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Original Article

Socioeconomic and lifestyle behavioral factors associated with overweight and obesity among rural to urban migrant children in central China

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Abstract: Overweight and obesity are widespread among rural to urban migrant children and teenagers in cities of central China, but have not been studied. Through physique measurement and questionnaire, here we explored the correlations of overweight and obesity with socioeconomic factors, living behaviors and habits among rural to urban migrant children in central China. A scheme of multistage stratified full-group sampling was used in the investigations. Three cities in central China, including Nanchang from Jiangxi Province, Wuhan from Hubei Province, and Changsha from Hunan Province were selected. Then 7- to 12-year-old rural to urban migrant children were randomly selected and involved for physique measurement and questionnaire. Statistical analysis was performed on SPSS 22.0 at the significance level α=0.05. We found the result as follow: (1) The incidence rates of childhood obesity with father's and mother's profession being businessman are 2.25 and 1.79 times higher, respectively, compared with other professions. The rates of childhood obesity with father's education level at high school and college/above are 0.66 and 0.54, respectively, compared with the level of elementary school/below. The rates of childhood obesity with mother's education level at high school and college/above versus are 0.36 and 0.21, respectively, that at the level of elementary school/below. The rate of childhood obesity with family monthly income > 5000 Yuan is 1.96 times higher than that at the level < 2000 Yuan. (2) The rate of childhood obesity with daily exercise > 20000 paces is 0.34 that with the level of < 10000 paces. (3) The rates of overweight and obesity with ≥ 4 times/month of snacks are 1.62 and 2.06 times, respectively those at the level of < 4 times/month of snacks. The rates of overweight and obesity with sodas drinking ≥ 3 times/month are 2.12 and 3.26 fold higher, respectively, compared with the level of < 3 times/month. The overweight and obesity among rural to urban migrant children are largely associated with socioeconomic factors, living behaviors/habits, and eating habits. We find obesity and overweight are very widespread among children with parental occupation being businessman or civil servants, with parents' education level at elementary school/below, and with high family monthly income. Overweight and obesity are also very frequent among children with little daily exercise or with excessive high-energy intake.

Keywords: Rural to urban migrant children, overweight and obesity, socioeconomic factors, living behaviors and habits

Introduction

The implementation of Reform and Opening-up has accelerated the urban economic growth in China, but the speed far surpasses that of rural economic development. Due to the labor force surplus in rural areas, a growing number of farmers are migrating to cities for a better life [1]. The migration of parents directly decides the stay or movement of children. A part of children migrate together with their parents and become rural to urban migrant children [2]. The 2014 China Floating Population Development Report showed there were 0.245 billion floating migrants, more than 1/6 of the total population, by the end of 2013 in China [3] . The floating population mainly migrated to cities, especially megacities [3]. Up to 62.5% of 6- to 15-year-old children migrated together with their parents. The numbers of floating population and migrating children are still on the rise. Obesity becomes a global public health prob-

