



# Association of Sedentary Behavior with Obesity and Comorbidities In Omani Women (Age 30-49 Years): A Cross-Sectional Study

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## Abstract

The alarming rise and increasing prevalence of abdominal obesity in developed as well as developing nations has made abdominal obesity a major health concern globally. Abdominal obesity not only predisposes to life threatening conditions like hypertension, cardiovascular diseases, diabetes mellitus, and cancer but also leads to premature mortality. Physical inactivity is a matter of grave concern globally as the whole world has switched from a demanding physically active life to a sedentary lifestyle exposing the populations to a myriad of health complications.

**Objective:** The main purpose of this research was to study the association between sedentary lifestyle with obesity and comorbidities in Omani women.

**Method:** The study was carried out during Aug 2019 to Jan 2020 and included a sample of total 398 obese Omani women aged 30-49 years from Muscat and Batina Governorates in Oman. Assessment of sedentary behavior and abdominal obesity associated comorbidities was performed using an IPAQ questionnaire allowing self-evaluation of diverse activities and self-report for the presence of hypercholesterolemia, hypertension, or diabetes mellitus.

**Result:** The current data indicates that 47% of the women had grade 1 obesity, 32% had grade 11 obesity and 21 % of the women suffered from morbid abdominal obesity which is alarming. Further, 25% of the subjects suffered from hypertension and were on medication, 18% suffered from hypercholesterolemia, 23% suffered from diabetes and 16 % reported to have suffered from gestational diabetes.

**Conclusion:** Sedentary lifestyles were common among the adult Omani women in the study sample. Lack of any kind of physical activity and sedentary behavior are commonly associated with high BMI, high WHR (abdominal obesity) and the associated diseases like high cholesterol, hypertension, and type 2 diabetes.

**Keywords:** lifestyle; Physical Activity; Obesity; BMI; WHR; Women; Oman

## Introduction

Sedentary behavior can be defined as actions which have low energy expenditure typically between 1-1.5 metabolic equivalent of task (MEs), such as sitting [1]. The rapidly increasing trends in overweight and obese individuals globally and obesity becoming the number one health concern in developed as well as developing nations is alarming [2]. Being obese not only predisposes an individual to chronic life threatening diseases i.e. cardiovascular diseases, dyslipidemia, hypertension, type 2 diabetes and cancer but also

causes premature mortality [2,3]. Genetic and environment factors (physical activity, sedentary lifestyle, nutritional and socioeconomic status) have been found to be significant contributory in obesity development [4]. It is now well understood that physical inactivity and sedentary lifestyle pose a notable threat to the body and regular physical exercise of any kind improves physical and mental health [5]. Urbanization and subsequent automatization of daily routine activities have reduced manual labor resulting in lower en-

ergy expenditures giving birth to lazier and physically inactive people worldwide [6]. TV viewing was closely linked to obesity not only because of decreased energy expenditure but also due to increased energy intake caused during this inactivity by fat and sugar laden food consumption[7]. During the period of last forty years, most of the Gulf countries including Oman have undergone a remarkable change in the socioeconomic status and several studies reveal significant increase in adopting inactive lifestyle in the Gulf region. This shift from a physically demanding life to a sedentary lifestyle have exposed people to high risk of diseases like obesity, hypertension, heart diseases, diabetes, cancer to name a few. Cultural differences and restrictions in lifestyle choices available to females in Arabic countries are the main reasons for increased rates of obesity: Females have restricted access to sporting/communal physical activities [8]. In Oman women may be at a greater risk of developing obesity and the associated morbidities due to their decreased physical activity and sedentary lifestyle. According to a study done in 2000 on Omani adults, approximately 17% of adult male and 24% of adult females were observed to have higher body weight [9]. It was also revealed in a research by the Health Ministry in Oman during 2011 that approximately 52% of 5,000 newly diagnosed cases of T2 diabetics, were female [10]. It was clearly postulated in a newly done study in Oman that metabolic syndrome related to the lifestyle and eating habits increases with the existence of causative risk factors like diabetes, cardio vascular disease and presence of extra fat in the body [11]. A very strong correlation between less physical activity, maximum hours spent sedentarily or sitting every day and increased prevalence of associated complications indicating an inverse relation between reduced activity and risk of getting more diseases [12]. Despite this, the studies indicating the sedentary lifestyle of Omani women are rare therefore the aim of the present study was to examine the association between sedentary behavior and obesity as well as the associated co morbidities.

