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Eye Health Screening in School-Age Children During Online Learning

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ABSTRACT

The "school from home" policy during the COVID-19 pandemic a few years ago led to increased interaction between children and gadgets. Prolonged and intense gadget use among children can result in complaints that, if left unaddressed, may cause vision problems. To prevent permanent eye damage, it is essential to conduct vision screening for school-aged children to identify potential issues. This study was conducted in 2020 using a simple descriptive method with accidental sampling, involving 50 children aged 8–13 years as research respondents. Vision screening using the PEEK Acuity application revealed that 52% (26 children) had abnormal visual acuity. Additionally, 46% (23 children) reported symptoms of dry eye, such as frequent eye rubbing. Furthermore, 72% of the children used gadgets for more than 2 hours per day. The study concludes that nearly half of the children had undetected visual acuity issues. Regular eye examinations for school-aged children are recommended to identify eye problems as early as possible.

INTRODUCTION

The outbreak of the corona virus disease (COVID 19) was once a global problem faced by almost all countries in the world in the past few years. One way to prevent the spread of this virus is to keep a distance of at least 1 meter from other people, avoiding physical contact with people suffering from this virus. Seeing the high and rapid spread of this virus, many countries recommend social isolation to their citizens. In Indonesia itself, the movement to limit social activities has been recommended by the government since mid-March 2020. Several regions have started to close schools and universities since March 16 to support these activities. Through Circular Letter Number 4 of 2020, the Minister of Education and Culture of the Republic of Indonesia Nadiem Anwar Makarim launched an education policy during the emergency period of the spread of COVID-19 including 6 points, one of which is the learning process carried out from Home or also known as Distance Learning (PJJ) (1). Learning activities are carried out online and children are asked to stay at home during the period of social activity restrictions. Until now, learning activities from home have been going on for almost 7 months. Many schools carry out learning activities using online media, either through online communication media such as Whatsapp, social media such as Youtube, online meeting media such as zoom or google meet or online classes such as google classroom. This causes children's interaction with electronic media to increase. Most children access learning media using laptops or cellphones. This will pose a risk of visual impairment. One of the vision problems that may arise is DES (digital eye strain) which is characterized by redness, itching, and burning in the eyes (2) (3). Other vision problems can also occur further, such as refractive errors (4), exposure to Blu ligth (5),

accommodation problems (4). The emergence of various vision disorders is caused by a collection of waves on the monitor screen such as X-rays, Ultraviolet rays, and microwaves. Electromagnetic radiation has a fine and very low frequency or is also known as Extremely low Frequency (ELF) (6)

The intensity of exposure to light for a long time will be easily captured by the cornea of the eyes of students, especially children, because physiologically the child's eye nerves are more susceptible to damage (7). These eye complaints are exacerbated when using electronic devices for more than 1 hour (8) with a distance of use of less than 30 cm (9). Prolonged use of gadgets and use of gadgets that are too close to the eyes will cause problems such as reduced visual acuity, red and watery eyes. The compound eye complaints in question include symptoms related to the ocular surface in the form of irritated eyes as a result of light reflections and shadows formed on the monitor (10).

The implementation of the school from home policy during the COVID-19 pandemic has increased children's interaction with gadgets. The increasing intensity of gadget use in children will cause complaints which if not addressed will cause visual impairment in children. To prevent permanent damage to the eyes, screening for vision problems in school-age children is needed to identify problems in children.

METHOD

This study was conducted in Pekanbaru City, in May - August 2020, at a time when there were still many restrictions imposed on the learning process in schools. The study population was school-age children aged 8-12 years in Pekanbaru City. The sample was obtained by accidental sampling method, with criteria including children undergoing formal education, having no physical and mental disabilities, having access to the internet and not wearing glasses. Data collection was carried out in 2 ways, namely, the first by assessing visual acuity using the PEEK acuity application and the second by asking questions about children's behavior when using gadgets and complaints related to eye health using a questionnaire. The research procedure began by distributing broadcasts about eye health examinations in school-age children on social media, then the researcher explained the purpose of the study and related research procedures and guaranteed the rights of respondents according to research ethics. Informed consent and parental approval were obtained by filling in the child's data and a statement of consent on the Google form for parents who agreed to collect data on children online. Researchers use informed consent in the form of a physical sheet if the respondent/parent agrees to data collection being carried out directly/offline. After that, the researcher explained how to use the PEEK Acuity measuring instrument via chat/phone/video call to the parents. After that, the examination was carried out by the parents or companions from home under the supervision of the researcher. The results of the examination were recorded by the researcher. After all the data was collected, data analysis was carried out using frequency tabulation.

