SHORT RESEARCH ARTICLE

Key Dimensions of Refractive Errors Screening at School in Indonesia: A Primary Educator's Perspective

Ray Wagiu Basrowi[1*], Kianti Raisa Darusman[2], Yitro Wilar[3], Tri Rahayu[4], Yeni Dwi Lestari[5], Nila Djuwita Moeloek[6]

[1,3,4]Universitas Indonesia, Indonesia
[2,6]Indonesian Ophthalmologist Association (PERDAMI), Indonesia
[5]Indonesian Occupational Medicine Association (IOMA), Indonesia

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ABSTRACT

Introduction: The school-based refractive error screening program is important in preventing visual impairment caused by uncorrected refractive errors and enhancing students' academic performance. This study aimed to identify key dimensions for establishing an effective school-based refractive error screening program from the perspective of elementary teachers.

Methodology: The focus group discussion (FGD) using the qualitative-exploratory method among ten elementary teachers from one public school in Jakarta. The voice records of participants were transcribed verbatim, coded, and qualitatively analyzed to generate relevant dimensions. Several dimensions in the conceptual framework were concluded within the twelve categories.

Results: Four key dimensions to establish an effective school-based refractive error screening program were identified ranging from resources, screening procedure, education and awareness, and spectacles. These dimensions emphasized the significance of having trained teachers as screeners, understanding the comprehensive screening and referral process, offering incentives and user-friendly tools, and ensuring accessible and affordable spectacles to enhance students' compliance.

Conclusion: This study identified four dimensions for effective school-based refractive error screening programs, which are resources, screening procedures, education and awareness, and spectacles.

Keywords: Refractive error screening program, Primary school, Compliance, Primary school teacher

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***Correspondence:** Ray Wagiu Basrowi (Email: ray.basrowi@gmail.com)

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INTRODUCTION

About 2.2 billion people globally have a visual impairment, primarily attributed to refractive errors.[1–3] Approximately 12.8 million children aged 5 to 15 experience visual impairment due to uncorrected refractive errors.[4,5] According to Global Data LESH, Indonesia ranks fourth in the prevalence of individuals with blindness and moderate to severe visual impairments.[1]

In Indonesia, the most prevalent eye health concern among children is refractive error.[6] Refractive errors, encompassing myopia, hyperopia, and astigmatism, manifest commonly in children, with myopia being the predominant refractive error.[6,7] This phenomenon is closely tied to prolonged gadget usage, reaching up to 8 hours per day, associated with an elevated occurrence of refractive errors.[8,9] Continuous engagement with electronic screens contributes to eyestrain and eye irritation in children.[10] Unfortunately, school-age children with vision impairment encounter challenges, such as reduced school participation and lower educational achievement.[2,11,12]

Myopia often emerges in children aged 6 to 11 years old.[13] Correcting this condition with spectacles is a solution for children within this age group.[3,7] Using spectacles to address refractive errors is notably cost-effective among all healthcare interventions. Yet, globally only 36% of people who experience distance vision impairment due to refractive error have acquired suitable spectacles.[2] Moreover, routine screening for refractive errors is infrequently practiced in Indonesia.[8]

Refractive error screening in children is a process of detecting refractive error, aiming to enhance outcomes and prevent visual impairments.[13] Yet, many low- and middle-income countries (LMICs), especially in remote rural areas, face ophthalmologist shortages, leading to challenges in implementing vision screening in schools.[7] For instance, Indonesia grapples with a scarcity of ophthalmologists, with a ratio of 1 ophthalmologist for every 90,743 people.[14] Considering that constraint, teachers should be trained to screen refractive error at school.[7] Thus, it becomes imperative for each school-based refractive error screening program to ensure a consistent testing method and the competence of teachers as screeners for accurate screening tests.[5,7] The combination of school-based refractive error screening programs and spectacle provision may present a cost-effective approach to reducing uncorrected refractive error cases among school-aged children.[15] This approach provides a short-term benefit, improved academic performance, and prevents more severe vision problems, such as strabismus and blindness.[15,16]

Nevertheless, there are various concerns regarding school-based refractive error screening programs, including the effectiveness of the screenings, the availability of affordable eyeglasses, and ensuring students compliance with wearing spectacles. Therefore, this study aims to identify key dimensions for establishing an effective school-based refractive error screening program.

