Comparison of body composition and physical activity of nomadic and urban school students

Mehdi Chahiyan Borujeni[1], Farhad Ahmadi Kani Golzar[2], Hadi Moradi[3], Fatemeh Afzali Borujeni[4], Hossein Mojtahedi[5], Seyed Mohammad Marandi[6]

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1. MSc in Exercise Physiology, Faculty of Physical Education & Sport Sciences, University of Isfahan, Isfahan, Iran
2. **Correspondence to**: PhD Student in Exercise Physiology, Department of Physical Education & Sport Sciences, University of Mazandaran, Babolsar, Iran
Tel/Fax: +98 112 5342201
Email: farhadahmadi19@yahoo.com
3. MSc in Exercise Physiology, Faculty of Physical Education & Sport Sciences, Khodabandeh Branch, Islamic Azad University, Zanjan, Iran
4. Bachelor Degree of Physical Education, University of Shahrekord, Shahrekord, Iran
5. Associate Professor of Exercise Physiology Department, Faculty of Physical Education & Sport Sciences, University of Isfahan, Isfahan, Iran
6. Associate Professor of Exercise Physiology Department, Faculty of Physical Education & Sport Sciences, University of Isfahan, Isfahan, Iran

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Abstract

The current and future well-being of children and adolescents are significantly threatened with lack of physical activity, poor diet and chronic obesity. The present study aimed to compare the body composition and physical activity of urban and nomadic students. 119 urban students with the mean age of 13.41±0.92 and 125 nomadic students with the mean age of 13.95±1.10 were selected randomly and anthropometric and physical activity indices were measured in them. The independent t-test was used to compare the difference between the two groups. A significant difference was found between urban and nomadic students in terms of the values of height, sitting height, weight, body mass index (BMI), waist hip ratio, body composition, sleeping, daily activity, exercise activity and working activity (physical activity). Urban students showed higher values in all the measured variables compared to rural students except for the physical activity rate and exercise rate, however, the negative correlation was found only in nomadic students between daily activities and physical activity rate with body fat percentage and BMI. In general, results of the present study showed that nomadic students had more favorable body composition compared to urban students which is probably due to more physical activity rate in them.

Keywords: Body Composition, Fat Mass, Physical Activity, Student

Introduction

Nowadays, on the one hand, the improvement of industrial facilities has resulted in having a better life and more leisure time and on the other hand, it has decreased physical activity. This has led the individuals toward a sedentary life and a tangible activity deprivation has occurred in their lives. Study results and various statistics have shown that one of the reasons for the increase in body fat is the lack of physical activity [1]. The importance of obesity in childhood and adolescence is not only due to its early physical and mental complications but also due to the adulthood obesity increase, mortality rate and its heavy economic burden on society [2]. Adolescence is a critical stage to expand obesity and gaining weight, which is related to mortality in adulthood period.

It is estimated that more than 70% of obese adolescents will turn to obese adults [3].

Extensive efforts have been conducted to understand the key indicators of obesity and its associated behaviors. For example, lack of activity is related to age, sex, socioeconomic status and ethnicity [4]. During the past few decades, the energy expenditure in children has decreased and physical activity patterns in adolescents has changed, which result from spending more time watching television and the advent of video games and the internet as well as the decrease of physical activity time at schools and the societies [5,6]. Although the relationship between physical activity and social factors such as gender and race/ethnicity has been widely studied, geographical factors have received less attention [7]. One of the indicators that has recently attracted attention is the place of residence (urban or rural areas) [8]. Differences between rural and urban environments are taken into consideration in recent decades for the effects on growth and sexual puberty. Nowadays, researches have shown that urban children are larger, and grow faster compared to rural children in. Two significant points in studies are economic, social factors and the environmental overlap between rural and urban areas. In other words, it is not easy to distinguish between factors that are effective on growth process [9]. There are a number of reports showing that rural adults compared to their urban peers have higher levels of obesity and lower levels of physical activity [10-12], however, physical activity findings might not be generalized [12]. In a study in America, adults in rural areas had a higher prevalence of obesity and lack of physical activity compared to adults in urban areas [13]. This might be contrary to the belief in higher physical activity needs in rural life, but a reflection of the changing nature of rural life [11]. Recently, rural life may not necessarily involve heavy chores and might be an important factor for a greater incidence of obesity in rural areas [14]. Various and conflicting evidence is present regarding urban and rural children.

