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Research Article

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Analysis of Prevalence and Influencing Factors of Myopia among Middle School Students in Jiangsu Province of China

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Abstract Objective: to know myopia status and its influencing factors among middle school students in Jiangsu, and to provide evidence for effective prevention of myopia. Methods: a cluster stratified sampling method was used to investigate 3600 students in Jiangsu. Results: a total of 2498 cases of myopia were detected, and the myopia rate was 69.4%. The myopia rate of girls is higher than that of boys (p<0.01). The myopia rate of high school students is higher than that of junior high school students (p<0.01). The higher risk factors for students' myopia are higher school age, girls, learning time longer than 8h/d, more than 1h/d playing electronic products on rest days, less time for outdoor physical training on rest days than 0.5h/d, and father's myopia. Mothers are myopia, parents are myopic, own mobile phones, and play electronic products sometimes have eye discomfort, *OR* values are 1.42, 2.92, 2.42, 16.21, 5.58, 4.25, 8.73, 10.47, 3.47 and 3.83. Reading and writing can maintain correct posture and self-restraint ability of playing electronic products is a protective factor to reduce myopia. The *OR* values are 0.16 and 0.26 respectively. Conclusion: comprehensive understanding of the risk factors and protective factors that lead to myopia, guiding young students to form correct eye use habits and strengthening students' outdoor exercise can prevent the occurrence and development of teenager myopia.

Keywords middle school students, myopia; Present situation; influence factors

1. Introduction

The poor eyesight of adolescent students has become an important factor affecting the health of our students. The results of the 2010 National Survey on Students' Physical Fitness and Health show that the detection rate of poor eyesight among Chinese students continues to rise, and there is a tendency of younger age. Poor eyesight has become a public health problem of great concern to the whole society. Myopia is the main form of poor eyesight in adolescent students. The formation and development of myopia in adolescent students are related to many factors such as heredity and environment. This study investigates the prevalence of myopia among middle school students in Jiangsu Province of China, in order to understand the epidemiological characteristics of myopia among middle school students in Jiangsu Province, and to analyze the current situation and influencing factors of myopia, so as to provide reference for the prevention of myopia among middle school students.

2. Objects and Methods

2.1. Objects

The respondents were students from Grade One to Grade Three of Junior Middle School in Jiangsu Province, in November 2017. Using stratified cluster sampling method, all middle schools in Jiangsu administrative district are divided into two levels according to city and countryside, and then one junior middle school and one senior high school are randomly selected from each district (city) city and countryside, so there are 20 schools in total. Finally, each school was stratified according to grade, and 60 students (30 boys and 30 girls) were randomly selected from each grade for testing.

2.2. Method

Binocular visual acuity was screened with indoor light box "E" digital standard logarithmic visual acuity chart. The myopia test method was carried out according to the National Student Constitution survey standard. The naked eye vision was checked in right order and left order. The naked eye vision of one side was less than 5.0, which was judged as low vision.

2.3. Questionnaire

A questionnaire survey was conducted among the students who participated in visual screening. 3600 questionnaires were distributed, 3554 were collected and 206 were rejected. A total of 3348 questionnaires were valid, with an effective rate of 94.2%.

2.4. Statistical Analysis

EpiData 3.10 software was used to input data in pairs, and after checking data consistency, the data was imported into SPSS 19.0 for statistical analysis. X^2 test was used for univariate analysis and logistic regression was used for multivariate analysis.

The model analysis showed that the test level of single factor analysis and multi-factor analysis were both $P < 0.05$.

3. Results

3.1. Myopia in Students of Different Grades

The results of visual acuity test for 3600 students showed that the number of myopic students reached 2498, and the detection rate of myopia was 69.4%. Among them, 1073 boys were myopic, accounting for 29.8% of the respondents, and 1425 girls were myopic, accounting for 39.6% of the respondents. The myopia rate increased with the increase of school age. The myopia rate of girls was higher than that of boys ($X2 = 1.47$, $P < 0.01$); the myopia rate of high school was higher than that of junior high school ($X2 = 2.58$, $P < 0.01$).

