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FACTORS AFFECTING MYOPIA IN ELEMENTARY SCHOOL

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ABSTRACT

Refractive errors are the most common visual disturbances in the world, of which myopia is the most common refractive error. Myopia can be caused by genetic and environmental factors, one of which is by doing close-up activities such as using gadgets. The use of gadgets today is very much needed in everyday life. At least 30 million children and adolescents in Indonesia use digital media as their main choice of communication channel. This study was conducted to find out what factors can affect the incidence of myopia in Darul Quran elementary school children Semarang including gender, heredity, close-range activities, outdoor activities with the research sample being all Darul Quran elementary school students who suffer from myopia. The research used is quantitative research oriented with inductive logic, data collection is done by questionnaire. With saturated sample technique, the total population and the number of samples is 90 respondents, the questionnaire used in primary data collection was carried out. Validity and reliability tests were tested on 30 respondents taken from outside the research location. The results of the study were carried out with the Chi-Square correlation test where, the highest incidence of myopia is in children with female sex as many as 33 (56.9%), there is a history of myopia as much as 27 (46.6%), melee activity < 5 jam many as 25 (43.1%) and outdoor activities < 5 jam sebanyak 25 (43.1%). The incidence of myopia that is most related and influential sequentially is heredity, melee activity, gender and outdoor activities.

Keywords: elementary school; gender; heredity; melee activity; myopia; outdoor activities

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INTRODUCTION

Refractive errors are the most common visual disturbances in the world, of which myopia is the most common refractive error. Myopia can be caused by genetic factors as well as environmental factors, one of which is by doing close-seeing activities such as using gadgets. The use of gadgets today is very much needed in everyday life. At least 30 million children and adolescents in Indonesia use digital media as their main choice of communication channel (*Badan Penelitian Dan Pengembangan Kesehatan Kementrian Kesehatan RI Riset Kesehatan Dasar*, 2013).

One of the factors that cause a decrease in a person's quality of life is visual impairment. Based on WHO data, there are 285 million people in the world who have visual impairment, of which 39 million people are blind and 246 million people have low vision. Globally, visual impairment is caused by 43% of refractive errors, 33% of cataracts and 2% of glaucoma(*WHO*, 2012). Refractive errors are known in the form of myopia, hypermetropia and astigmatism (Prof. dr. H. Sidarta Ilyas, 2012). Of all the refractive errors that exist, myopia ranks first as the most common refractive error suffered by the world's population (*WHO*, 2012). The incidence of myopia which has continued to increase in the last 50 years is

estimated to have affected 1.6 billion people worldwide. The Institute of Eye Research estimates that by 2020 the number of people with myopia will reach 2.5 billion people (Yu L, Zhi-Kui Li, Jin-Rong Gao, Jian-Rong Liu, 2011).

The location of this research was carried out at Daqu Elementary School Semarang because based on a preliminary study there was an increase in children with myopia, this was possibly caused by the online learning system which was almost 1.5 years old, thus requiring children to get used to using gadgets as a medium of learning or the freedom of children. to play games on the sidelines of learning because of the lack of supervision of working parents. The purpose of this research is to find out what factors can influence the incidence of myopia because the incidence of myopia is increasing with technological advances, especially the use of gadgets as a means of learning and playing games. This is what parents sometimes do not realize that the use of technology without supervision Old age can have a negative impact on eye health.

METHOD

This research is included in the explanatory research, which is to explain the relationship between the independent variable and the dependent variable through the hypothesis testing that has been formulated. The method used in this study is a survey method using a cross sectional survey approach (Notoatmojo, 2018) (Nursalam, 2019). The sample in this study were all students of Semarang City. The sampling technique used is saturated, which is taking all the population as samples who are willing to become research respondents. analysis of research results using the Chi-Square correlation test

RESULTS

Table 1.
Respondent Characteristics (n=58)

Variable	Category	f	%
Gender	Men	25	43.1 %
	Women	33	56.9 %
Heredity	No hereditary history	26	44.8%
	Father or Mother	27	46.6%
	both parents	5	8.6%
Melee activity	< 5 hours	25	43.1%
	5 s/d 10 hours	15	25.9%
	>10 hours	18	31.0%
Outdoor activities	< 3 hours	44	75.9%
	> 3 hours	14	24.1%
Myopia	No	25	43.1%
	Yes	33	56.9%

Table 1, it shows that the majority of respondents are male, most of them experience myopia due to hereditary factors from their parents, with close-range activities < hours, and long-distance activities < 3 hours.

