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Parental Perceptions of Preschool Children's Weight Status in China: A Cross-Sectional Study

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Keywords
Preschool children · Obesity · Weight status · Parental perceptions

Abstract

Introduction: Currently, overweight/obesity rates among children are increasing. Moreover, parents generally misunderstand their children's weight status. The correct perception of overweight/obesity in early childhood is very important for children's growth and development. The purpose of this study was to investigate parental perceptions of children's weight status. ***Methods:*** We analyzed data from a questionnaire study conducted among 1,971 preschool children in local kindergartens from December 1, 2021, to January 31, 2022, and classified the participants as having non-overweight and overweight/obesity according to the International Obesity Task Force (IOTF) criteria. Parents were asked whether they perceived their children to have non-overweight or overweight/obesity. We analyzed the related factors that parents underestimated or overestimated their children's weight status. ***Results:*** The rate of overweight/obesity in preschool children was 17.9%. Parental perceptions of children's weight status were inconsistent with children's real weight (kappa = 0.351, $p < 0.001$). The correctness of mother's perceptions of children's weight was higher than that of father's. Among children who were affected by overweight/obesity, 68.5% of parents underestimated their children's weights. Mothers with overweight/obesity had a 1.56 times greater risk of underestimating the children's weight than mothers who were affected by non-overweight ($p = 0.010$, odds ratio: 1.56, 95% confidence interval: 1.11–2.18). Children's sex and families with siblings were independent risk factors for parents to overestimate children's weight. ***Conclusion:*** Parents were highly likely to misinterpret the weight status of their children who were affected by overweight/obesity. Mothers with overweight/obesity were more likely to underestimate their children's weight.

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Introduction

Globally, overweight and obesity rates among children are increasing year by year. As per recent data, the overweight/obesity rates in China were 10.4% in preschool children and 19% in school children and adolescents [1]. Children with overweight/obesity are more likely to have obesity as adults, and 77% of children are expected to be affected by overweight and obesity in adulthood [2]. The preschool age is an important period of growth and development in children, and obesity interventions are most effective in this age [3, 4]. Therefore, early intervention is required for these children who are affected by overweight and obesity.

Parents play a major part to develop healthy diet and lifestyle during childhood and the early treatment and prevention of overweight and obesity in children. Parents' correct perception of their children's weight status is a key factor in early intervention for overweight/obesity. The correct recognition of children's body size is a key step in controlling overweight and obesity rates. Research shows that misconceptions about their children's weights are general among Chinese parents [5]. As per a data report from China, 72% of mothers of children with overweight underestimated their children's weight status [6]. A Spanish study showed that >50% of parents failed to correctly identify their children's weight condition [7]. A Canadian study confirmed that 63% of parents thought their children who were affected by overweight were normal weight, and 63% of parents thought their children with obesity were affected by overweight [8]. A systematic review found that parents were more likely to misunderstand the weight status of children who were affected by overweight, especially those aged 2–6 [9]. At present, the relevant factors affecting children's weight perception are still inconclusive. Sex, birth weight, mother's job, and household income are factors that influence parental perception on the weight status of children [10]. Furthermore, racial and age differences may lead to parents classifying their children's weight incorrectly [11]. Most of the research in this area focused on the USA, the UK, and some large cities in China. However, few studies in Taizhou addressed the parental perception on the weight status of preschool children. Therefore, this study aimed to understand parental perception on the weight status of preschool children and explore the related factors that parents underestimated or overestimated their children's weight status.

Methods

Study Design and Population

A questionnaire survey was conducted in Taizhou, China, from December 1, 2021, to January 31, 2022. We conducted a cross-sectional online survey at eight kindergartens in Taizhou using the WeChat-combined Wen-Juan-Xing platform, which was widely accessible to the large population in China. A total of 3,200 preschool children were included, and 2,049 of them completed the questionnaire. The response rates to the questionnaire for the eight kindergartens included in our study were 66.9%, 68.9%, 70.6%, 60.9%, 64.0%, 74.3%, 59.1%, and 57.5%, respectively. We obtained informed consent from caregivers before collecting data. The final data used in our analysis excluded the following: (i) data submitted repeatedly (n = 10); (ii) participants aged less than 3 and greater than 7 years (n = 29); (iii) participants with abnormal weight status (n = 29); and, (iv) data filled by grandparents or other persons (n = 10). After quality control, a total of 1,971 respondents were included in the study.

