

Analysis of the Visual Healthy Status and Problems Impaired Adolescents in China

Fangyi Ning^{1,a}, Yongqiang Mao^{1,b,*}

¹Department of Physical Education, Beijing Union University, Beijing, China

^aldtyfy@buu.edu.cn, ^bmaoyongqiang@buu.edu.cn

*Corresponding author

Keywords: Healthy China, Adolescent, Visual Impairment, Health Status, Problem

Abstract: In the past ten years, the fact that the rate of myopia in China remains high has become the main problem that seriously endangers youths a teenagers' public health. Related data shows that the myopia rate of students' from Chinese middle or high schools and colleges has exceeded by 70%. The myopia rate of primary school students' has risen to 40%, and the percent of preschool children of myopia is up to 2.5%. Therefore, it is very important to explore the prevention and strategies to control myopia in China and reduce the myopia of adolescents. From the perspective of healthy China, the problem of visual impairment in China has not caused due attention, and parents and guardians lack of cognition of environmental factors to prevent myopia, leading to a serious lack of children's correct cognition of eye hygiene and life behavior. Therefore, it is the core of this paper to effectively reduce the problem of myopia in Chinese adolescents to deeply analyze the influencing factors of visual health in Chinese adolescents and strengthen the exploration of the prevention and control strategies of myopia in China.

1. Introduction

Visual impairment which is not only myopia included, but also farsightedness, amblyopia and other eye health problems are included. Farsightedness, amblyopia and myopia high detection rate is the most important visual impairment problem troubling the adolescent group. In 2020, the lancet public health article shows that in 2019 China moderate visual impairment prevalence is 2.57%, the rate of severe visual impairment is 0.25%, blindness is 0.48%. Highly poor vision may also lead to a variety of blinding complications, such as cataract, glaucoma, retinal detachment, myopic macular disease, etc. Myopia is the biggest threat of visual impairment [1]. However, the number of teenagers with poor vision in China ranks first among the world in the world in terms of the number and incidence data, and the high myopia rate among teenagers has become a serious public health problem [2]. However, according to the results of a related literature search, experts' interviews and questionnaire surveys, the problem of visual impairment in Chinese adolescents has not attracted due attention, and parents and guardians are cognition of environmental factors in the prevention of myopia, leading to a serious lack of cognition of eye hygiene and correct life behavior [3]. Therefore, it is the core to effectively reduce the problem of myopia in Chinese adolescents to deeply analyze the influencing factors of visual health in Chinese adolescents and strengthen the

exploration of the prevention and control strategies of myopia in China.

2. Overview of the Main Health Status of Adolescents with Visual Impairment in China

2.1 High Myopia Rate Has Become the Main Cause of the Visual Health of Adolescents, So Does the Awareness of Corrective Treatment

According to the data of 2019 World Vision Report of the World's Health Organization [4], the myopia rate of Chinese teenagers is as high as 67 percent, and uncorrected refractive error is one of the main causes of visual impairment among the Chinese population. According to the 2018 and 2020 statistics of the Health Commission, the myopia rate of children and adolescents in China was 53.6% in 2018, 50.2% in 2019 and 52.7% in 2020, and the incidence of myopia in adolescents remained high, showing a trend of younger age. According to the results of the literature search, the main visual disorders and eye diseases in China are concentrated in the following three aspects: First, due to the excessive use of the eyes, causing lens adjustment fatigue, resulting in adjustment lag, thus stimulating the axial growth of the eye. Axis lengthening is an irreversible injury that cannot be recovered by medication or physical therapies; second, genetic factors and acquired environmental factors are the main factors that impaired visual health. However, according to the questionnaire surveys and expert interviews, it believes that adolescent myopia is developing rapidly and corrective measures should be taken as soon as possible. However, the current domestic myopia market is chaotic, and a comprehensive prevention and control system for myopia prevention and control work participated by the government, hospitals, schools, families, students and other subjects has not been established. Parents have misunderstandings about the prevention and control of myopia, which leads to the rapid progress of myopia among teenagers.