RESULTS AND DISCUSSION

Results

The number of samples in this study was 50 people obtained through accidental sample collection. The characteristics of the samples in this study are answered in table 1

Respondent Characteristics

Table 1
Distribution of Respondent Characteristics

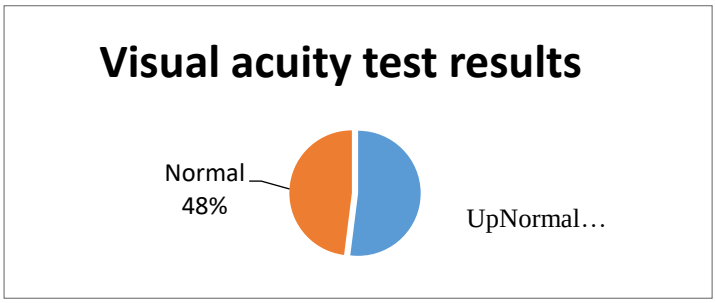
Characteristics	Amount	
	n	%
Gender		
Female	17	34
Male	33	66
Age		
8 Years	6	12
9 Years	12	24
10 Years	11	22
11 Years	11	22
12 Years	10	20

Class		
Grade 3	10	20
Grade 4	15	30
Grade 5	14	28
Grade 6	11	22

Table 1 shows that the majority of children are male, as many as 33 people (66%), the number of samples is almost the same at the age of 9-12 years with the largest number of samples in grade 4 of elementary school.

Description of visual acuity in children

Diagram 1. Description of children's visual acuity



Children's visual acuity was examined using the PEEK acuity android application and grouped into normal and abnormal. Children are said to have normal visual acuity if the examination value is 6/6 in both eyes. From the results of the study, it was found that the number of children with normal and abnormal visual acuity was almost balanced.

Other Eye Complaints

Diagram 2. Rubbing/rubbing eyes

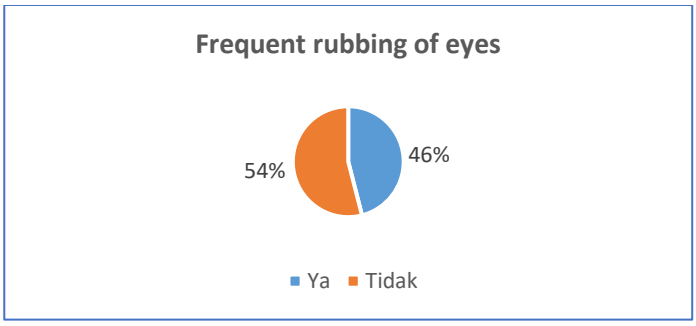
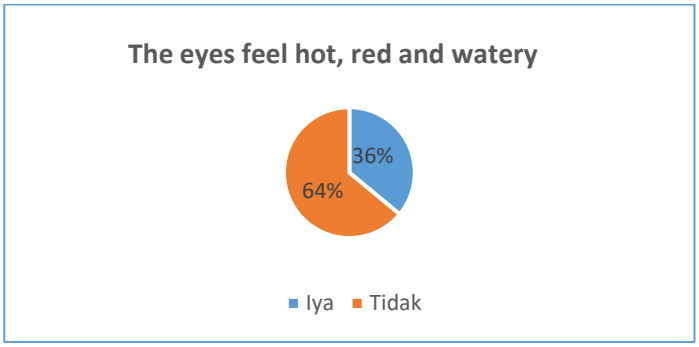


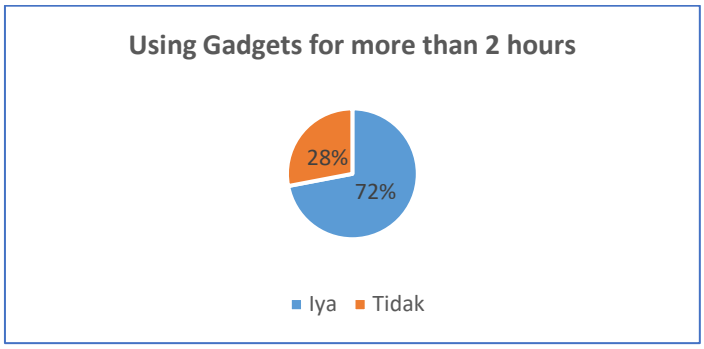
Diagram 3. Hot, red and watery feeling in the eyes



Another eye complaint that is most often found is children often rubbing their eyes, which is 23 people (46%). Children often rub their eyes usually because of blurred vision or itchy eyes. While the number of children who feel their eyes feel hot and watery is 18 people (36%).