The data of this study were approved by the Medical Ethics Committee of Taizhou Hospital of Zhejiang Province (Approval No. K20220123). This study was ratified by our Institutional Ethics Committee. A copy of the questionnaire was attached to the online supplementary File (for all online suppl. material, see https://doi.org/10.1159/000544074).

Children's and Parental Weight Status

In the questionnaire, parents were asked to answer the following question, "What is the children's current height and weight?" Height and weight data were provided from memory by the parents. Body mass index (BMI) was calculated as weight (in kilograms) divided by square of height (in meters). We adopted International Obesity Task Force (IOTF) criteria to define overweight and obesity in preschool children. Based on the IOTF criteria, we indicated children's weight status by converting BMI to z-score and classifying them by weight into non-overweight and overweight/obesity according to sex and age [12]. The weight status of parents was classified by international cutoff points as having a non-overweight (BMI <25 kg/m^2), overweight/obesity (BMI ≥25.0 kg/m^2) [13].

Parental Perceptions of Children's Weight Status

Parental perceptions of children's weight status were assessed by the question: "How do you feel about your children's current weight?" Parents were asked to

subjectively report on their children's weight status by giving the following three possible answers: thinness, normal, and overweight or obesity.

Real weight referred to the weight status calculated based on height and weight by the questionnaire. Comparing parents' perceptions of their children's weight to children's real weight status, the parental perceptions of children's weight status were classified as underestimated, accurate, and overestimated. If the children had overweight or obesity, parents who responded "non-overweight" were considered to have underrated their children's weight status, whereas those who answered "overweight or obesity" were considered to have properly perceived their children's weight status. Parents who answered "overweight or obesity" were considered to have overestimated their children's weight status if the children were non-overweight.

Demographic and Socioeconomic Characteristics

The questionnaire collected information on the children's sex, date of birth, kindergarten, residence (urban and rural). One-child family was inferred by asking the question: "How many siblings does the child have?" (three items: 0, 1, or ≥2). Annual normalized household income was divided into three categories (<12,000, 12,000–50,000, or >50,000 Chinese Yuan [CNY]). Parental education level was divided into two groups (below university and university or above), and parental occupations was classified into brain work, physical work, and other occupations.

Statistical Analysis

Descriptive analysis (percentage, mean and standard deviation) was used to describe the relationship between the variables being tested. The agreement between parental weight perceptions and children's weight status was measured by calculating weighted kappa. The reflected content of kappa value is as follows: kappa <0.20, poor; 0.21< kappa <0.40, fair; 0.41< kappa <0.60, moderate; 0.61< kappa <0.80, good; and, 0.81< kappa <1.00, very good [14]. The lower the kappa value, the worse the parents' perception of their children's weight status. Chi-square test was used to assess the relationship between baseline characteristics and parental perceptions of children's weight status. Finally, logistic regression model was used to calculate odds ratio and 95% confidence interval to evaluate the association between maternal weight status and underestimation and overestimation of children's weight status. Perform statistical analysis by using SPSS version 26.0 (IBM). p <0.05 (two-sided) was considered to be statistically significant.

Results

A total of 1971 preschool children were enrolled in the study, including 1,040 boys and 931 girls. In our study, 17.9% of children were affected by overweight or obesity. The distribution of weight status of mothers was similar to that of children: 16.2% were affected by overweight or obesity. More than half of the children lived in cities. Furthermore, 57.9% of children had siblings. In addition, Table 1 also shows information on other socioeconomic conditions, such as the parental occupations, education level, and household income.

The weight status of girls was more likely to be misunderstood by the parents rather than that of boys (p = 0.013). There was a significant difference between the mother's weight status and the parental perception of the children's weight status (p = 0.003). Mothers who were affected by overweight/obesity were more likely to underestimate their children's weights. Furthermore, parents' education level and presence of siblings also significantly influenced parental perceptions (Table 1).