Table 1: Myopia rate in different sex groups of middle school students

School type	Male		Female	
	Total	myopia（%）	Total	myopia（%）
Junior middle school	900	427（47.4）	900	585（65.0）
Senior high school	900	646（71.8）	900	840（93.3）

3.2. Occurrence time of myopia

According to the survey on the occurrence time of myopia among myopic students, it was found that students' myopia mainly occurred in primary school and junior middle school, accounting for 44.1% and 45.0% respectively, while kindergartens and high schools were less, accounting for 2.1% and 8.8% respectively.

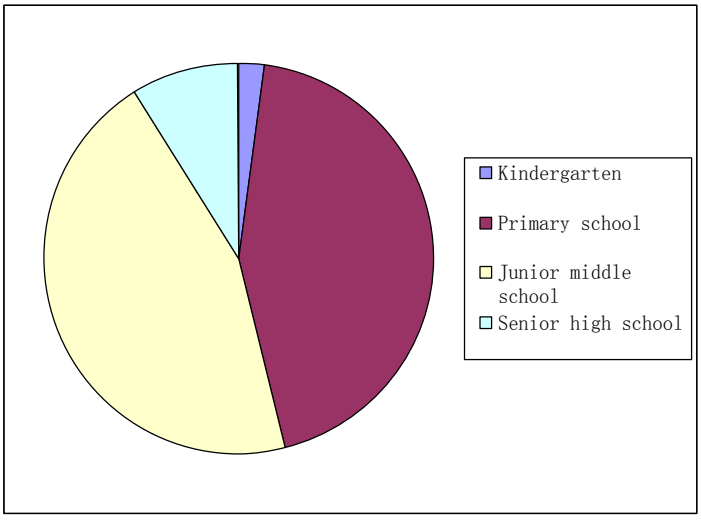

Table 2: The Occurrence Time of Myopia in Students

Time interval of myopia	Number	rate
Kindergarten	53	2.1%
Primary school	1101	44.1%
Junior middle school	1123	45.0%
Senior high school	221	8.8%

3.3. Influencing factors of myopia

Taking whether students are myopic (myopia = 1, non-myopia = 2) as dependent variable, taking gender, grade, sleep time of study day, sitting time of study day, homework time of study day, tutorial class time of study day, time using electronic products (including watching TV, playing mobile phone, playing computer) of study day time using electronic products (including watching TV, playing mobile phone, playing computer), exercise time of study day, sleep time of rest day and sitting time of rest day as dependent variable. Writing homework on rest day, tutoring class on rest day, using electronic products on rest day (including watching TV, playing mobile phones, playing computer), outdoor exercise on rest day, whether parents are myopic, whether they pay attention to eye hygiene, whether they take eye health exercises seriously, whether parents have restrictions on their use of electronic products, whether they own mobile phones, whether they own them. Whether their own computers (including Pad), mobile phones, computers sometimes produce eye discomfort 21 factors as independent variables, were included in the Logistic regression model for multivariate analysis.

The results showed that under the control of other factors, there were 10 factors associated with myopia of Jiangsu students with statistical significance. Multivariate logistic analysis showed that the factors influencing the prevalence of myopia in middle schools in Jiangsu were gender, School type, study time, time spent sitting, time spent playing electronic products on rest day, time spent exercising outdoors on rest day, parents' myopia, reading, writing posture, self-restraint ability of playing electronic products, and whether they had mobile phones and discomfort of playing electronic products eyes. Among them, the risk factors for myopia include female, high school students and students who spend more than 8h/d in sitting, playing electronic products for more than 1h/d on rest day, participating in outdoor physical exercise for less than 0.5h/d on rest day. Father's myopia, mother's myopia, parents are all myopic, having their own mobile phones and playing electronic products often cause eye discomfort. OR values are 1.42, 2.92, 2.42, 2.42, respectively. 16.21, 5.58, 4.25, 8.73, 10.47, 3.47 and 3.83. Reading and writing can maintain correct posture and play electronic products self-restraint ability are protective factors to reduce myopia, OR value is 0.16 and 0.26, respectively.

