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Factors Occurrence of Refractive Error in Grade 3 Junior High School Al-Azhar in Medan City 2018

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Abstract: ***Objective: To examine the influences of multifactors causing refractive error in a population based sample of grade 3 Junior High School Al-Azhar children. Method: The study was conducted on junior high school students of Al-Azhar Medan 3rd grade. Students were collected for a visual acuity examination of vision using Snellen Chart and Trial Lens and then filled out the prepared questionnaires, were interviewed by trained fieldworkers using a structured questionnaire. Then collected data and presented in tabulation of data. Results: With chi-square test found significant relationship between female gender, genetic history, reading while sleeping and reading with unfit sitting position, doing outdoor activities after school and the intensity of exercise in a week with the occurrence of refractive error in grade 3 student of Junior High School Al-Azhar Medan. By multivariate analysis test, from all variables in this research, found 2 variables that directly affect the refractive error, there are the history of parents always use glasses and reading books while lying down. Conclusions: History of parents always use glasses and reading position while sleeping is the factor that most affect the occurrence of refractive errors in grade 3 students of Junior High School Al-Azhar Medan in 2018.***

Keywords: Refractive error, Al-Azhar junior high school, multivariate test

1. Introduction

Refractive error is a state of image not formed on the retina. In general, there is an imbalance of the vision system in the eye resulting in a blurry image.[1,2,3,4,5] The rays are not refracted exactly on the retina, but can be in front of or behind the retina and not located at one focal point.[1,2,3,4] Myopia is the most common refractive error globally, with an estimated 1.44 billion people affected, equal to 22.6% of the world's population.[6,7,8] The prevalence of myopia has increased worldwide during the 20th century, and is now considered to have reached an epidemic level, especially in some populations including those from East Asia where prevalence estimates often exceed 80%.[8,9,10] Although the precise cause of myopia is unknown, experimental, clinical, and epidemiological studies have shown that myopia is influenced by both genetic and environmental mechanisms.[10,11] Some studies sugessted that myopia is influenced by heredity (genetic) and high near-work activity, such as reading and playing computer games or mobile phones.[10,11] Proper reading techniques (reading position, reading distance, reading time and lighting) are needed to prevent myopia from occurring early.[10,11] In addition to activity, myopia is also associated with genetics. Children with parents whose myopia tends to experience myopia. In America, the prevalence of myopia in children with both parents of myopia is 32.9%, whereas 18.2% in children with one parent is myopia and less than 6.3% in children with parents without myopia.[5,6,7,12] In Indonesia refractive error is the most cause of vision disorder. Based on the 1993-1996 Hearing and Impaired Health Surveys survey, refractive error ranks first in 10 major eye diseases in Indonesia with a prevalence of 22.1%.[13,14] According to data obtained from Basic Health Research (Riskesdas) in 2013 in North Sumatra, showed the prevalence of wearing glasses or contact lenses are 4.0%.[15] Myopia is a major cause of vision abnormality in the world, especially in adolescents. It is estimated that 10% of the 66 million school-age children in the world suffer from refractive error of myopia with the highest prevalence at the age of 13 to 18 years.[16,17]

Refraction examination is a basic examination, but it is crucial to determine the next step in diagnostics and therapy.[18,19] In this study refractive examination will be done by using subjective refractive methods.[18,19] The disadvantage of this method, however, is that the refraction depends entirely on the response of the patient, requiring good communication between the doctor and the patient.[18,19.] In this population based study, we use snellen chart and trial lens for examination procedure of refractive error in grade 3 Al-Azhar junior high school students.

2. Methods

This study was analytic cross sectional series by taking data on Al-Azhar Junior High School grade 3 from January to February 2018. Data were taken from subject group divided into two groups using the five variables and analyzed. The inclusion criteria for this study were grade 3 students with refractive error who were willing to be sampled for the study. The exclusin criteria were students with the abnormalities in anterior and posterior segment, students with systemic diseases, students with orbital tumor, students with congenital abnormalities and students who are uncooperative during examination. The sample data were collected by performing a sharp visual examination using snellen chart and trial lens and then filled out the prepared questionnaires, were interviewed by trained fieldworkers using a structured questionnaire. The visual acuity divided into normal vision and vision with refractive error. The data were processed using Chi-Square Test and Multiple Logistic Regression Test. All statistical tests used p <0.05 as a meaning margin with SPSS software.

3. Results

This study was a population based analytic series that aims to examine the influences of multifactors causing refractive error in a population based sample of grade 3 Junior High School Al-Azhar children. They were 108 students with refractive error and 89 students with normal vision. Total sample was 197 students.