Table 2 it shows that there is a relationship between the incidence of myopia and gender, heredity and activities at close range and distance activities.

Table 2.
Relationship Between the Incidence of Myopia and Gender, Heredity and Activities at Close Range and Distance Activities (n=58)

Variable	Category	Myopia incident				ρ
		No		Yes		
		f	%	f	%	
Gender	Laki Laki	22	88	3	12	ρ = 0,000 < 0,05 Ha received
	Perempuan	3	9.1	30	90.9	
Heredity	Tidak Ada	23	88.5	3	11.3	ρ = 0,000 < 0,05 Ha received
	Ayah/Ibu	2	7.4	25	92.6	
	Kedua Orang Tua	0	0	5	100	
Melee activity	< 5 jam	25	100	0	0	ρ = 0,000 < 0,05 Ha received
	4 s/d 10	0	0	15	100	
	> 10 jam	0	0	18	100	
Outdoor activities	< 3 hours	12	28.6	30	71.4	ρ = 0,000 < 0,05 Ha received
	> 3 hours	13	81.3	3	18.7	

DISCUSSION

Gender

Based on gender, women have more refractive errors than men. This is in accordance with the results of a study by the National Institute of Eye Health which stated that women had more refractive errors than men, where more than 26% of women aged 12 years and over had uncorrected vision problems due to refractive errors compared to men. In addition, it was found that 14% of women aged over 40 years had refractive errors compared to men aged 40 years and over. Based on various myopia studies including the Baltimore Eye Survey, Beaver Dam Eye study, Andhra Pradeesh Eye Disease Study, Visual Impairment Project, Tanjong Pagar Survey, it was found that the prevalence of myopia was higher in young adults and decreased in the older age group or over 65 years (Primadiani et al., 2017)(Porotu et al., 2015). In each age group, women experience more myopia than men. This is also in accordance with research in the United States which differentiated refractive errors based on gender and race, both black, white and Hispanic, it was found that all races with female sex were higher than male, namely women as many as 75,147,949 cases or 55%, while men only 67,500,444 cases or 45% (Kalangi, W., Rares, 2016) (Dianita Veulina Ginting, 2018). The results of this study are in accordance with the results with the theory above because gender is one of the causes of myopia (Porotu et al., 2015)(Pada et al., 2018).

Heredity

Genetic factors can pass on the nature of refractive errors to their offspring either autosomal dominant or autosomal recessive. Children with both parents suffering from myopia have a greater risk of developing myopia than children whose parents have myopia (Komariah, 2014) (RIZALDY, 2017) Family history of high myopia will also affect the degree of myopia (Tang, S. M., Rong, S. S., Young, A. L., Tam, P. O. S., Pang, C. P., & Chen, 2014) (Fivi, 2017). The results of this study are in accordance with the results of the research and the theory below that children with parents who have refractive errors tend to also have refractive abnormality (Yustina Elisa Febriany, Kentar Arimadyo, 2015).

Melee activity

Close work activities, such as reading and writing have been responsible for the remarkable increase in the prevalence of myopia. The cohort study showed that schoolchildren with a significantly greater incidence of myopia were closer to work and had a greater increase in axial length of the eyeball. A meta-analysis showed that more time spent on close work activities was associated with a higher likelihood of myopia. The odds for someone who works closely with myopia will increase by 2% for every 1 diopter-hour in a week. Therefore, close work is a strong important risk factor for myopia. The severity of the risk corresponds to intensity, such as the length of continuous reading and distance to close objects. When reading, the occurrence of myopia will also be influenced by the position, the adequacy of light when reading, the size of the letters or numbers that are read (Primadiani et al., 2017). Activities near nature for a long period of time can cause the eyes to accommodate continuously. Several studies have shown that the continuous increase in accommodation power causes the eyes to become less able to accommodate at other distances so that the eyes become nearsighted (Ramamurthy, D., Lin Chua, S. Y., & Saw, 2015). Melee activity such as studying are unavoidable, taking breaks for a certain period of time and preventing close reading can reduce the risk of close work(Huang H M, Dolly Shuo-Teh Chang, 2015).