METHODOLOGY

The focus group discussion (FGD) was conducted as part of a qualitative-exploratory method. FGD was conducted in a local language, Bahasa Indonesia. The FGD was organized as a single session involving 10 elementary teachers (ETs) affiliated with a public school in Jakarta. This extensive FGD spanned a duration of 90 minutes, allowing for in-depth exploration and exchange of insights among the participants. As for the descriptives, the mean age of ETs was expressed as a mean ± standard deviation of 40.9 ± 8.5 years with a ratio of male and female at 1:9. All ETs held Bachelor's degrees and had an average work experience of 16.3 ± 7.3 years.

All ETs were invited for discussion to understand the perspective of ETs in identifying several dimensions of establishing an effective school-based refractive error screening program. The rationale behind selecting all ETs was rooted in their involvement in the program and gathering their input based on their experience within a school setting. All ETs agreed to participate in FGD and provided consent for audio recording by signing the informed consent form before being involved in the discussion. FGD was continued until the information became redundant.

A framework analytical approach for data analysis was audio conversion to text (transcribed verbatim), data categorization with NVIVO, and theme interpretation with a constraint-solution approach focusing on discussing several dimensions to establish an effective school-based refractive error screening program. During data analysis, we coded the transcripts and listed all the constraint categories that emerged following the coding of transcripts. Then, we reviewed these categories to identify key dimensions of this study.

This study was a part of quantitative research conducted by Wilar et al. (2023), focusing on examining the correlation between nutritional status, refractive function, and hemoglobin levels toward cognitive function and academic performance of elementary students. This study had prior approval from the Ethics Committee of The Medical and Health Research Ethics Committee (Non-Medical) Muhammadiyah University of Prof. Dr. Hamka (KEPKK-UHAMKA 03/23.05/02515, 16 May 2023) or (POB-KE.B/008/01.0, FL/B.06-008/01.0, 04 June 2021).

RESULTS

The FGD explored various dimensions of establishing

an effective school-based refractive error screening program from the perspective of ETs. The FGD established a conceptual framework encompassing four key dimensions, which emerged within twelve constraint categories. These dimensions include resources, screening procedure, education and awareness, and spectacle, as illustrated in Figure 1.

