

Knowledge of Child Health and Affecting Factors Among Preschool Teachers: A Cross-Sectional Study in Chongqing, China

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Aim: This research aims to explore the health knowledge mastery of preschool teachers in Chongqing.

Methods: A cross-sectional questionnaire survey of preschool teachers in Chongqing was conducted by random sampling. A total of 399 preschool teachers were included in this research. Multiple linear regression analysis was conducted to explore the influencing factors on preschool teachers' mastery of preschool child health knowledge.

Results: This research found that the average score of preschool teacher's knowledge of preschool children was only 34.01 ± 0.78 , and the accuracy of the knowledge points of continuous short-distance eye use time was the lowest, at less than 5%. The conducting of eye exercises by the kindergarten and the scores of preschool teachers were negatively correlated ($\beta = -0.257$, $p < 0.001$); the score of health knowledge of preschool teachers of the kindergarten whose screen time met the standard was lower ($\beta = -0.113$, $p = 0.017$); whether the time and frequency for outdoor activities of the kindergarten met the standards and the health knowledge score of preschool teachers was positively correlated ($\beta = 0.130$, $p < 0.001$ vs $\beta = 0.163$, $p < 0.001$). Male preschool teachers and teachers overweight according to BMI had higher scores for preschool health knowledge ($\beta = -0.114$, $p = 0.016$ vs $\beta = 0.099$, $p = 0.034$).

Conclusion: Preschool teachers in Chongqing had a poor grasp of knowledge regarding preschool children's health, and in particular, knowledge of children's exercise and eye use. Educational background and work experience may no longer indicate preparedness for teaching these topics, and suggests that supportive measures can also be directly provided at the kindergarten level in the future to increase the health knowledge of preschool teachers.

Keywords: preschool teachers, preschool children, health knowledge, supportive measures

Introduction

Health problems of preschool children (3-6 years old) will not only have a serious impact on their physical development, but it also will have negative effects on the child's cardiovascular, respiratory, and endocrine systems, liver function, bone mass density, psychosocial behavior, and other aspects, and will increase the risk of obesity, hypertension, mental illness, and other related chronic diseases in adulthood.¹⁻⁴ The current health status of preschool children is compromised, as there are at least 41 million children under the age of 5 who are overweight or obese in the world. By 2030, this number may increase to at least 50 million.⁵ The obesity rate of children aged 0-7 in China will reach 6%, and the number of obese children will increase to 6.64 million by 2030.⁶ At the

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same time, the data show that one in five children in the world have mental health or behavioral problems.⁷

Most of the poor health conditions are caused by unhealthy lifestyles of preschool children, as revealed by a global review that showed that preschool children spend 10 hours a day in sedentariness.⁸ There is not only a strong positive correlation between sedentary behavior and the level of overweight and obesity in children and adolescents, but also found that it has become the fourth leading risk factor for coronary heart disease after smoking, hypertension and hypercholesterolemia.^{9–11} European data show that children's TV viewing time increased by 25% from 2000 to 2020.¹² The screen time of preschool children aged 4 to 6 in cities such as Shandong and Xinjiang in China exceeded the recommended guidelines.^{13,14} The evidence^{9,15,16} showed that there is a gap between the prevalence of metabolic syndrome and the time spent watching TV or using a computer, and the overweight or obesity and sedentary lifestyle are attributable to 25% of cancer cases worldwide.¹⁷ Therefore, reducing and preventing children's health problems or unhealthy lifestyles is particularly urgent.

Since the implementation of China's comprehensive two-child policy in 2016, the population of children may increase in China. According to the data from the sixth nationwide population census, approximately 16 million babies were born each year before 2016, and there were more than 60 million preschool children aged 3–6 in the country, accounting for 4.6% of the total population.¹⁸ In China, children aged 3–6 years old were referred to as preschool children, and they all can study in kindergartens before going to primary school. According to the data from the National Bureau of Statistics of China, as of 2019, there were 281,174 preschool educational institutions in China, an increase of 41,362 from 2016. Additionally, there were 2.7631 million preschool principals and teachers in China, an increase of 511,000 from 2016.¹⁹ With the increase in the number of preschool children and the current health problems of preschool children, previous research has determined that health interventions in the educational system are an effective way to establish and promote healthy living habits as soon as possible, which will reduce adverse health consequences.²⁰ A previous study indicated that preschool teachers' health knowledge and health behaviors will have a profound impact on preschool child health knowledge, health behaviors, and future healthy life.²¹