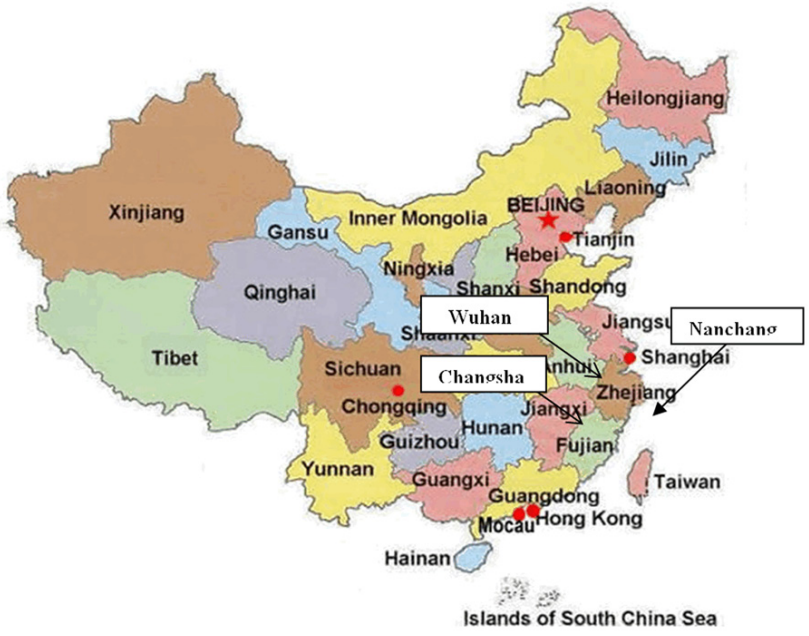

Figure 1. Location of the three areas in China where the study was conducted.

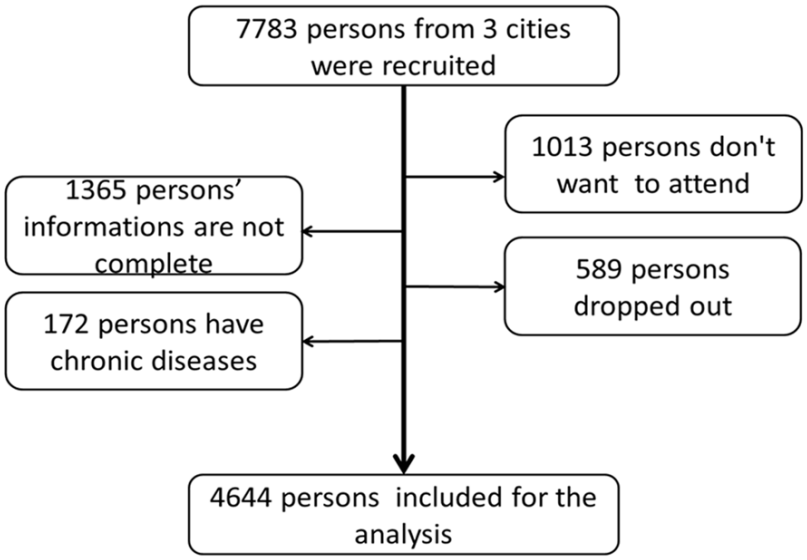

Figure 2. Flowchart of participant screening.

lem and is increasingly severe [4]. This problem is more evident among children and teenagers [5] and the incidence rate has doubled in the past decade [6]. Worth Health Organization estimated in 2011 that there were 0.155 billion outweighed or obese children/teenagers at age 5-17, with 30-40 million obese children or teenagers [7]. The rate of outweighed or obese children/teenagers in China is rising even more significantly. There were 0.12 billion outweighed/obese persons under age 18 in 2013, with more than 70% in cities [8]. As reported, the incidence rate of overweighed and obese rural to urban migrant children/teenagers in cities (not local household registration) is rising rapidly and becomes epidemic [9]. Since rural to urban migrant children and teenagers do not have urban household registration and thus do not enjoy urban social welfare or health security services in China, they are faced with severe overweight and obesity.

The overweight and obesity of rural to urban migrant children have altered researchers. A study involving 2457 children in Shanghai (7-12 years old) shows that the incidence rates of overweight/obesity among rural to urban migrant children are close to those of urban children and far higher compared with rural children [9]. The risk factors of overweight and obesity among rural to urban migrant children include intake of rice, family income, and systolic blood pressure ≥ 140 mmHg (Lu 2015). The rates of overweight and obesity among 1465 school-aged children (7-12 years old) from migrant worker families are significantly lower than those of urban school-aged children in Shanghai, and the rates among school-aged boys from migrant worker families are very high [10]. A study involving 2431 pupils (7-12 years old) from eight public schools in Sichuan shows that the rates of overweight and obesity among

Table 1. Baseline characteristics of the participants by weight status (N=4644)