In a cross-sectional study on American adolescents, it was found that rural children had higher obesity levels (16.5%) compared to urban children (14.3%). This study also showed that children in rural areas had sedentary lifestyle compared to urban children [15]. These findings were more supported by the findings of a study on 8- to 12-year-old kids from one of the central states in America in which the rural kids were overweight (25.1%) compared to urban kids (19.4%) and urban kids were less active. In addition, a cross-sectional study on Canadian children between 11 and 15 years old showed that overweight and obesity levels were increasing with an increase in rural dwelling [16]. Urban-rural differences were not reported for physical activity in this Canadian research, moreover, rural kids had lower levels of leisure time (watching television and video and working with computers). The urban and rural differences regarding the amount of physical activity in Australian girl adolescents were reported for summer and not winter; no difference was found in boys [17]. Although previous studies have investigated the differences between physical activity and obesity of urban and rural children in developed countries, it is not clear whether these findings could be generalized to other ethnicities with different cultures and life styles. Due to the effects of environmental factor on physical activity rates and the nutrition status, it is probable that because of the differences in nutrition culture of the urban and rural parts, physical activity and individuals' body shape are different in these two parts. Moreover, there is no study that has investigated the differences between body composition and physical activity in urban and rural adolescents in Iran which shows the necessity for studying this subject and especially on adolescents. Therefore, the purpose of present study is to compare the body composition and physical activity in urban and nomadic students.

Method

In this study, anthropometric indices and the level of activity were determined in urban and nomadic students and then they were compared (inter-group manner). Study population of the present study included all the urban and nomadic male students from Chaharmahal-Bakhtiari studying during 2010-11 academic year. Random cluster sampling was carried out by drawing among all male students of Chaharmahal-Bakhtiari. Number of samples was calculated using the sample size formula based on the mean of two independent groups and based the acquired volumes in related studies, considering 95% reliability and 90% test power, 120 individuals were chosen for each group [18]. To this end, 119 urban students and 125 nomadic students were randomly selected from urban and nomadic schools of Chaharmahal-Bakhtiari and their anthropometric indices were measured. The present study's variables include height, sitting height, weight, age, subcutaneous fat thickness, waist to hip ratio (WHR), body mass index (BMI), lean body mass, body fat percentage and the physical activity. In order to measure the participants' weight, a compact mechanical scale having a measuring range of 100 g to 120 kg was used. In order to measure the height, a stadiometer (Height Roller, accuracy of 1 mm) was used. WHR was measured using a tape measure. For this purpose, the smallest part of the waist circumference and hip circumference in the most massive section was measured using a tape measure. BMI was calculated using the formula weight (kg) by height squared (in meters). In order to measure skinfold thickness of the participants, a caliper (Harpenden, England) having 0.2 mm and measuring range of 80 mm was used. To this end, the skin fold thickness of two parts such as triceps and sub scapular were measured. After three repeats, the average was recorded as the subcutaneous fat thickness measure in each area. Roger et al. (2009) formula was utilized to measure the fat percentage [19]. In this formula, the skin fold thickness of subscapular and the triceps were calculated and in case the total of subscapular and triceps skinfold thickness was above 35 mm, the formula (%Fat = 0.783 ∑SF + I Male) was used and in case the total of subscapular and triceps skinfold thickness was less than 35 mm, the formula (%Fat = 1.21(∑SF) – 0.008(∑SF) 2 + I Male) was administered.

Where, ΣSF is the total of subscapular and triceps skinfold thickness. I coefficient was substituted in accordance with age, race and table 1. In this study, the mean age was 13.41 for urban students and 13.95 for nomadic students and (-1.7) coefficient was used for this age average which included the pre-puberty period.

Table 1 *Coefficient I according to age and race*

Age	Black	White
Prepubescent	-3.5	-1.7
Pubescent	-5.2	-3.4
Postpubescent	-6.8	-5.5
Adult	-6.8	-5.5

To measure the physical activity, Barbosa et al. questionnaire in 2007 was used which showed reliability and validity of 0.98 and 0.89, respectively [20]. According to this questionnaire, in order to analyze the data, the activities were classified into 4 sections such as sleeping, daily activities (using bathroom, meal times, transportation, inside and outside of school activities, religious activities, artistic activities), exercising activities (official sports, competitive sports, physical activities at school and in holidays) and other activities (such as item 18 in the questionnaire). In order to gain information and extract results from the raw data, descriptive and inferential methods were used. To this end, the data was firstly entered in SPSS version 16. After collecting the data, statistical tests such as Kolmogorov-Smirnov and independent t-test and Pearson correlation coefficient were conducted to evaluate the data normality and to compare the differences between the two groups ($P<0.01$) and to evaluate the correlation between body fat percentage and BMI with physical activity indices ($P<0.05$).

Results

The mean, standard deviation (SD), and independent t test, descriptive characteristics of the participants such as age, height, weight, fat percentage, sitting height, body mass, lean body mass, physical activity, WHR and BMI are presented in Table 2 and 3, respectively.

