

Obesity and Overweight in Young Adult Females of Northern Badia of Jordan

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ABSTRACT

The objective of the study was to describe anthropometric indices of obesity in young adult females from Northern Badia of Jordan and explore their association with some socio-economic and lifestyle factors. A representative random sample based on a proportional sampling method of 233 females aged 20-25 years from the Jordan Northern Badia was used. Studied variables were: weight, height, skinfold thickness at selected sites, body mass index (BMI), % body fat (BF%), and associated factors including education, marital status, smoking, employment, housing and having a chronic disease. The main anthropometric characteristics of the Badia young females were: body weight (55.7 ± 0.7 kg), height (153.4 ± 0.4 cm) and BF% (26.5 ± 0.3). The prevalence of the BMI categories in the sample were: 8.2% underweight (BMI < 18.5 kg/m²), 27.0% overweight (BMI 25.0-29.9 kg/m²) and 6.9% obese (BMI ≥ 30.0 kg/m²). Median height matched the 5th NCHS percentiles. Medians of weight and triceps skinfold thickness were located between the 25th and 50th, and the 10th and 25th NCHS percentiles respectively. Factors that were found to be significantly ($p < 0.05$) associated with BMI among the Badia young females included educational status, being married, not working, non smokers, settlers and having no chronic disease. In conclusion, underweight, overweight and obesity do exist in the young adult females of Northern Badia of Jordan, with a tendency towards obesity. The presence of overweight and obesity in Badia may be a reflection of the ongoing development in the area.

INTRODUCTION

Obesity is a major public health problem. It is associated with increased morbidity and mortality. The prevalence of obesity is increasing worldwide and is more evident in affluent societies and in those undergoing modernisation (WHO, 1998; WHO, 2003; IOTF, 2005). There are indications that obesity and other non-communicable diseases have increased in many Middle Eastern countries (Musaiger

& Miladi, 1996). A few population studies from the area have indicated that the prevalence of obesity is higher than in most other countries of the world (Al-Nuaim *et al.*, 1996; Musaiger & Miladi, 1996; Ajlouni, Jaddou & Batieha, 1998; Stene *et al.*, 2001; CDC, 2003).

Anthropometry is widely used as a clinical and research tool to assess nutritional and general health status of man (Gibson, 1990; Lee & Nieman, 2003). Indices of anthropometry reflect the

outcome of gene-environment interactions (WHO, 1998; BNF, 1999). They have a prognostic value in describing and categorising human growth, body composition and malnutrition (WHO, 1995; Lee & Nieman, 2003).

There are no national anthropometric assessment data of the adult population in Jordan. Some growth parameter data have been reported for groups of Jordanian infants and children (Hijazi, 1977; Mawajdeh *et al.*, 1995; Hasan *et al.*, 2001; Ahmad & Darawsheh, 2002) and adolescents (El-Masri, 1989; Hasan *et al.*, 2001). There are also few studies which indicate an alarming high prevalence rate of obesity among adult women and men (WHO, MoH & MoA, 2006). This subject has been recently reviewed (Takruri, 2003). No nutritional anthropometric studies have been conducted on the Badia inhabitants. The purpose of the present study was to report on anthropometric data of overweight and obesity among young adult females aged 20-25 years living in the Northern Badia of Jordan and to compare them with the documented reference data for females of similar age range (NCHS, 1987; WHO, 1990), as well as to relate them with selected socio-economic and life-style factors.

SUBJECTS AND METHODS

Study site

Northern Badia of Jordan comprises about 11% of the Jordanian area. It is an arid region with an annual rainfall below 100mm (FAO, 2002). The area consists of 34 villages varying in size from 200 to 6000 people (DoS, 2004). The population, which is estimated to be 18000, consists of settled, semi-settled and nomadic inhabitants. Demographically, the area has higher fertility and mortality rates than the national average (DoS, 2002). It has also a younger population with more than 50% under the

age of 15 years and less than 3% over 65 years. Health in the area is poor compared to Jordan as a whole, with a comparatively high infant mortality rate, crude death rate and a lower life expectancy than the Jordanian average (Spicer, 1995; DoS, 2002).