	Normal (n=3482)	Overweight (n=737)	Obese (n=425)	Total (N=4644)	*P*-value
Gender					< 0.001
Boys	1684 (48.4)	519 (70.4)	317 (74.6)	2520 (54.3)	
Girls	1798 (51.6)	218 (29.6)	108 (25.4)	2124 (45.7)	
Age					< 0.001
7	183 (5.3)	85 (11.5)	39 (9.2)	307 (6.6)	
8	370 (10.6)	132 (17.9)	61 (14.4)	563 (12.1)	
9	738 (21.2)	171 (23.2)	106 (24.9)	1015 (21.9)	
10	1109 (31.8)	206 (28.0)	141 (33.2)	1456 (31.4)	
11	680 (19.5)	97 (13.2)	51 (12.0)	828 (17.8)	
12	402 (11.5)	46 (6.2)	27 (6.4)	475 (10.2)	
Weight	36.74±3.83	49.61±6.53	54.22±8.15	40.34±4.77	< 0.001
Height	139.4±3.61	143.6±5.73	147.5±7.92	140.81±4.92	< 0.001
BMI	18.03±2.86	20.15±3.07	24.03±3.49	18.91±2.95	< 0.001

rural to urban migrant children are associated with parental occupations, parents' education levels, and family income [11]. Overweight and obesity are more common among children with parental occupation of civil servants or business servants compared with the profession of farmers. The rates of overweight and obesity are higher among children with low parental education level and low family income.

The existing research of overweight and obesity among rural to urban migrant children is focused on seashores and western regions in China, but rarely on central China. In this study, three cities in central China, including Nanchang from Jiangxi Province, Wuhan from Hubei Province, and Changsha from Hunan Province, were selected (**Figure 1**). Then 7- to 12-year-old rural to urban migrant children were randomly selected and involved in physique measurement and questionnaire. We aimed to explore the correlations of overweight/obesity with socioeconomic factors and living behaviors/habits.

Methods

Study population

The correlations of overweight/obesity among rural to urban migrant children with socioeconomic and lifestyle behaviors' factors were evaluated. A scheme of multistage stratified full-group sampling was used in the investigations. From each city, 3 schools were randomly selected. All pupils in each of the classes were enrolled, with a total of 7783 participants. However, 1013 pupils not willing to participate, 589 pupils who dropped out, 1365 pupils with incomplete information, and 172 pupils with chronic diseases in heart, kidney or liver were excluded. Finally, 4644 pupils were included (2520 boys and 2124 girls) and their information is listed in **Figure 2**.

Data collection

Before measurement, some volunteers were selected and given professional training. After that, the qualified volunteers were selected as investigators, who completed physique measurement and questionnaire investigation. (1) The physique measurement included height and weight. The height was counted as the vertical distance from the foot bottom to the head vertex [11]. Weight was counted as the total weight of the body. Unified instruments and scientific standards were used. An RCS-200 electronic height and weight balance (Jiangsu Suhong Medical Apparatus Co., Ltd.) was used. The instrument was zero-calibrated before measurement. During the measurement, the performer's line of sight was parallel to the graduation line, while each participant stood on the baseboard in bare feet, with thin clothing and at the attention position [12]. The height was counted to integral (cm); weight was measured to one decimal (kg). Body mass index (BMI) was determined as weight (kg)/[height (m)] 2. Obesity was diagnosed as per Application of Overweight Obesity in BMI Screening Criteria into Chinese Students [13]. (2) The questionnaire covered the basic information of rural to urban migrant children, socioeconomic information of families, and daily living behaviors/habits. The questionnaire was conducted in each class per time by the investigators. Before the investigations, the qualified investigators informed the pupils about the objective and significance of the investigation, the method of questionnaire filling, and notes of attention, which were aimed to get the trust and cooperation from the pupils, guaranteeing that informed consents were obtained from all

Table 2. Correlations between overweight/obesity and socioeconomic factors among rural to urban migrant children

