

# Prevalence of Obesity and Overweight among Military Personnel in North of Jordan and Some Associated Risk Factors

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## ABSTRACT

**Objective:** Obesity and overweight has emerged as one of the important issues in the Jordanian community. Military is important part of this community and it is important to understand such problem and it's associated factors in the military; so as to introduce early measures to increase awareness and provide solutions among the study population. The current study was conducted to do determine the prevalence of overweight and obesity among military personnel serving in North of Jordan and to investigate some of its associated risk factors.

**Methods:** A cross-sectional survey was conducted in army units in North of Jordan from October 2011 to April 2012. Multistage sampling technique was used to recruit 570 male participants, who then completed a self-administered questionnaire. The questionnaire included questions about socio-demographic variables, the nature of work, physical activity, dietary and life style history. Anthropometric measurements were recorded by using one standardized scaling instrument for height and one for weight to measure Body Mass Index (BMI). SPSS was used to analyze the data using logistic regression analysis with backward selection methods. The adjusted effect of independent variables was measured on overweight and obesity. Adjusted Odds (OR) and 95% Confidence Intervals ( 95% C.I.) were reported.

**Results:** The current study found that about 36% of participants were overweight and 16.8% were obese; the combined percentage of obesity or overweight among study population was 53.1%. The significant predictors of overweight were age, educational level, exercising score, impression about weight gain, dietary patterns/ frequency of having meals, and self-satisfaction about health and physical appearance. As for obesity, the significant predictors were marital status, educational level, residency, self-assessment of health status, impression about gaining weight, frequency of having meals, frequency of health complain, perception about weight gain because of their unhealthy, low active lifestyle , and perception about the possibility of getting out of shape.

**Conclusion:** According to the current finding; overweight and obesity pose a serious problem among military personnel in Jordan and there seems to be an urgent need to initiate and activate interventions specially designed to this group that aim at increasing physical activity and controlling risk factors.

**Keywords:** Obesity, Overweight, Military personnel, North of Jordan .

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## Introduction

Today, obesity and overweight are a major public health problem in developed nations, as well as in the global south countries <sup>(1)</sup>.

The extent of this global problem has increased in the last 3 decades <sup>(2-3)</sup> as the prevalence of obesity and overweight is increasing at an alarming rate <sup>(4)</sup>. It is

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estimated that there are more than 300 million obese people living today <sup>(5)</sup>. According to WHO; Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health <sup>(6)</sup>. Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. BMI is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m<sup>2</sup>). BMI = weight (kilogram) / Height (meters)<sup>2</sup>

Using BMI as a measurement of excessive weight is not a precise approach. For example, adipose tissue is distributed differentially between males and females; in the pelvis for females and abdomen in males. Therefore, it is difficult sometime to get a threshold level of BMI to define overweight and obesity <sup>(7)</sup>. Research on obesity and overweight showed that their etiology is multi factorial in nature. Genetics play an important role in metabolizing calories that are responsible for obesity and overweight. Both disorders could be related to excessive calories intake with inadequate energy utilization. The effect of such imbalance between intake and utilization could be modified by sedentary lifestyle and high fat consumption may <sup>(8-9)</sup>. Obesity and overweight are assumed a global epidemic <sup>(10)</sup> with serious risk factors and deleterious impacts on cardiovascular <sup>(11-12)</sup>, respiratory disease <sup>(13)</sup>, bronchial asthma, certain forms of cancer <sup>(14)</sup>, and metabolic syndrome <sup>(15)</sup>. Obesity and overweight are also found to be associated with several diseases and disorders like degenerative joint, gallbladder, renal disease, hypertension, diabetes mellitus (D.M), obstructive sleep apnoea syndrome (OSAS), hyperlipidemia, and depression <sup>(16)</sup>. These disorders are responsible for decreased quality of life and increased mortality. According to report by the International Obesity Task Force, one in each ten children worldwide is overweight; a total of 155 million children and adolescents are overweight and around 30–45 million are classified as obese <sup>(17)</sup>. In 1998, Ajlouni *et.al* reported in that the overall prevalence of obesity in Jordan (body mass index, BMI≥30 kg/m<sup>2</sup>) was 49.7%. The prevalence in males was 33% and in females 60% in females <sup>(2)</sup>. Age-standardized prevalence of obesity in

northern Jordan was reported to be 28.1% (95% CI: 23.4, 32.8) for men and 53.1% (95% CI: 49.3, 57.0) for women according to a study by Khader *et.al* <sup>(18)</sup>. While data regarding obesity and overweight are established in Jordan, little is known about its prevalence among military personnel in Jordan. Obesity and overweight among military personnel is very crucial issue and every military personnel should be in the best physical fitness at all times, as it is a requirement from the day they start their training at military schools.