Subjects

A proportional sampling technique was used to obtain a representative sample of 233 young adult females aged 20-25 years living in the Northern Badia of Jordan (Steel, Torrie & Dickey, 1997). The sample represented approximately one in four females of this target age group in the area (DoS, 2004). The design provided a systematic sampling of all villages and gatherings comprising the Northern Badia based on the cumulative population in each location. The sample consisted of settled, semi-settled and nomadic inhabitants of the Badia. Lactating and pregnant women were excluded from the sample. Participants were interviewed by a trained researcher who obtained their consent prior to participation in the study, took their anthropometric measurements and completed a structured questionnaire which included information on their personal, health, lifestyle and socio-economic backgrounds.

Measurements

Anthropometric variables were measured using standard anthropometric techniques (Gibson, 1990; WHO, 1995). Height was measured without shoes to the nearest 0.5 cm using a non-stretchable measuring tape. Weight was measured to the nearest 0.1 kg with the participant in light clothes and without shoes using a precalibrated Seca scale. Skinfold thicknesses were measured in triplicates to the nearest 0.1 mm using the Harpenden skinfold caliper at the following standard body sites: triceps, biceps, subscapular and

Table 1. Anthropometric reference indices of obesity and overweight for adults

Body weight status	Anthropometric index	
	Body mass index (kg/m ²)	Fat %
	WHO (1990)	Nieman (1995)
Underweight / lean	< 18.5	< 13%
Normal / optimal fat	18.5-24.9	13-23%
Overweight / fat	25.0-29.9	24-32%
Obese / over fat	≥30.0	≥33%

suprailiac (Lee & Nieman, 2003). Percent body fat (BF%) was calculated by the method of Durnin and Womersley (1974) to estimate body density, and of Siri (1956) to estimate body fat from density. Body mass index (BMI) was calculated as the weight in kilograms divided by the height in meters squared. Calculation and classification categories of the BMI and BF% were based on the principles and criteria attributed to WHO (1990) and Nieman (1995), respectively. The anthropometric categories that were adopted by the present study are given in Table I. Information on a number of demographic variables were obtained from each participant, and were categorised into: (1) Educational status: category-1 (illiterate or less than secondary schooling), or category-2 (secondary or higher education) as given by DoS (2004); (2) Marital status: single or married; (3) Employment: not working or working; (4) Smoking: no (non-smokers) or yes (smokers); (5) Housing: settlers or exclusively nomads; (6) Suffering from a chronic disease: no or yes, with a particular emphasis on diseases such as diabetes mellitus, hypertension, and coronary heart disease.

Data analysis

Statistical Package for Social Sciences (SPSS) was used for data analysis. Data were presented as mean ± standard error of the mean (SEM). BMI data according to different socio-economic and lifestyle

factors were tested by analysis of variance and significant means were separated by the least significance difference test (LSD). The Chi-squared test was used to assess the association between BMI of participants and socio-economic and lifestyle factors. The p-value < 0.05 was used as a cut-off level for significance.

RESULTS

Table 2 shows the anthropometric measurements and indices which were characteristic of the Jordan Badia participants; whereas Table 3 compares their percentile values for weight, height and triceps skinfold thickness with the

Table 2. Anthropometric characteristics of the young adult females in Northern Badia of Jordan

Character	Mean ±SEM (n=233)
Age (years)	22.1±0.1
Weight (kg)	55.7±0.7
Height (cm)	153.4±0.4
Body mass index (mg/m ²)	23.6±0.3
Body fat (%)	26.5±0.3
Skinfold thickness	
Biceps (mm)	8.0±0.2
Triceps (mm)	14.3±0.4
Suprascapular (mm)	12.3±0.3
Suprailiac (mm)	13.0 ± 0.3

