Original Article

Comparison of dietary habits between migrant and local adolescents in Shenzhen, China

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Background: It is estimated that the number of migrant adolescents in Chinese cities may have reached 25 million. However, little research has been conducted on their dietary habits. The objective of this study was to compare dietary habits between migrant and local adolescents in Shenzhen, China. Methods: A school based cross-sectional study was conducted in 3368 adolescents (aged 11-18 years; 52.5% boys). A self-administered questionnaire completed by adolescents was designed to gather information on socio-demographic characteristics, meal location, food pattern and intake. Results: Of the 3368 adolescents, 58.2% were migrants. Compared with locals, migrant adolescents showed significantly higher percentage of having three meals away-from home. Nearly half of the subjects (45.6 %) skipped breakfast, with a higher proportion among migrant students (48.5 vs 41.5%). Migrant students consumed street food more frequently (12.2 vs 8.5%), while the difference was opposite in Western fast food intake (27.3 vs 32.5%). No significant difference was found in snacks intake between these two groups. Migrant students exhibited lower percentage of vegetables (57.3 vs 63.7%), fruits (27.7 vs 38.3%), meats (37.0 vs 44.3%), soybean (11.6 vs 17.5%) and dairy products (28.4 vs 42.5%) intake daily. After adjusted for socio-demographic confounders, the difference mentioned above still remained except Western fast food. Conclusion: Dietary habits among adolescents showed pronounced household variation. Migrant adolescents are more likely to exhibit unhealthy dietary behavior. Schools and families should collaborate to improve the dietary environment for adolescents, especially those from migrant families.

Key Words: migrant adolescents, dietary habits, nutrition, sociodempgraphic factors, China

INTRODUCTION

Adolescence represents a crucial period for lifestyle development.[1] A favorable dietary habit developed early not only promotes physical development in childhood, but also reduces chronic disease occurrence in their later life.[2] Previous study show that food preference/choice during childhood often determines adult dietary habits.[3] Especially in early adolescence, the impact of dietary habits on biopsychological development is substantial. Therefore, identifying factors that affect diet behaviors or habits would be helpful to establish a healthy dietary habit.

China first instituted the "Household registration system" in 1958. Since its reform and opening-up policy in 1978, an immense migrant population without local household registration in their new locations has emerged, primarily concentrated in large coastal cities.[4] The most recent demographic statistics released by Chinese government indicated a migrant population of 147.35 million.[5] In general, migrant people are not allowed to possess local household registration, thus deprived of benefits available to locals, including local social security, subsidized houses, health-care and compulsory education.[6,7] If migrant children go to public schools, their parents have to pay extra expenses.[6] Previous studies suggested that socioeconomic factors may play a key role in the dietary habits in childhood.[8,9] However, little is known about whether dietary behaviors will be affected by the interprovincial migration in China.

Shenzhen, one of the largest cities in south China, was inhabited by 14 million people in 2007, almost 60% of which were migrant labor workers from other regions of China.[10] It provides a good field to study the problems of migration. This paper aims to assess the differences in terms of dietary behaviors or habits between migrant and local adolescents in Shenzhen, China.

MATERIALS AND METHODS

Subjects and methods

A cross-sectional descriptive study was carried out in junior high schools in the Bao'an District, which has the largest migrant population (~90% of the total 6.04 million residents) in Shenzhen. A total of 203 schools in the Bao'an District enrolled 250,600 students, including 157,400 (62.8%) from migrant families. A stratified, mul-

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ti-staged, clustered sampling method was employed. The sampling process was as follows: 4 out of 8 blocks in the Bao'an district were randomly chosen; two middle schools in each block were randomly selected; three classes in each grade (7^{th}-9^{th}) of each school were randomly chosen. A total of 3400 students from 72 classes were recruited in this study.

The data were collected during May and July of 2008. The self-administered questionnaire was designed and modified for best readability and clarity before survey implementation. The investigators explained the study to all students in advance and answered any questions regarding the questionnaire. All students were required to complete the questionnaire independently and anonymously in 40 minutes at school. A total of 3368 students finished the questionnaire and the response rate was 99.06%. This study was approved by the Research Ethics Committee of the School of Public Health, Sun Yat-Sen University and local school authorities. A written consent form was also obtained from adolescents, adolescents' parents or legal guardians.