	Normal (n=3482)	Overweight (n=737)	Obese (n=425)	*P*-value	
				Overweight vs. normal	Obesity vs. normal
Parental occupation					
Father's occupation				< 0.001	< 0.001
Civil servant	571 (16.4)	115 (15.6)	96 (22.6)		
Worker	547 (15.7)	103 (14.0)	38 (8.9)		
Companystaff	815 (23.4)	148 (20.1)	62 (14.6)		
Businessman	514 (14.8)	174 (23.6)	149 (35.1)		
Farmer	343 (9.9)	48 (6.5)	32 (7.5)		
Others	692 (19.9)	149 (20.2)	48 (11.3)		
Mother's occupation				< 0.001	0.002
Civil servant	600 (17.2)	159 (21.6)	67 (15.8)		
Worker	496 (14.2)	93 (12.6)	62 (14.6)		
Company staff	882 (25.3)	162 (22)	95 (22.4)		
Businessman	481 (13.8)	174 (23.6)	89 (20.9)		
Farmer	190 (5.5)	34 (4.6)	14 (3.3)		
Others	833 (23.9)	115 (15.6)	98 (23.1)		
Parental education level					
Father's education level				< 0.001	0.020
Primary school or lower	490 (14.1)	168 (22.8)	80 (18.8)		
Junior high school	685 (19.7)	162 (22.0)	88 (20.7)		
Senior high school	910 (26.1)	201 (27.3)	113 (26.6)		
College or above	1397 (40.1)	206 (28.0)	144 (33.9)		
Mother's education level				< 0.001	0.001
Primary school or lower	685 (19.7)	204 (27.7)	96 (22.6)		
Junior high school	1145 (32.9)	238 (32.3)	164 (38.6)		
Senior high school	574 (16.5)	102 (13.8)	73 (17.2)		
College or above	1078 (31.0)	193 (26.2)	92 (21.6)		
Family monthly income				0.018	0.002
< 2000 Yuan	669 (19.2)	117 (15.9)	63 (14.8)		
2000-5000 Yuan	1893 (54.4)	393 (53.3)	215 (50.6)		
> 5000 Yuan	920 (26.4)	227 (30.8)	147 (34.6)		

participants. Then in each class, the teacher in charge distributed the questionnaires to the pupils, asked them to fill in a unified way, and collected the questionnaires back after completion.

Statistical analysis

Statistical analysis was performed on SPSS 22.0 at the significance level $\alpha=0.05$. Quantitative data meeting normal distribution and homogeneous variances were statistically described as mean ± standard deviation ($\bar{x} \pm s$). Intergroup comparison was tested via analysis of variance (ANOVA) and further assessed via least significant difference (LSD)-t test. Quantitative data not meeting normal distribution or homogeneous variances were statistically described as median and quartile range (M ± QR). Intergroup comparison was conducted via rank sum test and further assessed via Nemenyi test. Qualitative data were statistically described as relative data. Groups were compared via Chi-square test. Data not meeting Chi-square test conditions were expressed as Fisher's exact probability. Multiple logistic regressions were conducted, and significance level at $P < 0.05$.