Table 3. Percentile values for weight, height and triceps skinfold thickness of young adult females in Northern Badia of Jordan and corresponding NCHS percentile norms of norms of women aged 18-24 years

Percentile	Weight		Height		Triceps	
	Badia	NCHS*	Badia	NCHS	Badia	NCHS
5th	39.0	47.3	143.5	153.1	7.1	10.5
10th	44.0	49.5	146.0	155.7	8.2	11.5
25th	48.0	53.3	150.0	159.4	10.5	15.0
50th	55.0	57.9	153.8	163.9	13.5	19.0
75th	62.0	64.8	157.4	167.7	18.5	25.0
90th	67.5	74.3	171.4	171.8	22.1	32.0
95th	72.5	82.4	163.4	174.0	24.2	37.1

NCHS (1987)*

Table 4. Anthropometric indices of obesity and overweight of young adult females in Northern Badia of Jordan

Body Weight Status ¹	Jordan Northern Badia Females (n=233)	
	Mean \pm SEM	n
Body mass index (kg/m ²)		
< 18.5	16.8 \pm 0.4	19
18.5-24.9	21.0 \pm 0.1	135
25.0-29.9	27.1 \pm 0.2	63
\geq 30.0	32.3 \pm 0.5	16
Body fat (%)		
< 13%	0.0	0
13-23%	20.9 \pm 0.3	68
24-32%	27.9 \pm 0.2	141
\geq 33%	34.6 \pm 0.3	22

¹Criteria of body weight status are given in table

corresponding NCHS percentile norms (1987) for women with similar age range. The median height of Badia females matched the 5th percentile, whereas the median weight was located between 25th and 50th percentiles. The median triceps skinfold thickness was located between the 10th and 25th NCHS percentiles.

Table 4 presents the mean values for the different categories of the major

anthropometric indices of the young adult females in Jordan Badia. Figure I shows the percent distribution of body weight status of the Badia participants according to BMI and BF%. The data indicated that percentages of females living in the Badia with underweight (BMI < 18.5 kg/m²) and normal weight (BMI 18.5-24.9 kg/m²) categories of BMI were 8.2% and 57.9% respectively. On the other hand, percent-

ages of the subjects with overweight (BMI 25.0-29.9 kg/m²) category of BMI was 27.0%. Considering BMI \geq 30 as obese, the percentage was 6.9% among the study sample. Thus, the prevalence of overweight and obesity (BMI) in the study sample was 33.9%. Percentage of participants who had optimal BF% was 29.5%. With respect to overfat category (BF% \geq 33%), it was 9.5%. None of the participants

were considered lean in terms of BF%.

Means of BMI as associated with socio-economic and lifestyle factors of the Jordanian females included in the study, are given in Table 5. With the exception of education and marital status, the BMIs of participants in the Badia did not show significant differences ($p > 0.05$). The mean BMI of Badia females with better educational status was higher ($P < 0.05$) than of

Table 5. Socio-economic and lifestyle factors associated with body mass index of young adult females in Northern Badia Jordan (n=233)

Factor	Body Mass Index (kg/m ²)			P-value ²
	Mean \pm SEM ¹	n	%	
Educational status ³				0.050
Category-1	23.1 \pm 0.5 ^a	148	63.5	
Category-2	24.6 \pm 0.5 ^b	85	36.5	
Marital status				0.005
Single	21.4 \pm 0.5 ^a	55	23.6	
Married	24.3 \pm 0.3 ^b	178	76.4	
Employment				0.018
Not working	23.7 \pm 0.3 ^a	222	95.3	
Working	23.2 \pm 1.1 ^a	11	4.7	
Smoking				0.019
No	23.7 \pm 0.3 ^a	228	97.9	
Yes	23.1 \pm 1.8 ^a	5	2.1	
Housing				0.010
Settlers	23.7 \pm 0.3 ^a	219	94	
Nomads	22.2 \pm 1.1 ^a	14	6	
Having a chronic disease				0.018
No	23.7 \pm 0.3 ^a	226	97	
Yes	23.2 \pm 1.7 ^a	7	3	

(1) Values in columns with different superscripts are significantly different among subcategories of each socio-economic or lifestyle factor.