Duration of Gadget Use

Diagram 4. Overview of gadget usage duration of more than 2 hours



Based on the research results, it was found that almost 75% of children use gadgets for more than 2 hours.

DISCUSSION

Respondent Characteristics

Based on the research results, the largest number of samples were in the male group, which could be because boys access gadgets more to play online games. Research shows that boys have higher access to digital devices (11). This is because boys often experience fewer restrictions from parents in the use of digital devices compared to girls, with stricter rules usually applied to girls, especially for computer use (12). Gender differences in device use also affect access, where boys tend to use devices more to play games, resulting in higher perceptions of access, while girls are less likely to engage in such activities (13). Research in China shows that socioeconomic status and family dynamics also shape this pattern; families with higher socioeconomic status usually provide more restrictions for girls because it is considered that the use of digital devices can have a negative influence on girls compared to boys (14), plus because social norms encourage boys to be more involved with technology (15). In the context of education, boys are often perceived as more likely to be interested in technology, a perception reinforced by teachers and parents, resulting in them being given greater access (16). This higher engagement allows boys to develop digital skills earlier and more intensively, particularly through activities such as gaming and technology exploration (17) (18).

Visual acuity in children

Visual impairment in school-age children is a common condition, with prevalence varying by region and study. For example, in Portugal, a study of 672 children aged 6–11 years found that 11.3% had decreased distance visual acuity, and 10.3% had uncorrected refractive error (19). In Nanterre, France, a pilot project involving 515 children found that 20% had decreased visual acuity, with 12% requiring glasses but not yet receiving them (20). In Turkey, the prevalence of decreased visual acuity was found to be higher in children aged 7–9 years (21). The results of this study showed that children identified as having abnormal visual acuity had a visual acuity of 6/7.5. However, these results cannot be used as a definitive reference for the diagnosis of visual impairment, because the examination was conducted at home by parents with online supervision, without using a Snellen chart. Environmental conditions, such as inadequate lighting or inappropriate examination distance, can be a source of bias. Nevertheless, these results provide an initial picture for parents to immediately check their children's eye health at a health facility.

Visual disorders that are not intervened early can have a negative impact on children's learning abilities. Therefore, routine refraction examinations every six months are highly recommended to detect and address refractive problems in a timely manner (22). Research in China also shows that myopia is common in school-age children, but only one-third of these children use glasses. This is due to the lack of screening and parental awareness to check their children's eye health (23). It can be concluded

that visual acuity problems in school-age children are quite common, with the main cause being uncorrected refractive disorders. Many children who need glasses have not received them, indicating the need for a more comprehensive vision screening program and better access to vision correction services, especially for elementary school-age children.

Other Eye Complaints

In addition to visual acuity problems, school-age children can experience various other eye disorders. The following are some common eye disorders and their prevalence: Trachoma 10.9%, Ocular Melanosis 3.8%, Xerophthalmia 2.2%, Epicanthus Tarsalis 1.6%, Ptosis 1.1%, Amblyopia 1.7–13%, and Strabismus 1.4–4.0% (24) (25) (26). Symptoms of frequent eye rubbing and burning eyes can be an indication of more serious eye disorders. Frequent eye rubbing is a risk factor or condition associated with uncorrected refractive disorders, which are found in around 40% of cases of visual impairment in children (27). Meanwhile, a burning sensation in the eyes can be a symptom of dry eye, which is found in 15.9% to 19.55% of cases. This condition can be influenced by various risk factors such as excessive screen time, lack of sleep, and the habit of rubbing the eyes (28). Dry eyes can occur due to intensive use of the eyes to see certain objects without blinking. Continuous use of digital media is known to reduce the frequency of blinking, thereby reducing the amount of tear production and reducing the lipid layer that protects the eyes. As a result, the eyes can feel hot and itchy (29). To understand eye health problems in children in more depth, an analysis of children's behavior in using their organs of vision is needed.

