



## Risk Factors Relate to Visual Acuity in School Age Students of Public Primary School (SDN) 07 Pondok Labu South Jakarta

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### Abstract

Vision is one of the most important factors in the education process. Abnormalities of visual acuity in school-age children will impact their achievement. Myopia is appointed by WHO as one priority to restrain and prevent world blindness in 2020. Refraction disorder is third rank (0.14%) of blindness cause in Indonesia after cataract (0.78%) and glaucoma (0.20%). Jakarta itself has a 0.5% incidence of refraction disorder. This study was aimed to discover which factors determined the most to declining visual acuity which caused myopia. This was an observational analytic study with a cross-sectional design from August – October 2017. The samples were all 144 students of fifth and sixth grade at Public Primary School (SDN) 07 Pondok Labu South Jakarta that compiled the criteria. Bivariate analysis results obtained that relation between risk factors with myopia occurrence with p-value of myopia family history 0.048 [OR=2.17(1.07-4.40)], knowledge 0.961 [OR=0.76(0.29-1.99) and, OR=0.90(0.39-2.05)], attitude 0.947 [OR=0.92(0.46-1.83)], behavior 0.149 [OR=0.43(0.18-1.02) and, OR=0.72 (0.32-1.63)], screen time 1.000 [OR=0.99(0.51-1.91)], reading position 0.497 [OR=1.40(0.66-2.99)] dan reading distance 0.283 [OR=2.00(0.71-5.58)]. In conclusion, there was a relation between myopia family history with visual acuity and there was no relation between knowledge, attitude, behavior, screen time, reading position, dan reading distance with visual acuity. The main cause of myopia is the long anteroposterior axis of bulbus oculi that inherited from parents to children.

### Introduction

Visual acuity is one of the most important factors in the educational process. In the conventional classroom studying process, visual acuity becomes the most significant factor due to the ratio of class area to the number of students that often inadequate. The ability to see clearly in the classroom would affect the students to understand the lessons. Minimal decreased visual acuity might not be realized by the students because their self-awareness is not adequate yet. Teachers sometimes do not comprehend the student's condition referred to as visual acuity. Mild decreased visual acuity if ignored would cause vision disruption and become severe that finally affect student

achievements (Basri, 2014; SM et al., 2003; Sutrisna et.al., 2007).

Based on the development of eyeball anatomy, children myopia prevalence increased with age. High prevalence was found in several Asian countries as high as 70 -90%, Europe and US 30 – 40%, and Africa 10 - 20% (Mutti et.al., 2002). Myopia had been appointed by WHO as one of the priorities to control and prevent world blindness in 2020 (WHO, 2007).

Visual impairment still becomes a social problem in Indonesia. It is important to check up and treat the eye regularly at an early age. In children, annually eye screening should be held to detect decreased visual acuity that could influence school activities (Basri, 2014;

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Tiharyo et.al., 2008). In Indonesia, refraction abnormality is the main eye disease. Refraction cases increase every year. In Indonesia, almost 25% of the population or 55 million people suffer refraction disorders. Refraction disorder is third rank (0.14%) of blindness cause in Indonesia after cataract (0.78%) and glaucoma (0.20%). Jakarta itself has a 0,5% incidence of refraction disorder (Indonesia, 2016).

In accordance with the WHO report in Fauzi et.al., (2016) stated that ninety percent of visual impairment cases occurred in developing countries. Generally, refraction disorder that does not correct (myopia, hyperopia, and astigmatism) is the cause of visual impairment, while cataract is the primer cause of blindness in developing countries. Eighty percent of visual impairment is actually preventable and treatable (Fauzi, Anggorowati et.al., 2016; World Health Organization, 2015).

In pursuance of Indonesia Health Ministry in Fauzi (2016) that visual impairment and blindness in Indonesia increased with the prevalence of 1.5% and was highest compared to blindness number in Asian regional countries. From Indonesia Health Ministry survey of 8 provinces (West Sumatera, South Sumatera, West Java, Central Java, East Java, North Sulawesi, South Sulawesi, West Southeast Nusa) 1996 found refraction disorder as many as 24,71% and was in the first rank in 10 most eye diseases in Indonesia (Fauzi et al., 2016; Kementerian Kesehatan Republik Indonesia, 2010). Around 80-85% of the learning process relies on poor sight and visual acuity could impact children's development, particularly visual depending skill. Visual impairment that does not correct would affect academic achievement and social behavior. Even farther this could cause a work accident in the future, also become an economic burden to the country (Saminan, 2013).