Figure 1 shows the agreement between parental perceptions of their children's weight and the children's real weight. The agreement between perceived and real children's weight status was fair (kappa = 0.351, p < 0.001). Among the children who were affected by overweight/obesity, 68.5% of parents underestimated their children's weights. In addition, mother's perception of children's weight status (kappa = 0.361, p < 0.001) was more accurate than father (kappa = 0.295, p < 0.001).

Table 2 analyzed the risk factors related to parents' underestimation and overestimation of children's weight status. Mothers with overweight/obesity had a 1.56 times greater risk of underestimating the children's weight than mothers who were affected by non-overweight (p = 0.010, odds ratio: 1.56, 95% confidence interval: 1.11–2.18). Children's sex and families with siblings were independent risk factors for parents to overestimate children's weight.

Discussion

Overweight/obesity is a major public problem in China [15]. In our study, the overweight/obesity rate of preschool children was 17.9%, which was higher than the 2015–2019 average in China (10.4%).

Our research shows that it is not well that the agreement between parental perception of their children's weight

Table 1. Differences in demographic characteristics by parental perceptions of children's weight status

	Total, *n* (%)	Parental perceptions of children's weight status			*p* value
		underestimated, *n* (%)	accurate, *n* (%)	overestimated, *n* (%)	
		241 (12.2)	1,672 (84.8)	58 (3.0)	
Child-related characteristics					
Sex					0.013
Boy	1,040 (52.8)	118 (11.3)	901 (86.6)	21 (2.0)	
Girl	931 (47.2)	123 (13.2)	771 (82.8)	37 (4.0)	
Age					0.312
3 years	484 (24.6)	60 (12.4)	403 (83.3)	21 (4.3)	
4 years	647 (32.8)	74 (11.4)	556 (85.9)	17 (2.6)	
5 years	648 (32.9)	86 (13.3)	549 (84.7)	13 (2.0)	
6 years	192 (9.7)	21 (10.9)	164 (85.4)	7 (3.6)	
Mother-related characteristics					
Weight status					0.003
Non-overweight	1,652 (83.8)	184 (11.1)	1,420 (86.0)	48 (2.9)	
Overweight/obesity	319 (16.2)	57 (17.9)	252 (79.0)	10 (3.1)	
Educational level					0.007
Below university	712 (36.1)	109 (15.3)	584 (82.0)	19 (2.7)	
University or above	1,259 (63.9)	132 (10.5)	1,088 (86.4)	39 (3.1)	
Occupations					0.183
Brain work	1,483 (75.2)	166 (11.2)	1,272 (85.8)	45 (3.0)	
Physical work	103 (5.2)	17 (16.5)	83 (80.6)	3 (2.9)	
Others	385 (19.5)	58 (15.1)	317 (82.3)	10 (2.6)	
Father-related characteristics					
Weight status					0.044
Non-overweight	1,115 (56.6)	123 (11.0)	965 (86.5)	27 (2.4)	
Overweight/obesity	856 (43.4)	118 (13.8)	707 (82.6)	31 (3.6)	
Educational level					0.034
Below university	845 (42.9)	122 (14.4)	699 (82.7)	24 (2.8)	
University or above	1,126 (57.1)	119 (10.6)	973 (86.4)	34 (3.0)	
Occupations					0.145
Brain work	1,624 (82.4)	191 (11.8)	1,380 (85.0)	53 (3.3)	
Physical work	133 (6.7)	23 (17.3)	109 (82.0)	1 (0.8)	
Others	214 (10.9)	27 (12.6)	183 (85.5)	4 (1.9)	
Family-related characteristics					
Residence					0.197
Urban	1,265 (64.2)	143 (11.3)	1,082 (85.5)	40 (3.2)	
Rural	706 (35.8)	98 (13.9)	590 (83.6)	18 (2.5)	
One-child family					0.014
Yes	829 (42.1)	87 (10.5)	725 (87.5)	17 (2.1)	
No	1,142 (57.9)	154 (13.5)	947 (82.9)	41 (3.6)	
Annual household income (CNY)					0.090
<12,000	416 (21.1)	66 (15.9)	339 (81.5)	11 (2.6)	
12,000–50,000	1,265 (64.2)	147 (11.6)	1,082 (85.5)	36 (2.8)	
>50,000	290 (14.7)	28 (9.7)	251 (86.6)	11 (3.8)	

status and the real weight status. The study from Vienna also showed a high level of parental misperceptions about their children's weight status, especially in children who were affected by overweight or obesity [16]. The difference is that they investigated school-age children and used WHO criteria to determine childhood obesity status. A

