of electronic device usage. Adolescents, specifically junior high school students, represent a highly vulnerable group due to prolonged screen time and lifestyle influences during puberty, which are heavily dependent on digital trends.<sup>[8]</sup> Despite this, a critical gap exists regarding the correlation between adolescent health literacy, encompassing knowledge, attitudes, and behaviors with the actual prevalence of refractive errors within the school environment. While existing literature often focuses on broad digital trends, this research provides a precise analysis to identify specific behavioral determinants. Consequently, this study aims to determine the relationship between the level of knowledge, attitude, and behavior of students and the incidence of ocular refractive errors, providing an evidence-based foundation for tailored, school-based eye health interventions.

## 2. Methods

This study employed an analytical observational design with a cross-sectional approach to investigate the correlation between risk factors and the prevalence of refractive errors among adolescent subjects without researcher intervention. The study was conducted over a three-month period from September to November 2025, centered at SMP Harapan 2 Medan, Indonesia. This location was selected because junior high school students represent an adolescent population characterized by high levels of digital device usage. The study population comprised all students enrolled in grades 7, 8, and 9. Because the cumulative population across these grades was fewer than 100 individuals, a total sampling technique was utilized. Ultimately, 50 respondents who were present at the time of the study were included as the final sample.

This study employed an analytical observational design with a cross-sectional approach to investigate the correlation between risk factors and the prevalence of refractive errors among adolescent subjects without researcher intervention. The study was conducted over a three-month period from September to November 2025, centered at SMP Harapan 2 Medan, Indonesia. This location was selected because junior high school students represent an adolescent population characterized by high levels of digital device usage. The study population comprised all students enrolled in grades 7, 8, and 9 at the school. Given that the total number of students across these three grades was exactly 50, a total sampling technique was utilized, ensuring that every member of the population was included in the study. Ultimately, all 50 students who were present at the time of the study served as the final sample.

The dependent variable in this study was the incidence of ocular refractive errors, defined as an optical imbalance preventing light from focusing correctly on the retina, resulting in blurred vision. The independent variables included the students' levels of knowledge, attitudes, and behaviors regarding eye health. Knowledge was operationally defined as the extent of understanding possessed by students regarding ocular refractive errors and their underlying mechanisms. Attitude represented the students' internal responses, beliefs, and convictions regarding eye health. Behavior encompassed the practical actions and habits performed to fulfill health needs, such as screen time habits and reading distance, which are influenced by knowledge and social norms.

Ocular refractive errors were assessed by a general practitioner through standardized visual acuity examinations using a Snellen chart. In cases where impaired vision was identified, a comprehensive manual refraction procedure was performed, commencing with a pinhole test and proceeding to objective lens assessment to determine the refractive status. Levels of knowledge, attitude, and behavior were evaluated using distinct questionnaires that were validated for both content and construct by the author (FAHHS). Reliability testing yielded Cronbach's alpha ( $\alpha$ ) coefficients of 0.634 for knowledge, 0.655 for attitude, and 0.728 for behavior. The scoring and categorization systems for the instruments were structured as follows:

- Knowledge: assessed via 8 items (score range: 0–16) and categorized as good (12–16), sufficient (8–11), or poor (0–7).
- Attitude: assessed via 7 items (score range: 0–14) and categorized as good (11–14), sufficient (7–10), or poor (0–6).
- Behavior: assessed via 9 items (score range: 0–9) and categorized as good (7–9), sufficient (4–6), or poor (0–3).

Bivariate analysis was performed using Spearman's rank correlation test to evaluate the relationship between the independent variables (knowledge, attitude, and behavior) and the dependent variable (refractive errors). This statistical test was selected because the data were not normally distributed, and the variables are measured on an ordinal scale. Given that the data violated the assumptions of parametric tests, Spearman's rank correlation provides a robust non-parametric alternative to assess the strength and direction of the association between these variables. Regarding ethical considerations, informed consent, respondent anonymity, and data confidentiality were strictly maintained throughout the research process. The study protocol received formal ethical approval from the Research Ethics Committee of Universitas Islam Sumatera Utara, Medan, Indonesia (No. 105/EC/KEPK.UISU/X/2025) on October 20, 2025.