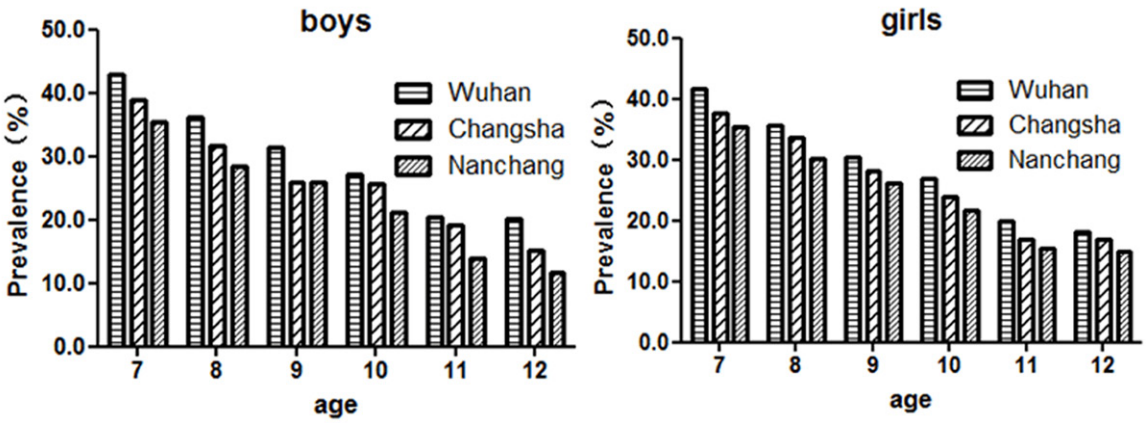

Figure 3. Prevalence of overweight and obesity by age and city.

Table 3. Differences in lifestyle behaviors among the participants with different weight status

	Normal (n=3482)	Overweight (n=737)	Obese (n=425)	*P*-value	
				Overweight vs. normal	Obesity vs. normal
Daily sleeping hours (h)				0.962	0.053
< 8	328 (9.4)	67 (9.1)	38 (8.9)		
8-9	2053 (59.0)	436 (59.2)	228 (53.6)		
> 9	1101 (31.6)	234 (31.8)	159 (37.4)		
Daily exercise (paces)				0.001	0.010
< 10000	136 (3.9)	46 (6.2)	30 (7.1)		
10000-20000	1992 (57.2)	447 (60.7)	234 (55.1)		
> 20000	1354 (38.9)	244 (33.1)	161 (37.9)		
Daily homework hours ≥ 2 h	558 (16.0)	132 (17.9)	65 (15.3)	0.209	0.698
Daily TV/computer hours ≥ 2 h	305 (8.8)	73 (9.9)	40 (9.4)	0.322	0.655
Going to school on foot/by bike	1694 (48.7)	335 (45.5)	216 (50.8)	0.115	0.397

Results

Totally 4644 participants were enrolled and divided by BMI into three groups: a normal group (3482), an overweight group (737) and an obesity group (425). The basic information of the three groups was analytically compared. The rates of both overweight and obesity are significantly different between genders ($P < 0.001$). Boys versus girls show higher rates of overweight (20.59% vs. 10.26%) and obesity (12.58% vs. 5.08%). The rates of overweight and obesity both change significantly in an age-dependent way ($P < 0.001$). Specifically, the rates of obesity decline from 12.7%, 10.8%, 10.4%, 9.7%, 6.2% to 5.7% with from age from 7 to 12, respectively. The weights and heights of the overweight group (or obesity group) are both significantly higher versus the normal group ($P < 0.001$) (**Table 1**).

Comparisons among the three cities show that the rates of overweight and obesity are both higher in Wuhan, irrespective of genders or age groups, followed by Changsha and Nanchang (**Figure 3**). Moreover, the rates of overweight and obesity both decline with age.

Comparisons of childhood overweight/obesity among parental occupation, Chi-square tests show that the rates of childhood overweight and obesity are both significantly different among parental occupation ($P < 0.001$). In particular, the rates of overweight and obesity are maximized to 38.59% and 35.35%, respectively, with the parental profession of businessman, followed by civil servants (26.98% and 27.36%) and are lowest at the profession of farmer (18.91% and 20.17%). The possible reason is that business men provide sufficient materials, but not enough time, for their chil-

Table 4. Differences in dietary characteristics among the participants with different weight status