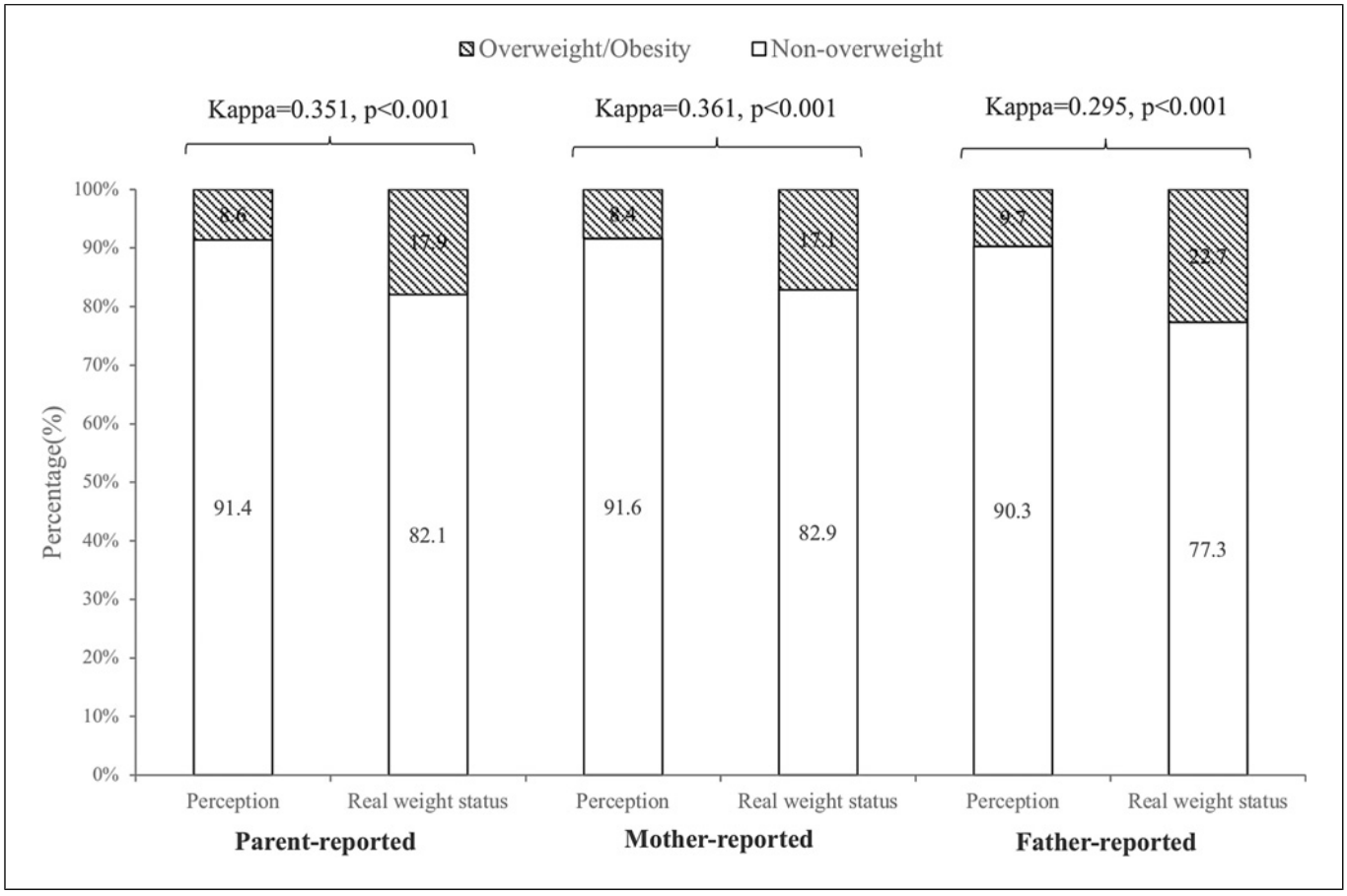

Fig. 1. Agreement between parental perception of children's weight and children's real weight status. Kappa <0.20, poor; 0.21< kappa <0.40, fair; 0.41< kappa <0.60, moderate; 0.61< kappa <0.80, good; and, 0.81< kappa <1.00, very good.