## Materials and Methods

The present cross-sectional study included obese women (aged 30-49 years) visiting Al Raffah Hospital. The subjects were enrolled between August 2019 and January 2020. The study was conducted after explaining the purpose of the study and obtaining informed consent from each participant. Pregnant women and those with any eating disorder were not included in the study. A total of 398 subjects with BMI above 30 aged 30-49 years were included. All the subjects were asked to complete a self-reported questionnaire (IPAQ) to assess physical activity and health status. Subjects were asked questions in order to assess physical activity/exercise and sedentary lifestyle levels on a weekly basis. BMI (Body Mass Index)=Weight (kg)/height (m<sup>2</sup>) was used as an indicator of obesity. The weight was measured using commercial scale "Seca, Germany" with an accuracy of  $\pm 100$  gm. Standing height of the participant was measured using a standardized measuring scale.

The participant was asked to stand on the horizontal platform without shoes, hold the arms loosely at the sides with the palms facing the thighs. The horizontal bar was lowered until it touched the crown of the participant's head. The height was recorded to the nearest centimeters and if the reading fell between two values, the lower reading was always recorded. BMI was calculated and the cutoffs provided by the World Health Organization for defining obese (BMI above 30), obesity Grade 1 (30-34.99), obesity Grade II (35-39.99), obesity Grade III (more than 40) were adopted [13]. Waist and hip circumference were measured using a flexible and inelastic tape measure and noted in cm. This ratio is calculated by dividing the waist circumference (cm) by the hip circumference (cm). The WHR above 0.85 in women is considered to be obese and risk of diseases rises steeply when the WHR rises above 0.8.

Statistical analysis was done by the use of the program SPSS version 16 by analyzing variables to see relationships and percentage. Data were analyzed and presented as mean  $\pm$  standard deviation and frequency tables. Data is expressed as mean  $\pm$  SD (standard deviation) and was analyzed using Graph pad Prism version 5. Chi square test was used for comparing the categorical variables. One-way analysis of variance (ANNOVA) followed by Turkey's test. Student's unpaired t-test and the stepwise logistic regression analysis were used for comparing the continuous variables. Probability value of  $< 0.05$  was considered statistically significant.

## Ethical Considerations

Permission was obtained from the Ethical Review Board of Al Raffah Hospital, Muscat before commencing the interviewing and measurements and the subjects were given a brief orientation.

## Results

The study included 398 obese women (BMI  $> 30$ ), with age ranging from 30-49 years with 38% (n=153) in age group 30-34 years, 22% (n=89) in age group 35-39 years, 16% (n=63) were between 40-44 years and 23% (n=93) in the age bracket of 45-49 years. Out of 398 obese women 47% were found to be grade I obese (n=187), 32% (n=126) were grade II obese and 21% (n=85) were morbidly obese with grade III obesity. The WHR calculations revealed that 69% (n= 276) of the women with WHR above 0.85 are suffering from abdominal obesity and are at high risk of comorbidities, 29% (n=114) were at moderate risk of diseases while only 2% (n=8) had low risk of morbidities. 25% (n=99) of the subjects self-reported to suffer from hypertension and were on medication. Hypercholesterolemia was found in 18% (n=70) of the study population and 23% (n=91) was suffering from diabetes and were regularly taking medication. 16% (n=63) of the women reported to have suffered from gestational diabetes, when asked about their past history of any diseases (Table 1 & 2).

Table 1:

Parameter		Type of Obesity			
		Class 1	Class 2	Class 3	Total
Do you get fatigued easily	Yes	132	103	73	308
	% Contribution	71%	82%	86%	77%
	No	54	23	12	89
	% Contribution	29%	18%	14%	22%
Do you suffer from any disease	None	42	25	7	74
	% Contribution	22%	20%	8%	19%
	Hypertension	37	31	31	99
	% Contribution	20%	25%	36%	25%
	Cholestrol	30	19	21	70
	% Contribution	16%	15%	25%	18%
	Diabetes	38	31	22	91
	% Contribution	20%	25%	26%	23%
	Back/Knee/Arthritis	42	36	26	104
	% Contribution	22%	29%	31%	26%
	Acidity	30	20	21	71
	% Contribution	16%	16%	25%	18%
Thyroid / Hormonal	22	14	13	49	
% Contribution	12%	11%	15%	12%	
Other diseases	44	28	13	85	
% Contribution	24%	22%	15%	21%	

Table 2:

Parameter		Type of Obesity			
		Class 1	Class 2	Class 3	Total
Sample size		187	126	85	398
Vigourous exercise in last 7 days	Yes	18	11	6	35
	% Contribution	10%	9%	7%	9%
	2 to 3 Days	10	10	5	25
	% Contribution	5%	8%	6%	6%
	4 to 7 days	8	1	1	10
% Contribution	4%	1%	1%	3%	
Time spent on vigourous exercise (N=35)	1 hour + per day	7	3	2	12
	% Contribution	39%	27%	33%	34%
	31 to 59 mins / day	5	5	3	13
	% Contribution	28%	45%	50%	37%
	15 to 30 mins / day	6	3	1	10
% Contribution	33%	27%	17%	29%	
Moderate exercise in last 7 days	Yes	15	5	3	23
	% Contribution	8%	4%	4%	6%
2 to 3 Days		11	5	2	18

