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GENDER AND PHYSICAL ACTIVITY: ARE THEY ASSOCIATED WITH BODY MASS INDEX IN ELDERLY JORDANIAN PEOPLE?

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Abstract

Background: *The number of elderly people is increasing worldwide, and elevated body mass index is a common problem that occur with elderly people, which can be directly or indirectly affected by level of physical activity and gender. So, it is essential to study the effect of both physical activity and gender on body mass index in elderly people.* ***Material and methods:*** *A cross-sectional, observational study was conducted on 120 elderly Jordanian people who live in Amman (62 women; 58 men) and evaluated for body mass index. Those participants were 40 elderly persons who attended the gym at least twice a week for the last 2 years, and 80 elderly who were home resident or physically inactive. A structured questionnaire was used to collect data about personal, social, health and life-style information including the daily activities and the anthropometric measurements for the study participants.* ***Results****: The results of this study showed that as elderly people become physically inactive, their body mass index will increase to become as overweight or obese. The results of this study also showed that body mass index of 30 and more was associated with gender, with majority of female elderly (50%) having body mass index of 30 or more.* ***Conclusion:*** *Physical activity should be maintained by both genders in order to prevent obesity, primarily in women as they are more likely to become obese that men. Furthermore, body mass index should not exceed 30 in elderly. Physical activity is essential in order to obtain healthy weight.*

key words: *Body mass index, gender, obesity, physical activity, Jordanian.*

Background and Aims

The elderly population (>65 years old) is highly increased worldwide [1]. In developed countries, such as Europe and the United States (US) the ratio of old people to young is increasing, the figure is similar in developing countries such as Jordan. It was reported that 1 out of 25 people of the US population at the year 1900 were elderly, while the figure increased to be 1 out of 8 people were elderly in 2000 and the ratio is expected to further increase by the year 2030 to reach 1 out of 5 people to be elderly [2]. Furthermore, the Office of National Statistics reported in 2004 that about 16% of the European population is over 65 years [3]. In Jordan, 3.7% of the Jordanian population aged more than 65

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years and this number is expected to reach 7.6% in 2020 [4].

The risk of obesity is rapidly increasing worldwide which emerge as major risk factors for several chronic diseases that have significant impact on health [5]. Overweight and obesity have been considered major risk factors for mortality because of being associated with a variety of cardio-metabolic diseases, such as type one diabetes mellitus, hypertension, dyslipidemia, and metabolic syndrome [6], which in turn contribute to loss of independence [7] and reduced health related quality of life [8] among elderly population.

Gender has been found to be associated with obesity, with women having more obesity than men, whereas men were found to be more overweight than women [9]. Participation in physical activity promotes healthy aging among elderly especially when physical activity become a corner stone in treatment for obesity-related chronic health diseases that lead to increased mortality [8]. For those two factors associated with obesity, the purpose of the study was to determine whether gender and physical activity are associated with BMI in Jordanian elderly people and to identify whether gender and physical activity can affect BMI level or not.

Material and methods

Subject and study design

In this cross-sectional, observational study about 120 elderly Jordanian who live in Amman (58 men; 62 women) were evaluated for body mass index (BMI) after they signed a consent form. The study participants were divided into two groups; the first group consisted of 40 physically active elderly who attended the gym at least twice a week for the last 2 years, and the second group consisted of 80 elderly who were home resident or physically inactive. The participants suffering from acute illness and those receiving artificial feeding were excluded from the study. A structured valid and reliable questionnaire was used for collecting the personal, social, health and life-style information including the daily activities and the anthropometric measurements through a personal interview by the principal investigator.

Anthropometric measurements

The same stadiometer was using for all participants to measure height. The study objectives were with minimal clothing and barefooted to obtained correct position, and having their arms to the side, heels together, legs straight, relaxed shoulders and the head in the Frankfort horizontal plane. The nearest 0.5 cm was using in height recording [10].

The same beam scale was also using to measured weight (Seca700 physicians beam scale). In each measurement, the scale was calibrated and checked for zero-balance. Study subjects were asked to stand on the center of the scale, looked straight ahead with minimum clothing and without shoes. The nearest 0.1 kg was using in weight recording [10].

