

Ethnic Differences in Body Mass Index and Prevalence of Obesity in School Children of Urumqi City, Xinjiang, China

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Objective To investigate the prevalence of obesity and distribution of body mass index (BMI) in school children of four ethnic groups in Urumqi, Xinjiang, China. **Methods** A total of 55 508 school children of Han, Hui, Uygur and Kazak nationalities aged 8-18 years were selected by a cluster sampling from a districts of Urumqi City for anthropometric measurement and demographic survey. Prevalence of obesity and overweight and distribution of body mass index (BMI) by gender, age, and nationality were analyzed and compared. Cutoff points of BMI for defining obesity and overweight were based on the proposal set by the Working Group on Obesity in China (WGOC) to assess age-, gender- and nationality-specific prevalence of obesity and overweight. **Results** Prevalence of obesity was 5.34%, 6.78%, 3.39 %, and 1.22% for boys and 2.61%, 1.83%, 1.78%, and 1.40% for girls of Han, Hui, Uygur and Kazak nationalities, respectively. Prevalence of obesity tended to decrease with age overall, whereas that of overweight increased with age in Han children. **Conclusions** Prevalence of obesity in school children in Urumqi varies with their nationalities and is lower than that of an average national level and a level of western countries. Obesity is more prevalent in boys than in girls of Urumqi overall, which is just the opposite in Kazak children. Han boys and Hui girls have the highest prevalence of obesity and Kazak boys and girls have the lowest ones. Prevalence of obesity decreases with age, but that of overweight shows a different trend.

Key words: Child; Obesity; Overweight; Ethnicity; Body mass index

INTRODUCTION

Obesity has become a global epidemic and continues to be increasing both in industrialized and developing countries^[1-3]. Data from China Health and Nutrition Survey (CHNS) indicate that overall prevalence of obesity among children aged 2-6 years increased from 4.2% in 1989 to 6.4% in 1997, and from 1.5%-12.6% in urban areas within this period of time^[4]. The Fourth National Nutrition and Health Survey in 2002 in China showed that overall prevalence of obesity in childhood was 8.1%^[5]. But to date, there is little information about prevalence of obesity in children of ethnic minority in China. The purpose of this study was to understand prevalence of overweight and obesity and distribution of body mass index (BMI) in school children of four ethnic groups

in Xinjiang Uygur Autonomous Region of China with the criteria recommended by the Working Group on Obesity of China (WGOC)^[6].

SUBJECTS AND METHODS

A total of 55 508 school children aged 8-18 years in the New City District of Urumqi were selected for the study by cluster sampling between August and November in 2003, including 41 640 (75.0 %) of Han, 4 736 (8.5 %) of Hui, 6 362 (11.5 %) of Uygur, and 2 770 (5.0 %) of Kazak nationality. Their name, gender, age, and ethnicity were recorded and anthropometric measurements were made at the City School Health-care Center. Height, waist, and hip circumferences were recorded by trained observers with a precision of 0.5 cm and weight of 0.5 kg, with

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0895-3988/2006
CN 11-2816/Q
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overcoat and shoes off. Age- and gender-specific BMI was calculated by weight (kg)/height (m)². Written informed consent was obtained from each participant or his/her parents before the study. Fifty-four children were excluded from the analysis for incomplete or inaccurate data. Prevalence of obesity for Hui, Uygur, and Kazak children was adjusted for age with Han group as reference population. All statistical analyses were performed with SAS software (SAS Institute, Inc., Cary, NC), with $P < 0.05$ as statistically significant.

RESULTS

Characteristics of Study Population

There was no significant difference in gender ratios of children investigated among four ethnic groups ($\chi^2 = 7.718$, $P = 0.052$), however, there was a significant difference in age among them ($\chi^2 = 1675.510$, $P = 0.001$); indicating that age standardization of prevalence was necessary for comparison among

various ethnic groups.

Mean BMI Among Children of Different Ethnic Groups

Average height adjusted for age was 149.6 cm, 148.5 cm, 146.5 cm, and 146.0 cm for boys and 147.9 cm, 147.2 cm, 145.1 cm, and 145.1 cm for girls, of Han, Hui, Uygur, and Kazak ethnic groups, respectively (Table 1). There was a significant difference in height for boys and girls among different ethnics, except for Uygur and Kazak girls. Table 2 shows average BMI among children of four ethnic groups by gender adjusted for height and age. Han boys had the highest BMI, 1.0 kg/m² while Kazak boys had the lowest BMI. Han girls still had the highest BMI, or 0.5 kg/m² higher compared with Hui girls. There was no significant difference in BMI between Uygur and Kazak girls and Han and Hui girls ($P < 0.001$). There was a significant difference in BMI among four ethnic groups of boys ($P = 0.0001$).