study in Barcelona selected 101 schools and recruited pupils aged 3–4 years showed that most parents of children with obesity underestimated the weight of their children [17]. This is consistent with our findings. Therefore, it is essential to guide parents to correctly recognize their children's weight status.

Related Factors of Parental Misunderstanding of Children's Weight Status

Consistent with previous research, certain socioeconomic characteristics appear to predict differences in parental cognition [18]. Compared to boys, the weight status of girls was more likely to be misunderstood by parents. Consistent with previous research, the children's sex was a significant factor influencing parental misconceptions about the child's weight [19]. However, not all literature is consistent [20]. Although this trend may be influenced by differences in body composition, it is more likely to be explained by different social norms about ideal body size for boys and girls [19]. Parents with less education tended to underestimate their children's overweight/obesity status. Further, parents with higher than university education were more likely to recognize that their children were affected by overweight or obesity than those with lower than university education. Parents with higher education might be more aware of the concept of overweight/obesity, and they would pay more attention to their children's health. This emphasizes the need to design and implement educational intervention measures for families with lower education level to solve the problem of overweight and obesity. Educational campaigns can be carried out for parents with a low level of education to give them a correct understanding of their children's weight status. This will

Table 2. Analysis of risk factors associated with parents underestimating and overestimating their children's weight status

Variable	Parental perceptions of children's weight status			
	underestimated		overestimated	
	p value	OR (95% CI)	*p* value	OR (95% CI)
Children's sex				
Girl vs. boy	0.150	1.22 (0.93–1.60)	0.007	2.11 (1.22–3.64)
Mother's weight status				
Overweight/obesity vs. non-overweight	0.010	1.56 (1.11–2.18)	0.747	1.13 (0.55–2.30)
Father's weight status				
Overweight/obesity vs. non-overweight	0.137	1.23 (0.94–1.62)	0.124	1.52 (0.89–2.59)
Mother's educational level				
University or above vs. below university	0.166	0.78 (0.54–1.11)	0.456	1.32 (0.64–2.72)
Father's educational level				
University or above vs. below university	0.565	0.90 (0.63–1.28)	0.963	0.98 (0.50–1.95)
One-child family				
Yes vs. no	0.129	0.80 (0.60–1.07)	0.024	0.51 (0.28–0.92)

OR, odds ratio; CI, confidence interval.

help children establish good eating and behavioral habits and promote a healthy lifestyle. Furthermore, parents in families with siblings had a disposition to underestimate their children's body weight. This may be because in the current society, most parents with higher education have only one child. Parents of families with siblings had lower educational background, and they were more likely to misunderstand the weight of their children.

Mothers with Overweight/Obesity Were More Likely to Underestimate Their Children's Weight

Consistent with findings in other populations, maternal misconceptions about children's weight were more common among mothers who were affected by overweight/obesity than those among mothers with non-overweight [21]. Parents with overweight/obesity are reluctant to consult their doctor about their children's weight because they will often be reminded that they do not have the ideal weight [22]. This may explain why parents with overweight/obesity, especially mothers, have a greater disposition to underestimate children's weight status than other parents. Currently, the media often distort the definition of overweight/obesity, and they think it is very bad to have overweight/obesity [23]. Women's weight status is more likely to receive media attention than men [24]. Mothers with overweight/obesity may be the first to know the negative connotations associated with "overweight" and "obesity," and they would not want to attach a label to their children at an early age. Mothers are of the opinion that telling others that their children having overweight/obesity may affect their children's self-esteem, which is not conducive to their healthy growth.

The Importance of Understanding Children's Weight Status Correctly

Proper parental understanding of children's weight status is crucial because parental participation is a vital part of the treatment of childhood obesity [25]. It is unlikely that we will be able to effectively address the growing childhood obesity epidemic if parents do not appropriately understand their children's weight status.