School myopia is a disorder that frequently found in school-age children and tends to increase along with age. Children myopia also has a chance to be progressive. School myopia risk factors are very complex (Basri, 2014; Tiharyo et al., 2008). Genetic and environmental factor are expected as the cause of children's variation of myopia emergence (Basri, 2014). The majority of children with

myopia have parents with myopia too. Types of research also stated the relation between myopia with closed distance reading habits in children (Mutti et al., 2002).

Close distance reading activity duration and habit were risk factors of myopia. Close distance sight activity employs eye capability to accommodate. Normally accommodation process takes place when the eye sees an object as far as 5 – 6 meters. The longer the accommodation process occurs, the eyes will get exhausted and this condition will trigger blurring in retina and eyes will not be focused (Saminan, 2013).

Visual acuity impairment could be detected by a simple examination using the Snellen chart. This research aimed to discover several factors that related to children myopia (family myopia history, attitude, behaviour, screen time, reading position, and reading range).

#### **Method**

This study was observational analytic with cross-sectional method. The population of this study was fifth and sixth-grade students of SDN 07 Pondok Labu South Jakarta. The inclusion criteria of this study were aged between 9 – 11 years old. While the exclusion criteria were the student with eye impairment besides refraction disorder (strabismus, juvenile cataract). The sample calculation was done by the proportion difference hypothesis test sample size formula, with confidence interval 95%. The sample was taken by total sampling that fulfills inclusion and exclusion criteria as many as 114 students.

Data obtained was primary data and taken at SDN 07 Pondok Labu South Jakarta on August – October 2017 after ethical clearance received from Health Research Ethics Committee of Pembangunan Nasional "Veteran" Jakarta University (Number B/1178/VIII/2017/KEPK). There were 67 fifth grade students and 77 sixth grade students.

The research instrument used were a questionnaire and the Snellen chart. The questionnaire was tested for its validity and reliability. The validity and reliability of the questionnaire was tested. The sample amount used to test validity and reliability was 30 samples. Pearson correlation test was used. The total question for the level of knowledge was

10 questions with  $r$  between 0.423-0.511 and Cronbach alpha 0.691. This means all questions were valid and reliable. Total question for attitude was 10 questions with  $r$  between 0.366-0.551 and Cronbach alpha 0.697. This means all questions were valid and reliable. The total question for behavior was 10 questions with  $r$  between 0.473-0.660 and Cronbach alpha 0.897. This means all questions were valid and reliable. Visual acuity examination was conducted. Obtained data were analyzed univariate and bivariate. Univariate analysis was to describe a respondent characteristic, myopia history, knowledge level, attitude, behavior, screen time, reading position, reading range, and visual acuity. Bivariate analysis was done by Chi-square and Fisher or Kolmogorov Smirnov test to analyze factors that relate to visual acuity of SDN 07 students, Pondok Labu South Jakarta.

### Result and Discussion

Tabel 1. Respondent Characteristic

	N	%
Age		
9 years old	4	2.8
10 years old	33	22.9
11 years old	70	48.6
12 years old	37	25.7
Total	144	100
Sex		
Male	84	58.3
Female	60	41.7
Total	144	100
Class		
5A	34	23.6
5B	33	22.9
6A	35	24.3
6B	42	29.2
Total	144	100

Source: Primer Data 2017

The respondent that involved in this research were 114 students, who were students of fifth and sixth-grade at SDN 07 Pondok Labu South Jakarta. The majority of the students aged 11 years old, 70 students (48.6%), most of them

were male, 84 students (58.3%) and most of them came from VIB class, 42 students (29.2%).

Table 1 shows that most of the fifth and sixth-grade students of SDN 07 Pondok Labu South Jakarta had the family history of myopia as many as 91 students (63.2%), most of the respondents had average knowledge as many as 77 students (53.5%). Ninety-three students (64.6%) had a low attitude and 57 students (39.6%) had average behavior. Most of the students had screen time more than 2 hours as many as 78 students (54.2%). As many as 108 students (75%) had sat upright reading position. Visual acuity screening resulted from most of the students were emetrop as many as 81 students (56.3%) and the rest had myopia.