Table 2 *Descriptive characteristics of subjects (based on the mean and standard deviation) for each of the two experimental groups.*

	Urban Mean ± SD	Nomadic Mean ± SD
Age (y)	13.41 ± 0.92	13.95 ± 1.10
Height (cm)	160 ± 8.61	153 ± 9.59
Sitting height (cm)	78.11 ± 5	74.70 ± 8.36
Weight (kg)	50.52 ± 11.73	39.42 ± 8.23
WHR (cm2)	0.82 ± 0.04	0.79 ± 0.02
% Body Fat	23.58 ± 9.46	15.43 ± 3.76
Fat Mass (kg)	12.68 ± 7.57	6.27 ± 2.55
Fat free mass (kg)	37.80 ± 6.23	33.15 ± 6.09
BMI (kg/m^2)	19.60 ± 3.54	16.47 ± 1.86
Sleep (hours a day)	8.67 ± 1.60	8.21 ± 1.08
Daily activity (hours a day)	11.62 ± 1.26	9.56 ± 1.25
Exercise (hours a day)	2.29 ± 0.95	2.73 ± 0.64
Other Activities (work) (hours a day)	1.14 ± 0.82	3.44 ± 0.88

Table 3 *Independent T-test for differences variables analysis between urban and nomadic groups*

	Mean difference	T	F	Sig.(2tailed)
Height (cm)	6.43	6.53	2.87	0.00 *
Sitting height (cm)	3.40	4.52	0.58	0.00 *
Weight (kg)	11.1	10.28	2.09	0.00 *
WHR (cm2)	0.02	7.26	9.32	0.00 *
% Body Fat	8.14	10.57	35.17	0.00 *
Fat Mass (kg)	6.40	10.60	33.15	0.00 *
Fat free mass (kg)	4.65	7.01	0.40	0.00 *
BMI (kg/m^2)	3.13	10.33	13.12	0.00 *
Sleep (hours a day)	0.45	2.60	19.72	0.01 *
Daily activity (hours a day)	2.06	12.76	3.67	0.00 *
Exercise (hours a day)	- 0.44	- 4.23	18.31	0.00 *
Other Activities (work) (hours a day)	- 2.02	- 18.45	0.64	0.00 *

* P≤ 0.01

There was a significant difference (P<0.001) between urban students (mean age 13.41± 0.92) and rural students (mean age 13.95± 1.10) regarding height (160 and 153 cm), sitting height (78.11 and 74.70 cm), weight (50.52 and 39.42 kg), BMI (19.60 and 16.47 kg/mm), WHR (0.82 and 0.79), fat percentage (23.58 and 15.43), body mass (12.68 and 6.27 kg), lean body mass (37.80 and 33.15 kg), sleeping (8.67 and 8.21 hours daily) physical activity (11.62 and 9.56 hours daily), exercising activities (2.29 and 2.73 hours daily) and working activities (1.14 and 3.44 hours daily). Urban students showed higher rates (P<0.01) compared to nomadic students in all the measured values except working activity and exercising. Nomadic students had higher rates of working activities and exercising compared to urban students (P<0.01). Results showed that urban students had higher weights and BMI compared to their nomadic peers but nomadic students had more physical activity. The results of Pearson correlation coefficient between body fat percentage and BMI with sleeping rate, physical activity, exercising activities and the amount of daily work are shown in Table 4.

Table 4 *Results of Pearson correlation coefficients between percentage body fat and BMI with the amount of sleep, daily activities, sport activities and rate of daily work*

		Body Fat (%)		BMI	
		The correlation coefficient	P-value	The correlation coefficient	P-value
Urban	Sleep	0.004	0.96	0.01	0.90
	Daily Activity	- 0.06	0.51	- 0.08	0.34
	Exercise	0.05	0.57	0.05	0.57
	Work	0.02	0.79	0.04	0.59
Nomadic	Sleep	0.13	0.09	0.12	0.11
	Daily Activity	0.21	0.006*	0.19	0.01**
	Exercise	- 0.03	0.67	0.01	0.90
	Work	- 0.38	0.00 *	- 0.35	0.00 *

P≤ 0.01 *
P≤ 0.05 **

In urban students, no correlation was found between body fat percentage and BMI with physical activity rates (P>0.01). However, a negative correlation was found in nomadic students between their daily activities and the working amount with body fat percentage and BMI (P<0.01).