Table 3.1: Distribution of Subjects Based on Respondent Characteristic Data

Characteristic	Visual Acuity				Total		p.
	Normal		Refraction Error				
	n	%	N	%	n	%	
Gender							
- Men	57	52,3	52	47,7	109	100,0	0,026*
- Woman	32	36,4	56	63,6	88	100,0	
Age							
- 13 y.o	27	47,4	30	52,6	57	100,0	
- 14 y.o	59	45,4	71	54,6	130	100,0	0,594
- 15 y.o	3	30,0	7	70,0	10	100,0	
Tribes							
- Batak	34	55,7	27	44,3	61	100,0	
- Melayu	5	33,3	10	66,7	15	100,0	
- Padang	11	55,0	9	45,0	20	100,0	
- Jawa	18	39,1	28	60,9	46	100,0	
- Mandailing	11	44,0	14	56,0	25	100,0	0,459
- Karo	3	37,5	5	62,5	8	100,0	
- China	0	0	1	100,0	1	100,0	
- Aceh	7	35,0	13	65,0	20	100,0	
- Arab	0	0	1	100,0	1	100,0	
Class							
- Plus A	14	50,0	14	50,0	28	100,0	
- Plus B	16	55,2	13	44,8	29	100,0	
- Bilingual A	9	42,9	12	57,1	21	100,0	
- Bilingual B	11	44,0	14	56,0	25	100,0	
- Bilingual C	8	40,0	12	60,0	20	100,0	0,906
- Tahfiz	10	38,5	16	61,5	26	100,0	
- Regular	11	39,3	17	60,7	28	100,0	
- SKS	10	50,0	10	50,0	20	100,0	
Parent's Job							
- Entrepreneur	58	50,4	57	49,6	115	100,0	
- Government employees	20	34,5	38	65,5	58	100,0	
- Doctor	1	25,0	3	75,0	4	100,0	
- Housewife	2	100,0	0	0	2	100,0	
- Police	4	66,7	2	33,3	6	100,0	0,117
- Lecturer	0	0	2	100,0	2	100,0	
- Teacher	4	50,0	4	50,0	8	100,0	
- Notary public	0	0	2	100,0	2	100,0	
Total	89	45,2	108	54,8	197	100,0	

* Chi-Square test, significant <0.05

In table 3.1. above shows that more girls student have refractive error that is as much 56 people (63,6%) compared with normal eye that is as much as 32 people (36,4%). Fewer boys student had refractive error of 52 people (47.7%) compared with the normal eye of 57 people (52.3%). By using Chi Square test obtained P <0,05. This shows there is a relationship between the sexes with the occurrence of refractive error.

Table 3.2: Distribution of Subjects by Family History

Family History	Visual Acuity						
	Visual Acuity				Total		**P**
	Normal		Refractive Error				
	n	%	n	%	n	%	
Parents Using Glasses							
- Yes	51	39,8	77	60,2	128	100,0	
- No	38	55,1	31	44,9	69	100,0	0,040*
Total	89	45,2	108	54,8	197	100,0	
If Yes, from							
- Father or mother	25	32,5	52	67,5	77	100,0	
- Father and mother	26	51,0	25	49,0	51	100,0	0,036*
Total	51	39,8	77	60,2	128	100,0	
Siblings usuing glasses							
- Yes	24	45,3	29	54,7	53	100,0	
- No	65	45,1	79	54,9	144	100,0	0,986
Total	89	45,2	108	54,8	197	100,0	
Parents always wearing glasses							
- Yes	78	50,0	78	50,0	41	100,0	
- No	11	26,8	30	73,2	156	100,0	0,008*
Total	89	45,2	108	54,8	197	100,0	

* Chi-Square test, significant <0.05

In Table 3.2. above obtained the relationship between the history of parents using glasses with refractive error, where in respondents whose parents use glasses refractive error is more than 77 people (60.2%) compared with the normal eye only 51 people (39.8%). Parents who do not use glasses have children with refractive error as many as 31 people (44.9%), this number is less when compared with the normal eye that is as many as 38 people (55.1%). By using Chi Square test obtained P <0,05. This shows there is a relationship between the history of parents using glasses with the occurrence of refractive error.

In table 3.2. above obtained the relationship between the history of the use of glasses on one or both parents with refractive error, where only the father or mother using glasses obtained more who experience refractive disorder of 52 people (67.5%) than the normal eye that is 25 people (32 , 5%). In both parents who use the glasses found more in the normal eye that is 26 people (51.0%) than the refractive error of 25 people (49.0%). By using Chi Square test obtained P <0,05. This suggests there is a relationship between the father or mother and the use of glasses with the occurrence of refractive error. In table 3.2. siblings using glasses by using Chi Square test obtained P> 0,05. This shows no relationship between siblings using glasses with the occurrence of refractive error And in table 3.2. above obtained the relationship between the history of parents who always use glasses with refraction error, where the parents who always use glasses found refractive error as much as the normal eye that is 78 people (50.0%), while the parents are not always using glasses found as many as 30 people (73.2%) who experienced refractive error compared to normal eye only 11 people (26.8%). By using Chi Square test obtained P <0,05. This shows there is a relationship between parents who always use glasses with the occurrence of refractive error.

