Analysis of Myopia Related Factors of School-age Children in Shuangyashan City

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Abstract: Objective — To investigate the prevalence of myopia in a primary school in Shuangyashan City in recent two years and to make analysis on the influencing factors, so as to reduce the prevalence of myopia in children, as a result, to provide a theoretical basis for the prevention and treatment of myopia in Shuangyashan City. Methods — A total of 303 school-age children from a primary school in Shuangyashan City were selected for diopter screening, and the situation of myopia in preschool children was investigated. Results — The positive rate of 45 myopic children screened out from 303 school-age children stood at 14.85%. The positive rate increased with age. Univariate analysis showed statistically significant differences in age, mother's history of myopia, distance between books, time of using electronic devices, and time of sleep between myopia and age (P<0.05). On this basis, the data with insufficient sample size were integrated and binary logistic analysis showed that adequate sleep, genetic factors and age were independent influencing factors. Conclusion — The incidence of myopia in school-age children is high. It is hoped that school, family and society should strengthen the protection of myopia and jointly carry out prevention and treatment work.

Keywords: school-age children, myopia, influencing factors diopter

Introduction

In recent years, the prevalence of myopia among children in China continues to increase,which is characterized with prevalence among people with young age. According to Xu Xiqing's research [1], the incidence of myopia increases with age. Liu Yanfen [2] has shown that long-term use of the eye and bad posture are risk factors for myopia. Parents are required to conduct correct guidance to effectively reduce the incidence of myopia among teenagers. It is predicted that by 2050, about 5 billion people in the world will face the problem of myopia [3][4]. It is urgent to prevent and treat the occurrence and development of myopia among Chinese children. This study provides a theoretical basis for the prevention and treatment of adolescent myopia.

1. Objects and methods

1.1 Survey objects

A total of 303 children in low grade from a primary school in Shuangyashan City were selected, including 156 boys and 147 girls. Twenty-one children aged 6-7 years, 173 children aged 8-9 years and 109 children aged 10-11 years. There were 72 children in the rural areas and 231 in the urban area. The children and their families were required to sign the informed consent, and parents and children completed the questionnaire together. A total of 303 cases were examined, and 303 cases were sent out and recovered. The questionnaire recovery rate was 100%. Other diseases such as mental retardation were excluded.

1.2 Survey methods

1.2.1 Examination methods of visual acuity

Vision screening was performed using a standard logarithmic visual acuity chart with the word "E". The diagnostic criteria were evaluated by referring to Ophthalmology Technology. Myopia: the visual acuity of naked eye is <5.0, of which, 4.9 represents mild myopia, 4.6-4.8 represents moderate myopia, and ≤4.5 is severe myopia. If the visual acuity between the two eyes is different, the one with lower visual acuity will be taken as the standard, so as to exclude pseudomyopia, astigmatism and other conditions.

1.2.2 Questionnaire survey

Self-made questionnaire. The content of the questionnaire includes students' basic information and myopia related situation as well as bad living habits and myopia related cognition.

1.2.3 Data input and analysis methods

Epidata3.0 application software is adopted to realize double data information input; SPSS25.0 was used for statistical analysis, X² test was used for data of each group, and binary Logistic analysis was performed for data with statistically significant difference (P < 0.05).

2. Results

2.1 Univariate analysis of myopia risk factors in children

The results showed that there were statistically significant differences in age, mother's myopia, distance between eyes and books, time of using electronic devices, and slumber duration (P<0.05). As shown in Table 1, the difference in accuracy rate of children's myopia screening in different age groups is statistically significant (P<0.05), and the detection rate increases with age.

Table 1. Univariate analysis of influencing factors of myopia in a primary school in Shuangyashan City

Factors	Types	Number (N)	Number of myopia (N)	Detection rate	X^2 value	P value
Gender	Male	156	23	14.74	0.003	0.957
	Female	147	22	14.97		
Age	6 ~ 7	21	0	0.00	29.165	<0.001
	8 ~ 9	173	13	7.51		
	10 ~ 11	109	32	29.36		
Residence	Village	72	10	13.89	0.069	0.793
	City	231	35	15.15		
History of myopia of relatives	Myopia of father	60	13	21.67	2.748	0.097
	Myopia of mother	95	32	33.68	38.813	<0.001
Types of bad eye behavior	<3	26	7	26.92	3.277	0.070
	≥3	277	38	13.71		
Correct use of light	Incandescent light	14	2	14.29	3.682	0.451
	LED lamp	72	8	11.11		
	Common desk lamp	28	7	25.00		
	General light	87	11	12.64		
	Eye protection lamp	102	10	9.80		
Outdoor stay	< 1	215	36	16.74	2.097	0.148
	≥1	88	9	10.23		
Electronic equipment	< 1	241	7	2.90	132.933	<0.001
	≥1	62	38	61.29		
Slumber duration(h)	< 8	39	11	28.20	6.312	0.012
	≥8	264	34	12.88		
Daily intake of food with vitamin A	Yes	262	37	14.12	0.814	0.367
	No	41	8	19.51		
Knowledge in myopia	≤2	52	7	13.46	0.096	0.757
	> 2	251	38	15.14		
Practice diabolo every week	Yes	135	23	17.04	0.920	0.338
	No	168	22	13.10		
Distance from books(cm)	Distance < 25	76	28	36.84	17.277	<0.001
	25≤Distance < 33	112	14	12.50		
	Distance≥33	24	3	12.50		

2.2 Binary logistic analysis of myopia risk factors in children

Binary logistic regression analysis was performed with the myopia condition of the students as the dependent variable (Without myopia =1, myopia =2), and the different factors in the univariate analysis were taken as independent variables.