	% Contribution	6%	4%	2%	5%
	4 to 7 days	4	0	1	5
	% Contribution	2%	0%	1%	1%
Time spent on moderate exercise	1 hour+ per day	9	4	0	13
	% Contribution	60%	80%	0%	57%
	31 to 59 mins / day	3	1	1	5
	% Contribution	20%	20%	33%	22%
	15 to 30 mins / day	3	0	2	5
% Contribution	20%	0%	67%	22%	
Min 10 mins walk / day in last 7 days	Yes	64	39	33	136
	% Contribution	34%	31%	39%	34%
	1 to 3 days	43	27	22	92
	% Contribution	23%	21%	26%	23%
	4 to 7 days	21	12	10	43
% Contribution	11%	10%	12%	11%	
Walk Yes (time spent / day)	Upto 15 mins / day	25	8	12	45
	% Contribution	39%	21%	38%	33%
	16 to 30 mins / day	37	31	21	89
% Contribution	58%	79%	66%	66%	
Time spent sitting on a week day in last 7 days	4 to 6 hrs / day	20	15	4	39
	% Contribution	11%	12%	5%	10%
	7 to 9 hrs / day	56	28	19	103
	% Contribution	30%	22%	22%	26%
	10 to 12 hrs / day	74	56	46	176
	% Contribution	40%	44%	54%	44%
12 hrs plus/day	36	27	16	79	
% Contribution	19%	21%	19%	20%	

Regarding physical activity parameters, only 9 % (n=35) study participants reported that they indulged in vigorous activity (i.e. heavy lifting, swimming, running, bicycling, tennis etc.). 6 % (n=25) did some kind of vigorous activity 2-3 times a week while 2% (n=10) subjects were regularly doing a vigorous activity around 4 to 7 times a week. Out of those who were involved. Out of thosewho were involved in vigorous activity 29% (n=10) were doing for 15 to 30 minutes, 37% (n=13) were doing between 31 to 59 minutes and 34% (n=12) were doing for 1 hour ormore. Further, only 6% (n=23) of the women were involved in any kind of moderate physical activity (i.e. dancing, carrying light loads, house cleaning etc.). 5% (n=18) of the subjects were doing moderate physical activity 2-3 times a week while only 1% (n=5) of the subjects were regularly doing moderate physical activity 4-7 times a week. Out of those who were involved in moderate physical activity 22% (n=5) spent 15 to 30 minutes and 78% (n=18) spent 1 hour and more.

65 % (n=260) of the subjects reported that they never indulged in walking, 23 % (n=93) of the women had a walking routine for

1-3 days/week, 11 % (n=43) of the participants regularly indulged in walking for 4-7 days/week. Of those who regularly indulged in walking 35% (n=47) walked about 15 minutes per day and 65% (n=89) walked between 16 to 30 minutes per day. When asked about the total time spent on sitting (at work/home/while doing course work/leisure time) 44% (n=176) of the women reported to spend 10-12 hours sitting/day, 26% (n=103) of the subjects were sitting for 7-9 hours/day, 20% (n=79) of the women spent more than 12 hours on sitting per day and 10% (n=39) of the women spent only 4-6 hours on sitting.

## Discussion

The increasing burden of diseases globally is a major health concern. As per the WHO, the obesity related morbidities account for approximately 61% of the deaths and 49% of the disease burden across the world and if this alarming trend continues, roughly 70% of total global deaths and 56% of the disease burden worldwide will be attributable to these diseases by 2030 [14]. Like many Gulf countries, Oman is also facing new health challenges due to increasing trends in lifestyle related diseases thus increasing the incidence of the disease in the country. Women may be more prone to adopting sedentary lifestyle; thus becoming obese and at higher risk of developing associated health disorders due to lack of physical activity. The current data indicates that 47% of the women had grade 1 obesity, 32% had grade 11 obesity and 21 % of the women suffered from morbid obesity which is alarming. The WHR calculations indicated that majority of the subjects i.e. 70% had abdominal obesity and were at a very high risk of developing co morbidities, 28% of the subjects were at moderate risk while only 2% of the women had low risk of developing obesity associated diseases. Though BMI has been consistently linked with an increased risk of cardiovascular diseases and type 2 diabetes [15], abdominal obesity assessed through WHR is associated with higher risk for obesity related morbidities and mortalities than overall adiposity [16,17]. 25% of the women were having high blood pressure and were regularly taking medication and these findings are in agreement with several other studies where age, obesity, and sedentary lifestyle were significant factors for hypertension [18-21]. 23% of the participants reported to have type 2 diabetes and were on medications. Studies indicate that sedentary lifestyle like spending long hours on screen, TV, reading (encourages overeating), driving etc. are strongly linked to excessive weight gain further leading to type 2 diabetes [22]. According to a survey conducted by International journal of behavioral nutrition and physical activity in 2013, 90% of type 2 diabetes in women can be strongly linked to obesity, unhealthy eating habits and physical inactivity i.e. sedentary behaviors [23,24]. 18% of the subjects had high cholesterol levels. A positive correlation has been found between sedentary lifestyle and higher chances of developing heart diseases through raised blood triglycerides and reduced HDL cholesterol, as indicated by a recent meta-analysis [25,26]. The ATTICA study

