

**INCREASED MYOPIA PREVALENCE IN YOUNGSTERS
AS A RESULT OF ONLINE LEARNING**

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Abstract

Myopia is a condition in which distant objects cannot be clearly displayed on the retina by the optical system of the eye, because the incoming light is refracted in front of the retina or yellow spot. Along with genetic factors, another important aspect that affect myopia is lifestyle. When a pandemic strikes, it alters people's behavior. Outdoor activities have decreased significantly, while the use of gadgets has increased as a result of youngsters learning online, which needs the use of gadgets. This study aims to determine the increase in the incidence of myopia in children due the online learning process. The type of research conducted is in the form of literature review. Searches for data that meets literature reviews that match the topic are conducted online. Online searches conducted through scientific journal sites have a diverse and quality database, namely PubMed, Schocar, and Libgen published in the last 6 years (2015-2021). Researchers found 8 journals using keywords relevant to the study. The findings highlight that the use of smartphones can cause DED, myopia and blurred vision. Due the pandemic Covid-19 situation that occur today requires children to take part in online learning programs from home via smartphone screens. Indirectly, short distance activities and lack of exposure to natural sunlight increase asthenopia conditions and increase myopia cases for children. If not addressed early on, these risks becoming an explosion of myopia cases, while the end of the COVID-19 pandemic is still unknown. Therefore, myopia preventive measures are required during pandemic outbreaks that are relevant and effective.

Keywords: *Myopia, Myopia Preventive Measures, Online Learning*

1. INTRODUCTION

Corona virus is a category of viruses that can cause mild to severe sickness. This particular form of coronavirus is known to cause illnesses with severe symptoms such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The World Health Organization has designated the novel virus responsible for Severe acute respiratory syndrome coronavirus-2 and the condition Coronavirus Disease 2019 (COVID-19) (Arifdarma, 2020).

The outbreak of Covid-19 has emphasized the importance and necessity of maintaining social distance in social interactions. This effort is being made to ensure that the health care system does not become overwhelmed by the growing number of people who require service. The more activities a person engages in outside the home (the location of the house), the more susceptible he or she will be to the virus (Maria & Novianti, 2020).

This condition is not limited to adults; it may also affect youngsters. Children are infected with COVID-19 at a lower rate than adults. Almost majority COVID-19 infections in children are spread within their families. COVID-19 occurs at a rate of 1% (549 children) in children aged 10-19 years, but at a rate of 0.9 % in children aged less than 10 years (416

children). The global outbreak of COVID-19 infection has had an effect on society as a result of the government's policy mandating that all work and learning activities be conducted away from home in order to prevent the spread of COVID-19 virus (Supriatun et al., 2020).

Because learning is done online, the Learning at Home process encourages children to interact more often with gadgets. It is believed that greater engagement with devices would lead to a rise in the number of gadget addictions (Maria & Novianti, 2020).

According to Oktafia & Siti (2020) gadgets can affect the eyes because it can cause many things such as lack of accommodation, dry eyes and eye fatigue. This eye fatigue can occur due to inadequate lighting. Children who are accustomed or often use gadgets to access the internet and study can experience health problems in their eyes. Many children have minus eyes because they often use gadgets (Nisaussholihah et al., 2020).

Myopia is a condition in which distant objects cannot be clearly displayed on the retina by the optical system of the eye, because the incoming light is refracted in front of the retina or yellow spot. Myopia generally occurs when the eyeball becomes elongated or when the cornea has an increased curvature. In myopia, light entering the eye is focused in front of the retina so that distant objects appear blurry. Myopia is also one of the main causes of decreased visual acuity in school-age children, while good eyesight is indispensable in the teaching and learning process (Indrarini et al., 2016).

Preventing increased myopia during the pandemic, the WHO estimates that almost 40% of the world's population (3.3 billion people) will be myopic by 2030. Indeed, by 2050, it will account for more than half of the world's population (4.8 billion people). Especially during the pandemic time, which contributed to a rise in myopia, particularly among children. According to a recent study conducted in China, children aged 6-8 years were three significantly more likely to occur myopia in 2020 than in earlier years (Pranita & Sumartiningtyas, 2021). Along with genetic factors, another important aspect is lifestyle. When a pandemic strikes, it alters people's behavior. Outdoor activities have decreased significantly, while the use of gadgets has increased as a result of youngsters learning online, which needs the use of gadgets.

At this moment, there is an increase in the prevalence of myopia worldwide, particularly in Asia and, more specifically, among school-age children. Statistics in China, which is one of the countries with the highest prevalence of myopia in the world, shows that 9.7% of children aged 7 years have myopia, 43.8% in children aged 12 years and 72.8% among adolescents aged 18 years (Sun et al., 2018).

Based on the existing phenomena, this study aims to determine the increase in the incidence of myopia in children in the online learning process.