Body mass index was calculated according to following formula:

BMI= weight (kg) / height $(m)^2$ [10]. The BMI categories were classified using WHO classifications for underweight (BMI< 18.5 kg/m^2), normal weight (BMI 18.5-24.99 kg/m^2), overweight (BMI 25-29.99 kg/m^2) and obesity (BMI> 30 kg/m^2) [11].

Data Analysis

Collected data from the observational cross-sectional study was twice entered in data sheets, checked and analyzed. Participants were classified according to physical activity and gender. Descriptive statistics were performed using means and standard deviation as well as frequency to describe the numerical and categorical data, respectively. Chi square test

was used to compare the categorical variables and when one of the cells is less than 5; Fisher exact test was used. Analysis was made by SPSS program and p-value that is ≤ 0.05 was considered significant.

Ethical Approval

A written informed consent was obtained from all participants and this study was conducted according to the Declaration of Helsinki (2013).

Results

The final sample constituted 120 elderly people; 62 of them were women, and 58 of them were men. Their ages varied from about 67 to 71 years old, with men having higher mean age than women (Figure 1). The mean age for physically active elderly was about 65 years, and the mean age for elderly who were physically inactive was about 71 years. In the study sample which contained 62 elderly women and 58 elderly men, 24 women and 14 men were physically active, whereas 38 women and 44 men were physically inactive (Figure 2).

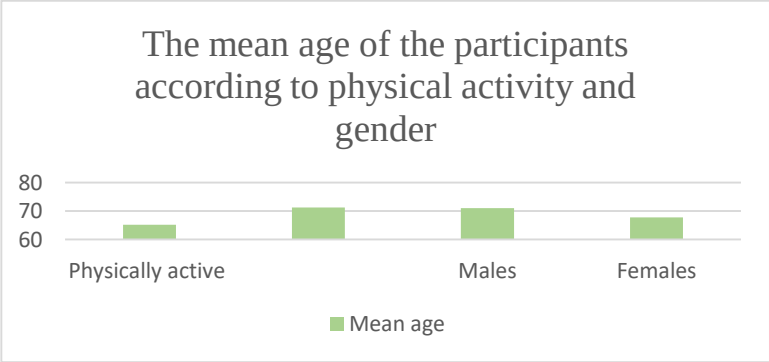

Figure 1. *The mean age of the participants according to physical activity and gender (N = 120).*

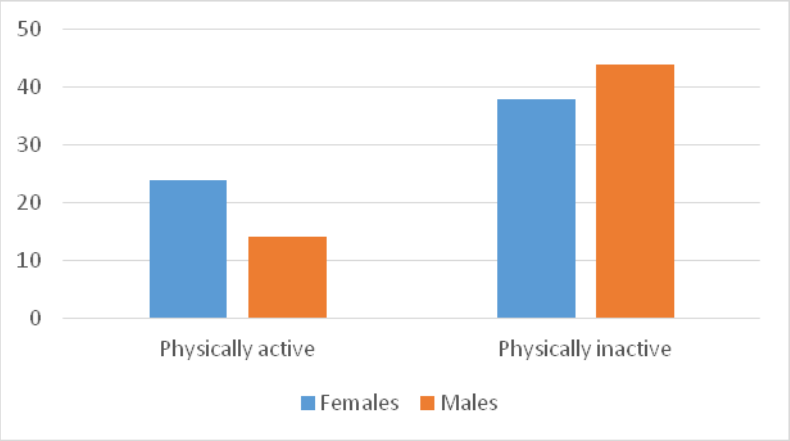

Figure 2. *Gender distributions according to physical activity (N = 120).*

To assess the association between BMI and gender in elderly people, Chi- square statistic was used to determine if BMI is associated with gender or not. From results shown in Table 1 and after applying Chi square statistic at α = 0.01 level, BMI of 30 and more was associated with gender, with majority of female elderly (50%) having BMI of 30 or more.