### 3. Results and Discussion

The study included 50 students from SMP Harapan 2 Medan, with variables analyzed including gender, age, grade level, visual acuity, and levels of knowledge, attitude, and behavior regarding refractive errors. The majority of respondents were male, accounting for 28 individuals (56.0%). In terms of age distribution, students aged 13 and 14 years were equally represented, with 17 individuals each (34.0%). More than half of the participants were in the ninth grade (52.0%). Regarding visual health, the distribution of visual acuity was perfectly divided, with 25 students (50.0%) exhibiting normal vision and 25 students (50.0%) presenting with visual impairment (abnormal visual acuity). Furthermore, most respondents demonstrated a high level of awareness and positive outlook, 33 students (66.0%) possessed good knowledge, and 35 students (70.0%) showed a good attitude toward refractive errors. However, their practical application was less optimal, with the majority (54.0%) categorized as having only sufficient behavior.

**Table 1.** Sample characteristics

| Characteristics   | Category        | Frequency | Percentage |
|-------------------|-----------------|-----------|------------|
| Age               | 12 years old    | 13        | 26.0%      |
|                   | 13 years old    | 17        | 34.0%      |
|                   | 14 years old    | 17        | 34.0%      |
|                   | 15 years old    | 3         | 6.0%       |
|                   | Male            | 28        | 56.0%      |
| Gender            | Female          | 22        | 44.0%      |
|                   | 7 <sup>th</sup> | 12        | 24.0%      |
| Grade             | 8 <sup>th</sup> | 12        | 24.0%      |
|                   | 9 <sup>th</sup> | 26        | 52.0%      |
| Refractive errors | Yes             | 25        | 50.0%      |
|                   | No              | 25        | 50.0%      |
| Knowledge         | Good            | 33        | 66.0%      |
|                   | Sufficient      | 15        | 30.0%      |
|                   | Poor            | 2         | 4.0%       |
| Attitude          | Good            | 35        | 70.0%      |
|                   | Sufficient      | 13        | 26.0%      |
|                   | Poor            | 2         | 4.0%       |
| Behavior          | Good            | 19        | 38.0%      |
|                   | Sufficient      | 27        | 54.0%      |
|                   | Poor            | 4         | 8.0%       |

Based on the data in Table 2, the distribution of variables across 50 respondents highlights distinct patterns in visual acuity. Regarding knowledge levels, among students with normal vision, 13 (26.0%) demonstrated good knowledge, 10 (20.0%) were categorized as sufficient, and 2 (4.0%) were categorized as poor. In contrast, for those with impaired vision (abnormal visual acuity), 20 respondents (40.0%) possessed good knowledge, while 5 (10.0%) had sufficient knowledge. In the attitude variable, respondents with normal vision included 14 (28.0%) with a good attitude, 10 (20.0%) with a sufficient attitude, and 1 (2.0%) with a poor attitude. For those with impaired vision, the majority (21 respondents or 42.0%) showed a good attitude, while 3 (6.0%) and 1 (2.0%) were categorized as sufficient and poor, respectively. Similarly, for the behavior variable, respondents with normal vision comprised 21 (42.0%) with good behavior, 3 (6.0%) with sufficient behavior, and 1 (2.0%) with poor behavior. Meanwhile, among students with impaired vision, 16 (32.0%) exhibited good behavior and 9 (18.0%) showed sufficient behavior. Statistical analysis using the Somers' D test confirmed a significant relationship between knowledge, attitude, and behavior and the occurrence of refractive errors among students at SMP Harapan 2 Medan.

**Table 2.** Statistical Analysis of the Relationship between KAP Factors and Refractive Error Status (Somers'D test)

| (Somer's D test) |                  |      |    |      |       |
|------------------|------------------|------|----|------|-------|
| Variable         | Refractive Error |      |    |      | p     |
|                  | Yes              |      | No |      |       |
|                  | N                | %    | N  | %    |       |
| Knowledge        |                  |      |    |      |       |
| Good             | 13               | 26.0 | 20 | 40.0 | 0.020 |
| Sufficient       | 10               | 20.0 | 5  | 10.0 |       |
| Poor             | 2                | 4.0  | 0  | 0.0  |       |
| Attitude         |                  |      |    |      |       |
| Good             | 14               | 28.0 | 21 | 42.0 | 0.032 |
| Sufficient       | 10               | 20.0 | 3  | 6.0  |       |
| Poor             | 1                | 2.0  | 1  | 2.0  |       |
| Behavior         |                  |      |    |      |       |
| Good             | 3                | 6.0  | 16 | 32.0 | 0.001 |
| Sufficient       | 18               | 36.0 | 9  | 18.0 |       |
| Poor             | 4                | 8.0  | 0  | 0.0  |       |