TABLE 1

Average Height in Children of Four Ethnic Groups by Gender

Gender	Ethnicity	Age-adjusted Height		<i>P</i>	Pair-wise Test				
		<i>n</i>	Mean		<i>i</i> / <i>j</i>	Han	Hui	Uygur	Kazak
Male	Han	28572	149.6	0.0001	1	—	0.0001	0.0001	0.0001
	Hui	2431	148.5		2	0.0001	—	0.0001	0.0001
	Uygur	3245	146.5		3	0.0001	0.0001	—	0.01
	Kazak	1349	146.0		4	0.0001	0.0001	0.01	—
Female	Han	27191	147.9	0.0001	1	—	0.0001	0.0001	0.0001
	Hui	2305	147.2		2	0.0001	—	0.0001	0.0001
	Uygur	3113	145.1		3	0.0001	0.0001	—	NS
	Kazak	1421	145.1		4	0.0001	0.0001	NS	—

Note. *P* refers to the significance of the comparison of age-adjusted height among children of four ethnic groups.

TABLE 2

Average BMI in School Children of Four Ethnic Groups Adjusted for Age and Height

Gender	Ethnicity	Average BMI		<i>P</i>	Pair-wise Test				
		<i>n</i>	$\bar{x} \pm s$		<i>i</i> / <i>j</i>	Han	Hui	Uygur	Kazak
Male	Han	28572	18.43 ± 0.02	0.0001	1	—	0.0001	0.0001	0.0001
	Hui	2431	18.06 ± 0.06		2	0.0001	—	0.0067	0.0001
	Uygur	3245	17.84 ± 0.05		3	0.0001	0.0067	—	0.0001
	Kazak	1349	17.39 ± 0.08		4	0.0001	0.0001	0.0001	—
Female	Han	27191	17.67 ± 0.02	0.0001	1	—	0.0001	0.0001	0.0067
	Hui	2305	17.23 ± 0.05		2	0.0001	—	0.0359	0.0081
	Uygur	3113	17.39 ± 0.05		3	0.0001	0.0359	—	NS
	Kazak	1421	17.47 ± 0.07		4	0.0067	0.0081	NS	—

Note. *P* refers to the significance of the comparison of average BMI among school children of four ethnic groups.

Figure 1 shows increasing trends of BMI with age in boys and girls of four ethnic groups. Average BMI in Han girls was much higher than that in girls of other three ethnic group. However, average BMI in girls tended to be higher than that in boys of Hui, Uyghur and Kazak ethnic groups, increasing with age. The average BMI in girls was significantly higher

than that in boys of Kazak ethnic group ($P<0.01$). Figure 2 shows that average BMI in Han boys was significantly different from that in Uyghur and Kazak ethnic group ($P<0.05$). However, such significant difference in BMI could be only observed in girls of Han and Hui ethnic groups aged 9-14 years, and Han girls had a higher BMI than Hui girls.

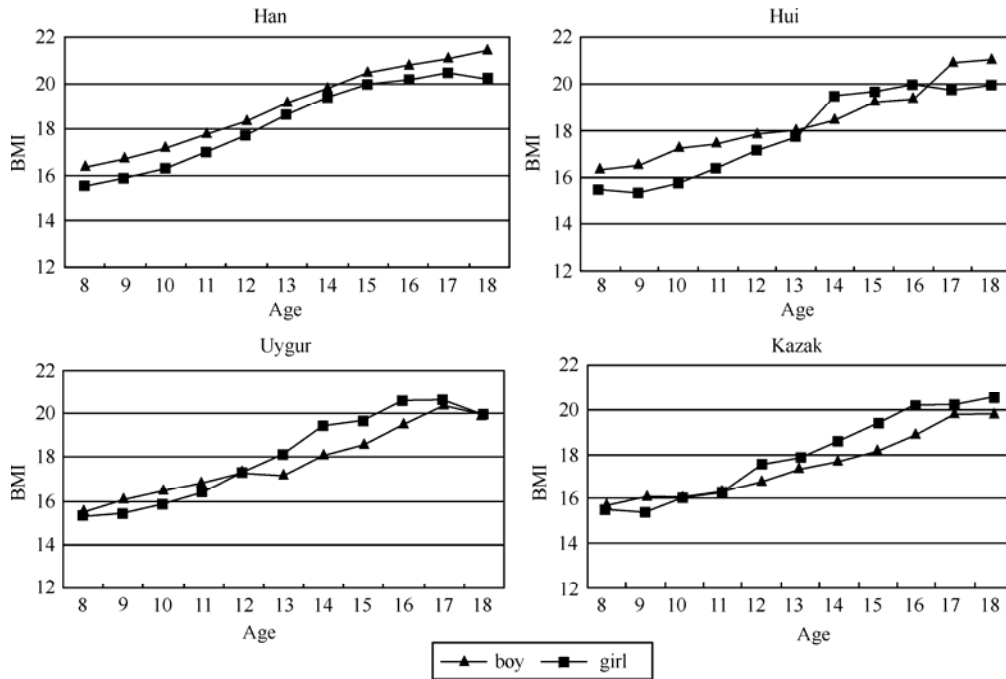


FIG. 1. Average BMI in school children of four ethnic groups (adjusted for height).