(2) Results of the Chi-squared test: Association between BMI and each socio-economic or lifestyle factor.

(3) Educational status was categorised according to DoS (2004) as follows:

Category-1: illiterate or less than secondary schooling.

Category-2: secondary or higher education.

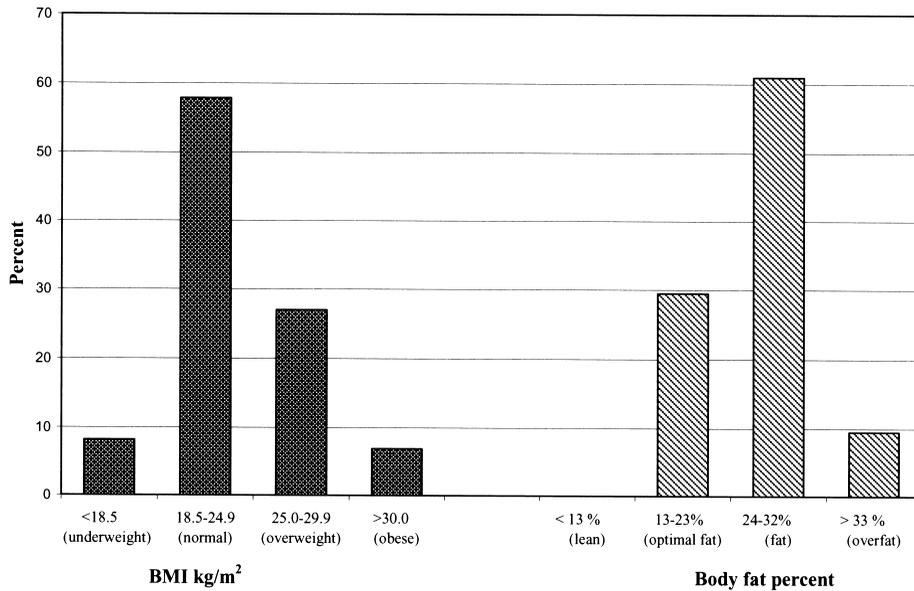


Figure 1. Percent distribution of young adult females in Northern Badia of Jordan according to BMI and body fat percent categories

those with lower educational status. Married females had a significantly ($p < 0.005$) higher mean BMI than unmarried ones.

The overall association between BMI of the participants, and socio-economic and lifestyle factors is illustrated in Table 5. There was a significant ($p < 0.05$) relationship between BMI and all factors studied. These factors included education, marital status, employment, smoking, housing and having a chronic disease. Therefore, BMI increased with educational status, being married, not working, being non-smokers, settlers and not suffering from a chronic disease.

DISCUSSION

The present study dealt with a group of young adult females that represent the dwellers of the Northern Badia of Jordan. Several important findings were obtained

from this study. The weight status of the young adult females in the Badia associated significantly with socio-economic and lifestyle factors. The Badia females were lighter and shorter, with more deficits in height than in weight, compared to the NCHS reference data (NCHS, 1987). The height of the females studied was found to be far below these standards. In this context, available data in Jordan, yet unpublished, indicated that the Badia females were found to be markedly lighter and shorter with lower percentage of body fat and a higher percentage distribution of underweight compared to females with similar age range living in urban areas of the country.

