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## Relationship between Obesity, Dietary Behaviour and Dietary Intake in Obese Omani Females (age 30 – 49 Years): A Cross-Sectional Study

### ABSTRACT

The increasing prevalence of overweight and obesity worldwide is alarming with 39% of adults (1.9 billion) in the overweight category and 13% (650 million) of adults in the obese category as per WHO 2016 data. During last forty years most of the Gulf countries including Oman underwent a remarkable change in the socioeconomic status and many studies reveal significant increase in adopting inactive lifestyle and inclination towards western food choices.

**Objective:** The main purpose of this study was to assess the relationship between dietary behavior, nutritional status and obesity in obese Omani women between 30-49 years who were not pregnant and free from any eating disorder. Sample size was close to 400 and selected randomly.

**Results:** Personal interviews were conducted using a study questionnaire to collect the dietary behavior, nutritional data (24-hour dietary recall method) and anthropometric measurements. The study participants had a high calorie intake that is associated with obesity as indicated by high BMI and WHR.

**Conclusion:** The study subjects had a trend for obesity that is mainly attributed to unhealthy eating habits and lack of knowledge about a healthy diet. There is a need to adopt physical education intervention programs to improve the lifestyle characteristics of Omani women and to increase their awareness about health risks associated with obesity.

**Keywords:** BMI; Calorie intake; Diet; Obese; WHR; Women

### INTRODUCTION

Overweight and obesity are multifaceted life threatening conditions with very serious implications on social and psychological aspect affecting almost each and every socio – economic sections in already developed and upcoming countries [1]. Obesity and the associated comorbidities are the leading cause of approximately 2.8 million adult deaths worldwide every year [2]. The most discouraging fact about this burning problem is that roughly 45% of the diabetics, 22 to 23% of the heart diseases patients and between 7 to 41% of cancer patients are imputable to overweight and obesity [3].

Obesity development includes various factors such as excessive food

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intake, sedentary lifestyle, physical activity habits, social and environmental variables, determined by unaltered genetic and biological factors [4]. Food intake has been correlated to obesity not only in terms of the total amount consumed per day but also of the composition and consistency of the daily diet. Due to the nutrition transition eating habits have changed worldwide; irregular meal patterns, skipping meals especially breakfast, eating low fiber, energy dense diet i.e. low in fruits and vegetables and excessively high in fast and fried foods, sweetened and aerated drinks and juices, leading to a persistent rise in obesity globally [5].

It was observed in the recent years that modernization and advanced living conditions especially in all the Gulf nations contribute significantly to increased consumption of very high calorie food followed by low physical activity further leading to an increase in prevalence of obesity. Cultural differences and restrictions in lifestyle choices available to females in Arabic countries are the main reasons for increased rates of obesity [6]. In Oman, women suffer from an increased risk to develop adiposity and associated diseases. 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 [7]. Lack of awareness of balanced and proper nutrition, absence of any motivation to indulge in healthy and planned diet and lack of awareness on healthy cooking and eating accompanied by sedentary living habits seem to be the main barriers. Multiple studies have reported an inclination towards adopting westernized food habits by the people in Gulf region [8].

The rapid rise in fast food consumption and changing trends of Omani diets may be attributed to an improved socioeconomic status, easy and affordable access to widely spread supermarkets and eating/pick up joints and lack of knowledge about benefits of eating a healthy diet as well as the health implications of regular indulgence in high calorie, fat and sugar laden foods. The tendency to adopt unhealthy eating habits is concerning due to the rising trends in obesity and the associated morbidities especially in women in Oman. Obesity is a well-known risk factor for NCDs and their manifestation is mediated by dietary habits such as regular indulgence in high calorie foods with high glycemic index, and saturated fats and trans fatty acids rich foods. The inclination towards modern, unhealthy eating habits should be a matter of grave concern owing to the potential negative impact on the overall health.

There is a lack of comprehensive published data in Oman concerning the crucial role of a healthy and balanced diet in

preventing obesity and the associated morbidities for adult women. Therefore, this research was conducted to assess the dietary behavior, dietary intake and anthropometric measurements of adult Omani women with an ultimate aim for establishing and developing a data base for nutritional and anthropometric parameters in high risk group of Omani population.

## 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 December 2019. 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. Each subject was administered a bilingual food frequency questionnaire to collect data on their eating habits, food preferences and the food intake (24-hour recall method). The dietary intake was calculated using The Food Processor Software version 10.2 (ESHA Research, Salem, OR, USA) and compared with the RDAs used in Oman. BMI (Body Mass Index) =  $\text{Weight (kg)} / \text{height (m}^2\text{)}$  was used as an indicator of obesity. The weight was measured using commercial scale "Seca, Germany" with an accuracy of  $\pm 100\text{g}$ . 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 [9]. Waist and hip circumference was 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.

Collected data were analyzed using IBM Statistics SPSS 25.0 (IBM Corp. Released 2017). For the descriptive purposes, continuous variables were presented with Mean, Median and Standard deviation. Categorical variables were presented with frequency and percentage. Chi square test was used for comparing the categorical 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) well spread in the age ranging from 30-49 years. 38% (n = 153) were in age bracket of 30-34 years, 22% (n = 89) in the age bracket of 35-39 years, 16% (n = 63) in the age bracket of 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 obesity classification based on age group is detailed in table 1.