#### 4. Discussion

The correlation analysis reveals a statistically significant relationship between the level of knowledge regarding refractive errors and their occurrence among students at SMP Harapan 2 Medan. Interestingly, respondents with refractive errors tended to possess better knowledge concerning prevention, complications, and management. This finding suggests that post-diagnostic education and clinical management play a vital role in increasing awareness. This is consistent with Wang et al. (2023), who stated that students with high eye health literacy have a significantly lower risk of myopia progression compared to those with lower literacy levels.<sup>[9]</sup> Similarly, Johnson and Davies (2021) highlighted that students with high knowledge, supported by parental awareness of the necessity of outdoor activities, show a significant increase in outdoor behaviors, which directly correlates with refractive stabilization.<sup>[10]</sup> Furthermore, Lee et al. (2024) argued that adequate knowledge can prevent the onset, progression, and complications of refractive disorders.<sup>[11]</sup>

These findings strongly support the theory that knowledge acts as a protective factor in disease prevention. High levels of knowledge enable students to understand the importance of visual hygiene, such as maintaining an ideal reading distance, limiting screen time, particularly following the COVID-19 pandemic and increasing time spent on outdoor activities, which has been proven to mitigate myopia risks.<sup>[12-14]</sup>

This relationship aligns with health promotion concepts, which assert that enhancing eye health literacy is a crucial first step toward healthy behavioral changes and reducing vulnerability to pathological conditions like refractive errors.<sup>[15]</sup> Nevertheless, it is important to acknowledge that the findings at SMP Harapan 2 Medan may be influenced by unmeasured confounding variables, such as socioeconomic status, which affects access to eye examinations and corrective lenses or genetic factors, which are significant determinants in refractive development. Nonetheless, this study demonstrates that school-based eye health education initiatives have a tangible impact on fostering awareness and indirectly influencing living practices that affect visual health status (Puspitasari et al., 2021; Anggraini and Indrawati, 2024).<sup>[16,17]</sup> These results validate the urgent need for sustainable, education-based prevention programs.

The analysis of student attitudes toward the prevention and management of refractive errors at SMP Harapan 2 Medan reveals a significant correlation. Notably, respondents with impaired visual acuity exhibited more positive attitudes, likely as a result of post-diagnostic education and clinical management. This suggests that students with diagnosed conditions are more receptive to health interventions. Our findings align with Smith and Jones (2023), who argued that positive attitudes, such as the belief in the importance of ocular health, willingness to undergo routine screenings, and acceptance of corrective lenses are associated with a lower risk of severe refractive impairment.<sup>[18]</sup> Similarly, Zhang et al. (2024) demonstrated that students with favorable attitudes toward eye rest and outdoor time showed higher compliance with preventive behaviors ( $p=0.002$ ).<sup>[4]</sup>

These findings are consistent with established psychological frameworks, specifically the Theory of Planned Behavior (TPB) and the Health Belief Model (HBM). In these models, a positive attitude serves as a potent predictor of behavioral intention, influencing actions such as limiting screen time, maintaining proper reading distances, and increasing outdoor activity.<sup>[19]</sup> Modern ophthalmological literature recognizes these behaviors as critical in mitigating refractive error progression in school-aged populations.<sup>[12]</sup> Furthermore, a positive attitude helps overcome behavioral barriers, such as the social stigma associated with wearing spectacles among adolescents.<sup>[15]</sup>

Regarding behavioral patterns, the study found a significant relationship between health-related habits and refractive error incidence. Respondents with impaired vision demonstrated better preventive behaviors, likely reinforced by clinical guidance. He et al. (2023) corroborated this, finding that myopia incidence was significantly lower in groups with high behavioral compliance ( $p < 0.001$ ).<sup>[20]</sup> Our results indicate that protective habits, including maintaining a reading distance of at least 30 cm, limiting continuous near work to under two hours, and prioritizing outdoor time, correlate with lower refractive severity. This is consistent with global literature highlighting environmental behavior as a primary protective factor against myopia, the most prevalent refractive condition in Asia.<sup>[14]</sup>

Consistent with previous research, a meta-analysis by Xiong et al. (2020) identified outdoor time as the single most effective predictor in myopia prevention. Exposure to natural light and long-distance viewing stimulates retinal dopamine release, which inhibits axial elongation of the globe.<sup>[13]</sup> Thus, the negative correlation found at SMP Harapan 2 Medan validates that behavior, based interventions, such as reducing screen time and encouraging outdoor play, are effective in altering student habits and reducing refractive risks.<sup>[16]</sup>