Table 2 shows that most students with a family history of myopia suffer Myopia as many as 46 students (50.5%) and students with no family history of myopia were emetrop as many as 36 students (67.9%). Chi-Square test  $p$ -value = 0.048 means there was a relationship between family history of myopia with visual acuity of fifth and sixth-grade SDN 07 students at Pondok Labu South Jakarta. This was consistent with the theory stated that environmental and genetic factors play a role in myopia occurrence. A genetic factor that plays a role in myopia is not only 1 gene but rather multiple genes. Parents with myopia have the predisposition of children with myopia too (Basri, 2014). This research was in accordance with Kristianti's research (2008) that stated there was a significant relation between family history of myopia and myopia incidents of Faculty of Medicine University of Gajah Mada students class of 2004 – 2006 with  $p$ -value = 0.005. But this study was not in accordance with research by Rahimi et.al., (2015) that stated there was no relationship between parents with myopia and children who suffered myopia which was students of a high school at Padang. This study didn't support a research by Rizky, Eka dan Deviani (2014) that stated the genetic factor did not relate to myopia with  $p$ -value = 3.055 (Rizky et.al., 2014). Besides that, this study was also not in accordance with a research by Purwanto S (2010) that stated there was no relation between the genetic factor and myopia incidents at SMAN 2 Palembang students.

The table above also shows most of the

Table 2. Distribution Factors Relate to Visual Acuity

	Frequency	%
<b>Myopia History</b>		
Yes	91	63.2
No	53	36.8
Total	144	100
<b>Level of Knowledge</b>		
Low	35	24.3
Average	77	53.5
Good	32	22.2
Total	144	100
<b>Attitude</b>		
Low	93	64.6
Average	49	34
Good	2	1.4
Total	144	100
<b>Behaviour</b>		
Low	48	33.3
Average	57	39.6
Good	39	27.1
Total	144	100
<b>Screen time</b>		
>2 hours	78	54.2
<= 2 hours	66	45.8
Total	144	100
<b>Reading Position</b>		
Do not sit up right	36	25
Sit up right	108	75
Total	144	100
<b>Reading distance</b>		
< 30 cm	17	11.8
30 cm	127	88.2
Total	144	100
<b>Visual Acuity</b>		
Myopia	63	43.8
Emetrop	81	56.3
Total	144	100

Source: Primer Data 2017

Table 3. Factors Relate to Visual Acuity

		Visual Acuity						p-value	OR (IK 95%)
		Myopia		Emetrop		Total			
		N	%	N	%	N	%		
Family History of Myopia	Yes	46	50.5	45	49.5	91	100	0.048	2 . 1 7 (1.07 - 4.40)
	No	17	32.1	36	67.9	53	100		
	Total	63	43.8	81	56.3	144	100		
Knowledge	Low	14	40	21	60	35	100	0.961	0 . 7 6 ( 0 . 2 9 - 1.99)
	Average	34	44.2	43	55.8	77	100		
	Good	15	46.9	17	53.1	32	100		
Attitude	Total	63	43.8	81	56.3	144	100	0.947	0 . 9 2 (0.46 - 1.83)
	Low	40	43	53	52.3	93	100		
	Average + Good	23	45.1	28	54.9	51	100		
Behaviour	Total	63	43.8	81	56.3	144	100	0.149	0 . 4 3 (0.18 - 1.02)
	Low	16	33,3	32	66.7	48	100		
	Average	26	45.6	31	54.4	57	100		
Screen Time	Good	21	53.8	18	46.2	39	100	1.000	0 . 7 2 (0.32 - 1.63)
	Total	63	43.8	81	56.3	144	100		
	>2 hours	34	43.6	44	56.4	48	100		
Reading Position	≤ 2 hours	29	43.9	37	56.1	57	100	0.497	0 . 9 9 (0.51 - 1.91)
	Total	63	43.8	81	56.3	144	100		
	Do Not Sit Upright	18	50	18	50	36	100		
Reading Distance	Sit Upright	45	41.7	63	58.3	108	100	0.283	1 . 4 0 (0.66 - 2.99)
	Total	63	43.8	81	56.3	144	100		
	< 30 cm	10	58.8	7	41.2	17	100		
	30 cm	53	55.6	74	71.4	127	100	0.283	2 . 0 0 ( 0 . 7 1 -5.58)
	Total	63	43.8	81	56.3	144	100		