	Normal (n=3482)	Overweight (n=737)	Obese (n=425)	*P*-value	
				Overweight vs. normal	Obesity vs. normal
Having breakfast everyday	1978 (56.8)	419 (56.9)	228 (53.6)	0.982	0.215
Times of eating meat/week				0.884	0.394
< 2	736 (21.1)	152 (20.6)	90 (21.2)		
2-5	1872 (53.8)	394 (53.5)	216 (50.8)		
> 5	874 (25.1)	191 (25.9)	119 (28)		
≥ 4 times/week of eating fruits	2145 (61.6)	458 (62.1)	242 (56.9)	0.784	0.063
Eating duration ≥ 20 min each time	2402 (69.0)	492 (66.8)	287 (67.5)	0.237	0.541
≥ 4 times/month of snacking	2109 (60.6)	485 (65.8)	287 (67.5)	0.008	0.005
Dietary pickiness/bias	2276 (65.4)	469 (63.6)	270 (63.5)	0.371	0.453
≥ 3 times/week of drinking sodas	1615 (46.4)	381 (51.7)	296 (69.6)	0.009	< 0.001

dren. Together with the low self-discipline, the children gradually fall into unhealthy living and eating habits.

The rates of childhood overweight and obesity are significantly different among (P < 0.05) and reversely correlated with parental education levels. The rates of childhood overweight and obesity with parental education level at college and above are 20.03% and 20.91%, respectively, and are 33.60% and 30.46% at the condition of elementary school and below. The possible reasons are that parents with higher education are more aware of the harms of obesity, thus are more strict about their children's living habits and pay more attention to reasonable eating, thereby controlling the weights of their children (**Table 2**).

The rates of childhood overweight and obesity are significantly different among (P < 0.05) and positively correlated with family income levels. The rates of childhood overweight/obesity at family income < 2000, 2000-5000, and > 5000 Yuan are 21.20%, 24.31% and 28.90%, respectively (**Table 2**).

As showed in **Table 3**, the rates of childhood overweight/obesity are significantly different among daily exercise levels (P < 0.05). The rate of childhood overweight/obesity declines with the daily exercise level as follows: < 10000 paces (35.85%), 10000-20000 paces (25.48%), and < 20000 paces (23.02%). The rates of childhood overweight/obesity are not significantly different regardless of sleeping hours, homework hours, TV/computer hours, or going to school on foot/by bike (all P > 0.05).

As showed in **Table 4**, the rates of childhood overweight/obesity vary significantly with the monthly frequency of snacks, or weekly frequency of sodas (P < 0.05). The rate of childhood overweight/obesity is higher with ≥ 4 snacks/month versus < 4 snacks/month (26.80% vs. 22.12%). The rate of childhood overweight/obesity is higher with ≥ 3 soda drinking/week versus < 3 soda drinking/week (29.54% vs. 20.62%). The rates of childhood overweight/obesity are not significantly different in terms of having breakfast or not, times of eating meat/week, times of eating fruits, time duration of eating, and dietary pickiness/bias (all P > 0.05).

Univariate analysis shows that the rates of overweight/obesity among rural to urban migrant children are affected byparental occupation, parental education levels, family monthly income, daily exercise, having snack, and drinking sodas. Multifactor logistic regression was carried out to reveal the acting amplitude s and directions of each factor (**Table 5**).

The parental occupation that significantly affect the occurrence of childhood overweight or obesity are civil servants, businessman, and farmers (P < 0.05). The rates of childhood overweight with father's occupations of civil servants, businessman, and farmers are 1.72, 2.05 and 0.43 times larger, respectively, compared with other professions. The rates of childhood obesity with father's professions being businessman and farmers are 2.25 and 0.55 times higher than other professions. The rate of overweight with mother's profession being farmers is 0.56 that of other professions. The rate of childhood obesity with mother's profession