2. RESEARCH METHOD

The type of study that was carried out was a review of the existing literature. The search for data that corresponds to the literature review according to the topic is carried out online, as is the analysis of the data. In order to find articles published in the recent six years (2015-2021), researchers conduct online searches on scientific journal websites that include diversified and high-quality databases, such as PubMed, Schocar, and Libgen. This study discovered 8 journals that contained relevant keywords.

3. RESULT AND DISCUSSION

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Indonesia has the highest prevalence of refractive errors among all eye diseases, with refractive defects affecting 25 % of the population, or over 55 million peoples (Suroiyah et al., 2017). North and South Sulawesi placed third in Indonesia with the greatest frequency of blindness, at 0.8 % population, according to the 2013 Basic Health Research (Riskesdas). This statistic has risen since 2007, when the prevalence of blindness was barely 0.5 %. In fact, at 7.5 %, the availability of refraction correction for those aged 6 and up is the third highest in the country (Riskesdas, 2013).

Myopia, which has long been a global epidemic concern, increased in prevalence during the COVID-19 pandemic in numerous nations throughout the world. About 87% of the world's student population is covered by COVID-19, which is why more than 160 countries have implemented learning from home. To put it another way, this could lead to an increase in myopia. There has never been a consistent way to measure how much time people spend staring at a computer screen before. As a result, the impact of prolonged exposure on refractive function remains uncertain (Pellegrini et al., 2020).

According to Ganne et al. (2021) an increase in screen time exposure of 6 hours or more can increase the incidence of myopia up to seven times in children who attend online classes during the pandemic when compared with before the pandemic (57.01% versus 10.9%). The majority of children use their devices within 20–37 cm. Furthermore, Pietrobelli et al. (2020) in Italy and Bahkir & Grandee (2020) in India shows an increase in the use of devices up to 4-5 hours per day in children and adolescents during the quarantine period at home because the COVID-19 pandemic requires them to take part in learning activities (online classes, assignments, and webinars). Because adults also work from home, gadgets are a useful tool to accompany children when their parents work (López-Bueno et al., 2021). Meta-analysis by Huang et al. (2015) who reviewed 12 cohort studies, 15 cross-sectional studies, and had a subject size of 25,025 children aged 6–18 years have advised children to reduce short distance activities to reduce the risk of nearsightedness or myopia in future. Close-range activities in question are activities such as reading, studying, writing, doing homework, watching television, and playing video games.

Moreover, Picotti et al. (2021) shows that the progression of myopia cases increased significantly from 2019 to 2020, the period in which children were homebound, compared to the period 2018-2019. During the 2019-2020 period, children were in a state of lockdown due to homeschooling conditions and stayed at home after government policies were implemented. Long time exposure for children to play outside can limit the increase in axial elongation of the eyeball and myopic changes in refraction (Picotti et al., 2021). Prolonged stay at home can also increase the likelihood of being exposed to close-range activity conditions in the form of reading and increasing screen times along with a reduction in sun exposure and the incidence of outdoor activities (Sathyan, 2020; Wong et al., 2021)

According to J. Wang et al. (2021) in China reported the prevalence of myopia in 2020 increased by 3 times in children aged 6 years, 2 times in children aged 7 years and 1.4 times in children aged 8 years. However, this increase was not seen in children in the older age group (9-13 years) even though children at that age (3rd – 6th grades) carried out online learning more intensively (2.5 hours) than the group of children in 1st and 2nd grades (1 hour per day). This leads to a hypothesis that younger children will be more sensitive to environmental changes than older children. Age 6-8 years is an important period for the development of myopia. In this age range, Myopia plasticity is still high, hence it is easier

to control myopia when compared to the group of children older than 8 years. Meta-analysis conducted by Holden et al. (2016) predicts a two-fold increase in the prevalence of myopia and a seven-fold increase in the risk of vision loss caused by myopia by 2050. This prediction could occur sooner if no action is taken during the COVID-19 pandemic.

Meanwhile, according to Zhang et al. (2021) during Covid-19 pandemic, the incidence of myopia is potentially increase due a significant reduction in outdoor time and an increase in screen time among schoolchildren in Hong Kong. Therefore, Zhang et al. (2021) have warns eye care professionals, as well as policy makers, educators and parents, that collective efforts are needed to prevent childhood myopia—a potential public health crisis resulting from COVID-19.

