



Risk Factors Related to Decreased Vision in Primary School Children in Palembang

Dicky Hartono^{1*}

¹ Undergraduate Student of Medical Education, Universitas Sriwijaya, Palembang, Indonesia

ARTICLE INFO

Keywords:

Visual Acuity
Myopia
Reading
Visual Acuity Left Eye
Visual Acuity Right Eye

Corresponding author:

Dicky Hartono

E-mail address:

dickyhartono@gmail.com

All authors have reviewed and approved the final version of the manuscript.

<https://doi.org/10.37275/sjo.v5i1.66>

ABSTRACT

Introduction. Visual acuity is the ability of the eye to see an object clearly, and this depends on the ability of the eye to accommodate. Myopia is one of the causes of a sharp decline in vision in children aged 8-12 years. Close working distance is one of the most frequently mentioned risk factors for myopia. Head and back posture that bends forward when reading or doing other close-up tasks causes a higher prevalence of myopia. This study was conducted to describe risk factors related to decreased vision in elementary school children. **Methods.** The study was a descriptive research with a sample of 100 elementary school children taken by simple random sampling. Data was taken using a questionnaire and a Snellen chart. **Results.** A total of 100 students participated in this study. Most of the participants were aged 11 years old. Based on visual acuity, 20 students have decreased right eye vision, and 21% have decreased left eye vision. Most respondents read every day for 1 hour time as many as 58 (58%) people and had screen time for less than 2 hours (52%). In addition, based on family history, most respondents had parents' glasses (73%). **Conclusion.** More elementary school children had normal right and left eye vision than those with decreased vision. Most respondents have less screen time and less reading duration.

1. Introduction

Visual acuity is the ability of the eye to see an object clearly, which depends on the eye's ability to accommodate.^{1,2} A person with early eye disorders may have near-normal vision; the rest may experience moderate to severe visual impairment. The classification of visual impairment used is based on sharp vision according to World Health Organization in 2016, which is the normal vision if sharp vision is obtained 4/6 and 6/6 near-normal vision if it has sharp vision 6/9, 6/18.³ Then there is the moderate low vision if sharp eyesight 6/24, 6/48.

WHO estimates that people with visual impairment in the world in 2010 were 285 million people or 4.24% of the population, 0.58% or 39 million people who have blindness, and 3.65% or

246 million people experienced a sharp decrease in vision.³ About 65% of people with visual impairment and 82% of people with blindness are 50 years or older. The most common cause of visual impairment worldwide is an uncorrected refractive disorder, followed by cataracts and glaucoma; 18% cannot be determined, and 1% is a visual impairment since childhood. At the same time, the most common cause of blindness worldwide is cataracts, followed by glaucoma and age-related macular degeneration (AMD). As much as 21% of the cause can not be determined, 4% is a visual impairment since childhood. The prevalence of blindness at 55-64 years was 1.1%, aged 65-74 years by 3.5%, and ages 75 years and over by 8.4%. Although in all age groups, it seems that the

prevalence of blindness in Indonesia is not high, in old age, it is still far above 0.5%, which means it is still a public health problem.⁴

The incidence of myopia increases during the school years, especially before and at the age of tithing. Sharp visual impairment in school-aged children is a significant health problem. Early detection and publication of the prevalence and factors associated with visual impairment in elementary school students in Indonesia are still rarely done. Visual impairment in school children can impact long-term health, performance at school, and the child's emotional or social development. Children with visual impairment have a greater risk of social development and integration deterioration. Visual problems that are not detected early can negatively influence children throughout their lives, which has the potential to cause inappropriate behavior.⁵

Visual acuity disorders in school-age children become health problems that need attention. Myopia is one of the causes of a sharp decrease in vision in children aged 8-12 years. When children aged 13-19 years, experience very rapid growth, this will worsen myopia.⁶ Based on these problems and the high prevalence of a sharp decrease in vision in Indonesia, early detection and publication of the prevalence and factors associated with visual impairment in elementary school students in Indonesia is still rarely done. Children are often unaware of decreased vision and may not complain even when they suffer from tired eyes or blindness. Therefore, it needs to be maintained early to prevent significant damage. This study was conducted to analyze the relationship between learning duration and reading position with decreased visual acuity in elementary school children in Palembang.