showed that physically active women had significantly lower levels of total cholesterol, LDL-cholesterol, triglycerides, and higher levels of HDL- cholesterol, compared to sedentary women [27]. 16--% of the women reported that they had gestational diabetes and were on medication throughout the pregnancy. A myriad of studies done globally suggest that GDM is prevalent in almost 17.8% of the pregnancies [28]. which is strongly associated with a greater risk of complications and developing type 2 diabetes later in life both for mother and baby [29]. Reports indicate an inverse correlation between GDM and regular exercise during pregnancy as well as the BMI at the time of conception [30,31].

Regular physical exercise of any kind plays a crucial role not only in preventing obesity but also by reducing the risk of developing metabolic syndrome i.e. type 2 diabetes, hypertension and dyslipidemia. The physical activity parameters were assessed through IPAQ by interview method and 91% of the women reported that they never indulged in any vigorous physical activity in the last seven days, 6% of the subjects indulged in vigorous physical activity 1-3 times a week while only 2% of the women were doing vigorous exercise for almost 5-6 times a week. Intense physical activity has been associated with the prevention of heart diseases in middle aged adults [32]. Those who were involved in regular vigorous activity i.e. 29% were doing for 15 to 30 minutes, 37% were doing between 31 to 59 minutes and 34% were doing for 1 hour or more. Furthermore, 94% of the women were not involved in any kind of moderate physical activity (i.e. dancing, carrying light loads, house cleaning etc.), only 4.5% of the subjects were doing moderate physical activity 1-3 times a week while only 1.3% of the subjects were regularly doing moderate physical activity 4-5 times a week. Out of those who were involved in moderate physical activity i.e. 22% spent 15 to 30 minutes, 22% spent 31 to 59 minutes and 56% spent 1 hour and more. Further, 65% of the subjects reported that they never indulged in walking, 23% of the women had a walking routine for 1-3 days/week, 11% of the participants regularly indulged in walking for 4- 5 days/week. Those who regularly indulged in walking i.e. 33% walked about 15 minutes per day and 65% walked between 16 to 30 minutes per day. Regular brisk walk may reduce the risk of obesity as well as its associated co morbidities [33]. When asked about the total time spent on sitting (at work/home/leisure time i.e. TV watching) 44% of the women reported to spend 10-12 hours sitting/day, 26% of the subjects were sitting for 7-9 hours/day, 18% of the women spent more than 12 hours on sitting per day and 10% of the women spent only 4-6 hours on sitting. Sitting time (car/ chair /TV/screen/working hours) involves minimal movement with low energy expenditures. Prolonged Sitting time is a serious health concern due to the deleterious effects caused by the sedentary lifestyle if a subsequent rise in physical activity does not balance it out [34]. A recent study revealed that long hours of continuous sitting (sedentary time) is independently associated with obesity and its associated diseases

like type 2 diabetes [35]. Normal weight women need at least 1 hour of moderate-to-vigorous physical activity for maintaining a steady weight as reported by The Women's Health Study done on 34,000 middle aged women [36]. The results of another study indicate that any kind of vigorous activity is more effective than slow walking for weight loss and it was reported that those women who increased their physical activity by 30 minutes/day gained less weight than those with steady activity levels [37-39]. Furthermore, recent research done on a control group of obese middle-aged women suggested that 45 minutes of moderate-to-vigorous aerobic activity, 4-5 days/week significantly reduced the body weight and the abdominal fat as compared to those who did not exercise [40].

## Conclusion

Such changes are essential to make physical activity an integral and natural part of people's everyday lives and ultimately, to turn around the obesity epidemic. Our data calls for attention to the need for implementation of effective interventions focusing on restricting sedentary behaviors and encouraging a physically active lifestyle especially in high risk Omani women. The public health programs should take into consideration these factors while planning for obesity prevention. Public awareness of the health concerns associated with sedentary lifestyle is urgently needed along with public health interventions aimed at changing lifestyle behaviors among Omani women.

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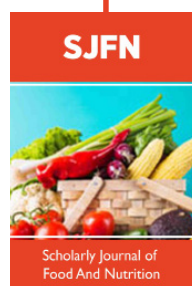


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