Anthropometric measurements

Anthropometric measurements of height and weight were carried out by mobile anthropometry with measurement resolution of 0.5 cm and 0.1 kg, respectively. Body mass index (BMI) was calculated by the standard formula for each individual: weight (kg)/ height^2 (m^2). Overweight and obese subjects were determined based on the sex-age-specific cutoff points of BMI.[11]

Socio-demographic characteristics

All adolescents were divided into two groups according to their resident status: "local" refers to those possessing local household registration and those without it were regard as "migrant". Parents' education level was divided into three categories: middle school or lower, high school, junior college or higher. Parents' occupation was divided into four categories according to current employment status: unemployed, worker, self-employed, and official.

Dietary habit questionnaire

Food intake frequencies were assessed by the validated qualitative food frequency questionnaire developed by Zhao *et al*.[12] We modified food items and categories by removing the cooking oil and wine and adding street food, western fast food and snacks. A preliminary study was conducted and further modifications were made to make the questionnaires more applicable to the adolescent population. Portion sizes were not included. Questions and answers were summed up according to information related to the growth and development of adolescents from the Chinese Nutrition Society.[13] The assessment questions of food intakes and eating habits were "how often do you usually eat the following foods/meals"? The response categories were: once a day or more, 3-6 times per week, 1-2 times per week, less than once a week or never. The answers for meal (breakfast, lunch, dinner) location were

Table 1. Characteristics of 3368 adolescents from Shenzhen in China by household

Characteristics	Local (n=1407)	Migrant (n=1961)	t (χ^2)	*p-value*
Boys (%)	53.8	51.5	1.74	0.19
Age (y), mean±SD (95%CI)	14.5±1.14 (14.4-14.5)	14.6±1.23 (14.6-14.7)	-4.30	<0.001
Height (cm), mean±SD (95%CI)				
boy	165±7.44 (165-166)	164±7.81 (163-164)	4.23	<0.001
girl	158±5.38 (157-158)	157±5.47 (156-157)	4.29	<0.001
weight (kg), mean±SD (95%CI)				
boy	53.1±9.26 (52.4-53.8)	50.4±9.11 (49.8-51.0)	5.88	<0.001
girl	45.9±6.74 (45.3-46.4)	44.6±6.79 (44.1-45.0)	3.50	<0.001
BMI(kg/m^2), mean±SD (95%CI)				
boy	19.4±2.92 (19.2-19.6)	18.8±2.69 (18.6-18.9)	4.58	<0.001
girl	18.4±2.43 (18.2-18.6)	18.1±2.42 (18.0-18.3)	1.91	0.06
Overweight and obesity (%)				
boy	12.9	7.6	11.9	0.001
girl	4.9	2.4	6.53	0.01
Family size >3 persons (%)	39.2	52.6	58.1	<0.001
Father education (%)			201	<0.001
Middle school or lower	36.6	59.6		
High school	41.4	31.6		
Junior college or higher	21.9	8.9		
Mother education (%)			229	<0.001
Middle school or lower	51.3	75.5		
High school	34.9	20.3		
Junior college or higher	13.8	4.1		
Father occupation (%)			138	<0.001
Official	20.3	6.9		
Self-employed	61.8	71.3		
Worker	14.6	18.9		
Unemployed	3.2	2.9		
Mother occupation (%)			134	<0.001
Official	12.6	2.9		
Self-employed	37.7	47.7		
Worker	9.8	16.4		
Unemployed	39.9	33.0		

at home and away-from home. Some eating habits in this study were described as follows: (1) Street food refers to floating food vendor, barbecue stalls, and snack bar supplying meals and snacks around the campus. (2) Snacks include beverage, fries, biscuits, cookies, ice-cream, candy, conserved fruit and nuts. (3) Western fast food refers to fast foods introduced from western countries, such as KFC, McDonalds, Pizza Hut, Dicos and Subway .

Statistical analyses

SPSS13.0 software was used to analyze data, *p*-values less than 0.05 were considered statistically significant. Mean values, standard deviations and 95% confidence intervals (CIs) were derived to describe the distribution of age, height, weight and BMI, compared by *t*-test. Frequencies were used to show distribution of categorical variables. Chi square test was used to compare the frequencies; crude odd ratios (ORs) and 95% CIs were also provided. Multivariable logistic regression was performed to calculate the adjusted OR and 95% CI to examine correlation with dietary habits.