As with reading and writing there has been a dramatic increase in the use of gadgets in recent years, Increased screen time is associated with the development of myopia (Bintari, 2021). The link between myopia and light is that brighter light can decrease myopia progression through narrowing of the pupil, resulting in less blurring of vision or through retinal stimuli which are known to act as inhibitors of eye growth. However, if the light is seen continuously when looking at the screen, it can cause continued accommodation of the lens of the eye which can cause eye fatigue. The part of the eye that is tired is the muscle that plays a role in pupil constriction. When this muscle is tired, the image cannot be focused precisely on the retina. The use of gadgets will relate to the presence of an image beam that allows for different forms of accommodation and the distance required to do this will have a different effect on myopia. The long duration of viewing the screen and the emission of blue light from the LED screen, the risk of developing myopia and the danger of blue light eyes should be a serious concern, especially in children. (Ramamurthy, D., Lin Chua, S. Y., & Saw, 2015).

The results of this study are in accordance with the above that close-up activities can affect myopia, that near-sight activities are a factor causing myopia through direct physical effects due to accommodation that occurs continuously, causing high ciliary muscle tone and convex lens. The closer the distance, the stronger the accommodation of the eye (Liwang F, Hanifati S, n.d.). The activity of looking closely at the monitor at an inappropriate distance will have a negative impact due to exposure to ultraviolet light. In addition, according to another theory, the long activity of seeing at close range will cause the formation of blurry images on the retina. This blurry image initiates chemical processes in the retina to stimulate biochemical and structural changes in the sclera and choroid that cause axial elongation (Ramamurthy, D., Lin Chua, S. Y., & Saw, 2015).

Outdoor activities

Outdoor activities in question do not have to be sports activities, but the factors that play a role in myopia are the length of time outdoor activities. Outdoor activities have recently been recognized as a protective factor for myopia. (Lestari et al., 2020) (Alifina, 2021). It can even overcome the risk factors for myopic parents if children spend enough time

outdoors per week. Meta-analysis studies have shown that people who spend a lot of time outdoors are less likely to develop myopia than people who are always indoors. Outdoor activity is a protective factor that can prevent myopia, but until now the mechanism is still unclear (Muhamedagic, L., Muhamedagic, B., Halilovic, E. A., Halimic, J. A. & A., & Muracevic, n.d.). The results of this study are consistent with the above that long-distance activities can affect myopia. A widely accepted hypothesis is that exposure to bright light stimulates the release of dopamine, which inhibits elongation of the eyeball (French, A. N., Ashaby, R. S., Morgan, I. G., & Rose, 2013).

CONCLUSION

Factors that influence the incidence of myopia in SD Daqu Semarang are gender, heredity, close-up activities, outdoor activities.The highest incidence of myopia is children with female sex as much as 33 (56.9%), there is a history of hereditary myopia as much as 27 (46.6%), close distance activities < 5 hours as many as 25 (43.1%) and long distance activities < 5 hours as many as 25 (43.1%). The cause of myopia is when light enters the eye, it falls inappropriately on the retina, this condition occurs because the shape of the eyeball with myopia is longer than that of a normal eyeball, where the most related and influential myopia events are hereditary factors, short-range activities , gender and long-distance activities.

REFERENCES

Alifina, N. (2021). Hubungan Aktivitas Luar Ruangan dengan Miopia Mahasiswa Kedokteran Angkatan 2019 Universitas Andalas. *JIKESI (Jurnal Ilmu Kesehatan)*, *2* no *1*.

Badan Penelitian dan Pengembangan Kesehatan Kementrian Kesehatan RI Riset Kesehatan Dasar. (2013).

Bintari, R. H. (2021). Kecanduan Gadget di Masa Pandemi covid-19 pada Siswa Kelas XII MIPA SMAN 1 Sutojayan Kabupaten Blitar. *Jurnal Kesehatan Hesti Wira Sakti*, *8*(2). https://doi.org/10.47794/jkhws.v8i2.294

Dianita Veulina Ginting, P. O. A. (2018). Hubungan Usia Dan Jenis Kelamin Dengan Jenis Kelainan Refraksi Pada Anak Di Pusat Mata Nasional Rumah Sakit Mata Cicendo. *Departemen Ilmu Kesehatan Mata Fakultas Kedokteran Universitas Padjadjaran Pusat Mata Nasional Rumah Sakit Mata Cicendo*.