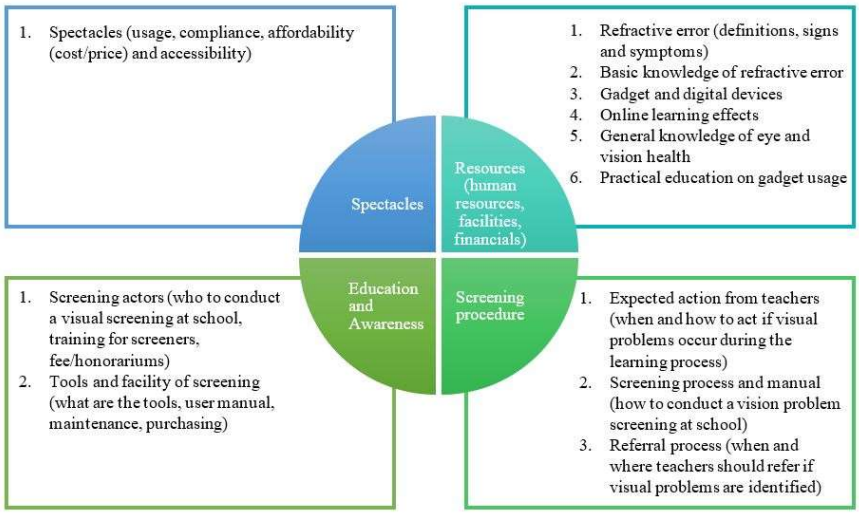

Figure 1: Major dimensions of refractive error screening at school in Indonesia

Resources

The ETs participating in this study shared insights into students experiencing vision problems at school. They highlighted the significance of being attentive to their students' refractive errors or vision problems. They emphasized that students with refractive errors have specific signs, such as straining to see the whiteboard, blinking frequently, and holding reading material close to their eyes. Thus, the ETs asserted that teachers should know about eye health and refractive errors.

The ETs also highlighted the detrimental impact of extended screen time and gadget use on students' refractive errors. They noted that students' familiarity with gadgets intensified during the COVID-19 pandemic when online learning became essential. This trend persists even after the pandemic, with students continuing to adapt to gadget use. In this context, the ETs emphasized teachers' need to incorporate practical education on gadget use into the learning curriculum.

Screening Procedure

The ETs observed that students frequently exhibit signs of refractive error while doing indoor and outdoor activities. For instance, they noticed students squinting their eyes in class, struggling to focus, or experiencing difficulties during exercises and outdoor games. The ETs suggested that teachers should offer guidance upon recognizing these situations. This guidance might include seating students closer to the whiteboard or ensuring their participation in exercise classes with added protective measures.

Furthermore, ETs emphasized the significance of implementing a school-based refractive error screening program. They believed such a program could swiftly identify refractive errors in students, especially upon noticing certain signs. The ETs said teachers should guide students with refractive errors to seek examinations and prescriptions from ophthalmologists or service providers. Moreover, they suggested that teachers reach out to parents to garner support for students requiring further treatment, such as spectacle. Additionally, the ETs expressed that sponsorship for the school-based refractive error screening program could be advantageous, alleviating the financial burden on parents while facilitating the provision of spectacles.

Education and Awareness

The ETs unanimously endorsed the refractive error screening program as a pivotal solution to address refractive error at schools. In outlining the implementation of this program, the ETs proposed the establishment of a dedicated team comprising capable teachers to conduct the screenings. The ETs underlined the importance of team members' commitment to learning and practice for being competent screeners. They recommended that training sessions be facilitated by experts such as service providers or ophthalmologists to ensure adequate knowledge dissemination.

Regarding the training of screeners, the ETs highlighted the necessity for the teachers in the team to gain a thorough understanding of the utilized tools. They underscored the merits of adopting a standardized screening test with accessible guidelines, particularly beneficial for non-health professionals like teachers. This standardized approach, they believed, would simplify the learning process. The ETs also encouraged applying conventional methods, citing that the tools needed

for this method are user-friendly. Thus, those tools would be easy to maintain and store at schools. The ETs re-emphasized that to ensure the program's successful continuation, there should be any sponsorship covering both necessary tools and training.

Spectacles

The ETs said that students with refractive errors are commonly corrected by spectacle. Consequently, they highlighted the significance of ensuring convenient access to spectacles for parents. Moreover, ETs added that sponsorship might be needed to ensure the spectacle's price is affordable. Apart from its price, the ETs further emphasized the need for adjusting the spectacle frames to enhance students' comfort.

DISCUSSION

Refractive errors in students are often untreated for various reasons, including a lack of awareness about vision problems, students not realizing they have vision problems and limited access to affordable refractive services and spectacles.[16] Therefore, implementing school-based refractive error screening programs is beneficial in addressing these issues, with teachers playing a supportive role in helping students with refractive errors. Elementary students encountering vision problems tend to exhibit signs of refractive error while engaged in the learning process at school. According to the School Vision Screening Guidelines, there are several signs of refractive errors, including holding the body tensely while reading or viewing distant objects, frowning while reading, attempting to clear blurriness, frequent eye rubbing, frequently blinking while reading, covering one eye, squinting, tilting the head, and appearing to use peripheral vision for viewing materials.[17]