Table 3: Multivariate logistic regression analysis of myopia

	B	Standard error	Wald	P	OR	Confidence interval of OR value 95%	
						min	max
Sex (female)	0.35	0.31	1.29	0.046	1.42	0.77	2.62
Students of Senior high school	1.07	0.33	10.78	0.001	2.92	1.54	5.54
sitting time more than 8h/d on study day	0.89	0.41	4.68	0.031	2.42	1.09	5.41
playing electronic products for more than 1h/d on rest day	2.79	0.85	10.75	0.000	16.21	3.07	85.72
participating in outdoor physical exercise for less than 0.5h/d on rest day	1.72	0.51	11.16	0.001	5.58	2.04	15.3
Father's myopia	1.45	0.75	3.69	0.044	4.25	0.97	18.64
mother's myopia	2.17	0.77	7.94	0.000	8.73	1.93	39.42
parents are all myopic	3.77	1.05	8.01	0.000	10.47	2.8	47.26
Reading and writing can maintain correct posture	-1.81	0.59	9.43	0.000	0.16	0.05	0.52
Students who have their own mobile phones	1.24	0.58	4.55	0.030	3.47	1.11	10.88
play electronic products self-restraint ability	1.35	0.66	4.19	0.041	0.26	0.07	0.94
products often cause eye discomfort	1.34	0.62	4.77	0.036	3.83	1.15	12.79

4. Discussion

Myopia is one of the main reasons that endanger the health of adolescent students. According to the results of the 2010 National Student Physical Health Survey conducted by the Ministry of Education, the myopia rate of students in all academic sections (primary, junior, high school and university) in 2010 was higher than that of students in the same academic section in 2015. Through this survey, we have a preliminary grasp of the prevalence of myopia among middle school students in Jiangsu, Jiangsu Province. The rate of myopia among middle school students in Jiangsu is 69.4%, which is higher than the national average rate of myopia among primary and secondary school students (27.63%~58.30%) [1-2]. The myopia rates of boys and girls are 29.8% and 39.6% respectively. The myopia rate of girls is significantly higher than that of boys, and the myopia rate of high school students is significantly higher than that of junior middle school students, which may be due to the fact that the Girls' learning habits, attitudes and high school academic burden. The occurrence time of myopia of Jiangsu students is mainly concentrated in primary and junior middle schools (44.1% and 45.0% respectively). Therefore, the prevention of myopia of adolescent students should be carried out in primary and junior middle schools.

With the popularity of electronic products, more and more affect the daily life of young students in China. Jiang [3] research shows that the pre-screen behaviors of urban adolescent students on study days and weekends are 23% and 40% respectively. The main pre-screen behaviors are watching TV (14%) in peacetime and playing computer (15%) on weekends. The results of this survey show that students play with electronic products for more than one hour every day on rest days. Having their own mobile phones and playing with electronic products sometimes cause eye discomfort are risk factors for myopia among Jiangsu students. Good self-restraint ability of playing with electronic products is a protective factor for reducing myopia. It shows that the long-term and unconstrained use of mobile phones, iPad and other electronic products has become one of the important threats to adolescent eye diseases.

Heredity has always been an important factor in the study of juvenile myopia. ZADNIK et al. [4] found that the myopia rate of children whose parents were both myopic was 6.4 times higher than that of children whose parents were not. Wang et al [5] studies show that the higher the degree of myopia of parents, the higher the heritability. The results of this survey show that parents with one side of myopia and both parents' myopia have an impact on children's myopia rate. The myopia rate of students with parents' myopia is significantly higher than that of students without parents' myopia. The myopia rate of students with both parents' myopia is 10.47 times higher than that of students without parents' myopia. The genetic cause of myopia may be that ocular axis length is highly heritable due to multiple genes on the long arm of chromosomes 2p24 and 5, which is the most important determinant of ametropia [6].