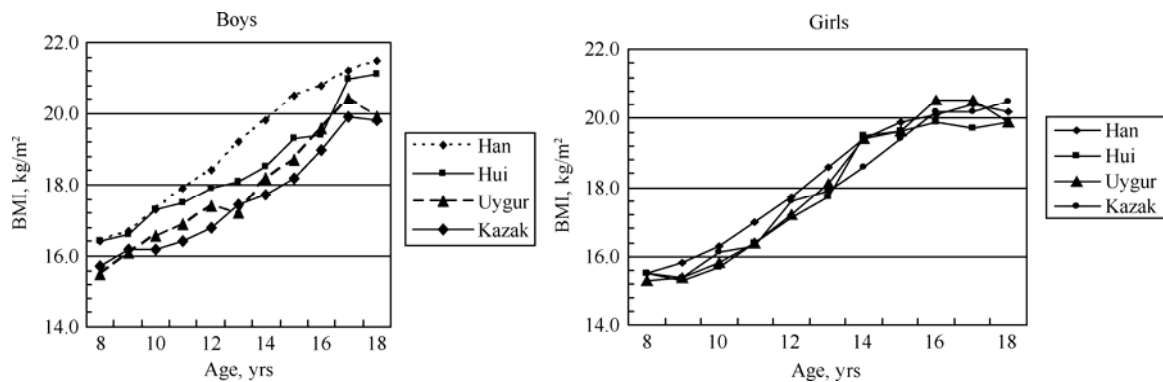


FIG. 2. Gender- and age-specific mean BMI among school children of four ethnic groups.

To estimate prevalence of overweight and obesity in school children of four ethnic groups (Fig. 3), the cutoff value of BMI recommended by the WGOC criteria^[6] was adopted, with Han children as reference population to obtain age-standardized prevalence in the other three ethnic groups. Age-adjusted prevalence of obesity was 5.34%, 6.78%, 3.39%, and 3.17% for boys and 2.61%, 1.83%, 1.78% and 1.40% for girls, of Han, Hui, Uyghur, and

Kazak ethnic groups, respectively. Figure 4 shows that obesity was more prevalent in Han than in Hui, Uyghur, and Kazak boys, and more prevalent in Hui than that in Han, Uyghur, and Kazak girls. Prevalence of obesity was as 2.0, 3.7, and 1.9 times higher in boys than in girls of Han, Hui, and Uyghur ethnic groups, respectively. However, obesity was more prevalent in girls than in boys of Kazak ethnic group, with a gender ratio of 1: 0.9.

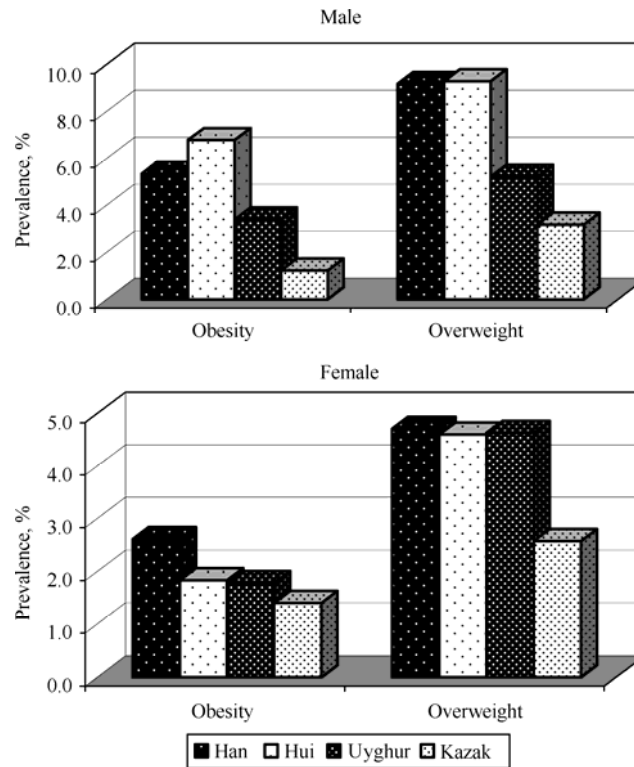


FIG. 3. Age-adjusted prevalence of overweight and obesity among school children of four ethnic groups.