2. Methods

This research is a quantitative analytic observational study with a cross-sectional approach conducted at Kertapati Public Health Center in Palembang using questionnaires and

Snellen charts from October to November 2018. This research has been approved by ethical committee of Faculty of Medicine, Universitas Sriwijaya. The data used in this study are primary. The research sample is elementary school children in Palembang who meet the inclusion and exclusion criteria with an amount that has been adjusted to the minimum sample formula. The inclusion criteria in this study were elementary school children in Palembang who were still active as students in the period October to November 2018 and were willing to answer the questionnaire. Elementary school children in the city of Palembang who are not active as students in the period October 2018-November 2018, elementary school children who have worn glasses since childhood and have eye defects or eye injuries that can result in bias in measurements excluded from this study. The variables in this study consisted of the dependent, independent, and confounding variables. The dependent variable is visual impairment, and the independent variable is the length of study and reading position. Univariate analysis is used to display each variable in the frequency distribution table.

3. Results

A total of 100 students participated in this study. Most of the participants were aged 11 years old. Based on visual acuity, 20 students have decreased right eye vision, and 21% have decreased left eye vision. According to the reading position, 66 respondents answered they had the correct position when reading. Most respondents read every day for 1 hour time as many as 58 (58%) people and had screen time for less than 2 hours (52%). In addition, based on family history, most respondents had parents' glasses (73%).

Table 1. Baseline characteristic and risk factor of respondents

Characteristics	Frequency (%)
Age	
10 years old	27 (27%)
11 years old	56 (56%)
12 years old	17 (17%)
Right eye vision	
Normal	80 (80%)
Decreased	20 (20%)
Left eye vision	
Normal	79 (79%)
Vision	21 (21%)
Parents wear glasses	
Yes	73 (73%)
No	27 (27%)
Reading position	
Right position	66 (66%)
Wrong position	34 (34%)
Reading duration	
Less than 1 hour	58 (58%)
1-2 hours	34 (34%)
2-3 hours	8 (8%)
Screen time	
Less than 2 hours	52 (52%)
More than 2 hours	48 (48%)

4. Discussion

Teenage respondents in the study were aged between ten to twelve years old. The age of most respondents is 11 years old. These results indicate that most respondents in pre-adolescence and according to age to be in elementary school fifth and sixth grades. For the study duration, most elementary school children study less than an hour every day at home compared to more than one hour every day. In line with research conducted by Juneti most respondents study <2 hours every day. This shows the lack of interest of elementary school students in reading books every day, it could be because they are not in the examination period or have felt enough for learning in school, but this must be proven by further research.

The research shows that elementary school children look more at the screen less than two

hours every day. The screen was defined as television, smartphone and computer. According to these data, most elementary school children more often play outdoors. This is in line with research conducted by Hinkley et al on the children in USA in 2018, which said more primary school children play outdoors more than two hours a day.⁷

Then from a decrease in eye vision of elementary school children in this study were divided into right and left eyes; for the right eye, there were only 20 people who experienced a decreased vision, while for the left eye, there were 21 people who experienced a decreased vision. The difference in the decrease in the eye vision can be caused by various factors, amblyopia or strabismus. Falkenberg et al., stated that reading position when sitting causes the illuminating lights to come from above so that the reading position is thus

considered the best.⁸ At the same time, reading or looking at an object lying down causes the lack of lighting received by the eye. Reading with lying down position is quite risky. This position will cause eyes to get tired easily. This makes the distance of the book with the eye closer. When lying down, the body cannot relax because the eye muscles will pull the eyeball downward, following the location of the book being read. Eyes that are often accommodated for a long time will quickly reduce the ability to see far. In addition, eyes that are accommodated for a long time will more quickly experience decreased visual acuity.⁹ Therefore, using a chair is recommended to reduce the risk of eye health problems.