Source: Primer Data 2017

students with less knowledge level as many as 21 students (60%), average knowledge level 43 students (55.8%) and good knowledge level 17 students (53.1%). Chi square test p-value = 0.961 means, there was no relation between knowledge level to visual acuity of a fifth and sixth-grade students of SDN 07 Pondok Labu South Jakarta. The same table also stated that students with low attitude as many as 53 students and average and good attitude 28 students (54.9%) were emetrop. Chi square test p-value = 0.947 means that there was no relation between attitude and visual acuity of students of SDN 07 Pondok Labu South Jakarta. This is in accordance with Usman's et.al., research (2014)

that stated there was no significant relation between prevention attitude towards myopia to myopia incidents of Medical Faculty Riau University students class of 2010, 2011 and 2012 with p-value = 0.144 (Usman et.al., 2014). In this study, most students with low, average, and good attitudes were emetrop, so there was no relation between attitude and visual acuity with p-value = 0.419. This study was not in accordance with a research by Aristyana M, Wahyu RA dan Galih Setia A (2016) that stated there was the relationship between attitude and myopia incidents at school-age students in Solo Eye Hospital with p-value = 0.000 (Aristyana et.al., 2016).

This table also shows that students who had low behavior as many as 32 students (66.7%), average behavior 31 students (54.4%) and good behavior 18 students (46.2%) were emetrop. Chi square test p value = 0.149 means there was no relation between behavior and visual acuity of students SDN 07 Pondok Labu South Jakarta. This study was not in accordance too with research by Lenawati H dan Eka Rudi (2010) that stated there was a positive relationship between study behavior with myopia incidents of Pamenang Nursing Academy Pare with p-value = 0.000 and coefficient correlation 0.707.

Table 3 also shows students with screen time more than 2 hours as many as 44 students (56.4%) and screen time less than 2 hours 37 students (56.4%) were emetrop too. By Chi square test p value = 1.000 which means there was no relation between screen time and visual acuity of students SDN 07 Pondok Labu South Jakarta. This was not in accordance with Porotu's (2015) research that stated there was a relationship between screen time and visual acuity of Catholic Santa Theresa 02 students at Manado. This study was also different with Rudhiati's (2015) research that stated there was a relation between video game playing duration and visual acuity of school-age student (third, fourth, and fifth grades) at SDN Majalaya 2 with p-value = 0.0001.

Table 3 also shows students sit upright and not sit upright as many as 18 students each (50%) between myopia and emetrop. By Chi square test p value = 0.497 means that there was no relation between reading position and visual acuity of students SDN 07 Pondok Labu South Jakarta. This result was supported by Andrias's research that stated there was no relation between reading-writing position and refraction disorder at fifth-grade students of SDN X Semarang, with p-value = 0.324. (Andrias et.al., 2015). Porotu's research also stated there was no relation between reading position and visual acuity at students of Catholic Santa Theresia School 02 at Manado with p-value = 0.114 (Porotu' et al., 2015).

This table also shows students with a reading distance less than 30 cm mostly myopia as many as 10 students (58.8%), while students with reading distance more than 30 cm mostly

emetrop as many as 53 students (58.3%). Chi square test p-value = 0.283 which means there was no relation between reading distance and visual acuity of students SDN 07 Pondok Labu South Jakarta. This result was in accordance with Kristianti's research that stated there was no significant relation between a reading distance and myopia with p-value = 0.869 (Kristianti et al., 2008). This study was also in accordance with Andrias's research that stated there was no relation between writing - reading distance and myopia at fifth-grade students at SDN X Semarang with p-value = 0.474. (Andrias et al., 2015). This study was also not in accordance with Porotu's (2015) research that stated there was no relation between reading distance and visual acuity of Catholic Santa Theresia 02 School at Manado (Porotu' et al., 2015).

The limitation of this study, there was no classification of screen time variety (watching TV, gadgets or both). This study only classified refraction disorder as myopia with or without astigmatism.

### Conclusion

Conclusion of this research that there was relation between myopia family history and visual acuity of fifth and sixth-grade students of SDN 07 Pondok Labu South Jakarta, but there was no relationship between knowledge, attitude, behavior level, screen time, reading position, reading distance and visual acuity of fifth and sixth-grade students of SDN 07 Pondok Labu South Jakarta.

Students with myopia family history are recommended to examine their visual acuity as early as possible to prevent myopia risk. Public Health Center which responsible for this school is suggested to do a routine screening of student visual acuity.

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