RESULTS

Sample characteristics

Of the 3368 adolescents, 58.2% were from migrant families, with more boys (52.5%) than girls. The average age was 14.6 years, ranging between 11 and 18 years. Compared with the local group, migrant students were older (14.6±1.23 vs 14.5±1.14), had lower body weight, shorter body height and smaller BMI. Table 1 showed that there was a lower percentage of migrant students with overweight and obesity. Approximately 47% of the subjects lived in a family of more than 3 persons. Migrant parents had lower education levels. 59.6% of the fathers and 75.5% of the mothers from migrant group had middle school or lower education, compared to 36.6% and 51.3% respectively in the local group. Though almost all of the fathers (97.0%) were employed, nearly 40% of the mothers were unemployed in both groups. 20.3% of local fathers worked as officials compared with 6.9% of those from the migrant group. For mothers, the corresponding figures were 12.6% and 2.9%.

Dietary habits and food intake

As shown in Tables 2, 3 (for boys) and 4 (for girls), more migrant students, no matter boys or girls, had three meals away from home, especially lunch, the percentage of students eating outside the home in the migrant group was 34.7%, much higher than the 13.7% in local students (OR_{crude}=3.35, 95% CI=2.80-4.00, p <0.001). Breakfast was skipped (not eaten daily) by 45.6% of the adolescents. Compared with the local students, migrant students were more likely to skip breakfast (OR_{crude}=1.33, 95% CI= 1.15-1.52, p<0.001). About 10% of the students consumed street foods frequently (more than 3 times per week), with higher percentage among migrant students (12.2 vs 8.5%). After adjusted for potential socio-demographic confounders (including family size, parents education and occupation, age), significant differences in girls skipping breakfast and boys consuming street food did not remain. Of the total subjects, nearly 30% ate western fast foods more than once per week with migrant students consuming western fast foods less frequently (OR_{crude}=0.78, 95% CI=0.67-0.90, p<0.001). After ad

Table 2. Dietary habits and food intake of 3368 adolescents from Shenzhen in China by household (%)

	Local (n=1407)	Migrant (n=1961)	*p*-value †	OR c‡	95% CI	OR a§	95% CI
Meal location (away-from home)							
Breakfast	30.3	41.0	<0.001	1.60	1.38-1.85	1.60	1.36-1.89
Lunch	13.7	34.7	<0.001	3.35	2.80-4.00	3.64	2.98-4.46
Dinner	6.9	13.2	<0.001	2.05	1.61-2.62	2.14	1.62-2.83
Food pattern							
Breakfast (<1 t/d)	41.5	48.5	<0.001	1.33	1.15-1.52	1.19	1.02-1.39
Snacks ¶ (≥1 t/d)	9.1	10.4	0.230	1.15	0.91-1.46	1.26	0.87-1.83
Street food †† (≥3 t/w)	8.5	12.2	0.001	1.50	1.19-1.89	1.45	1.12-1.88
Western fast food ‡‡ (≥1 t/w)	32.5	27.3	0.001	0.78	0.67-0.90	0.88	0.74-1.03
Food intake (≥1 t/d)							
Vegetable §§	63.7	57.3	<0.001	0.76	0.66-0.88	0.85	0.73-0.99
Fruit ¶¶	38.3	27.7	<0.001	0.67	0.53-0.71	0.70	0.59-0.82
Meats products †††	44.3	37.0	<0.001	0.74	0.64-0.85	0.83	0.71-0.97
Soybean products ‡‡‡	17.5	11.6	<0.001	0.62	0.51-0.75	0.66	0.53-0.82
Dairy products §§§	42.5	28.4	<0.001	0.54	0.47-0.62	0.68	0.58-0.79