The wrong position when reading can cause headaches and pain in the neck. Neck pain is caused by an incorrect and tense neck position because of frequent reading for a long time and continuously. Headaches are a complaint that is often found when a person experiences eye disorders. Eye disorders and eye fatigue can cause complaints of headaches. Headaches caused by eye strain or fatigue occur, such as headaches due to muscle tension related to eye muscles; headaches that occur with eye strain will be seen if the eyes are used for too long.¹⁰

The anatomy of the human eye is designed to see long distances for a long time and see objects close in a short time. So when reading, using a computer, or working with objects at close range for hours, it means that we have used the eye against the will of nature. As a result, the vision system will be depressed and eventually cause damage called stress near the point. The eyesight of too close and continuously for more than two hours can cause eyestrain.

Prolonged screen time also can put additional pressure on the eyes and nervous system. When looking at the screen for a long time and continuing with low blinking frequency can cause the eyes to experience excessive evaporation so that the eyes become dry. In this case, tears have an essential function. Tears function to improve vision, clear impurities entering the eyes from the atmosphere,

nutrients (glucose, electrolytes, enzymes, proteins), and contain antibacterial and antibodies. If the eyes lack tears, they can cause the eyes to lack nutrients and oxygen. In a long time, this condition can cause a permanent visual disturbance.^{9,10}

Research conducted by Foreman et al., states that the average duration of playing online games in school-age children is 20.80 hours per week, and the average eye vision value of children decreases by 0.8 as much as 35%.¹¹ This shows a relationship between the duration of playing online games with the value of eye vision. Children who play games usually find eye distance and the monitor is close enough, then the muscles that make accommodation eye patterns will work all. For example, focusing, i.e., intraocular muscles (infra-eye muscles) or cylindrical muscles that make the lens more convex, must work, including extraocular muscles outside the eye, which makes the eye glance left right up and down.

5. Conclusion

More elementary school children had normal right and left eye vision than those with decreased vision. Most respondents have less screen time and less reading duration.

6. References

1. Giandini RJ, Masi E, Coelho EC, Oréface FR, Moraes RA. Prevalence of low visual acuity in public school's students from Brazil. *Rev Saúde Pública*. 2004; 38(2).
2. Xu L. Visual Acuity in Northern China in an urban and rural population: the Beijing eye study. *Br J Ophthalmol*. 2005; 89: 1089-1093.
3. World Health Organization. Global initiative for the elimination of avoidable blindness: action plan 2006-2011 [cited 2018 9 November]. Available from: [http://www.who.int/blindness/Vision2020-report.html](http://www.who.int/blindness/Vision2020%20-report.html).
4. RENSTRANAS PGPK. 2005. Material for the national strategic plan for the management

of visual impairments and blindness [in Indonesian].

5. Basu M, Das P, Pal R. Spectrum of visual impairment among urban female school students of Surat. *Indian J Ophthalmol*. 2011; 59(6): 475-9.
6. Theophanous C, Modjtahedi BS, Batech M, Marlin DS, Luong TQ, et al. Myopia prevalence and risk factors in children. *Clin Ophthalmol*. 2018; 12: 1581-7.
7. Hinkley T, Brown H, Carson V, Teychenne M. Cross sectional associations of screen time and outdoor play with social skills in preschool children. *PLoS One*. 2018; 13(4): e0193700.
8. Falkenberg HK, Langaas T, Svarverud E. Vision status of children aged 7-15 years referred from school vision screening in Norway during 2003-2013: a retrospective study. *BMC Ophthalmol*. 2019; 19:180.
9. Pärssinen O, Kauppinen M. Association of reading posture, gaze angle and reading distance with myopia and myopic progression. *Acta Ophthalmol*. 2016; 94(8): 775-9.
10. Aleman AC, Wang M, Schaeffel F. Reading and myopia: contrast polarity matters. *Sci Rep*. 2018; 8:10840.
11. Foreman J, Salim AT, Praveen A, Fonseka D, Ting DSW, et al. Association between digital smart device use and myopia: a systematic review and meta-analysis. *Lancet Digi Health*. 2021; 3(12): e806-18.