Duration of Gadget usage

Based on the results of this study, it was found that almost 75% of samples used gadgets for more than 2 hours. The COVID-19 pandemic significantly increased the duration of gadget use in school-age children, with various studies showing this trend in various regions and age groups. During the pandemic, studies consistently reported a substantial increase in screen time. For example, a study in Canada found that screen time in children doubled during the pandemic, with higher levels of use in boys and children from minority groups (30). Likewise, a study in Italy showed a significant increase in screen exposure for both school and entertainment purposes, with 72% of children using gadgets more for school purposes and 49.7% for entertainment (31). Meanwhile, after the pandemic, this increase in screen time continued. In Hong Kong, the increase in screen time documented during school closures continued after schools partially reopened (32). A similar study in the US found that the prevalence of excessive screen use for recreation remained high post-pandemic, with a significant association between screen time and psychological well-being problems (33). Excessive screen time can have negative impacts on school-age children, both physically, cognitively, and psychosocially. High screen time can cause difficulty controlling attention and solving problems (34). It can also hinder cognitive development and reduce academic achievement (35) (36). In addition, excessive screen time is often associated with behavioral problems such as hyperactivity, impulsivity, and difficulty focusing (37) (38). Children are also at greater risk of experiencing mental problems such as anxiety, depression, and mood disorders (39). In addition, too much screen time can reduce time for social interaction, so that children can have difficulty socializing and experience other social adaptation problems (40). Long-term use of digital screens, such as on smartphones, computers, and other gadgets, has been shown to significantly reduce blinking frequency. Research shows that screen use can reduce blinking frequency by up to 66%, which increases tear evaporation and causes dry eye symptoms (41). Decreased blinking frequency during exposure to digital screens disrupts the stability of the tear film, leading to dry eyes (36). This decreased blinking frequency is a common response to the visual concentration required during screen use (42). Decreased blinking frequency causes faster evaporation of the tear film, which can lead to dry eye disease (DED). This condition is characterized by symptoms such as irritation, burning sensation, and discomfort in the eyes (41) (36). Prolonged use of gadgets does result in decreased blinking frequency, which in turn causes dry eyes due to increased tear evaporation and disruption of the stability of the tear film. This is supported by various studies that highlight the relationship between digital screen use, reduced blinking frequency, and the appearance of dry eye symptoms.

To get a better picture in understanding eye health problems in children, it is necessary to see how children behave in using their visual organs. Unfortunately, this study has not identified whether these complaints were felt during the home learning period or had existed before. Based on the findings of this study, it can be concluded that prolonged use of gadgets has a negative impact on the health of school-age children, both physically, cognitively, and psychosocially. In particular, the increase in screen time during the COVID-19 pandemic has encouraged longer gadget use behavior, which continues even though schools have partially reopened. As a result, children are at risk of experiencing problems such as decreased academic achievement, difficulty

regulating attention, hyperactive behavior, and mental disorders such as anxiety and depression. In addition, excessive use of gadgets also causes a decrease in blinking frequency, which can disrupt tear stability and cause dry eyes. Therefore, it is important to better understand children's gadget use behavior in order to design interventions that can prevent further health impacts.

CONCLUSION

This study is a simple descriptive study with an accidental sampling research method. The number of children involved in this study was 50 children aged 8-13 years. Based on vision screening using the PEEK Acuity application, it was found that the number of children who experienced an abnormal decrease in visual acuity was 52% (26 people). While the number of complaints related to dry eye symptoms was that children often rubbed their eyes 46% (23 people). The number of children who used gadgets for more than 2 hours was 72%.

This study shows that of the 50 children aged 8-13 years involved, 52% (26 children) experienced an abnormal decrease in visual acuity based on screening with the PEEK Acuity application. In addition, 46% (23 children) reported frequent eye rubbing as a symptom of dry eyes, and 72% of children used gadgets for more than 2 hours per day. These findings highlight the high prevalence of vision problems in children during the period of increased gadget use, especially during the pandemic.

Parents are advised to routinely check their children's eye health to detect problems early. In addition, the Health Office and Education Office are expected to conduct regular eye health screenings for children to prevent more serious vision problems. Further research is also needed to explore eye health interventions during the home learning period.

Some recommendations to reduce the negative impacts of gadget use on children include parental involvement, such as implementing consistent rules and actively supervising children's screen time. In addition, encouraging screen time, especially for educational content rather than recreational screen time, can have a positive impact on children's cognitive development. Finally, limiting screen time according to guidelines that recommend gadget use of less than two hours per day can help reduce the risks associated with excessive screen use.

This study recommends the need for further studies to evaluate eye health interventions, such as training in healthy gadget use and eye relaxation techniques. In addition, it is necessary to explore the relationship between gadget use duration and vision disorders in children, as well as the long-term impact on vision development and prevention strategies in schools and communities.

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