## Methods:

A cross-sectional survey was conducted in army units in North of Jordan from October 2011 to April 2012. The approval of the study protocol has been obtained from the Ethics committee of the Royal Medical Services. Researchers were only able to conduct the study in the Northern part of the country so the sampling process included only military units located in the Northern part. Accordingly, a total of 35 battalions were identified (N=35). Multi-stage random sampling procedure was used. At the first stage, a sample of 5 units (battalions) were randomly selected from a list of all units located in the Northern part of Jordan using simple random sampling technique. The total number of subjects within each randomly selected sample was identified. At the second stage; a total of 10% of subjects, serving within each selected unit, was randomly selected from the enrollment list available for each unit.

The desired sample size was calculated using the following formula:

$$N = [(1.96)^2 \times pq] / d^2, \text{ where}$$

$N$  = sample size,

$p$  = expected prevalence of obesity and overweighted,

$q = 1 - p$ ,

$d$  = margin of error

The minimum conservative required sample size was found to be at least 385 subjects as shown below.

$$N = (1.96)^2 \times (0.50) \times (1 - 0.50) / (0.05)^2 = 384.16$$

To ensure adequate sample size and to control for potential loss to follow up effect we estimated aimed at sampling a total of

570 subjects. The research conducted multiple visits to the selected units to identify a suitable time to conduct the survey and to ensure availability of subjects. Subjects who were selected and approved to participate in the study were asked to participate in the study by answering a group of questions and, measuring their weight and height. Once oral the approval to participate was obtained, subjects were asked to sign an informed consent that was collected by the researcher. Participants were then invited to complete the questionnaire in a private room in each unit. The researcher invited participants to answer the questionnaire ensuring confidentiality of collected data. After completing the questionnaire, participants were asked by the assistant “nurse “to dress the minimum amount of clothes for their weight and height to be recorded by the investigator. Measures were recorded on the questionnaire using one standardized scaling instrument for height and one for weight. All measurements were taken using the same instruments throughout the research period. Both instruments were calibrated by the researcher before each use, who also performed all measurements and recorded them on the designated area of the questionnaire. The questionnaire included the following socio-demographic factors; age, sex, residence, governorate and marital status. Data regarding the nature of work, exercise history, dietary and lifestyle history was also collected. Anthropometric measurements (height and weight) were recorded and the BMI was calculated for each participant. Certain questions were grouped together to construct an index that is designated to measure one item using the grouped questions. Questions were categorized into the indices and an index score was calculated for each index. Questions in each index were identified using the rotated principal component analysis with varimax rotation method. Calculated index scores were then divided into quartiles or quintiles according to distribution of the variable within the data. Data collection started on October 2011 and was finished on January 2012. Data was collected during normal business hours between 8:00 AM and 5:00 PM.

### ***Statistical Analysis***

Collected data was coded and entered on an EXCEL sheet, which was then imported by the Statistical Package for Social Science (SPSS) software application version 17. Data was then cleaned and double-checked for errors by the researcher. SPSS was used for data manipulation and data analysis. At first, principle component analysis was used to identify questions that construct the same index. Once identified, questions that needed re-coded (reverse coding) were identified and the re-coding was performed. Questions were then grouped into indices and a score for each index was calculated by summing the code of the answer for each question. Index scores were then calculated for each participant and scores were divided into quartiles or quintiles as suggested by the distribution of the data. Variables were presented using frequency distribution tables. Multivariate logistic regression analysis with backwards selection method was used to test the independent effect of the variables and covariates on the presence of obesity and the presence of overweight. Adjusted Odds Ratios and 95% Confidence Intervals (OR, 95% C.I) were reported for the variables selected by the statistical model.

### **Results**

The current study found that about 36% of participants were overweight and 16.8% were obese; the combined percentage of obesity or overweight among study population was 53.1% (Table I). The significant predictors of overweight were age, educational level, exercising score, impression about weight gain, dietary patterns/ frequency of having meals, and self-satisfaction about health and physical appearance (Table II). As for obesity, the significant predictors were marital status, educational level, residency, self-assessment of health status, impression about gaining weight, frequency of having meals, frequency of health complain, perception about weight gain because of their unhealthy, low active lifestyle , and perception about the possibility of getting out of shape (Table III).