Preschool teachers assume a variety of roles and responsibilities for the health of preschool children, provide first aid,²² promote the self-regulation of preschool children,²³ assume the responsibility and initiative to increase children's health habits,²⁴ understand children's learning motivation,²⁵ as well as health problems, and encourage learning in early prevention programs.²¹ A previous study showed that by teaching nutrition and health knowledge in classes, children will be more receptive to the message, rather than inviting nutrition experts from outside the school to teach.²⁶ However, some descriptive studies showed that preschool teachers' health-related knowledge is limited and cannot fully meet the needs of health education for preschool children.

According to China's Management Measures on Health Care in Nurseries and Kindergartens, Kindergartens units should have full-time or part-time healthcare personnel according to the number of children.²⁷ However, the number of professional healthcare teachers in China is limited. Therefore, preschool health education is mainly undertaken by preschool teachers. These teachers require special education and training on health-related knowledge for preschool children so that they can teach preschool children how to prevent disease and avoid unhealthy behaviors.²⁷ This current study aims to explore the health knowledge mastery of preschool teachers in Chongqing and its influencing factors. We also aimed to understand how comparison of supportive measures in kindergarten with preschool teachers' social demographic characteristics impacted the teachers' health knowledge mastery. These data will provide reference for preschool teachers' targeted health education, and at the same time, will assist with determining how to improve children's health education in the future.

Materials and Methods

We used a random sampling method to conduct a cross-sectional survey in six regions of Chongqing: Jiangbei District, Shapingba District, Nan'an District, Banan District, Fuling District, and Xiushan County. The participants came from 18 different kindergartens. Self-administered questionnaires were used, and each questionnaire included detailed survey instructions. A total of 450 questionnaires were distributed in this survey, and a total of 423 questionnaires were recovered, with a response rate of 94%. If all the questions in the questionnaires were answered, they were considered as valid questionnaires. After excluding invalid questionnaires,

a total of 399 questionnaire samples were included in this research, response rate for the valid sample was 86.7%.

Questionnaire

The questionnaire for this survey was prepared through consultations with epidemiologists, education experts, and health education experts, with reference to a large number of documents and various guidelines and standards, such as Early Learning and Development Guideline at 3–6 Years Old,²⁸ Dietary Guidelines for Chinese Preschool Children and Residents,²⁹ and Exercise Guidelines for Preschool Children (3 to 6 years old).³⁰ The questionnaire consisted of three parts: (1) socio-demographic characteristics of preschool teachers, (2) knowledge regarding children's health, and (3) kindergarten-related information.

Socio-Demographic Characteristics

The socio-demographic characteristics included preschool teachers' gender, age, height, weight, education background, fertility status, income, working years, and self-evaluation of health status. These variables were discussed in previous studies.^{22,31–33}

Knowledge Regarding Preschool Children's Health

In this study, we choose the components of health according to the “3–6years Early learning and development guideline in China” that including the healthy eating behaviors, mental health, eye health, and exercise health. And knowledge items come from the Dietary Guidelines for Chinese Preschool Children and Residents²⁹ and Exercise Guidelines for Preschool Children (3 to 6 years old).³⁰ It includes 10 questions, consisting of 8 single choice questions, and 2 multiple choice questions. There is only one correct answer for single choice questions, and two or more correct answers for multiple choice questions. When the preschool teachers who participated in this survey answered the multiple-choice questions, 1 point was gained after all the correct options were checked. Otherwise, 0 points were counted. One point was counted for each question correctly answered, and 0 points for incorrect answers or no answer. The total score is 100, and the pass mark is 60. The higher the total score, the higher the preschool teachers' mastery of child health knowledge. Specific question entries include: (1) Which vitamin deficiency in preschool children may cause night blindness? (vitamin A/vitamin C/vitamin D/vitamin E/unknown); (2) What is the main cause of decayed teeth in preschool