Due to parents' misperceptions of children's weight, public health policies may not be able to address the problem of childhood obesity in a targeted manner. At the same time, it will lead to a significant increase in the investment of overall social healthcare resources in the treatment of childhood obesity-related diseases, crowding out the allocation of resources for other disease prevention and public health programs, thus posing a serious challenge to the sustainability of the entire social healthcare system. Therefore, there is a great need for

targeted educational interventions for parents. For parents who misunderstand the weight status of their children, we should first help them to understand the growth and developmental stages of their children and the corresponding nutritional requirements, which will help them to more accurately assess whether their children's weight is in the healthy range. Second, parents should be actively involved in their children's health activities, such as engaging in physical activities and planning healthy diets together, which can help motivate children and increase family cohesion. Parents who underestimate their children's weight should reduce their children's intake of sugary drinks and pay attention to their children's food portion sizes in terms of diet. In terms of behavior, they should reduce the use of electronic devices and increase physical activity.

School-based child weight status reports may be useful. This can provide parents with accurate information about their children's weight status. Once parents realize that their children's weight is within the range of overweight or obesity, this may prompt them to consult a doctor and take improvement measures. Clinicians need to be clear about the children's weight status and enable parents to gain a proper understanding about the children's weight status during patient clinic visits [26, 27]. Research shows that only 36.7% of children with overweight/obesity are told by their doctors that they are affected by overweight/obesity [28]. Only in this way can obesity prevalence be fundamentally controlled.

Strengths and Limitations

We are the first to study the distribution of overweight/obesity among preschool children in Taizhou in a large sample along with parent' perceptions of their children's weight status. There are several limitations to this study. First, this study was a cross-sectional study, and we cannot show the causal relationship of the results. Second, this study selected convenient samples of children from eight kindergartens in Taizhou. This may affect the universality of its research results, which cannot represent the whole population. Third, our study takes a convenience sample. We chose kindergartens with high levels of cooperation for the study, which is limited in terms of representativeness. The results need to be generalized with caution. Fourth, the data of weight and height were reported by parents through memory and self-report, which affected the accuracy of the data. Most studies showed that self-reported height was overestimated and weight and BMI were underestimated [29, 30]. Parents' self-reported weights are likely to be lower than their true weights, so the likely outcome is a higher proportion of parents underestimating their children's perceived weight. Fifth, the response rate of the questionnaire was relatively low, which may lead to biased results. Sixth, data for the study were collected during the COVID-19 epidemic, and some studies have shown significant changes in children's weight during the COVID-19 pandemic [31]. However, this study failed to obtain data on the dynamics of weight and parental perceptions and only collected data at one point in time, which may not accurately reflect the long-term status of weight perceptions. Finally, there was social expectation bias in our research. Everyone expected their children to be "healthy." Therefore, some parents may answer what they knew about the expected weight status of society, rather than their children's actual weight status.

Our research showed that the prevalence of overweight/obesity among preschool children was relatively high in Taizhou. There was a high percentage of parents misunderstanding their children's weight status, which is concerning. Mothers with overweight/obesity had a higher risk of underestimating their children's weight.

Statement of Ethics

This study protocol was reviewed and approved by the Medical Ethics Committee of Taizhou Hospital of Zhejiang Province, Approval No. K20220123, and was in line with national guidelines. All children's caregivers provided verbal informed consent.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

Jingyun Yang, Ludan Zhou, Lingjiao Chen, Yixin Wu, Yun Wang, Hailing Fan, Tao-Hsin Tung, Meixian Zhang, and Lizhen Wang contributed to the design and implementation of this study.

Jingyun Yang and Ludan Zhou conducted data analysis and mainly wrote the manuscript. Lingjiao Chen and Yixin Wu conducted the collection of questionnaires. Yun Wang, Hailing Fan, and Tao-Hsin Tung collated the data. Lizhen Wang and Meixian Zhang responded to the questions and made critical revisions to the manuscript.

Data Availability Statement

The date that support the findings of this study are not publicly available due to their containing information that could compromise the privacy of research participants but are available from the corresponding author (meixian0116@163.com).

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