The conclusion shows that the duration of using electronic devices is a risk factor for myopia in primary and secondary school students, and the absence of mother's history of myopia is a protective factor for myopia in primary and secondary school students, as shown in Table 2.

Table 2. Binary Logistic analysis of influencing factors of myopia in a primary school in Shuangyashan City

Independent variable	Regression coefficient	Standard error	WaldX² value	*P value*	OR value	95%CI
Slumber duaration≥8h	-0.977	0.400	5.957	<0.001	0.376	(0.172,0.825)
No record of myopia of mother	-0.994	0.329	9.123	<0.001	0.37	(0.194,0.706)
Distance from book≥25cm	-0.379	0.406	0.871	0.351	0.685	(0.729,2,918)
Time spent on electronic devices≥1h	0.386	0.438	0.774	0.379	1.471	(0.623,3.474)

3. Discussion

Based on this study, it can be found that the myopia rate of lower grades is 0% between 6-7 years old and 7.51% between 8-9 years old and 29.36% between 10-11 years old. As the age increases, the detection rate of myopia increases, which is consistent with the relevant research conclusion of Shen Xiaoqiu[5]. Because children are in the development period, the extensibility of the eye wall increases, which is vulnerable to the environment with changes of eye axis.

The investigation showed that myopia was related to genetics, environment and interior factors [6]. This study found that there were statistically significant differences in adverse eye use time, slumber duration, mother's myopia, adverse reading distance and age (P < 0.05). In addition, by binary logistic analysis, this study found that slumber duration and mother's history of myopia were independent factors.

3.1 Influencing factors of myopia among children and adolescents in Shuangyashan City

3.1.1 Analysis of adolescent myopia and use of electronic devices

It can be discovered from the study that the long time to watch TV and computer and other electronic equipment among students shows statistical significance (P < 0.05). The independent influencing factors between the use of electronic devices and myopia have not been proved, which may be due to the small sample size of this study and the short duration of this study, leading to errors in the results. However, studies have shown that too much use of electronic devices will lead to deteriorated vision with symptoms of shedding tears and other conditions, so parents need to control the time children play with mobile phones and other electronic devices to prevent the possibility of myopia from childhood.

3.1.2 Analysis of adolescent myopia and slumber duration

Adequate slumber relaxes the ciliary muscle and lens. Primary and middle school students are required to maintain 8 ~ 10 h slumber every day, but due to heavy learning tasks and other reasons, most of the primary school students developed the habit of sleeping at relatively late time, which leads to a serious lack of slumber time for many primary school students. In this study, it can be concluded that slumber duration ≥8h is a protective factor for myopia, and sufficient slumber duration will reduce the occurrence of myopia, so maintaining good slumber state and length has a delaying effect on myopia. Parents should also pay attention to the problems of sleep and mental pressure of children while studying, and avoid fatigue.

3.1.3 Analysis of adolescent myopia and maternal myopia

The prevalence of myopia in children and adolescents is also associated with genetic factors. If the father is highly myopic, the probability of myopia in children will increase significantly. 0.05), but there was no difference with father (P > 0.05). Through binary logistic regression, it can be seen that the mother having no history of myopia is a protective factor for children. Therefore, parents should protect their own eyesight and prevent the possibility of myopia while protecting their children from myopia.

3.1.4 Analysis of adolescent myopia and eye environment

It can be seen from this study that the difference between book distance and myopia is statistically significant, OR < 1, but the significance between book distance and myopia failed to be proved. The possible reason is that many parents failed to notice the distance between children and books when filling in the questionnaire, resulting in data errors. However, according to research [7], the farther away from books, the lower the risk of myopia, which is related to the continuous relaxation of ciliary muscle and shortening of eye wheelbase. Correct reading posture and correct distance between eyes and books play an important role in slowing down the occurrence of myopia. Therefore, through this study, I hope that parents pay more attention to the distance between children's reading posture and reading at ordinary times, and correct

children's bad way of using the eyes, which is very important to prevent children's myopia.

3.1.5 Analysis of adolescent myopia and outdoor activities

There was no statistical significance between outdoor activities and myopia in children and adolescents ($P>0.05$). The factors taken into account lie in the followings as: the exercise duration is not enough to achieve the effect of intervention, the length of the study and other factors, so it is not consistent with domestic and foreign studies. In the future, the sample size and outdoor exercise duration of senior primary school students can be increased in this study to eliminate interference factors, and further explore the degree of sports intervention on primary school myopia,as a result, to provide a theoretical basis for the prevention of myopia.

3.1.6 Analysis of myopia and vitamin A in adolescents

Diet plays an important role in the prevention and treatment of myopia in children. Although this study failed to show the relationship between daily intake of vitamin A-containing food and myopia ($P>0.05$), based on Li Hong's investigation [8], there is a close relationship between input of vitamin A-rich food among children and adolescents with myopia, and the difference is statistically significant ($P<0.05$).

Conclusion

The results of this study confirm that the investigation of myopia in children and adolescents in Shuangyashan City has achieved the expected social effect and experimental purpose. According to the results of the survey, relevant intervention measures were developed, which strengthened the attention of the family, society and children and adolescents to vision protection. As a result, it provided a certain theoretical basis for the prevention and treatment of myopia protection for children and adolescents, and improving the awareness of myopia prevention and treatment for children and adolescents.

Acknowledgments

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