† *p*-value was from chi-square test used to compare differences between local and migrant students. p<0.05 was considered statistical significant.
‡ OR^c: crude odd ratio.
§ OR^a: odd ratio adjusted by socio-demographic confounders including: age, family size, parental education, parental occupation.
¶ Snacks include beverage, fries, biscuits, cookies, ice-cream, candy, conserved fruit, and nuts.
†† Street foods refer to mobile food vendor, barbecue stalls, snack bar supplying for meal and snacks around campus.
‡‡ Western fast food refers to fast-food introduced from abroad, such as KFC, McDonalds, Pizza Hut, Dicos.
§§ Vegetables include fresh and cooked vegetables, as well as salted vegetables.
¶¶ Fruits include fresh fruit, fruit juice.
††† Soybean products include fresh and dried soybean curd, soybean and other soybean products.
‡‡‡ Meats products include meat from pork, beef, lamb, poultry, fish, shrimp, and egg.
§§§ Dairy products include fresh milk, yogurt, and cheese

Table 3. Dietary habits and food intake of boys from Shenzhen in China by household condition[5]

	Local (n=757)	Migrant (n=1010)	*p*-value †	OR c‡	95% CI	OR a§	95% CI
Meal location (away-from home)							
Breakfast	34.9	43.5	<0.001	1.44	1.18-1.75	1.47	1.18-1.84
Lunch	14.1	34.7	<0.001	3.23	2.53-4.11	3.50	2.66-4.60
Dinner	7.7	13.1	<0.001	1.82	1.32-2.52	1.86	1.29-2.69
Food pattern							
Breakfast (<1 t/d)	37.9	46.1	0.001	1.40	1.15-1.70	1.24	1.00-1.54
Snacks ¶ (≥1 t/d)	8.4	10.1	0.23	1.22	0.88-1.70	1.17	0.81-1.70
Street food †† (≥3 t/w)	9.4	12.9	0.02	1.43	1.05-1.95	1.34	0.98-1.95
Western fast food ‡‡ (≥1 t/w)	30.6	25.4	0.02	0.77	0.63-0.95	0.87	0.69-1.11
Food intake (≥1 t/d)							
Vegetable §§	60.9	54.2	0.01	0.76	0.63-0.92	0.87	0.70-1.07
Fruit ¶¶	37.4	26.1	<0.001	0.59	0.48-0.73	0.71	0.56-0.88
Meats products †††	47.8	37.7	<0.001	0.66	0.55-0.80	0.74	0.60-0.92
Soybean products ‡‡‡	20.5	12.9	<0.001	0.57	0.45-0.74	0.63	0.47-0.83
Dairy products §§§	45.9	30.7	<0.001	0.52	0.43-0.63	0.65	0.52-0.81

† *p*-value was from a chi-square test used to compare differences between local and migrant students. $p<0.05$ was considered statistical significant.
‡ OR[c]: crude odd ratio.
§ OR[a]: odd ratio adjusted by socio-demographic confounders including age, family size, parental education, parental occupation.
¶ Snacks include beverage, fries, biscuits, cookies, ice-cream, candy, conserved fruit, nut.
†† Street foods refer to mobile food vendor, barbecue stalls, snack bar supplying for meal and snacks around campus.
‡‡ Western fast food refers to fast-food introduced from abroad, such as KFC, McDonalds, Pizza Hut, and Dicos.
§§ Vegetables include fresh and cooked vegetables, as well as salted vegetables.
¶¶ Fruits include fresh fruit, fruit juice.
††† Soybean products include fresh and dried soybean curd, soybean and other soybean products.
‡‡‡ Meats products include meat from pork, beef, lamb, poultry, fish, shrimp, and egg.
§§§ Dairy products include fresh milk, yogurt, and cheese

Table 4. Dietary habits and food intake of girls from Shenzhen in China by household

	Local (n=650)	Migrant (n=951)	*p*-value †	OR c‡	95% CI	OR a§	95% CI
Meal location (away-from home)							
Breakfast	24.9	38.3	<0.001	1.88	1.50-2.34	1.86	1.45-2.38
Lunch	13.2	34.7	<0.001	3.49	2.68-4.55	3.82	2.83-5.16
Dinner	6.0	13.3	<0.001	2.40	1.65-3.48	2.55	1.65-3.94
Food pattern							
Breakfast (<1 t/d)	45.7	51.0	0.04	1.24	1.01-1.51	1.12	0.90-1.40
Snacks ¶ (≥1 t/d)	9.9	10.7	0.64	1.08	0.78-1.51	1.02	0.81-1.27
Street food †† (≥3 t/w)	7.4	11.4	0.01	1.61	1.13-2.31	1.65	1.10-2.45
Western fast food ‡‡ (≥1 t/w)	34.7	29.2	0.02	0.78	0.63-0.96	0.87	0.68-1.11
Food intake (≥1 t/d)							
Vegetable §§	67.0	60.5	0.01	0.75	0.61-0.93	0.83	0.65-1.04
Fruit ¶¶	39.4	29.3	<0.001	0.64	0.52-0.79	0.67	0.53-0.85
Meats products †††	40.2	26.3	0.12	0.85	0.69-1.04	0.94	0.75-1.18
Soybean products ‡‡‡	14.0	10.2	0.02	0.70	0.52-0.95	0.73	0.52-1.03
Dairy products §§§	38.5	26.0	<0.001	0.56	0.45-0.70	0.71	0.56-0.90