Table 5. Association between weight status and health-related factors

	Overweight		*P*-value	Obese		*P*-value
	OR	95% CI		OR	95% CI	
Parental occupation						
Father's						
Civil servant	1.72	1.05-2.81	0.030	0.93	0.71-1.22	0.604
Worker	0.87	0.64-1.19	0.384	0.89	0.57-1.4	0.612
Company staff	1.03	0.67-1.59	0.893	0.75	0.42-1.32	0.321
Businessman	2.05	1.18-3.55	0.010	2.25	1.05-4.83	0.038
Farmer	0.43	0.23-0.79	0.006	0.55	0.52-0.58	< 0.001
Others	Referent	-	-	Referent	-	-
Mother's occupation						
Civil servant	1.07	0.61-1.89	0.816	1.49	0.99-2.25	0.058
Worker	0.65	0.35-1.19	0.165	0.79	0.3-2.1	0.637
Company staff	1.07	0.71-1.61	0.747	1.21	0.59-2.5	0.606
Businessman	1.02	0.59-1.77	0.944	1.79	1.23-2.6	0.002
Farmer	0.56	0.47-0.67	< 0.001	0.63	0.34-1.16	0.136
Others	Referent	-	-	Referent	-	-
Parental education level						
Father's						
Primary school or lower	Referent	-	-	Referent	-	-
Junior high school	0.69	0.13-3.72	0.666	0.75	0.44-1.27	0.287
Senior high school	0.67	0.49-0.92	0.012	0.66	0.44-1	0.048
College or above	0.24	0.09-0.67	0.006	0.54	0.32-0.9	0.018
Mother's						
Primary school or lower	Referent	-	-	Referent	-	-
Junior high school	0.41	0.15-1.14	0.086	0.63	0.34-1.18	0.149
Senior high school	0.79	0.31-1.98	0.616	0.36	0.15-0.89	0.026
College or above	0.28	0.18-0.43	< 0.001	0.21	0.08-0.55	0.001
Family monthlyincome (Yuan)						
< 2000	Referent	-	-	Referent	-	-
2000-5000	1.72	1.1-2.7	0.018	1.09	0.61-1.96	0.774
> 5000	2.89	1.81-4.63	< 0.001	1.96	1.2-3.2	0.007
Lifestyle behaviors'						
Daily exercise (paces)						
< 10000	Referent	-	-	Referent	-	-
10000-20000	0.91	0.73-1.13	0.391	0.48	0.21-1.11	0.088
> 20000	0.18	0.14-0.23	< 0.001	0.34	0.15-0.79	0.012
≥ 4 snacking per month	1.62	1.07-2.44	0.022	2.06	1.1-3.86	0.024
≥ 3 sodas drinking per week	2.12	1.64-2.73	< 0.001	3.26	2.29-4.64	< 0.001

being businessman is 1.79 times that of other professions.

The parental education levels significantly affect the occurrence of childhood overweight/obesity ($P < 0.05$). The rates of childhood overweight with father's education levels at high school and college/above are 0.67 and 0.24, respectively, those of level at elementary school/below; the rates of obesity are 0.66 and 0.54, respectively, those of level at elementary school/below. The rate of childhood overweight with mother's education level at college/above is 0.28 that of education level at elementary school/below. The rates of childhood obesity with mother's education level at high school, and college/above are 0.36 and 0.21 that at education level of elementary school/below.

Family monthly income significantly affects the occurrence of overweight/obesity among rural to urban migrant children ($P < 0.05$). The rates of childhood overweight at the family monthly income 2000-5000, and > 5000 Yuan are 1.72 and 2.89 times that at the level of < 2000 Yuan. The rate of childhood obesity at the family monthly income > 5000 Yuan is 1.96 times that at the level of < 2000 Yuan.

The living behaviors and habits significantly affect the occurrence of overweight/obesity among rural to urban migrant children ($P < 0.05$). The rates of childhood overweight and obesity with daily exercise > 20000 paces are 0.18 and 0.34 times those at the level < 10000 paces.

The eating habits significantly affect the occurrence of overweight/obesity among rural to urban migrant children ($P < 0.05$). The rate of childhood overweight and obesity at level of ≥ 4 snacks/month are 1.62 and 2.06 times those at the level of < 4 snacks/month. The rates of childhood overweight and obesity at level of ≥ 3 soda drinking/week are 2.12 and 3.26 times those at the level of < 3 soda drinking/week.