Increased use of gadgets has the potential to cause ocular and non-ocular problems such as increased myopia, asthenopia, retinal damage, sleep disorders, musculoskeletal problems, and behavioral disorders. There are several ways that can be done in daily practice to prevent children from experiencing computer vision syndrome, including: others apply the '20-20-20' rule which means resting the eyes for 20 seconds for every 20 minutes of screen viewing, and the child needs to see a distance of 20 feet (6 meters) to prevent accommodative spasm and asthenopia. In addition, it is necessary to adjust the lighting in the surrounding environment to avoid glare, (Borhany et al., 2018) keep the eye distance from computer screen >36 inches (>90 cm), eye distance from cellphone screen >40 cm ,(Shokouhi-Moqhaddam et al., 2013) placing the digital screen 20° below eye level, limiting digital screen viewing time to <4 hours/day, and using night mode after late afternoon (Jaschinski et al., 1998). The recommended screen time for children can be adjusted according to age during the home study period. School-age children are advised to participate in moderate-intensity physical activity for at least 60 minutes, time to play with devices no more than 2 hours, and quality sleep time of about 9–11 hours per day (Guan et al., 2020).

Besides that, turning off all electronic device screens when eating with family and traveling, supervising and controlling children, avoiding the use of electronic screens as a child sedative or to stop tantrums, and turning off the screen and getting the device out of the bedroom 30–60 minutes before bedtime are some other things that are recommended for children to minimize screen time during the pandemic (Guan et al., 2020).

Myopia survey in 2020 (W. Wang et al., 2021) showed that students from rural areas outperformed urban students on the UCVA average (*uncorrected visual acuity*) and SE (*spherical equivalent*). These results are consistent with previous studies (Saxena et al., 2015), which shows that students in urban areas spend less time outdoors than in rural areas, an urban student spends more time watching TV than having outdoor exposure.

In the previous study, it was found that outdoor activities are closely related to the development of low vision. It has been reported that, compared to those in Western countries, students in certain Asian countries who experience more academic stress have a higher incidence of myopia and spend less time doing outdoor activities and physical exercise (Guggenheim et al., 2012; Rose et al., 2008). Effective outdoor promotional activities can reduce the incidence of myopia (Wu et al., 2018; Xiong et al., 2017). Home quarantine in the early stages of the COVID-19 outbreak reduces outdoor activity time for children and adolescents, which may further contribute to the increase in myopic rates. Therefore, we suggest that although personal protection is very important, outdoor activities should be done appropriately to prevent myopia during the COVID-19 pandemic.

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Exposure time to digital screens as well as digital devices used for online studies can also have an effect on the development of myopic vision in adolescents. According to our investigation, most students mainly use mobile phones and computers for online learning. However, they had worse UCVA and SE than those who used TV to study. Over the past few years, mobile phones and tablet PCs have become popular among the younger generation (one in three children aged 1-6 years use a mobile phone for 1-2 hours per day) (Bernard et al., 2017; Cho & Lee, 2017). During the COVID-19 pandemic, home and school confinement results in more online learning to maintain the normal process of academic assignments.

Education for children, parents, and teachers regarding recommendations that need to be implemented during the pandemic is an important thing. It should be emphasized the importance of prevention for children who are at risk of myopia, such as a history of myopia found in one or both parents and also children who have a high academic burden at school (Hussaindeen et al., 2020). Therefore, children need to be actively involved in outdoor play activities compared to digital games that can be accessed easily when they have free time.

According to Ma et al. (2021) shows that changes in lifestyle and learning environment due to COVID-19 led to greater myopia development (Hu et al., 2021). During periods of pandemic outbreaks, we speculate that the differential effects of environmental changes depend on individual genetic predispositions. Hu et al. (2021) found that, although environmental changes during the COVID-19 outbreak period substantially increased the incidence of myopia in the study population, the number of SER (spherical equivalent refraction) and changes in AL (*axial length*) among children with incident myopia (i.e., students without myopia at first visit and with myopia at the second visit) were not affected.

Outdoor play activities can take advantage of the area around the house such as a balcony that is exposed to sunlight for at least one hour a day. Parents and teachers are also required to be creative in modifying children's learning methods other than online, for example, such as giving assignments by doing independent recording, limiting material through screen viewing, and various other similar activities. On the other hand, health workers need to understand and recommend a healthy lifestyle to parents, household members, and child carers while still adhering to health protocols. Governments can play a role in promoting this healthy lifestyle among children by working with influential people or the media to regularly promote the need for physical activity and restrictions on prolonged sitting.

4. CONCLUSION

Based on the conclusions of this study, which states that the use of smartphones can cause DED, myopia and blurred vision. Therefore, it can be concluded that there is a relationship between smartphone use and visual acuity. The COVID-19 pandemic requires children to take part in online learning programs from home via smartphone screens. Indirectly, short distance activities and lack of exposure to natural sunlight increase asthenopia conditions and increase myopia cases for children. If not addressed early on, these risks becoming an explosion of myopia cases, while the end of the COVID-19 pandemic is still unknown. As a result, myopia preventive measures are required during pandemic outbreaks that are relevant and effective. It is necessary that parents, teachers, health

professionals, and governments collaborate in order to promote healthy lifestyles and achieve myopia prevention initiatives among school-age children.

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