To determine the association between physical activity and BMI, Chi square statistic was used when comparing each category of BMI with the status of physical activity (i.e.

physically active vs. physically inactive). From the results shown in Table 2 after applying Chi square statistics at $\alpha = 0.05$ level of significance, both overweight elderly (having BMI of 25 – 29.99) and obese elderly (having BMI of 30 or more) were associated with physical activity, which means as elderly people become physically inactive, their BMI will increase to become as overweight or obese.

Table 1. The distribution of BMI categories in the study sample according to gender[1,2] (*N* = 120)

The BMI categories (kg/m^2)	Females (*n* = 62)	Males (*n* = 58)	*P* Value
	n (%)	*n* (%)	
Underweight (BMI< 18.5)	3 (4.83)	4 (6.89)	0.981
Normal weight (BMI 18.5-24.99)	10 (16.13)	18 (31.03)	0.149
Over weight (BMI 25-29.99)	18(29.03)	24(41.37)	0.168
Obese (BMI≥ 30)	31(50.0)	12 (20.68)	0.009

1. The Chi-square statistic is significant at the .01 level.
2. The BMI (Body Mass Index) categories based on WHO classifications (x)

Table 2. The distribution of BMI categories in the study sample according to physical activity[1,2] (*N* = 120).

The BMI categories (kg/m^2)	Physically active (*n*=40)	Physically inactive (*n*= 80)	*P* Value
	n (%)	*n* (%)	
Underweight (BMI < 18.5)	2 (5.00)	5 (6.25)	0.981
Normal weight (BMI: 18.5-24.99)	8 (20.0)	20 (25.0)	0.074
Over weight (BMI: 25 - 29.99)	20 (50.0)	24 (30.0)	0.026
Obese (BMI ≥ 30)	10 (25.0)	31 (38.75)	0.05

1. The Chi-square statistic is significant at the .05 level.
2. The BMI (Body Mass Index) categories based on WHO classifications (x)

Discussion

Body mass index can be affected by level of physical activity and gender, and increased BMI represented in being overweight or obese is associated with several chronic diseases that have significant impact on health [5] and is associated with increased risk for mortality [6]. The purpose of the current study was to determine whether gender and physical activity are associated with BMI in Jordanian elderly and to identify whether gender and physical activity can affect BMI level or not. The results obtained in this study were comparable to results obtained from studies conducted globally and regionally.

The present study showed that as elderly people become physically inactive, their BMI will increase to become as overweight or obese. The association between physical inactivity and obesity risk among elderly has been previously reported [12-14]. It has been shown that overweight was not associated decreased physical activity. However, the obesity has age-related negative effects on physical activity [12,13]. In a longitudinal study [14], it was found that physical inactivity is not associated with the development of obesity, but obesity may lead to physical inactivity. Active elderly have lower rates of all-cause mortality and a higher level of muscular fitness when compared

to less active elderly [8]. Giving that, the elderly people BMI should not reach to the risk of obesity in order to remain physically active and to reduce the morbidity and mortality effects of obesity and physical inactivity.

The results of this study also showed that BMI of 30 and more was associated with gender, with majority of female elderly (50%) having BMI of 30 or more. In fact, men are more often overweight compared to women [13]. However, it was found that there is no significant difference in overweight prevalence between males and females, while females were significantly more obese than men [15]. Women had a higher prevalence of obesity than men, whereas more men were more overweight than women [9]. In relation to physical inactivity, it was found that inactivity was associated with higher BMI, markedly more in men than in women [16]. Physical activity should be maintained to the level that can prevent obesity, primarily in women as they are more likely to become obese than men. Furthermore, BMI in women should be assessed regularly in order not to reach 30 or more.

Study limits

Our study has several limitations due to the cross-sectional study design, it is difficult determined whether obese participants were physically inactive because they were obese or if they became obese because they were physically inactive. The self-report of physical activity data can reduce the sensitivity and specificity of the instruments because of report and response biases. Furthermore, obesity was determined using BMI, which does not distinguish between fat and lean mass, potentially causing the misclassification of participants into the normal weight, overweight, or obese groups.

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