Table 3.3: Distribution of Subjects by Distance Viewing Activity

Reading Distance	Visual Acuity				Total		p.
	Normal		Refractive Error				
	N	%	N	%	n	%	
Eye distance with the book while reading							
- 30 cm	39	51,3	37	48,7	76	100,0	
- < 30 cm	50	41,3	71	58,7	121	100,0	
Total	89	45,2	108	54,8	197	100,0	0,170
Often reading while lying down							
- Yes	43	36,8	74	63,2	117	100,0	
- No	46	57,5	34	42,5	80	100,0	0.004*
Total	89	45,2	108	54,8	197	100,0	
Reading with a straight sitting position							
- Yes	40	58,0	29	42,0	69	100,0	
- No	49	38,3	79	61,7	128	100,0	0,008*
Total	89	45,2	108	54,8	197	100,0	
Using lights while reading							
- Yes	25	47,2	28	52,8	53	100,0	
- No	64	44,4	80	55,6	144	100,0	
Total	89	45,2	108	54,8	197	100,0	0,733

* Chi-Square test, significant <0.05

In Table 3.3. above obtained the relationship between reading position while lying down with the occurrence of refractive error, where the students who like to lying down when reading found 74 people (63.2%) experienced refractive error and the students who did not lying down when reading was found as many as 34 people (42.5 %) had refractive error. By using Chi Square test obtained P <0,05. This shows there is a relationship between lying down position when reading a book with the occurrence of refractive error. In Table 3.3. above obtained the relationship when reading not with the straight sitting position with refractive error, where the students who sit unsteady when read encountered as many as 79 people (61.7%) experiencing refractive error and the students who sat straight when reading was found as many as 29 people (42.0%) had refractive error. By using Chi Square test obtained P <0,05. This shows that there is a relationship between a firm sitting position when reading a book with the occurrence of refractive error.

Table.3.4: Distribution of Subjects Based on Use of Electronic Devices

Television	Visual Acuity				Total		p.
	Normal		Refractive Error				
	n	%	N	%	n	%	
TV viewing distance							
- <1,5 m	26	40,6	38	59,4	64	100,0	
- >1,5 m	63	47,4	70	52,6	133	100,0	0,373
Total	89	45,2	108	54,8	197	100,0	
Average length of watching TV in one use							
- <1 hours continued	48	42,9	64	57,1	112	100,0	0,453
- >1 hours continued	41	48,2	44	51,8	85	100,0	
Total	89	45,2	108	54,8	197	100,0	

* Chi-Square test, significant <0.05

From table 3.4. above on the distribution of subjects based on the use of electronic devices using the chi-square test obtained P> 0.05 so this shows no relationship between the use of electronic devices with the occurrence of refractive error.

Table 3.5: Distribution of Subjects Based on Outdoor Activity Data

	Visual Acuity				Total		p.
	Normal		Refractive error				
	n	%	n	%	n	%	
Activities after school done							
- Indoor activities	48	38,4	77	61,6	125	100,0	0,012*
- Outdoor activities	41	56,9	31	43,1	72	100,0	
Total	89	45,2	108	54,8	197	100,0	
Intensity doing exercise in a week							
- 0-5 hours a week	71	49,7	72	50,3	143	100,0	
- 6-9 hours a week	18	33,3	36	66,7	54	100,0	
Total	89	45,2	108	54,8	197	100,0	0,040*

* Chi-Square test, significant <0.05

In table 3.5. above by using chi-square test showed a significant relationship between outdoor activities after school done and the intensity doing exercise in a week with the occurrence of refractive error.

4. Discussion

4.1. Responden Characteristic

In table 3.1. It is seen that the frequency of most subjects is male, that is as many as 109 people and subjects of female as many as 88 people. In this table shows that the history of refraction error experienced by female subjects are 56 people (63,6%) from all research subject, while the male is 52 people (47,7%). By using Chi Square test obtained P <0,05. This shows there is a relationship between the sexes with the occurrence of refractive error. The results of this study have similarities with research conducted Rosman M. (2009) and Fachrian (2009). According to research Rosman M (2009), refractive error is more common in women than men (61.1% versus 49.3%). While the results of Fachrian's research (2009) showed that the number of female respondents (53.2%) more than men (46.8%).[20,21] Women have a higher axial length of the eyeball, and have more deep vitreous chamber than in men. This allows women to have higher refractive error than men.