children? (Excessive intake of salt/excessive intake of sugar/excessive intake of fat/excessive intake of calcium/poor oral hygiene/unknown); (3) What is the longest time that students should continuously use their eyes at short distances? (<30 min/30–40 min/40–50 min/50–60 min/>60 min); (4) What are the main factors that contribute to obesity in 3–6-year-old children? (Multiple choices) (Excessive intake of fat/excessive intake of sugar/eating speed/too little exercise/genetic factors/unclear); (5) Does child obesity need to be prevented as soon as possible? (Yes, prevention should be started now/Yes, but it is too early/No); (6) What aspects should be included in the evaluation of the mental health of preschool children? (Multiple choices) (Emotional reaction situation/behavioral expression/social relations/cognitive function activity level); (7) Which mineral deficiency in children will cause inattention, decreased learning ability, and fatigue? (copper/calcium/iron/sodium); (8) What is the longest daily screen time (that is, the time spent watching electronic devices) that is recommended for children? (<30 min/31–60 min/61–90 min/91–120 min/≥120 min); (9) What is a suitable total time for outdoor exercise for preschool children? (<30 min/31–60 min/61–90 min/91–120 min/≥120 min); (10) How often should preschool children engage in sports for good health? (2–3 times a week/4–5 times a week/6–7 times a week/7 times a week or more). And the multiple-choice items we choose were many preschool teachers tend to be ignored or confused. The question “Does child obesity need to be prevented as soon as possible?” which seems like the attitude. In fact, this is a point that preschool teachers also often ignore that obesity should be prevented as soon as possible.

Kindergarten-Related Information

The kindergarten health-related arrangements and regulations involved in this questionnaire include the following questions from the Early Learning and Development Guideline at 3–6 years old.²⁸ Are preschool children allowed to bring snacks? (yes/no); Are eye exercises conducted? (yes/no); Is mental health education conducted? (yes/no); How much time is allotted for a class break? (≤5 min/5–10 min/11–15 min/16–20 min/≥21 min); What is the frequency of outdoor activities? (twice a day/once a day/once two days/once three days); How much time is allotted for outdoor activity? (≤15 min/16–30 min/31–45 min/≥4 min); and How much screen time is allotted? (<30 min/31–60 min/61–90 min/91–120 min/≥120 min). For a more optimal evaluation, we re-assigned this part of the test according to whether the arrangement is consistent

with the Chinese residents' dietary guidelines and children's health standards. If it is consistent, the value is 1; otherwise, the value is 2.

Quality Control

Two months before the formal survey, we conducted a pre-survey at a teacher recruitment fair, collected approximately 90 data samples, and revised the questionnaire based on these results. Reliability and validity tests were used. The reliability of Cronbach's alpha coefficient of the questionnaire was 0.81. The KMO validity statistical test (KMO = 0.765) and Bartlett sphericity test ($p < 0.0001$) were used. All the investigators received training on data collection quality control before the investigation.

Ethical Review

This study was approved by Ethics Committee Review Committee of Chongqing Collaborative Innovation Center for Functional Food in Chongqing University of Education (201901HS02). This study was conducted in accordance with the Declaration of Helsinki. All the teacher provided informed consent before participating in the study.

Data Analysis

All the data were double-entered using Microsoft Office Excel 2007 (Microsoft, Redmond, WA, USA). All statistical data were analyzed using two-sided *t*-tests in Stata statistical software (Stata, version 9.4, Cary, NC, USA). In the descriptive analysis, the characteristics of the preschool teachers were summarized using the mean and standard deviation or frequency and percentage. Variance analysis was used to test the significance of the differences between continuous variables. The variability of the categorical variables was tested using the chi-square test. The stepwise regression model was used to analyze the factors that affect the score of health knowledge. As the previous studies showed that sociodemographic characteristics and health-related arrangements and kindergarten regulations may have different effects on the knowledge.^{22,31–33} The following set of models was used: (i) Model 1 adjusted for sociodemographic characteristics, which include gender, fertility status, age, education level, marital status, working years, monthly income, BMI, and satisfaction with health; (ii) Model 2 adjusted for health-related arrangements and kindergarten regulations, which include supportive measures for kindergartens and (iii) Model 3 further adjusted for all variables in Model 1 and Model 2. After

analysis, it was determined that Model 3 was the most optimal. Statistical significance was set at $p < 0.05$.