Finally, age appropriate guidelines are crucial. The American Academy of Pediatrics (2016) recommends that for adolescents, recreational screen time should ideally be limited to two hours per day and should not displace sleep (8–12 hours) or physical activity (at least 1 hour).<sup>[21]</sup> To preserve circadian rhythms, device use should cease at least one hour before sleep to avoid blue light interference. While this study focuses on behavioral factors, it is essential to acknowledge the role of genetics. Recent Genome, Wide Association Studies (GWAS) have identified 336 genetic loci associated with myopia.<sup>[22]</sup> These genetic factors interact with environmental stressors to determine an individual's susceptibility to refractive errors.<sup>[23]</sup>

Aligning with earlier findings, An interesting finding in this study is that students with refractive errors demonstrated significantly higher levels of knowledge compared to those with normal vision. This discrepancy can be attributed to the clinical experience gained by students with refractive errors during their eye examinations and the subsequent process of being prescribed corrective lenses. These clinical encounters often involve direct counseling from eye care professionals regarding the nature of their visual impairment, the importance of lens wear, and preventive measures. Consequently, these students receive more targeted education, which likely accounts for their superior understanding of refractive errors compared to their peers who have never undergone such diagnostic processes.

It is essential to acknowledge the limitations of this study. First, while we identified significant associations, our cross-sectional design limits the ability to infer causality. Furthermore, although this study focuses on behavioral patterns, we recognize that individual health outcomes are complexly modulated by unmeasured confounding variables, particularly genetic predisposition and socioeconomic status. While these factors were not the primary focus of this analysis, their influence on the development of refractive errors and access to corrective care cannot be discounted. Future longitudinal research should employ multivariate modeling to control for these variables, thereby isolating the true impact of lifestyle habits from the underlying biological and structural determinants of visual health.

## 5. Conclusion

There is a significant relationship between the level of knowledge, attitude, and behavior and refractive errors among students at Harapan 2 Junior High School Medan. The findings of this study imply that refractive error among junior high school students is not merely a biological or genetic issue but is deeply influenced by modifiable behavioral factors. The significant correlation between students' knowledge and their refractive status suggests that educational interventions can serve as a primary preventive mechanism. Furthermore, the strong link between behavior and refractive status highlights that fostering healthy visual habits is essential for reducing the prevalence and severity of refractive errors in the school environment.