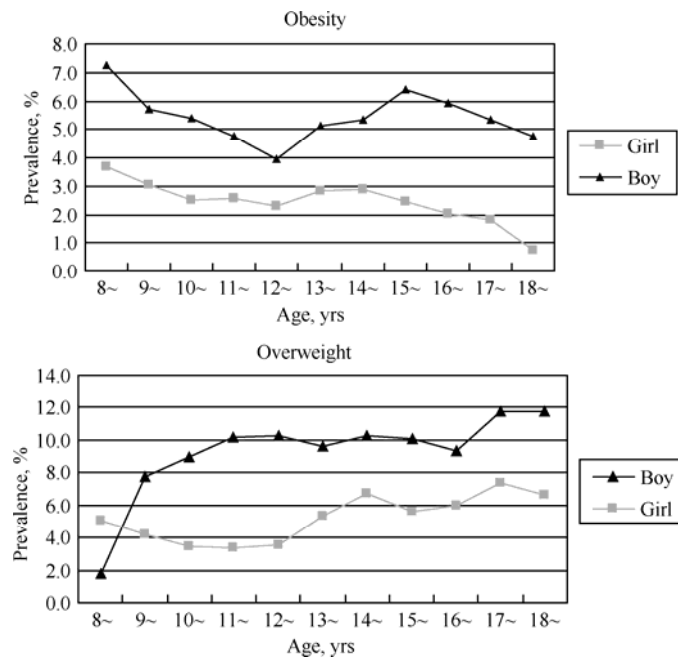


FIG. 4. Prevalence of obesity in Han children by age and gender (based on the criteria proposed by WGOC).

DISCUSSION

Obesity is a growing problem worldwide and an important risk factor for mortality of chronic diseases

in adult life. In children, BMI varies with age, and different cut-off points have to be used to define overweight and obesity depending on age. Few studies on childhood obesity were conducted in

ethnic minority of China according to the WGO criteria. The study population of the present study could be a good representative of school children of different nationalities in the urban area of Xinjiang with a fairly large sample size.

Overall, prevalence of obesity in school children of these four ethnic groups was lower than the national level (8.1%)^[5] and the level previously reported in China^[7-10]. By using the criteria for defining childhood obesity and overweight proposed by the International Obesity Task Force (IOTF)^[11], the study in urban school children of Shanghai^[9] showed that standardized prevalence of obesity and overweight was 3.30% and 13.2%, respectively. The study conducted by Luo *et al.*^[4] based on the China Health and Nutrition Survey (CHNS) showed that prevalence of obesity increased from 1.5% in 1977 to 12.6% in 1997 and that of overweight from 14.6% to 28.6%, much higher than that in our study (By IOTF criteria, prevalence of obesity was 3.45%, 3.22%, 1.73%, and 0.27% for boys, and 1.06%, 0.78%, 0.65%, and 0.19% for girls of Hui, Han, Uygur, and Kazak ethnic groups, respectively). One possible explanation is that different criteria were adopted. This study adopted a new cutoff value of BMI recommended by the latest CHNS in 2002. Another reason may be the less developed economy in Xinjiang. Higher prevalence of obesity in boys than in girls of Han, Hui, and Uygur ethnic groups is consistent with the previous studies, but not with that in Kazak children. Hui boys and Han girls had the highest prevalence of obesity, and overweight, whereas boys and girls of Kazak ethnic group had the lowest ones. The different life styles among ethnic children, such as frequency of meat, milk, butter, cheese intake in their diet, TV watching, and physical activity, may partly contribute to different prevalence of obesity; however, it could not completely explain the difference in obesity prevalence between Kazak boys and girls.

Many studies showed that prevalence of obesity increases with age in Western countries^[12-14], but decreases with age in Chinese children^[9]. In the present study, we observed that prevalence of obesity decreased in children aged 8-11 and 15-18 years, but increased in those aged 12-15 years. However, prevalence of overweight increased with age (Fig. 3). Some argued that body weight was associated with development status of trunk, maturation, and growth. We think that body weight is also related to nutrition, social, and psychological factors.

Limitation of this study is that our data on lifestyles and physical activity were collected from the records with uncertain accuracy. Therefore, we did not analyze the determinants that contribute to the ethnic difference in childhood obesity and overweight.

Although the current study suggested a lower prevalence of obesity and overweight in school children of four ethnic groups in comparison with the national level, an early prevention of obesity should be stressed by drawing lessons from western countries.

ACKNOWLEDGEMENTS

We would like to thank Wan-shan QIAO and Asya from the Health Care Center for Primary and Secondary School Children in Urumqi City for data collection. We also thank Professor Edward DAVIS from Department of Biostatistics, University of North Carolina for his advice on statistical analysis.

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(Received October 20, 2005 Accepted August 18, 2006)