2.2 Excessive Use of Internet and Electronic Products by Teenagers Brings Visual Health Risks

By December 2021, the number of child and adolescent Internet users in China had reached by 181 million, accounting for 17.6 percent of the total [5]. All localities are actively implementing eight actions, including reducing the burden of schoolwork, increasing outdoor sports, strengthening vision health education, and preventing and treating myopia among children and adolescents. Parents still have the inherent thinking of learning, and the change of learning online courses makes students spend more time using electronic products on average every day, which is an important factor causing children's vision problems. This also affects the scientific, accuracy and effectiveness of the national and relevant functional departments to formulate prevention and treatment strategies for children's myopia.

2.3 The Regular Vision Screening Mechanism for All Staff in China Has Not Been Established, Which Reduces the Rate of Visual Impairment

China pays close attention to the visual health of children and adolescents and has issued a number of relevant policies. In 2018, the Ministry of Education, the Health Commission and other eight departments jointly issued the Comprehensive Prevention and Control of Myopia in Children and Adolescents to raise the prevention and control of myopia to a national strategic height, requiring the improvement of the prevention and control system of myopia in children and adolescents [6]. The National Health Commission requires that vision screening should be obtained from the neonatal stage. However, in the actual implementation process, the main monitoring body of the visual health of teenagers is the parents of students. After research and analysis, most parents

begin to pay attention to the visual health status of their children when their children are five years old, while the strength screening cost of teenagers is high, and the parents' willingness to check regularly is low. The absence of this full-staff regular vision screening mechanism undoubtedly reduces the rate of visual impairment examination.

3. Analysis of the Causes of Major Eye Diseases in Adolescents with Visual Impairment in China

3.1 The Eye Duration of Teenagers Generally Exceeds the Standard, and There Is A Problem Of Irregular Eye Behavior

On August 29,2020, at the "Second National Visual Health Summit Forum", the Public Opinion Data Center of People's Daily Online and Aier Academy of Ophthalmology of Central South University jointly released the "2020 Big Data Report on the Prevention and Control of Myopia in Chinese Adolescents", which research on the eye behavior, visual environment and myopia cognition of adolescents in 2020. According to the report, from January to July 2020, the length of eye use (<2 hours), and the overall myopia rate of children and adolescents in 2018 was 53.6 percent, and myopia has become the main cause of visual impairment among Chinese people. According to the latest survey of 14,532 people in nine provinces in 2020, the myopia rate of students increased by 11.7 percent in the past half year of 2020, among which the myopia rate of primary school students increased by 15.2 percent, that of junior high school students increased by 8.2 percent, and the myopia rate of senior high school students increased by 3.8 percent. The situation of prevention and control of adolescent myopia is increasingly severe, and the development trend of younger age is showing. The problem of irregular eye behavior also aggravates the visual health problem. The average distance between the eyes throughout the day is 32.3cm, but 17.7% of teenagers still have an average daily eye distance below the standard line.

3.2 Lack of Eye Hygiene Knowledge, Such as Insufficient Outdoor Exercise and Lack of Standard Reading Environment, Will Deepen the Crisis of Myopia

According to human kinematics related studies, outdoor activities have an independent protective effect on vision, especially for 2 hours a day and more than 14 hours a week, which can effectively reduce the incidence of myopia by more than 10%. However, according to the 2020 Big Data Report on Myopia Prevention and Control among Chinese Adolescents, from January to July 2020, the average daily effective outdoor exposure time of adolescents was seriously insufficient, only 32.3 minutes, not yet reaching 1 / 3 of the recommended value, which greatly increased the risk of the development of myopia in children [7].

3.3 Parents and Main Guardians Have Insufficient Awareness of the Causes of Myopia and the Environmental Factors

According to the literature retrieval results, the majority of primary and secondary schools are not regular specialized lectures for myopia prevention and control problem, lead to the teenagers with the eye behavior and eye health correct cognitive lack, mainly embodied in the following four aspects: first, the adolescent group of parents and guardians is to give enough attention to the problem. More than 78% of parents believe that they can do myopia surgery or wear OK glasses without glasses as an important means to delay the progress of myopia, and there are serious cognitive misunderstandings about the causes of myopia and the protection strategy of vision after myopia [8]; second, the lack of daily outdoor activities and the lack of scientific nutrition