In the digitalization era, elementary students have widespread access to digital devices or gadgets, serving various purposes from entertainment to education. Prolonged gadget usage led to eye irritation and eye strain, causing difficulty maintaining focus among students.[10] A study by Neena et al. (2023) advised that students aged 5 to 10 should limit their gadget usage to no more than 2 hours per day to prevent vision problems.[18] Surprisingly, some students admitted using gadgets for over 2 hours, even after class ended.[18] Amidst the COVID-19 pandemic, the Indonesian government implemented the Large-Scale Social Restrictions (PSBB) in April 2020.[19] This policy transformed traditional in-person classroom learning into distance or online learning, affecting all educational levels, including elementary schools.[19] The emergence of online learning due to the COVID-19 pandemic has introduced a novel routine, such as using gadgets. While the benefits of using gadgets for students during the pandemic outweigh the drawbacks, Irawati et al. (2022) indicated that prolonged screen time during online learning increases the risk of refractive errors.[8] This trend persisted beyond the pandemic, with students integrating gadgets into their daily routines.

School-based refractive error screening program offers a valuable lesson for promoting the prevention, early identification, and treatment of common refractive errors. Teachers equipped with a foundational understanding of eye health and visual problems play a pivotal role in guiding students with refractive errors to ensure their active participation in all learning activities at school. Furthermore, the foremost requirement is enhancing teachers' competencies as screeners. This approach aligns with Yashadhana et al. (2021), who found that the acceptability of such a program is heightened when trained teachers are responsible for conducting screening tests.[20] Ophthalmologists should train teachers to provide accurate tests.[20] Given the shortage of ophthalmologists in Indonesia, trained teachers are vital in implementing the school-based refractive error screening program for students. As supported by Kaur et al. (2016), involving teachers in vision screening optimizes efficiency and resource allocation and extends eye care services to a broader population.[21]

Several studies demonstrated the effectiveness of trained teachers in executing refractive error screening programs, evident in their adeptness at accurately identifying students with refractive error.[22,23] Teachers needed comprehensive training that covered various aspects, including refractive error in students, the significance of early detection of refractive error in students, teachers' roles in early detection of refractive error, and the methodology for conducting school-based refractive error programs.[12,21] A standardized teacher training program for vision screening, encompassing both theory and practical sessions, is essential to reduce the occurrence of false positives and false negatives during the screening test.[16] A study by Tobi et al. (2021) explained that the training could be conducted over one day.[7] It covered the screening and referral process, with half a day designed to practically demonstrate the visual assessment and instructions on using referral tools, such as registers, summaries, and referral forms.[7] Additionally, a study by Omar et al. (2018) found that teachers can accurately screen for refractive errors in students when they receive proper training, indicating a high level of specificity.[24] The success of the screening program also hinges on teachers' motivation to carry out the refractive error screening test, which is driven by the desire to assist students.[16]

According to the School Vision Screening Guidelines, school-based refractive error programs should encompass distance and near visual acuity tests and color perception tests.[17] This approach is designed to be easily managed by non-health professionals

within a school setting. To execute a refractive error screening test, several affordable and accessible tools are required, including an eye chart positioned 10-20 feet away, an occluder to cover one eye, a pointer to indicate letters or symbols on the chart, and a pseudo isochromatic plate for checking color vision.[17,25] Interestingly, several studies and guidelines have recommended the use of eye charts for conducting refractive error screening tests in elementary school.[7,17,26,21,25] Above all, the government should support the refractive error screening program to ensure program continuity. Carlton et al. (2022) highlighted that funding for such programs could differ across countries and regions, ranging from national to local government sources.[27]