**Table 1:** Distribution of participants by Body Mass Index (BMI) (N=570).

BMI Category	Number	%
Underweight (BMI < 18.5)	8	1.4
Normal (18.5 < BMI < 24.99)	259	45.4
Overweight (25 < BMI < 30)	207	36.3
Obese (BMI > 30)	96	16.8

**Table II** Adjusted effect\* of selected variables on overweight among study participants (N=570).

Variable	OR	95% C.I.
Age (years)		
16 – 26	Ref	
27 – 30	1.94	1.12 - 3.34
31 – 35	1.38	0.793 - 2.43
36 – 46	1.81	1.02 - 3.21
Educational level		
Elementary	Ref	
Secondary	1.30	0.83 - 2.05
University or higher	2.36	1.25 - 4.47
Original place of residency		
North of Jordan	Ref	
Middle of Jordan	0.68	0.38 - 1.21
South of Jordan	0.63	0.36 - 1.08
Exercising Score / Intensity of Exercising Behaviors		
Low	Ref	
Middle	0.96	0.59 - 1.56
High	0.57	0.35 - 0.93
Impression about gaining weight		
S.disagree/disagree	Ref	
Agree	1.55	0.92 - 2.61
S.agree	3.29	1.99 - 5.43
Dietary pattern of participants (frequency of having meals)		
Rarely	Ref	
Frequently	1.34	0.77 - 2.33
Often	2.13	1.30 - 3.48
Dietary changing pattern		
Rarely	Ref	
Sometime	1.11	0.71 - 1.74
Often	0.72	0.44 - 1.16
Frequency of health complain		
Rarely	Ref	
Sometimes	1.25	0.73 - 2.15
Very often	0.89	0.51 - 1.55
Always	1.55	0.91 - 2.63
Self satisfaction about health, physical appearance		
Rarely satisfied	Ref	
Sometimes satisfied	0.70	0.42 - 1.16
Often satisfied	0.52	0.31 - 0.87
Impression about work stress level		
Low	Ref	
Middle	0.99	0.44 - 2.23
High	1.89	0.78 - 4.59

\*Using regression analysis backward selection method.

**Table III:** Adjusted effect\* of selected variables on obesity status among study participants (N=570).

Variable	OR	95% C.I.
Socio Economic Status		
Low	Ref	
Middle	0.56	0.25 - 1.25
High	2.12	0.83 - 5.39
Self assessment of health status		

Excellent	Ref	
Good	4.30	1.84 - 10.00
Average or below	11.08	3.98 - 30.79
Educational level		
Elementary	Ref	
Secondary	1.13	0.55 - 2.33
University or higher	0.23	0.68 - 0.83
Years of service		
1 – 5	Ref	
6 – 9	2.59	0.93 - 7.16
10 – 14	0.93	0.27 - 3.19
More than 15	2.23	0.70 - 7.10
Marital status		
Single	Ref	
Ever married	2.89	1.16 - 7.16
Original place of residency		
North of Jordan	Ref	
Middle of Jordan	5.30	2.22 - 12.63
South of Jordan	1.60	0.69 - 3.72
Type of work		
Office	Ref	
Office@ field	2.56	0.53 - 12.22
Field	3.42	0.80 - 14.64
Exercising Score/ Intensity of Exercising Behaviors		
High	Ref	
Middle	0.57	0.26 - 1.25
Low	0.48	0.21 - 1.09
Impression about gaining weight		
S.disagree/disagree	Ref	
Agree	1.04	0.24 - 4.42
S.agree	4.33	1.04 - 17.95
Perception about weight gain because of their unhealthy, low active lifestyle		
S.disagree	Ref	
Disagree	0.12	0.03 - 0.40
S.agree/ Agree	0.60	0.22 - 1.59
Perception about body possibly getting out of shape		
S. agree	Ref	
Agree	0.34	0.16 - 0.71
S. disagree/ Disagree	0.09	0.03 - 0.27
Dietary pattern of participants (frequency of having meals)		
Rarely	Ref	
Frequently	0.60	0.22 - 1.61
Often	1.56	0.63 - 3.83
Frequency of having meals		
Every 6 hours or more	Ref	
Every 4 hours	3.98	1.49 - 10.59
Every 2 hours	3.86	1.29 - 11.50
frequency of missing meals		
Rarely	Ref	
Frequently	1.11	0.37 - 3.35
Often	2.65	0.93 - 7.58
Frequency of health complain		
Rarely	Ref	
Sometimes	1.22	0.45 - 3.27
Very often	2.94	1.17 - 7.37
Always	2.50	1.03 - 6.07
Sleeping patterns		
Rarely	Ref	
Frequently	1.56	0.69 - 3.50
Often	2.13	0.90 - 5.01

\*Using regression analysis backward selection method.