Results

The survey found that the average score of preschool teachers was only 34.01 ± 0.78 (Table 1). Males scored higher than females, but the difference was not statistically significant (37.50 ± 16.87 vs 33.44 ± 15.38 , $p = 0.072$). The education background was mainly college and undergraduate; 51.88% of

Table 1 Sociodemographic Characteristics of Preschool Teachers

Variables	N=399 (n% or Mean)	Score (Mean \pm SD)	p
Age	25.93 \pm 8.37	34.01 \pm 0.78	–
Gender			0.072
Male	56 (14.04%)	37.50 \pm 16.87	
Female	343 (85.96%)	33.44 \pm 15.38	
Education level			0.18
High school and below	57 (14.29%)	34.04 \pm 13.34	
College	207 (51.88%)	33.91 \pm 15.44	
Undergraduate and above	135 (33.83%)	34.84 \pm 16.41	
Marital status			0.83
Unmarried	287 (71.93%)	34.22 \pm 15.76	
Married	108 (27.07%)	33.61 \pm 15.62	
Divorced	4 (1.00%)	30.00 \pm 8.16	
Fertility status			0.88
Do not have any kid	292 (73.18%)	33.94 \pm 15.77	
Have 1 or more kids	107 (26.82%)	34.21 \pm 15.36	
Working years			0.19
<1 year	120 (30.08%)	34.42 \pm 15.97	
1–3 year	157 (39.35%)	32.87 \pm 15.57	
3–5 year	60 (15.04%)	37.67 \pm 15.33	
>5 years	62 (15.54%)	32.58 \pm 15.25	
Monthly income			0.24
<2000yuan	106 (26.57%)	35.19 \pm 13.82	
2000–4500yuan	235 (58.90%)	33.49 \pm 16.03	
4500–7500yuan	45 (11.28%)	36.00 \pm 16.29	
\geq 7500yuan	13 (3.26%)	26.92 \pm 19.32	
BMI			0.036*
Thin	78 (19.55%)	30.38 \pm 15.41	
Normal weight	280 (70.18%)	34.29 \pm 15.98	
Overweight	32 (8.02%)	39.06 \pm 10.88	
Obesity	9 (2.26%)	38.89 \pm 16.16	

Notes: Data are presented as Mean \pm SD for continuous measures, and n (%) for categorical measures; * $p < 0.05$.

Abbreviation: SD, standard deviation.

preschool teachers graduated from junior colleges, 32.08% of preschool teachers graduated as undergraduates, and less than 2% graduated with postgraduate and above degrees, but the statistical difference in the scores of preschool teachers with different education backgrounds was insignificant ($p=0.18$). There was no significant difference in the scores of preschool children health-related knowledge obtained by preschool teachers with different working years, income levels, or kindergarten attributes ($p>0.05$). There was a significant difference in the scores of preschool children health-related knowledge among preschool teachers with different BMI levels.

Preschool teachers' specific cognition of child health-related knowledge is shown in Table 2. Compared with other questions, the highest collective score was for obesity prevention in preschool children, with an accuracy of 77.94%. However, the awareness rate of the main factors related to childhood obesity was only 23%. The accuracy of the knowledge points of continuous short-distance eye use time was the lowest, less than 5%. Less than 20% of participants could answer that of children's correct exercise frequency and outdoor exercise time. As for the correct screen time per day only 25.56% of preschool teachers know that. In addition, the awareness of which minerals lacking in children would cause inattention, decreased learning ability, and fatigue was only 31.58%. Only 40.85% of preschool teachers correctly answered the question regarding the main cause of decayed teeth in preschool children.

The relevant health regulations for kindergartens in this research are regarded as supportive measures for kindergartens (Table 3). Fifty-one percent of preschool teachers do not allow preschool children to bring snacks into the kindergarten, only 33% of preschool teachers showed that conduct eye exercises were conducted in kindergarten;

40% of preschool teachers allow a class break in accordance with standards, Only 21.8% of outdoor activity time of the kindergarten where the preschool teachers are working meets the standard; In these health-related regulations, the score of preschool teachers with consistent or inconsistent class breaks has little difference (33.84 ± 15.84 vs 34.26 ± 15.40 , $p=0.79$) whether the screen time meets the standard will not cause the difference in the preschool teachers' children health knowledge scores (36.53 ± 15.49 vs 33.66 ± 15.65 , $p=0.23$).