† *p*-value was from a chi-square test used to compare differences between local and migrant students. $p<0.05$ was considered statistical significant.
‡ OR[c]: crude odd ratio.
§ OR[a]: odd ratio adjusted by sociodemographic confounders including age, family size, parental education, parental occupation.
¶ Snacks include beverage, fries, biscuits, cookies, ice-cream, candy, conserved fruit, nut.
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¶¶ Fruits include fresh fruit, fruit juice.
††† Soybean products include fresh and dried soybean curd, soybean and other soybean products
‡‡‡ Meats products include meat from pork, beef, lamb, poultry, fish, shrimp, and egg.
§§§ Dairy products include fresh milk, yogurt, and cheese

justment, intake of western fast food did not show any difference across household status. Less than 10% of the consumed snacks everyday and no difference was found according to household status.

The food intake is shown in Tables 2, 3 and 4. Of all the subjects, less than 60% consumed vegetables every day. The highest proportion of daily consumption of vegetables was only 67.0% which was observed in the local girls. Daily fruit intake was less common (32%). The lowest daily consumption of fruits displayed by migrant boys was only 26.1%. Meats, soybean, and dairy products are a good source of high quality protein, while 40.1% and 14.0% of the students consumed meats and soybean products every day, respectively; only one-third of the adolescents drank milk at least once a day; In addition, 10.9% of the adolescents in the migrant group seldom or never drank milk (data not shown). A lower proportion of migrant students showed daily intake of these high protein foods. After the adjustment by socio-demographic factors, the differences in terms of food intake between locals and migrants remained. When analyzed by gender, the differences for boys remained significant in all foods (except vegetables), but, for girls, the only differences were found in fruit and dairy products consumption.

DISCUSSION

The purpose of this study was to explore an independent influence of household on food choice and eating habits in junior middle school students. The current results indicated that migrant adolescents were at higher risk of developing poor dietary habits than local ones.

According to the "Dietary Guideline and Balance Diet Pagoda for Chinese", adolescents are recommended to consume vegetables, fruits, meats, dairy and soybean products at least once a day.[13] But from current results, the frequencies of these food intakes were far from the recommendation, especially in migrant students. The health effects of fruits and vegetables are well known. Many countries carried out intervention programs to increase the consumption of fruits and vegetables.[14-16] Our study showed a higher frequency of vegetables and fruits consumption among adolescents than those from other studies.[17-19] This may be partially explained by the abundance of vegetables and fruits in southern China throughout the year. However, students in the migrant group appeared to eat vegetables and fruits less frequently than their local counterparts. Since sufficient intake of fruits and vegetables is crucial to reduce the risk of chronic diseases,[20,21] adolescents should be strongly encouraged to achieve daily intake of more than 400 g fruits and vegetables as recommended.[22]

Breakfast is increasingly recognized as the most important meal of the day.[23] School students who routinely had breakfast every day show overall higher energy and protein intake than those who skipped.[24] Breakfast skipping is a common problem among adolescents in many countries.[25,26] In our study, we found that the prevalence of breakfast skipping in adolescent was 45.6%, which was much higher than that found in Western countries.[27] Besides, we also found that skipping breakfast in migrant students was more common than locals. In general, there was a trend towards adolescents skipping breakfast more often from lower SES families.[28-30] In this study, the lower educational level and poor occupational status of migrant parents might be responsible for the higher prevalence of skipping breakfast in migrant adolescents. Omission of breakfast leads to inadequate intake of necessary nutrients and jeopardizes the students' normal development and growth. Therefore, it is necessary to raise the awareness on the importance of breakfast among the students.