knowledge. Outdoor sports and scientific nutrition are the most effective methods to maintain eye health, but more than 90% of students in China have insufficient daily outdoor exercise or nutrition imbalance; third, the initial time of vision screening is late, lack of awareness of regular review. Most parents start to pay attention to their children's visual health at most times over 5 years old, and there is a big gap with the requirement that the National Health Commission should start to pay attention to the newborn stage, which results in high difficulty and inadequate awareness of prevention and control [9]. Medical opinion, adolescents should keep the frequency of semi-annual examination to immediately understand vision problems; fourth, lack of understanding of eye environment factors. The light value of reading environment is an important external environmental factor affecting the occurrence and development of myopia, but the majority of teachers, parents and other main care people lack the theoretical and practical knowledge of children at different ages, close eye time and intensity, light, diet, life mode, which are effectively related to the visual health of teenagers and children. According to the report, the average adolescent reading environment is only 109.7, far below the recommended value (above 125lux) [10].

3.4 Overuse of Electronic Products Leads to a Low Age of Myopia

The overuse of electronic products is the main cause of adolescent use. With the popularity of tablet computers, mobile phones and other electronic products, teenagers become more dependent on electronic products, lack of awareness of self-control, the daily screen time is getting longer and longer, and the prevalence of myopia is getting lower and younger.

4. Study on the Visual Health Improvement Strategy of Adolescents

4.1 Establish a Visual Health Service System for Children and Adolescents

At present, China has promoted the visual health of adolescents to the national strategic position, and issued a series of policies to promote the attention of all social organizations to the visual health service of adolescents from the social units. In order to form synergistic effects and jointly build a youth visual health service system with Chinese characteristics, we need all the help of organizations, companies and government. With the further implementation of the policy and the gradual attention of the society, the government will continue to cooperate with social organizations, companies closely. As a result, the adolescent visual health management chain will be gradually improved. The government will form a monitoring mechanism for the management of adolescent vision health, and promote the application of emerging technologies in eye care by enterprises, organizations and organizations. The government should promote the intelligence and standardization of adolescent vision health screening, and promote the balanced distribution of ophthalmic medical resources. This will also solve problems such as the large amount of vision health screening, high prevention and control difficulty, and insufficient awareness among adolescents. By means of forward-looking myopia prevention signs and accelerating the construction of regional communication networks, the average daily and eye length, low efficiency and incomplete styles of young people are controlled, and accurate control strategies are constructed. Through the continuous promotion of national policies [11], it can help to promote the improvement of new intelligent screening and monitoring products, and cultivate a healthy adolescent visual health screening and monitoring market.

4.2 Cognition about Vision Nutrition, Health Education and Vision Health Care

Vision nutrition health education and vision health care knowledge education can not only

alleviate visual fatigue, help to prevent the occurrence of myopia or further development, but also can effectively reduce the probability of adolescent myopia through the visual training and outdoor activities, with the eye environment and other external factors, it's easy to maintain the eye health if sufficient material basis is provided. Therefore, it's important to pay attention to the intake of some nutrients. According to nutrition research, there are 6 categories of nutrients beneficial to eye health, lutein and zeaxanthin are beneficial to the "macular area" of the eye; vitamin A or carotene is beneficial to the eye light sense adjustment ability; anthocyanins can enhance the blood circulation ability of the fundus; vitamin family, minerals and DHA can effectively delay the aging of these nutrients; B vitamins, vitamin C and vitamin E will help to restore visual fatigue and delay the aging of eye function [12].

4.3 Promote the Implementation of Adolescent Vision Health Policies and Accelerate the Implementation of Detailed Rules

According to the children and adolescents myopia prevention and control light action plan (2021-2025) [13], visual health prevention and control work instructions, to promote the perspective of adolescent vision health control work is the basis to establish a comprehensive prevention and control system, regional detailed implementation. So it's important to establish adolescent vision health records, Do build children and adolescents visual health data platform. The development of this longitudinal visual health strategy will be sure to improve visual care and immediate monitoring outcomes greatly in the adolescent population. In particular, it is necessary to strengthen outdoor exercise for no less than 14 hours around the sunshine, at least 1 hour of high intensity exercise every day, and mainly aerobic exercise, including at least 3 times a week of strong bone and muscle exercise [14]. In addition, schools, families and society should be combined to build a scientific understanding of neck movement, sitting posture and writing environment to improve the effectiveness of eye health care.