## References

- [1] Defriva YA, Ibrahim, Rosita Y. Karakteristik Penderita Kelainan Refraksi pada Anak Sekolah Menengah Pertama Muhammadiyah 6 Palembang. *MESINA*. 2020;1(1):15-22. doi:10.32502/msj.v1i1.2616.
- [2] Honan BM, McDonald SA, Travers CP, Shukla VV, Ambalavanan N, Cotten CM, et al. Cerebral injury and retinopathy as risk factors for blindness in extremely preterm infants. *Archives of Disease in Childhood - Fetal and Neonatal Edition*. 2025;110(3):253-260. doi:10.1136/archdischild-2024-327707.
- [3] Mokoginta S, Marsiati H, Indriawati A, Panjiasih S. Prevalensi Kelainan Refraksi pada Siswa SD Negeri 09 Pagi Tanah Tinggi Jakarta Pusat. *Majalah Sainstekes*. 2017;4(1):30–35. doi:10.33476/ms.v4i1.900.
- [4] Zhang S, Ren J, Chai R, et al. Global burden of low vision and blindness due to age-related macular degeneration from 1990 to 2021 and projections for 2050. *BMC Public Health*. 2024;24(1):3510-19. doi:10.1186/s12889-024-21047-x.
- [5] Xu S, Chen J, Wang X, Zhuo X, Wang Y, Xu J, et al. Trends and projections of the burden of visual impairment in Asia: Findings from the Global Burden of Disease Study 2021. *Asia-Pacific J Ophthalmol*. 2025;14(3):100196. doi:10.1016/j.apjo.2025.100196.
- [6] Kemenkes RI. Infodatin Situasi Gangguan Penglihatan. Kementrian Kesehatan RI Pusat Data Dan Informasi. 2018;11. <https://pusdatin.kemkes.go.id/download.php?file=download/pusdatin/infodatin/infodatin-Gangguan-penglihatan-2018>.
- [7] Wang Y, Li X, Zhang Y, et al. Application of the precision eye health education model in myopia prevention and control in adolescents. *Frontiers in Pediatrics*. 2025;13(1):1-10. doi:10.3389/fped.2025.1554822.
- [8] Ding K, Li H. Digital Addiction Intervention for Children and Adolescents: A Scoping Review. *Int J Environ Res Public Health*. 2023;20(6):1-22. doi:10.3390/ijerph20064777.
- [9] Gao H, Ma J, Liu Z, Wang J, Wang W, Ye L. Prevalence of myopia in Chinese children and adolescents: a systematic review and meta-analysis. *J Glob Health*. 2026;16(1):1-10. doi: 10.7189/jogh.16.04056.
- [10] Dhakal R, Shah R, Huntjens B, Verkicharla PK, Lawrenson JG. Time spent outdoors as an intervention for myopia prevention and control in children: an overview of systematic reviews. *Ophthalmic Physiol Opt*. 2022;42(3):545-558. doi: 10.1111/opo.12945.
- [11] Park IT. Eye health behaviors and parental influencing factors among preschool children in Korea: a cross-sectional study. *Child Health Nurs Res*. 2025;31(3):144-154. doi: 10.4094/chnr.2025.011.
- [12] Bullimore MA, Richdale K. Myopia Control 2020: Where are we and where are we heading? *Ophthalmic Physiol Opt*. 2020;40(3):254-270. doi: 10.1111/opo.12686. PMID: 32338775.
- [13] Xiong S, Sankaridurg P, Naduvilath T. Time spent in outdoor activity in relation to myopia prevention and control: A meta-analysis and systematic review. *Ophthalmology*. 2017;95(6):551-566. doi:10.1111/aos.13403.
- [14] Zhai Y, Liu C, Wang Y. The impact of near work intensity and duration on myopia progression in children and adolescents. *BMC Ophthalmology*. 2021;21(1):189. doi:10.1371/journal.pone.0140419.
- [15] Dutheil F, Oueslati T, Delamarre L, Castanon J, Maurin C, Chiambaretta F, Baker JS, Ugbole UC, Zak M, Lakbar I, Pereira B, Navel V. Myopia and Near Work: A Systematic Review and Meta-Analysis. *Int J Environ Res Public Health*. 2023;20(1):875. doi: 10.3390/ijerph20010875.
- [16] Zainal MA, Basri S, Sofia S. Hubungan Pengetahuan dan Sikap Terhadap Perilaku Berisiko Miopia pada Siswa SMAN 10 Fajar Harapan Banda Aceh. *Cerdika Jurnal Ilmiah Indonesia*. 2022;12(3):201-209. doi.org/10.59141/cerdika.v2i5.349.
- [17] Tian Y, Yu Y. Knowledge, attitude and practice towards myopia among parents of primary school students: a cross-sectional study. *BMJ Open*. 2025;15(3):65-76. doi: 10.1136/bmjopen-2024-093565.
- [18] Li R, Zhang K, Li S, Zhang Y, Tian J, Lu Z, et al. Implementing a digital comprehensive myopia prevention and control strategy for children and adolescents in China: a cost-effectiveness analysis. *The Lancet*. 2023;38(11):1-10. Doi: 10.1016/j.lanwpc.2023.100837.
- [19] Estebansari F, Latifi M, Ghorbanzadeh S, Kandi ZRK. Health Belief Model in Predicting Screening Behavior among Population at Risk of Colorectal Cancer: A Systematic Review. *Iran J Public Health*. 2025 Jul;54(7):1411-1423. doi: 10.18502/ijph.
- [20] He X, Sankaridurg P, Wang J, Chen J, Naduvilath T, He M, et al. Time Outdoors in Reducing Myopia: A School-Based Cluster Randomized Trial with Objective Monitoring of Outdoor Time and Light Intensity. *Ophthalmology*. 2022;129(11):1245-1254. doi: 10.1016/j.ophtha.2022.06.024.
- [21] American Academy of Pediatrics. Policy Statement: Media and Young Minds. *Pediatrics*. 2016;138(5):1-6. doi:10.1542/peds.2016-2591.

- [22] Hysi PG, Choquet H, Khawaja AP, Wojciechowski R, Tedja MS, Yin J, et al. Meta-analysis of 542,934 subjects of European ancestry identifies new genes and mechanisms predisposing to refractive error and myopia. *Nat Genet.* 2020;52(4):401-407. doi:10.1038/s41588-020-0599-0.
- [23] Tedja MS, et al. Genome-wide association meta-analysis highlights light-induced signaling as a driver for refractive error. *Nature Genetics.* 2018;50(6):834–848.