Street foods, featured by low price, are common around the school campus, while their quality and hygiene are not governed by regulations. In this study, the migrant students showed higher frequency to choose street food. So the food choices available around campus should be carefully monitored and students will be more likely to choose healthy food .

Western fast foods are increasingly popular among adolescents in China because of its different flavor and taste from Chinese fast foods. Many parents even adopt Western fast foods as a reward or a birthday gift for adolescents. In addition, skipping breakfast and eating away-from home will increase their choice of fast foods near schools. Although migrant students showed higher frequency of skipping breakfast and eating out, their Western fast foods intake was lower than local students. The possible explanation may be that Western fast foods are more expensive than Chinese fast foods. With the development of the economy, this number may increase dramatically in China in the near future.

Family meals are vital for developing healthy dietary habits in adolescents. Eating at home provides parents an opportunity to educate their children on how to choose healthy foods and develop healthy eating habits. Videon' study also showed that students who spent more time having meals with their parents were less likely to skip breakfast and more likely to choose healthy foods.[31] Although we found, in this study, that more than two-thirds of the students had breakfast, lunch and supper at home, the proportion of those who do not eat at home in migrant group were much higher. The reasons can be explained as follows: first, migrant adolescents with less-educated parents had relatively poorer dietary behavior than local adolescents with better-educated parents. Second, the working hours of the migrant parents are usually longer, they are often too busy to cook or eat as a family. Thus, nutritional education for the parents should be given priority.

In addition, there are some other possible factors responsible for the difference in dietary habits and food preference between these two groups. One main reason is the Chinese-style household system. Migrant workers experienced marginalized and under-privileged living in urban China.[32] Although more than two thirds of migrant parents in this study were employed, they were not at all well-paid because most of migrant parents could only get the less attractive, lower paid and longer hour jobs, such as street vendors, bicycle or shoe repair, construction work, garbage and recyclables collection etc.[33,34] For this reason, migrant students must be frugal with their daily meals to relieve economic pressure on their families.[35] Similar patterns have been reported from oversea studies.[36] The second reason is that the increased parent-child conflict in migrant families would not be conducive for migrant students to accept their parents' food advice.[37] Besides, lower education level and bigger family size restricted the parents' capacity and energy to guide their

children's dietary behavior. Furthermore, migrant students tend to suffer from discrimination in the school by local children,[35] they are more likely to manifest serious psychological and physical problems,[38,39] potentially leading to irregular meals and consumption of low-quality food for comfort.[40]

Limitation

Since data were collected through a self-reported questionnaire from middle school students, subjective disparity is virtually unavoidable. In addition, these questions only assess the frequency of each food category, the subcategories or portion size was not measured. Moreover, the cross-sectional nature of this study only allowed the observation of a causal relationship between household factor and dietary habits, a prospective longitudinal study should be conducted.

Conclusion

In conclusion, household status is closely correlated with food intake and dietary preference of adolescents. Students from migrant group demonstrate less healthy dietary habits than their local counterparts. Breakfast skipping and street food intake are common, especially among migrant students. Intake of protein-rich foods such as meats, soybean and dairy products seem to be lower in the migrant group, and they are observed to have less family meals. Our observations highlight a pressing need to implement strategies to improve dietary habits of migrant students. Efforts should be dedicated toward educating both adolescents and their parents on maintaining healthy dietary habits. In addition, healthy diets should be advocated on school campuses.

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AUTHOR DISCLOSURES

We declare that we have no competing interests.