The present data are consistent with those of other studies in Jordan (Ajlouni *et al.*, 1998; Hasan *et al.*, 2001; Ahmad & Darawsheh, 2002; WHO, MoH & MoA, 2006) and in the region (Al-Isa, 1998; Musaiger, 2000; Musaiger, Al-Awadi & Al-Mannai, 2000) as underweight, overweight

and obesity exist in adolescent and young adult females. The considerable proportion of underweight in the Badia females is expected in view of the low socio-economic level of the participants and the limited health care facilities in the Badia (Al-Akour, 1994; Spicer, 1995; Branderburg, 1995). It is important to note that great divergence from reference standards in the height has been repeatedly reported in groups of infants, children and adolescents in Jordan (Hijazi, 1977; Mawajdeh *et al.*, 1995; Hasan *et al.*, 2001) and other Middle Eastern countries (Al-Shoshan, 1993).

The short stature of the Badia female dwellers can be interpreted as evidence of past malnutrition which might have occurred during the stages of childhood and/or adolescence. It has been found that stature reflects the individual's nutritional history better than weight, which indicates acute malnutrition (Gibson, 1990; WHO, 1995; Lee & Nieman, 2003). Stature has also been considered the indicator which best summarises the effects of socio-economical and dietary factors on the individual's nutritional status (Oliveira, Amanda Cezar & Soares, 2000). The short stature of the Badia females may also explain their high body weight indices, particularly the body mass index. Similar observations have been documented elsewhere (WHO, 1995; Sichieri, Mathias & Moura, 1996). This may partly justify the considerable proportion of overweight and obesity seen in the Badia females.

The prevalence of obesity (BMI \geq 30) given in this study was noticeably lower than that reported by Ajlouni *et al.* (1998) for Jordanian women aged 25-60 years (32.7%). The authors documented an age-related increase in obesity prevalence from 25-29 years (17.8%) to 50-59 years (47.5%). This may indicate a lower prevalence in younger groups as reported by the present study. However, differences in the lifestyle and socio-economic levels of the participants in the two studies should not be excluded. In fact, considerable changes in

the lifestyle and socio-economic level have occurred in Jordan during the last three decades, which contributed significantly to the increased prevalence of obesity and other chronic diseases in the country (WHO, MoH & MoA, 2006; Ajlouni *et al.*, 1998; CDC, 2003). The Badia of Jordan has undergone great development (Al-Akour, 1994; Branderburg, 1995); this could be eventually reflected on lifestyle and socio-economic status of the inhabitants. Therefore, it is not unexpected to find that the prevalence of overweight and obesity in some sections of the Badia population is comparable to that in the urban areas of Jordan. These data supported those reported in other countries of the Near East, as the prevalence of obesity and overweight reached an alarming level and was related to modernisation and improved socio-economic status of the population (Musaiger & Miladi, 1996; Al-Isa, 1998; Musaiger, 2000; Stene *et al.*, 2001).

Educational status, or being more educated, was associated with increased BMI of participants. This result conforms with that of other reports in the region (Hossain, Pugh & Malik, 1998; Musaiger & Al-Mannai, 2000). Marital status (being married) was also associated with overweight and obesity, in agreement with other results (Al-Mannai *et al.*, 1996; Al-Isa, 1999). Moreover, a subtle association between BMI and being non-smokers was observed, a result that was indicated by other studies (BNF, 1999; Musaiger & Al-Mannai, 2000). The association of BMI with employment (not working) and housing (settlers) may be explained in terms of the relationship between physical activity and overweight and obesity (BNF, 1999). It was observed that being free of a chronic disease was associated with increased BMI, a result that was not previously reported. However, it is known that the prevalence of chronic diseases such as diabetes mellitus, hypertension and coronary heart disease is closely related to age, and is more evident in the middle and late

adulthood (Musaiger & Miladi, 1996). Participants in the present study were young adults, in whom the association may not be apparent.

It may be concluded that underweight, overweight and obesity do exist in the studied sample. Several socio-economic and lifestyle factors contributed to the development of overweight and obesity in the participants. Evidence of past malnutrition in the Badia may be indicated, especially in view of the short stature of Badia females. The ongoing health and socioeconomic developments in the Jordan Badia may be the factor behind the presence of overweight and obesity in the area.

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