Reading and writing postures correctly or not will also affect the visual acuity of adolescent students. HE [7] showed that 79.6% of Shanghai pupils have poor reading and writing posture, and myopic pupils are higher than non-myopic pupils. LIU et al. [8] studies suggest that the occurrence of myopia is related to the incorrect use of eyes and reading and writing postures at continuous close range. WANG et al. [9] studies believe that teachers often correct students' posture and reading distance have obvious preventive significance for the progress of myopia. The results of this study show that the correct posture of reading and writing is of positive significance in preventing myopia. The non-myopic students pay more attention to the correct posture of reading and writing than the myopic students.

Physical exercise or outdoor sports have a more positive significance in preventing teenagers' myopia. XIE [10] research show that increasing outdoor sports is a protective factor to reduce the rate of teenagers' myopia. GUO et al. [11] research survey of 681 pupils showed that less outdoor activities and more indoor learning led to long eye axis, which was a risk factor for myopia. The results of this survey show that myopic students generally have less than half an hour of outdoor exercise on rest days. More outdoor activities can increase the exposure time of the retina to light, thereby stimulating the retina to synthesize and release dopamine, shortening the ocular axis [12], so as to reduce the occurrence of myopia.

5. Conclusion

The problem of myopia among adolescent students has attracted great attention from the society. More and more scholars have carried out active and effective research in exploring the causes of myopia among adolescent students and preventing it effectively. There are many factors affecting myopia. How to take more effective measures to prevent myopia among adolescent students needs more and more in-depth research.

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Reference

[1]. http://old.moe.gov.cn/publicfiles/business/htmlfiles/moe/s5948/201109/124202.html.
[2]. Zhu na, Luo Jiayou, Zeng Rong et al. The myopia status of 3586 Grade 1-9 students and its relationship with bad eye use behavior. China Health Statistics [J], 2014, 12: 987-991.
[3]. Jiang Xiaoxiao. Study on the Leisure Static Behavior of Urban Children and Adolescents in China. Ph.D. Dissertation of Fudan University [D]. May 2014.
[4]. Zadnik K, Satariano WA, Mutti DO, et al. The effect of parental history of myopia on children's eye size [J]. Jama, 1994, 271(17): 1323-1327.
[5]. Wang Tingting, Munich Reiz, Akram Aihemaiti et al. Heritability analysis of myopia among primary and secondary school students in Yining [J]. Chinese Journal of Child Health. 2017, 8: 834-836.
[6]. Zhu G, Hewitt AW, Ruddle JB, et al. Genetic dissection of myopia: evidence for linkage of ocular axial length to chromosome 5q [J]. Ophthalmology, 2008, 115 (6): 053-1057.
[7]. He Xian gui, Zhu Jian feng, Zou Hai dong et al. Analysis of the status and influencing factors of Myopia-Related reading and writing postures among primary school students in Shanghai [J]. Journal of Clinical Ophthalmology. 2017, 3:214-218.
[8]. Liu Lin, Li Ding mei, Yu Lan, et al. Investigation of myopia among primary and secondary school students in Huai hua City, Hunan Province and analysis of influencing factors [J]. Ophthalmology. 2016, 4:241-246.
[9]. Wang Chao, Wu Li juan, Song Yu zhen, et al. Progress and risk factors of myopia among primary and secondary school students in Beijing from 2008 to 2009 [J]. School hygiene in China. 2016, 1:81-83.
[10]. Xie Xiao hua. The prevalence and related factors of myopia among children and adolescents in Jiang yin City [J]. Occupation and health. 2017, 7:1967-1969.
[11]. Guo Y, Liu L J, Xu L, et al. Outdoor activity and myopia among primary students in rural and urban regions of Beijing [J]. Ophthalmology, 2013, 120(2): 277-283.
[12]. Yan Jin, Wang Li, Yang Yang. Advances in risk factors and epidemiology of myopia [J]. New advances in ophthalmology, 2015, 35 (9): 896-900.