REFERENCES

1. Gabhainn SN, Nolan G, Kelleher C, Friel S. Dieting patterns and related lifestyles of school-aged children in the Republic of Ireland. Public Health Nutr. 2002;5:457-62.
2. Mikkila V, Rasanen L, Raitakari OT, Pietinen P, Viikari J. Longitudinal changes in diet from childhood into adulthood with respect to risk of cardiovascular diseases. The Cardiovascular Risk in Young Finns Study. Eur J Clin Nutr. 2004; 58:1038-45.
3. Lytle LA, Seifert S, Greenstein J, McGovern P. How do children's eating patterns and food choices change over time? Results from a cohort study. Am J Health Promot. 2000;14: 222-8.
4. Bodvarsson Ö, Van den Berg H. The Economics of Immigration. Theory and Policy. Heidelberg, Germany: Springer; 2009.
5. National Bureau Of Statistics Of China(CNBS). Communiqué on Major Data of 1% National Population Sample Survey in 2005.2006/3/16[cited 2006/3/22].; Available from: http:// www.stats.gov.cn/ was40/ gjtjj_ en_ detail.jsp?channelid=1175&record=744
6. Nielsen I, Nyland B, Nyland C, Smyth R, Zhang. MQ Determinants of School Attendance Among Migrant Children:Survey Evidence from China's Jiangsu Province. Pac Econ Rev. 2006;11:461-76.
7. Fleisher BM, Yang DT. Labor law and regulations in China. China Econ Rev. 2003;14:426-33.
8. Rasmussen M, Krølner R, Klepp KI, Lytle L, Brug J, Bere E, Due P. Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part I: quantitative studies. Int J Behav Nutr Phys. 2006;3:22-41.
9. Lluı´s SM, Lourdes R, Carmen PR, Reina GC, Luis PQ, Javier A. Determinants of Nutrient Intake among Children and Adolescents: Results from the enKid Study. Ann Nutr Metab. 2002;46(S1):31-8.
10. Liu KM. Eye on migrant workers. Chin Econ. 2007;40:12-23.
11. Ji CY,WGOC. Report on Childhood Obesity in China (1) Body Mass Index Reference for Screening Overweight and Obesity in Chinese School-age Children. Biomed Environ Sci. 2005;8:390-400.
12. Zhao WH, Hasegawa K, Chen JS. The use of food-frequency questionnaires for various purposes in China. Public Health Nutr. 2002;5:829-33.
13. Ge, K., The transition of Chinese dietary guidelines and food guide pagoda. Asia Pac J Clin Nutr, 2011;20:439-46.
14. Ammerman AS, Lindquist CH, Lohr KN, Hersey J. The efficacy of behavioral interventions to modify dietary fat and fruit and vegetable intake: a review of the evidence. Prev Med. 2002;35:25-41.
15. Eriksen K, Haraldsdottir J, Pederson R , Flyger HV. Effect of a fruit and vegetable subscription in Danish schools. Public Health Nutr. 2003;6:57-63.
16. French SA, Stables G. Environmental interventions to promote vegetable and fruit consumption among youth in school settings. Prev Med. 2003;37:593-610.
17. Mikki N, Abdul-Rahim HF, Shi Z, Gerd HO. Dietary habits of Palestinian adolescents and associated sociodemographic characteristics in Ramallah, Nablus and Hebron governorates. Public Health Nutr. 2010;13:1-11.
18. Abudayya AH, Stigum H, Shi Z, Abed Y, Gerd HO. Sociodemographic correlates of food habits among school adolescents (12-15 year) in north Gaza Strip. BMC Public Health. 2009;9:185-98.
19. Savige GS, Ball K, Worsley A, Crawford D. Food intake patterns among Australian adolescents. Asia Pac J Clin Nutr. 2007;16:738-47.
20. Prynne CJ, Mishra GD, O'Connell MA, Muniz G, Laskey MA, Yan L, Prentice A, Ginty F. Fruit and vegetable intakes and bone mineral status: a cross sectional study in 5 age and sex cohorts. Am J Clin Nutr. 2006;83:1420-8.
21. Van Duyn MAS, Pivonka E. Overview of the health benefits of fruit and vegetable consumption for the dietetics professional: selected literature. J Am Diet Assoc. 2000;100:1511-21.
22. WHO/FAO. Diet, Nutrition and the Prevention of Chronic Diseases: Report of a Joint WHO/FAO Expert Consultation. Geneva: World Health Organization; 2003
23. Rampersaud GC, Pereira MA, Girard BL, Adams J, Metzl JD. Breakfast Habits, Nutritional Status, Body eight, and Academic Performance in Children and Adolescents. J Am Diet Assoc. 2005;105:743-60.
24. Chitra U, Reddy CR. The role of breakfast in nutrient intake of urban school children. Public Health Nutr. 2007;10:55-8.