Fivi, S. (2017). *Hubungan Faktor Keturunan Dan Gaya Hidup Dengan Kejadian Miopia Pada Anak Usia Sekolah Di Balai Kesehatan Indera Masyarakat Sumatera Barat Tahun 2017*.

French, A. N., Ashaby, R. S., Morgan, I. G., & Rose, K. A. (2013). *Time outdoors and the prevention of myopia. Experimental Eye Research*.

Huang H M, Dolly Shuo-Teh Chang, P.-C. W. (2015). The Association between near work activities and myopia in children. *A Systematic Review and Meta-Analysis*, *one*, 10(10):1–15.

Kalangi, W., Rares, L. & S. V. (2016). Kelainan Refraksi di Poliklinik Mata RSUP Prof. Dr.R.D. Kandaou Manado Periode Julil 2014 -Juli 2016No Title. *Junal Kedokteran Klinik (JKK)*, *1* no *1*, 1–9.

Komariah, C. (2014). Hubungan Status Refraksi, dengan Kebiasaan membaca, Aktivitas di Depan Komputer, dan Status Refraksi Orang Tua pada Anak Usia Sekolah Dasar. *Jurnal Kedokteran Brawijaya*, *28*(2), 137–140.

Lestari, T. T., Anggunan, A., Triwahyuni, T., & Syuhada, R. (2020). Studi Faktor Risiko Kelainan Miopia Di Rumah Sakit Pertamina Bintang Amin. *Jurnal Ilmiah Kesehatan Sandi Husada*, *11*(1), 305–312. https://doi.org/10.35816/jiskh.v11i1.275

Liwang F, Hanifati S, P. E. (n.d.). *Kapita Selekta Kedokteran* (4 (Ed.)). Media Aesculapius.

Muhamedagic, L., Muhamedagic, B., Halilovic, E. A., Halimic, J. A., S., & A., & Muracevic, B. (n.d.). Relation between near work and myopia progression in student population. *Materia Socio-Medica*, 26(2): 100–3.

Notoatmojo, S. (2018). *Metodologi Penelitian Kesehatan*. PT Rineka Cipta.

Nursalam. (2019). *Konsep & Penerapan Metodologi Penelitian Ilmu Keperawatan*. Rineka cipta.

Pada, M., Smp, P., Perkotaan, D. I., & Di, D. A. N. (2018). *Faktor-faktor yang mempengaruhi kejadian miopia pada pelajar smp di perkotaan dan di pedesaan skripsi*.

Porotu, L. I., Joseph, W. B. S., & Sondakh, R. C. (2015). Faktor-faktor yang Berhubungan dengan Ketajaman Penglihatan pada Pelajar Sekolah Dasar Katolik Santa Theresia 02 Kota Manado. *E-Journal Universitas Sam Ratulangi*, *4*(1), 31–39. http://ejournal.unsrat.ac.id/index.php/kesmas/article/download/7237/6739

Primadiani, I. S., Rahmi, F. L., & Miopia, P. (2017). Faktor-Faktor Yang Mempengaruhi Progresivitas Miopia Pada Mahasiswa Kedokteran. *Diponegoro Medical Journal (Jurnal Kedokteran Diponegoro)*, *6*(4), 1505–1517.

Prof. dr. H. Sidarta Ilyas. (2012). *Ilmu Penyakit Mata*.

Ramamurthy, D., Lin Chua, S. Y., & Saw, S.-M. (2015). A review of environmental risk factors for myopia during early life, childhood and adolescence. *Clinical and Experimental Optometry*, 98(6): 497–506.

RIZALDY, M. I. (2017). *Hubungan Faktor Keturunan Dengan Miopia Pada Mahasiswa Fakultas Kedokteran Dan Ilmu Kesehatan Universitas Muhammadiyah Yogyakarta*.

Tang, S. M., Rong, S. S., Young, A. L., Tam, P. O. S., Pang, C. P., & Chen, L. J. (2014). *Optometry and Vision Science*.

WHO, (2012).

Yu L, Zhi-Kui Li, Jin-Rong Gao, Jian-Rong Liu, C.-T. X. (2011). Epidemiology, genetics and treatments for myopia. *International Journal of Ophthalmology*, *4*, (6):658–69.

Yustina Elisa Febriany, Kentar Arimadyo, T. D. (2015). *Faktor risiko miopia pada mahasiswa Fakultas Kedokteran Universitas Diponegoro angkatan 2011- 2014*.