Besides the importance of screening tests, teachers need training on appropriately referring students with refractive errors to ophthalmologists for further assessment and prescription. A prior study by Saxena et al. (2015) indicated that when teachers act as screeners and refer them to ophthalmologists, it motivates students and their parents to agree to visit ophthalmologists for further eye examinations upon teachers' referrals.[28] Additionally, the students were more likely to comply with wearing spectacles regularly when encouraged by their teachers.[28] A previous study by Sathyan et al. (2017) indicated that teachers should refer all students who do not pass the screening test to ophthalmologists for a more thorough eye examination.[16] This approach was similar to the study of Kaur et al. (2016), which stated that students should be referred to ophthalmologists and obtain a prescription.[21] Another study by Murthy (2000) underscored that students are more inclined to wear spectacles when prescribed.[13]

Beyond referring to ophthalmologists, teachers can play a role in informing parents about screening outcomes to encourage parents' active involvement. This approach is aligned with the Guidelines for School-based Eye Health Programs, which recommends providing an information sheet to parents of referred students.[26] Additionally, teachers can educate parents about the advantages of spectacles, why and how their children should wear them, and how to maintain them.[16] Narayanan et al. (2018) highlighted that some students hesitated to wear spectacles because they feared their parents' reaction if they lost or misplaced them.[29] Furthermore, parents who felt guilty or upset about their children needing spectacles could make the children embarrassed and reluctant to wear them, causing them to pretend they had no vision issues.[29]

Apart from teachers'competencies in conducting screening tests, creating a supportive school environment can enhance the students' compliance with wearing spectacles. Besides, a study by Murthy et al. (2000) underlined the necessity of offering services to all students requiring spectacles.[13] Additionally, making good-quality, affordable spectacles available for parents to purchase is crucial.[13] It was because financial constraints might discourage students with refractive errors from using spectacle. A previous study stated that a sponsorship by the government to provide a spectacle may lower the price of buying a spectacle.[30] Yet, the characteristics of spectacles should be considered. A study by Narayanan et al. (2018) emphasized the importance of providing comfortable spectacles, as discomfort could undermine compliance.[29] He indicated that thick, heavy spectacles causing discomfort and nose scars were the least preferred.[29] Additionally, Sathyan et al. (2017) noted that minor adjustments should be provided to ensure the spectacle fits comfortably.[16] They also emphasized the importance of offering a variety of spectacle models so that students can choose the model they prefer, which can enhance their willingness to wear them.[16]

The ETs highlighted the significance of comprehensive involvement in setting up an efficient school-based refractive error screening program. Therefore, various factors need to be considered, such as teachers' competencies and performance, a suitable screening and referral process, standardized tools and methods, and the affordability and accessibility of spectacles.

Conclusion

The study identified four key dimensions for establishing an effective school-based refractive error screening program from the perspective of elementary teachers. These dimensions encompass the necessity for essential resources equipped with knowledge about eye health and refractive errors to recognize signs of vision problems in students. Moreover, understanding the comprehensive screening procedure and the ability to conduct screening tests are important. Strategies to enhance the utilization of spectacles among students are also addressed. The commitment of teachers to undergo training and perform screening tests, along with governmental support in providing screening tools and subsidizing spectacles, are important to ensuring the sustained school-based refractive error screening program and fostering students' compliance with spectacle usage.

Author Contributions

Conceptualization, RWB, NDM, KRD, and YW; methodology, RWB, KRD, TR, YDL, and NDM.; software, RWB, and YW; validation, RWB, KRD, TR, YDL, and ND.; formal analysis, RWB and KRD.; investigation, RWB, KRD, YW, TR, YDL, and NDM.; resources, RWB, KRD, and YW.; data curation, RWB, KRD, and NDM.; writing—original draft preparation, RWB.; writing—review and editing, KRD, TR, YDL,

and NDM.; visualization, RWB, KRD, TR, YDL, and ND.; supervision, RWB, KDR, YW, and NDM.; project administration, YW and NDM.; funding acquisition, RWB, KRD, and NDM.

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