## Discussion

The findings of this study raises serious concerns about the urgent need to preventive and controlling measure to handle overweight and obesity problems in the Jordanian military. Compared the general population in 1998, where the prevalence of obesity was found to 33% among civilian men, the current study found that military men had significantly lower prevalence compared to the general population <sup>(2)</sup> (Table IV). The prevalence rate estimates reported in the current study should be handled with caution. It may be true that using BMI to estimate body fat may introduce some misclassification bias as some respondents, males in particular, may be considered overweight due to excess lean mass. Still, if such prevalence is somehow overstated due to incorrect BMI classification of some participants, it is considered to be lower than that reported in other studies. In the US, for example, the combined prevalence of overweight and obese was reported to be 57.2% in 2002 and 60.5% in 2005. Still, the prevalence of overweight was 38.6% and 42.2% in 2005 and 2002, respectively. However, the reported prevalence of obesity, in the US, was lower than that reported in Jordan 12.9% and 8.7% in 2005 and 2002, respectively <sup>(24)</sup> (Table IV). The obesity of military personnel in North of Jordan (16.8%) is lower than in general population (32.7%), but this finding is higher than finding report in personnel survey of Royal Thai Army (RTA) in 2007, which expressed that the prevalence of overweight and obesity in RTA personnel was found to be 27.1% and 4.9%, respectively <sup>(22)</sup> (Table IV). Another study among Greek warship personnel in 2004 showed that 26.5% of participants were overweight and 4.7% obese, which is lower than finding in this study <sup>(25)</sup> (Table IV). Other comparisons of the prevalence of overweight and obesity are presented in (Tables II, III). In relation factors under investigation that contribute to obesity and underweight of military personnel in Jordan, the current research found that the significant predictors of overweight are: age, educational level, exercising score, impression about weight gain, dietary patterns/ frequency of having meals, and self-satisfaction about health and physical appearance. Subject are higher risk of overweight are subjects who are

in the older age groups, have higher educational level, have low exercising score, agree that they are gaining weight, have meals more frequently, tend not to be satisfied about their health and physical appearance. The current research also identified the following variable as significant predictors of obesity; marital status, educational level, residency, self-assessment of health status, impression about gaining weight, frequency of having meals, frequency of health complain, perception about weight gain because of their unhealthy and low active lifestyle , and perception about the possibility of getting out of shape. Subjects at higher risk of obesity are those who reported to be ever marries, in the higher educational category, live in the middle of Jordan, have low perception of their health status, strongly agree that they are gaining weight, have meals more frequently, complain about their health status, have a perception that they are gaining weight because of their unhealthy life style, and those who perceive that there are possibly getting out of shape (Table III). Identified variables are critical to design intervention programs to control for overweight and obesity. These factor establish a corner stone for designing any intervention program to combat the problem of obesity and overweight among a critical group in the Jordanian society. Some of the identified variables are social factors such as targeting older age groups, married, and those with higher educational levels. Other variables relate to self-assessment and perception of health status and exercising scores; where subjects tend to complaint more about their health and tend to be not physically active in their daily activities. Among variables identified as predictors of overweight and obesity are those related frequency of meals, and the changing dietary patterns. As military personnel, most participants should have access to meals and a schedule for food serving along with health options that provide them with the necessary calories to perform their work. While this is established, it seems to be a gap between the served food and the dietary and eating behaviors of participants. Such gap should be investigated and addressed in relation to BMI measures presented here. The current study is the first to address obesity and overweight among military personnel in

Jordan and the Arab world. It provided critical information to help design and prepare intervention programs to a critical group of the society. However, the study has some limitations. For example, the majority of indices were self-reported. In addition, it may not be generalized to the whole military as it only included members from the Northern region. Some of the variables under investigation were not investigated further due to security issues and the nature of military work. This includes the exact nature of the work and the rank of participants. Although

most health organizations and scientist support the use of BMI as good indicator to define overweight and obesity it does not take into account individuals who may have a large muscular habits and the percent of body fat. This is of special interest when studying military personnel. Therefore, we may have an overestimated rate of both overweight and obesity. This is because the study was not able to conduct waist circumference, skinfold caliper test, waist to hip ratio (WHR) as a good indicator for overweight and obesity due to the time constraint of the participants.

**Table IV:** Prevalence of overweight and obesity in different populations.

Study population	Overweight %	Obesity%	combined prevalence of overweight and obesity
Royal Thai army personnel 2007 [22].	27.1%	4.9%	32%
Greek warship personnel 2004 [25].	26.5%	4.7%	-
U.S military personnel 2005 [23].	47.6%	12.9%	60.5%
U.S population 2005 [24].	-	27.6%	-
Canadian Forces personnel 1990 [20].	50%	-	-
Civilians in Jordan 2007[18].	-	28.1%	-
Civilians in Jordan 1998[2].	-	32.7%	-
Military personnel in North of Jordan 2012	36.3%	16.8%	53.1%

## Conclusion

In conclusion, the present study indicated that up to 36.3% of military personnel in Jordan were considered overweight and 16.8% were obese, so the percentage of obesity and overweight among study population was 53.1%. These figures are alarming for a critical for the target group and need immediate attention to control and prevent obesity and overweight among military personnel. The present study provides information on the army prevalence of obesity and overweight, and strongly associated factors like age, educational level, self satisfaction about health, exercising score, impression about gaining weight, dietary pattern of participants, self assessment of health status, original place of residency, frequency of having meals, frequency of health complain and marital status.

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