Discussion

Childhood overweight and obesity become an increasingly severe public health concern in China [14]. The imbalance of economic development in China has driven the massive migration of rural to urban migrant children into cities with their parents. As a result, the number of rural to urban migrant children in cities has sharply increased in recent years. Thus, the overweight and obesity among rural to urban migrant children become intensified. The occurrence of overweight and obesity is jointly affected by multiple factors, including inheritance, environment and society and would largely affect the growth and development of children. We find the occurrence of overweight and obesity among rural to urban migrant children are largely associated with socioeconomic factors, living behaviors/habits, and eating habits. Obesity and overweight are very severe among children with parental occupation being businessman or civil servants, with parents' education level at elementary school and below, and with family monthly income > 5000 Yuan. Obesity and overweight are also very widespread among children with daily exercise > 20000 paces, ≥ 4 snacking per month, and ≥ 3 sodas drinking per week.

A multiple linear regression model about the correlations between children's BMI and family income shows that the rise of family incomes promotes the increase of children's BMI and the occurrence of overweight/obesity [15]. Then a logistic regression model about childhood overweight and obesity shows that after other confounders are controlled, the family income is still a major risk factor for childhood overweight and obesity [15]. Specifically, a higher family income level is a larger risk for childhood overweight and obesity [15]. As reported, family income is positively correlated with children's BMI, as a higher family income level indicates more-severe childhood obesity [16]. We find that overweight and obesity are more frequent among rural to urban migrant children with parents being businessman or civil servants, with parents' education level of elementary school and below, with family monthly income > 5000 Yuan, which prove that a higher family income is associated with better material condition, and the overweight and obesity of rural to urban migrant children are more common.

As reported, urban children intake significantly more proteins and fats compared with children of migrant workers [10]. Urban children undertake heavier homework load and less daily exercise compared with children of migrant workers. Therefore, the rates of overweight and obesity in urban children are significantly higher compared with children of migrant workers, indicating the occurrence of overweight and obesity among children is closely associated with eating habits and physical activities. The occurrence of childhood obesity is directly associated with bad eating habits, such as excessive intake of meat, and is proportional to the intake of meat and fats [17, 18]. Such habits would cause fat accumulation [19] and obesity. Thus, obesity is very common among children with high weekly meat intake [20], while the risks of overweight and obesity are reduced among children frequently eating fibrous foods, such as vegetables and fruits. Daily fruit intake, having breakfast every day, and slow chewing/swallowing are protective factors against overweight and obesity among school-aged children, but dietary bias and sodas drinking are risk factors [21]. Obesity is also associated with fast eating [22], probably because fast

eating would easily cause excessive intake and thereby induce obesity [23]. In the present study, ≥ 4 snacking/month and ≥ 3 sodas drinking/week both would cause overweight/obesity, indicating that high-energy and high-fat intake would raise the risks of overweight and obesity among children.

This study also has some limitations, though we adopted scientific investigations and analytical methods. First, as for data measurement, though the investigators received professional training, the measurements might slightly deviate from the real data, due to some uncertainties, such as instrumental errors and the investigators' sense of duty. Second, as for the questionnaire, the participants might have not carefully replied due to some complex psychology, such as inferiority and vainglory. Together with reply bias, the returned questionnaires might not reflect the reality. All these factors might cause deviations.

Conclusions

The overweight and obesity among urban rural to urban migrant children are largely associated with socioeconomic factors, living behaviors/habits, and eating habits. We find that overweight and obesity are widespread among children with parents being businessman or civil servants, with parents' education level at elementary school and below, and with high family monthly income. Overweight and obesity are more common among children with less daily exercise or excessive high-energy intake. Thus, rural to urban migrant children should pay more attention to exercise, healthy eating, and formation of good living behaviors/habits, which all would prevent overweight and obesity.

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Disclosure of conflict of interest

None.

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