Table 4 shows that a negative correlation between conducting eye exercises and scores of preschool teachers. The scores of preschool teachers whose kindergarten conducted eye exercises were lower ($\beta = -0.257$, $p<0.001$), compared those from kindergarten did not conduct eye exercises; the scores of children health knowledge of preschool teachers in the kindergarten whose outdoor activity time meets the standard are higher than those of the kindergarten teachers whose outdoor activity time does not meet the standard ($\beta=0.163$, $p<0.001$); the scores of children health knowledge of preschool teachers in the kindergarten whose outdoor activity frequency meets the standard are higher those of the preschool teachers whose outdoor activity frequency does not meet the standard ($\beta=0.130$, $p<0.001$); the scores of children health knowledge of preschool teachers who allow children to bring snacks into the kindergarten are lower than those of the kindergarten teachers who do not allow the preschool children to bring snacks into the kindergarten ($\beta=-0.137$, $p=0.004$); the scores of children health knowledge of the preschool teachers in the kindergarten whose screen time meets the standard are lower than those of the kindergarten teachers whose screen time does not meet the standard ($\beta=-0.113$, $p=0.017$); the scores of children health knowledge of female preschool teachers are

Table 2 Preschool Teachers' Awareness of Child Health Knowledge in Percentages

Item	Accuracy
Does child obesity need to be prevented as soon as possible?	77.94%
Which vitamin deficiency may cause night blindness in preschool children?	61.15%
What is the main cause of decayed teeth in preschool children?	40.85%
What aspects should be included in the evaluation of children's mental health?	46.87%
Which mineral deficiency in children will cause inattention, decreased learning ability, and fatigue?	31.58%
What is the longest daily screen time (that is, the time spent watching electronic devices) recommended for children?	25.56%
What are the main factors that contribute to obesity in 3–6-year-old children?	23.06%
How often should preschool children participate in sports for health?	18.05%
What is a suitable total time for outdoor exercise for preschool children?	11.03%
What is the longest time that preschool children should continuously use their eyes at short distances?	4.01%

Note: The accuracy is ranked from high to low.

Table 3 Single Factor Analysis of Health-Related Regulations in Kindergartens and Preschool Teachers' Health Knowledge

Items	N (%)	Score	p
Are preschool children allowed to bring snacks into the kindergarten?			0.002*
No	205 (51.38%)	36.39±15.80	
Yes	194 (48.62%)	31.49±15.11	
Are eye exercises conducted?			<0.001*
No	267 (66.92%)	36.78±14.49	
Yes	132 (33.08%)	28.41±16.43	
Is mental health education conducted?			0.001*
No	146 (36.59%)	37.33±13.91	
Yes	253 (63.41%)	32.09±16.28	
Do class break times meet the standard			0.79
No	237 (59.40%)	33.84±15.84	
Yes	162 (40.60%)	34.26±15.40	
Does the frequency of outdoor activities meet the standard?			0.003*
No	152 (38.10%)	31.05±14.20	
Yes	247 (61.90%)	35.83±16.23	
Does the outdoor activity time meet the standard?			<0.001*
No	312 (78.20%)	32.53±15.27	
Yes	87 (21.80%)	39.31±15.91	
Does the allotted screen time meet the standard?			0.23
No	49 (12.28%)	36.53±15.49	
Yes	350 (87.72%)	33.66±15.65	

Note: *p<0.05.

lower than male preschool teachers ($\beta=-0.114$, $p=0.016$); the scores of health knowledge of preschool teachers whose BMI indicates overweight are higher than those of the preschool teachers with normal weight ($\beta=0.099$, $p=0.034$). The model shows that the independent variables explain 14.64% (adjusted R²) of the differences found in the respondents' knowledge scores.

Discussion

Previous studies have shown that the time spent in kindergarten is an important period for children to develop healthy behaviors and habits in the future.³⁴ Therefore,

preschool teachers, as important leaders, have an important impact on the health knowledge and behaviors of preschool children.^{35,36} The current study found that preschool teachers who participated in the survey had poor cognition of child health knowledge. Without adequate health knowledge, the preschool teachers may not be able to provide effective help and support for the development of healthy behavior for children. And it is necessary to explore how to increase the health knowledge of preschool teachers.