25. Shaw ME. Adolescent breakfast skipping: an Australian study. Adolescence. 1998;33:851-61.
26. Samuelson G. Dietary habits and nutritional status in adolescents over Europe. An overview of current studies in the Nordic countries. Eur J Clin Nutr. 2000;54:S21-8.
27. Keski RA, Kaprio J, Rissanen A, Virkkunen M, Rose RJ. Breakfast skipping and health-compromising behaviors in adolescents and adults. Eur J Clin Nutr. 2003;57:842-53.
28. Hoglund D, Samuelson G, Mark A. Food habits in Swedish adolescents in relation to socioeconomic conditions. Eur J Clin Nutr. 1998;52:784-9.
29. Samuelson G. Dietary habits and nutritional status in adolescents over Europe. An overview of current studies in the Nordic countries. Eur J Clin Nutr. 2000;54:S21-8.
30. O'Dea JA, Caputi P. Association between socioeconomic status, weight, age and gender, and the body image and weight control practices of 6- to 19-year-old children and adolescents. Health Educ Res. 2001;16:521-32.
31. Videon TM, Manning CK. Influences on adolescent eating patterns: the importance of family meals. J Adolesc Health. 2003;32:365-73.
32. Wong DFK, Li CY, Song HX. Rural migrant workers in urban China: living a marginalised life. Int J Soci Welfare. 2007;16:32-40.
33. Li XM, Stanton B, Fang X, Lin D. Social Stigma and Mental Health among Rural-to-Urban Migrants in China: A Conceptual Framework and Future Research Needs. World Heath Popul. 2006;6:2-18.
34. Liang Z, Ma Z. China's Floating Population: New Evidence from the 2000 Census. Popul Dev Rev. 2004;30:467-88.
35. Goodburn G. Learning from migrant education: A case study of the schooling of rural migrant children in Beijing. Int J Edu Dev. 2009;29:495-504.
36. Gwyther ME, Jenkins M. Migrant farmworker children: Health status, barriers to care, and nursing innovations in health care delivery. J Pediatr Health Care. 1998;12:60-6.
37. Wong FK, Chang YL, He XS. Correlates of psychological wellbeing of children of migrant workers in Shanghai, China. Soc Psychiatry Psychiatr Epidemiol. 2009;44:815-24.
38. Vieno A, Santinello M, Lenzi M, Baldassar D, Mirandola M. Health status in immigrants and native early adolescents in Italy. J Community Health. 2009;34:181-7.
39. Fandrem H, Sam DL, Roland E. Depressive Symptoms Among Native and Immigrant Adolescents in Norway: The Role of Gender and Urbanization. Soc Indic Res. 2009;92: 91-109.
40. Young EM, Fors SW. Factors related to the eating habits of students in grades 9-12. J Sch Health. 2001;71:483-8.

Original Article

Comparison of dietary habits between migrant and local adolescents in Shenzhen, China

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中国深圳市流动青少年和当地青少年饮食习惯的比较

背景：据估计，中国城市流动青少年的数量已经达到了2500万。然而，有关于他们饮食习惯的研究却很少。本研究的目的是对深圳市流动青少年和当地青少年的饮食习惯进行比较。方法：选取学校中3368名青少年 (11-18岁；52.5%是男生) 展开横断面调查。调查问卷涵括调查对象社会人口学特征、就餐地点、饮食模式和摄入量等信息，由青少年自主完成。结果：3368名青少年中有58.2%是流动青少年。与当地青少年相比，流动青少年三餐在外就餐率较高。近一半学生 (45.6%) 不吃早餐，流动青少年不吃早餐的比例更高 (48.5 vs 41.5%)。流动青少年街边食品摄入更频繁 (12.2 vs 8.5%)，而当地青少年西式快餐摄入更频繁 (27.3 vs 32.5%)。两组在零食摄入频率上无显著差异。流动青少年每天蔬菜类 (57.3 vs 63.7%)、水果类 (27.7 vs 38.3%)、肉类 (37.0 vs 44.3%)、豆类 (11.6 vs 17.5%) 和奶制品类 (28.4 vs 42.5%) 摄入频率比当地青少年低。在调整社会人口学混杂因素后，除西式快餐外，上述差异仍然存在。结论：青少年不同户籍间表现出明显的饮食习惯的差异。流动青少年更容易出现不健康的饮食行为。学校和家庭应该共同合作来提高青少年，特别是来自于流动人口家庭青少年的饮食环境。

关键词：流动青少年、饮食习惯、营养、社会人口学因素、中国