Discussion

Findings of the present study showed that urban students were heavier compared to nomadic students. Urban students had heavier weights, higher BMI and more fat mass which shows more prevalence of obesity and heavy weight in urban adolescents. Nomadic students had a significantly lower BMI, less WHR and more tender skin fold thickness compared to urban ones. Moreover, urban students had significantly taller and heavier. Consistent with the present study, a study in New Zealand (2010) reported that rural kids were thinner than urban kids [8]. These findings were also in line with a cross-sectional study in Turkey (2005) that showed that urban kids had thicker skin fold (triceps, scapular and suprailiac) compared with rural kids and were significantly taller and heavier, as well [21]. In addition, a study investigating the obesity and low weight trend in America, Russia, China and Brazil, the prevalence of overweight in urban kids was higher. However, these results might reflect the changes in terms of economic developments in these countries [22]. Since in the present study, the physical activity of urban students was significantly lower compared to nomadic students, one of the reasons for the prevalence of obesity in urban kids might be their lower physical activities.

In the present study, people's diet was not investigated but probably more consumption of traditional foods in rural places compared to the consumption of fast foods in urban places could make changes in anthropometric and adolescents' nutrition status. However, there are some studies that show the opposite result. Lewis et al. (2006) studied the prevalence of obesity in children living in Georgia and America and found that kids in rural areas had higher prevalence of obesity compared to those living in urban and suburban parts [23]. Moreover, McMurray et al. showed that rural kids had significantly more BMI and total skin-fold thickness and were more obese compared to rural kids [24]. Studies conducted outside America generally show that the prevalence of obesity was higher in rural kids compared to urban kids [16,22,25]. The differences between results of the present study and other reports could be due to the demographic differences in urban and rural population in various studies. This is because social and economic and ethnical status is related to obesity [26] and it is probable that the difference between the urban and rural places is a demographic reflection of population.

Other explanations regarding the differences between urban and rural differences in terms of body composition could be due to the

physical and social environment [16]. This potential environmental difference needs more studies in future since it might present a useful insight to obesity interventions. According to the findings of the present study, urban students were significantly more active in daily activities (in terms of transportation, inside and outside school activities, religious activities, and artistic activities) compared to their nomadic peers. But nomadic students had more exercise activities. Moreover, the amount of daily activities (physical activity) was higher in nomadic kids. In urban kids, no significant relationship was found between any of body fat values and BMI with the amount of physical activity. Nomadic students spend most of their times on agricultural and animal husbandry activities, therefore, they have more physical activity compared to urban students. It is probable that one of the reasons of lower weight, less fat percentage and lower BMI is due to higher rate of physical activity. In 1996, children dwelling in urban parts of Cameron were more inactive and the total score of physical activity in rural kids was twice more [27].This difference in physical activity habits and inactivity might be due to the obesity differences between children in urban and rural parts since urban children are more obese compared to rural kids. Results of a study in Iceland showed that rural students participated in less active leisure time activities more [28]. Moreover, in Hodgki et al. in 2010 study, no difference was found in physical activities of urban and rural kids, but rural kids had less leisure time [8]. In another study, no significant difference was found in physical activities and habits and inactive manners among urban and rural kids dwelling in Cyprus [29]. In Huang et al. study in 2010, urban kids had more physical activity after school compared to rural kids and they showed that the availability of facilities had a significant impact on physical activity of children and these facilities were not available in rural areas [30]. These contradictory results have various interpretations. Firstly, as stated earlier, the differences could be due to demographic diversity such as economic or social or ethical status. The emphasis on controlling such variables in the conducted studies on urban and rural differences regarding obesity and physical activities is prominent. Secondly, in large population studies, physical activities are usually measured as self-report. Self-report is an easy and efficient way of collecting data, but might not be precise enough. This is because of the fact that urban and rural dwellers might have different understanding and interpretation of the questions being asked hence this bias might be problematic while interpreting the data. While the physical activity is often considered a recreational or leisure activity for urban dwellers it is often synonymous with working for rural people (for instance working in a farm), therefore, the latter might not be reported as a physical activity [31]. These findings which showed that urban children had higher levels of physical activity might be due to the fact that they have easier access to interventions such as exercise programs or exercise facilities [28]. Studies that found rural children are more active might be related to the fact that rural children spend more time outside their house [32]. One of the limitations of the present study was the population under study which might not be representative of the Iranian society in which various ethical groups live. Moreover, the amount of energy received and nutrition compound of urban and rural children was not measured. It is suggested that for more definite conclusion, other studies (prospective and cross-sectional) be conducted in various parts of Iran.

Conclusion

Based on the results of the present study, a difference was observed and nomadic students were thinner than urban students. Moreover, regarding the physical activity, a significant difference was found and nomadic students were more active compared to their counterparts in urban areas. Nomadic students had more favorable body composition compared to urban students which is probably due to their higher rate of physical activity. These results were different from the findings of other countries and this might be due to

social and physical environmental differences. However, more studies are required to comprehend the potential difference of rural and urban settings for they might present a useful insight regarding obesity interventions.

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Contributions
Study design and analysis: HM, MM
Data collection: MC, HM, FA
Manuscript preparation: FA, MC, FA

Conflict of interest
"The authors declare that they have no competing interests."

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