Knowledge is a key factor in triggering behavioral change.^{12,32} This survey found that most preschool teachers did not allow children to bring snacks into the kindergarten, which indicates the existence of some understanding of childhood obesity prevention. However, the awareness of preschool teachers regarding the main causes of obesity in children was only 23%, which was much lower than the awareness rate of the cause and effect relationship of obesity among parents in Chongqing during the same period.³⁷ This indicates that preschool teachers lack detailed health information regarding childhood obesity, which means the teachers may not provide support to the parents whose children were overweight or obesity in interventions or advice. In addition, the corrected awareness of preschool teachers was less than 20% regarding the correct frequency and time for outdoor exercise for preschool children, which was very different from the results of a study in Singapore,³⁸ but similar to the result of low physical education literacy of most preschool teachers in China.³⁹ In the future, it is necessary to provide preschool teachers with sports health knowledge for preschool children to help increase the time and frequency of children's exercise to a certain extent. Besides, no more than half of participants can correctly answer the causes of decayed teeth in preschool children, which is far lower than the 60% accuracy of oral health knowledge of preschool teachers in Xi'an.³³ The prevalence of deciduous teeth among 5-year-old children in China has reached 70.9%, which has been increasing year by year.⁴⁰ A high incidence of decayed deciduous teeth in early childhood will also be susceptible to decayed permanent teeth in the future. An increase in knowledge regarding tooth health in children is also needed for Chongqing preschool teachers.

In order to develop and encourage healthy behavior and habits in preschool children, countries around the world have proposed a series of policies, guidelines, and health projects.^{41,42} The World Health Organization (WHO) issued the Guidelines for Physical Activity, Sedentary Behavior,

Table 4 Multiple Linear Regression Analysis of Children's Health Knowledge Scores Among Preschool Teachers

Group		Coef.	Std. Err.	T	Beta	p
Whether eye exercises were conducted	No Yes	Ref. -8.525	Ref. 1.545	Ref. -5.520	Ref. -0.257	Ref. <0.0011*
Whether the outdoor activity time meets the standard	No Yes	Ref. 6.181	Ref. 1.757	Ref. 3.520	Ref. 0.163	Ref. <0.0011*
Whether the frequency of outdoor activities meets the standard	No Yes	Ref. 4.186	Ref. 1.506	Ref. 2.780	Ref. 0.130	Ref. 0.0061*
Whether preschool children are allowed to bring snacks into the kindergarten	No Yes	Ref. -4.295	Ref. 1.490	Ref. -2.880	Ref. -0.137	Ref. 0.0041*
Gender	Male Female	Ref. -5.110	Ref. 2.107	Ref. -2.430	Ref. -0.114	Ref. 0.0161*
Is the screen time reasonable	No Yes	Ref. -5.387	Ref. 2.250	Ref. -2.390	Ref. -0.113	Ref. 0.0171*
BMI	Normal weight Over weight	Ref. 5.701	Ref. 2.682	Ref. 2.130	Ref. 0.099	Ref. 0.0341*
R-squared	0.1614	Adjusted R-squared			0.1464	

Note: *p<0.05.

and Sleep for Children under 5 Years Old in 2018, and proposed that for children aged 3 to 4, the daily time for moderate-vigorous physical activity (MVPA) should reach 60 minutes; the daily time for watching TV, using a computer, and performing electronic reading or playing electronic games should be limited to 60 minutes or less.⁴² The screen time of nearly 88% of where the preschool teachers are working at kindergartens the meets the standard in this study, but the scores of child health knowledge of these preschool teachers are lower than those of preschool teachers in kindergartens whose screen time does not meet the standard. The preschool teacher's scores on child health knowledge in kindergartens whose time and frequency of outdoor activities meet the standards and do not allow preschool children to bring snacks into kindergartens are higher, and the differences are significant. This shows that reasonable and correct arrangements for kindergarten-related health activities can increase the level of health knowledge of preschool teachers to a certain extent, which may further strengthen the cognition of health knowledge by preschool teachers when completing the health activities prescribed by kindergartens.

Due to the development of science and technology, new methods, such as those of electronic multimedia, are used in class for preschool children, which may cause

more exposure in screen time of preschool children. The myopia rate of teenagers and children is increasing year by year, especially among young people in East Asia.⁴³ For children and teenagers in China in 2018, it was as high as 53.6%, of which 14.5% were 6-year-old children.⁴⁴ One-third of preschool teachers showed their kindergarten conducted eye exercises in this study, which may explain why the awareness rate of preschool teachers in children's continuous short-distance eye use time is less than 5% to some extent. However, the health knowledge scores of these teachers are lower than those whose working kindergarten do not conduct eye exercises. This may be because teachers rely so much on school eye exercise systems to protect children's eyesight that they neglect to learn about eye using health. Mental health education has only been conducted in 63.4% of the kindergartens where the preschool teachers are working, but the proportion of preschool teachers who can correctly provide the method to assess preschool children's mental health is only 46.87%. This shows that the mental health and eye health knowledge of preschool teachers are deficient. Preschool children may be less likely to receive mental health intervention and correct eye knowledge from preschool teachers and with the wrong transformation of knowledge from teacher to children.