4.2. Family History

Some studies indicate heredity is the most important factor causing refractive error. Parents who have refractive error tend to have children with refractive error. Research Goss mentions, the prevalence of 33-60% of myopia in children with both parents of myopia, in children who have one parent myopia the prevalence 23-40%, and only 6- 15% of children experience myopia that has no parent myopia.[22] In accordance with the results of these studies, there is a heredity factor that underlies a person experiencing refractive error. In the data from this study found 60.2% of respondents have a history of parents who suffer from refraction error, either from both parents, from the father, or from the mother. This may be due to genetically related factors x heretozygously from the mother or the female.[23,24]

This study is in accordance with research conducted by Melita Perty Arianti where from 44 respondents who experienced myopia, 18 respondents have a history of

myopia in the family, while from 26 respondents who did not experience myopia, 3 people have a history of myopia in the family and obtained p value 0.010 obtained by Chi-Square test.[25]

4.3. Near work Activity

The result of statistical test in this research about the relationship between long activity of near work activity with refraction error is shown from Chi square statistic test which is detailed as follows: eye distance while reading book (p> 0,05) and using lamp when reading (p> 0.05). This near work activity represents a meaningless relationship. Research conducted by Imam and his colleagues on the association of near work activity with refractive error also showed that there was no statistically significant difference (p> 0.05) for all parameters used for near-sight activity (learning, watching television, playing video games, computer use, other near work activities), but from the research there is a tendency that the higher the near work activity is closer the higher the increase in myopia.[26] This is consistent with the theory that reading habits for prolonged periods can lead to high ciliary tone so the lens becomes convex which causes the shadow of the object to fall in front of the retina and cause myopia. In this research, there is a relationship between reading with lying down and not straight sitting position with the occurrence of refractive error (p <0,005), this is contrary to the result of research from Abdul Kadir, reading habit although statistically the relationship is not significant (p = 0, 45), but there is a tendency that reading behavior lying down or sleeping, increasing a risk of incidence of refractive disorders.[27]

4.4. Electronic Devices

In this research, we did not find any relation between electronic devices with refractive error. This can happen because of several factors. First is another factor outside studies that cause refractive error in the respondents occur, such as using the computer in close proximity and long periods of time, and reading too close to less light conditions. Second is because watching television for a long time will only cause fatigue in the eyes, rather than exacerbate or increase the degree of myopia possessed. When using the computer and reading in close proximity for a long time causes the eyeball to gain prolonged muscle tension. This causes the eye axis to extend, so that the focal point of the formed shadow falls farther in front of the retina, so that the degree of myopia suffered will increase. The results of this study contradict the results of researchers in Singapore who observed children who spend their time reading, watching television, playing video games and using computers experiencing more refractive error.[28]

4.5. Outdoor Activities

In this study found the relationship between frequent exercise and spend time after school outdoors with refractive error, where the two variables above showed the results of respondents experiencing less refractive error compared to respondents who do not often do sports and prefer to spend time in home. This study is in line with that of Jones, where he compared lifestyle of 124 children of ethnic Chinese living in Sidney with 682 children of the same ethnicity in Singapore. There was a prevalence of myopia in Singapore 29% and 3.3% in Sidney. Though children in Sidney read more books every week and do activities in the short distance longer than children in Singapore. But kids in Sidney also spend more time outdoors (13.75 hours each week). This is the most significant factor associated with refractive error among group.[29]

Multiple Logistic Regression Analysis

Multiple logistic regression analysis is included in multivariate analysis which can be used to see the effect of one or more independent variables together on the dependent variable (visual acuity). The first step is to choose what independent variables are included in the multivariate analysis. This is done with bivariate test results, of all variables that exist, in the double logistic regression analysis is the parents wear glasses, the parents use glasses all the time, the distance while reading books, reading books while sleeping or lying down, reading with a straight sitting position, the intensity using electronic devices, activities done after school, and the intensity of exercise in a week. Variables selected as candidates having p. <0.25. Subsequent double logistic regression test with forward stepwise (conditional) method, it was found that from 5 independent variables included in multivariate analysis, only 2 variables that directly influence visual acuity, that is parents always use glasses and reading book while lying down. While the other 3 variables still influence visual acuity, but not directly. Thus the candidate is formed: yi = 1,381 - 1,029 (history of parents always use glasses) - 0.865 (reading while lying down).

5. Conclusion

In the parents who used the glasses found significant relationship (p <0.05) with the occurrence of refractive abnormalities in the study subjects, found 60.2% of respondents experiencing refractive abnormalities in the history of parents using glasses. Position during reading gave a significant correlation (p <0,05) with refractive occurrence in research subject, where reading position while lying found 63,2% and unstable sitting position encountered 61,7% having refractive error. There was a significant correlation (p <0.05) in the subjects who were always to perform activities outside the home after completion of school with refractive disorder, found only 43.1% who experienced refractive abnormalities compared to the normal eye 56.9%. With multivariate test obtained 2 variables that give direct effect to refractive disorder in this research, that is history of parents always use glasses and reading position while lying down.

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