5. Conclusion

On the basis of summarizing the health status of visual impairment in China, this paper deeply explores the main causes of the occurrence of myopia, and puts forward the prevention and strategies of myopia in adolescents from three aspects: the first part is about policy, participant and implementation mechanism. Among them, Strategy One believes that the construction of the visual health service system for children and adolescents and the visual health screening mechanism for all social staff is the policy support for the implementation of the adolescent visual health's work, which will enhance the participation of the whole society and the top-down attention to this problem. Strategy two believes that the health education of vision nutrition and the cognition of vision health care should be strengthened. This is an important strategy to improve the eye hygiene and environmental safety of student guardians. Strategy three believes that promoting the implementation of adolescent vision health policies and accelerating the implementation of the detailed rules are the fundamental to promote the comprehensive implementation of adolescent vision health work in China.

Acknowledgement

Supported by the Academic Research Projects of Beijing Union University (No.SKZD202302).

References

- [1] Deng Changqing, Zhong Zixin, Liu Zongqi, Zhong Guiliang. Analysis of poor vision of children and adolescents in China from 2019 to 2020. *Journal of Hunan Normal University (Medical edition)*, 2022 (19) 6: 124-128.
- [2] Yan Jinhui, Zhang Ye'an. Research on outdoor physical activity intervention system for adolescent visual health under ICF theory. *Journal of Physical Education*, 2023 (9): 76-84.
- [3] Wang Chenghao, He Hui, Xiong Kaiyu. Effect of aerobic exercise of different intensity on IO pressure in female college students with moderate and high myopia. *School Health in China*, 2019,40 (8): 1254-1257.
- [4] Li Xiaosong. Prevalence of poor vision among adolescents aged 13 to 18 years in Changsha. *Practical preventive medicine*, 2013 (9): 1103-1105.
- [5] Wang Tong, Zhang Weijiang, Pei Rui, Xu Shuyun. Effect of visual training on vision and refraction in adolescents with inadequate myopia. *Clinical Medicine*, 2021 (12): 130-132.
- [6] Guo Jibing, Ni Shengyan, Guo Pan, et al. Clinical study on prevention and control of myopia in visual training. *The Electronic Journal of Modern Medicine and Health Research*, 2018,2 (17): 147,149.
- [7] Ma Mingshen, Guan Wenyong, Shen Ying, et al. Research progress on the mechanism and environmental factors of myopia occurrence and development. *Journal of Inner Mongolia Medical University*, 2022 (01): 82-87
- [8] Gan Tingting, Liang Rong, Tang Wenwei, Ding Sainan. Exploration of visual correction methods for children and adolescents. *Glass enamel and glasses*. 2022 (9): 24-29
- [9] Li Xuan, Wu Sici, Zhu Xiaodong, Li Cuixia, Wei Xue, Peng Yingchun, Dou Zhengyi, Huang Haiyan. A survey on the current situation of vision and glasses wearing in children and adolescents aged 6-18 in Guangxi. *Guangxi Medical Journal*, 2022 (9): 1017-1021
- [10] Fan Zemin, Liu Lijing, Zhang Wei, et al. Summary of Progress in Implementing the Comprehensive Prevention and Control of Myopia in Children and Adolescents by the Ministry of Education. *Chinese School Health*, 2019,40 (10): 1449-1452
- [11] Li Liang, Xu Jianfang, Lu Yingli, etc Research progress on the prevention and control of myopia in children and adolescents through outdoor activities and physical exercise *China Sports Technology*, 2019, 55 (4): 3-13
- [12] Jin Gang, Pan Jingling, Cai Gong. The practical significance and empirical research of physical exercise on the visual health of primary school students. *Journal of Capital Sports University*, 2021, 33 (1): 40-48
- [13] Yan Jinhui, Zhang Ye'an. A study on the intervention system of outdoor sports activities for adolescent visual health under the ICF theory. *Journal of Sports*, 2023 (9): 76-85
- [14] Wang Lijuan. A study on the relationship between physical activity, outdoor time, and visual impairment in children and adolescents in Shanghai. *China Sports Science and Technology*, 2023 (8): 34-39