Our research found that scores of child health knowledge of female preschool teachers were lower than male preschool teachers, which was different from the results without gender difference in other health knowledge scores or awareness of other preschool teachers,^{31,35,36,38,45,46} but was similar to the results of a study in Greece regarding health knowledge of infant diabetes.⁴⁷ This finding suggests that male teachers may possess greater health knowledge in the group of preschool teachers, and it may also be due to the fact that male preschool teachers in China act as physical education teachers or health education personnel in kindergartens, and as a result, their health knowledge scores are higher.³⁹ Preschool teachers with BMI indicating overweight score higher on child health knowledge, and which is overall plus higher scores on nutritional knowledge.³² This may be because BMI may be correlated with age. Overweight preschool teachers are generally at an older age, and they may accumulate more health knowledge due to work experience. In addition, it is also possible that these overweight teachers will pay more attention to health knowledge due to their own reasons.

What is worth noting that child health education in China is a compulsory course for preschool education majors and preschool teachers and workers. Chinese preschool education-related majors will participate in courses on child health education or child hygiene during their studies.⁴⁸ However, the current study did not find significant differences in the scores of preschool child health-related knowledge of preschool teachers with different education backgrounds, working years, income levels, and kindergarten attributes. This is inconsistent with the results of some previous studies, which may indicate that the general socio-demographic characteristics of preschool teachers such as education, age, and working years are no longer the key factors affecting mastery of health knowledge by teachers, and the health support measures of the kindergartens where the teachers are working may be more critical factors.

This research on preschool teachers may play an important role in health promotion, education, and prevention of childhood diseases and unhealthy lifestyles in kindergartens in the future, and has certain public-health significance. Based on our findings, we should strengthen the training of preschool teachers' health knowledge, especially the training on the correct screen time for school children as well as exercise time and frequency for school children. These subjects were originally health education courses required by the country.²⁸ And female teachers, who may need more trained in health knowledge, such as exercise training. In

addition to targeted training, kindergartens can also adopt correct and reasonable health guidelines and regulations, carry out supportive measures for healthy behaviors, and promote participation by preschool teachers in the organization and implementation of healthy behavior measures.

There are certain limitations to the current study. First, a cross-sectional survey was conducted, and the data obtained do not allow us to determine causal relationship. Second, only 399 people participated in the study. The sample size is relatively small, which may affect the accuracy and reliability of some results of this research. Therefore, the conclusion of this study may only represent the part of preschool teachers' health knowledge in Chongqing, and further research is necessary in the future. Although our study has nearly covered preschool teachers in most regions of Chongqing. Thirdly, the health knowledge in the questionnaire was formulated with reference to various preschool guidelines in China, which may not be reflect the all health-related knowledge of preschool teachers and the assessment is a subjective self-administered questionnaire, which may cause bias.

Conclusion

The research indicated that preschool teachers in Chongqing had a poor grasp of knowledge regarding preschool child health. In particular, the accuracy of the teachers regarding preschool children's exercise was low. The current study found that preschool teachers' scores on preschool child health knowledge were related to the socio-demographic characteristics of the preschool teachers themselves and the supportive measures of the kindergarten where they were working. The scores of male preschool teachers were higher than those of female preschool teachers. The child health knowledge scores of preschool teachers may be affected by whether eye exercises were conducted or not, whether the outdoor activity time meets the standard, whether the frequency of outdoor activities meets the standard, whether to allow preschool children to bring snacks into the kindergarten, whether the screen time meets the standard, different genders, and BMIs. The influence of demographic characteristics on child health-related knowledge scores of preschool teachers is less than that of the implementation of executive measures in kindergartens. Kindergarten regulations can promote the knowledge scores of preschool teachers, which suggests that in addition to the intervention training to disseminate health knowledge among preschool teachers, supportive measures can also be directly

implemented at the kindergarten level in the future, which may efficiently increase the mastery of health knowledge of preschool teachers.

Ethics Approval and Informed Consent

This study was approved by Ethics Committee Review Committee of Chongqing Collaborative Innovation Center for Functional Food in Chongqing University of Education (201901HS02). All the teachers provided informed consent before participating in the study.

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Disclosure

The authors report no conflicts of interest in this work.

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