Age Group		BMI Group			Total
		Obese Class I	Obese Class 2	Obese Class 3	
30-34	Count	74	48	31	153
	% within	48.4%	31.4%	20.3%	100.0%
35-39	Count	43	31	15	89
	% within	48.3%	34.8%	16.9%	100.0%
40-44	Count	31	14	18	63
	% within	49.2%	22.2%	28.6%	100.0%
45-49	Count	39	33	21	93
	% within	41.9%	35.5%	22.6%	100.0%
Total	Count	187	126	85	398
	% within	47.0%	31.7%	21.4%	100.0%

**Table 1:** Obesity based on BMI and age.

The dietary behavior details indicated that 98% (n = 389) of the participants were non-vegetarians with 98% consuming non vegetarian food every day and only 2% eating non vegetarian food 2-3 times weekly. Only 2 % (n = 9) of the subjects were found to be vegetarians. 47% (n = 187) of the subjects preferred to eat eggs daily, 35 % (n = 140) 2-3 times weekly, 12% (n = 48) preferred eating eggs once a week and 6% (n = 23) ate eggs only fortnightly. About 55% (n = 220) of the women preferred to eat three large meals, 42% (n = 169) ate two large meals while only 2% (n = 7) were eating small

frequent meals. 67% of the subjects ate breakfast everyday (n = 266), 11% ate 2 - 3 times a week (n = 44) while 22% (n = 88) of the subjects skipped breakfast. 65% (n = 259) of the subjects revealed that they indulged in snacking every day in between the meals, 20% (n = 79) only sometimes while 15% (n = 60) did not eat any snacks during the day. 42% of the subjects (n = 165) preferred to eat fried snacks/chips, 62% (n = 246) liked to eat biscuits and cakes and doughnuts, 15% (n = 61) preferred burger/pizza and sandwiches, 19% of the women (n = 74) indulged in chocolates/sweets as snacks and only 16% (n = 65) were eating fresh fruit as snacks. About 56% (n = 221) of the women had a liking for fast foods, 28 % (n = 113) preferred to eat fried foods, 51% (n = 203) preferred to eat grilled and only 6% liked to eat mixed type of foods. Indulgence in fast foods in restaurants was observed to be a common practice among the subjects 19% (n = 76) eating daily, 22% (n = 89) three-four times a week, 40% (n = 161) eating one-two times a week while 18% (n = 71) indulged once a fortnight only. 29% (n = 116) of the subjects ate fresh fruits every day, 31% (n = 124) 1-2 times a week while 35% (n = 138) of the subjects did not eat fruits at all. Salads were consumed by 60% (n = 237) and 40% (n = 161) did not eat salads. The intake of sugary beverages like packed fruit juices, aerated drinks was found to be high in the study population. 40%, (n = 159) of the subjects indulged in aerated drinks 1-2 times a day, packed fruit juices were preferred by 40% (n = 160) of the subjects 1-2 times a day. Hot beverages like tea, coffee, milk, green tea etc were taken by 90% (n = 360) of the women during the day and majority (n = 301) of them indicated 2 to 3 cups/day. The nutrient intake with variance over RDA is shown in table 2 and some of the high variances were noticed in Calories (31% higher than then RDA), protein (112% more than the RDA), fat (78% more than the RDA), Iron (36% more than RDA) and Vitamin A (77% more than RDA).

Parameter	RDA	Actual	% Variance*
Calories	2000	2610	31%
Carbohydrates (g)	275 - 375	315	within range
Protein (g)	40 - 50	106	112%
Fat (g)	59	105	78%
Fibre (g)	16 - 40	18	within range
Iron (mg)	11	15	36%
Calcium (mg)	500 - 800	893	12%
Vitamin A (Iu)	2330 - 3330	5882	77%

**Table 2:** Average mean intake of nutrients of the subjects in comparison to Oman RDA\* variance is on higher limit of RDA

## DISCUSSION

Obesity is a global pandemic and is the new plague sweeping the whole world affecting people of all age groups and creating a health and economic burden on the governments. Many Arab countries have witnessed a significant lifestyle transition in recent decades, including food consumption and calorie-dense nutrient intake [10] and the improved socioeconomic status have resulted in more and more of the Omani population to select a sedentary lifestyle and unhealthy eating habits. The aim of this study was to identify the possible association between dietary behavior, dietary intake and obesity among a sample of women visiting Al Raffah hospital, Muscat. The anthropometric findings indicated that 47% of the women had BMI 30-35 (grade I obesity), 32% BMI 35-40 (grade II obesity) and 21% had morbid obesity (grade III obesity) with BMI >40. Unawareness regarding a healthy and balanced diet; frequent indulgence in unhealthy calorie dense, low fiber foods; emotional and stressful eating [11] synergized with the tradition of food hospitality remain the underpinning factors contributing to rising prevalence of obesity in the Arabian Gulf. The conventional Gulf diet, high in fiber and low in fat, has been replaced by a modern diet rich in saturated fats, sodium, cholesterol, free and added sugars [12]. Based on the information on dietary habits and behavior, the data indicated that non-vegetarianism was positively related to obesity having majority of the subjects as non-vegetarians i.e. 98% as compared to only 2% vegetarians. Further, daily intake of non-vegetarian foods was observed among most of the subjects and excessive meat intake on a regular basis has been strongly linked to obesity and the associated morbidities [13,14]. Generally, non-vegetarian foods are eaten in larger quantity as they shrink during cooking and are cooked with much more quantities of fat as compared with vegetarian foods. The findings also suggested that there was an association between excessive egg consumption, the way it was cooked and obesity in the subjects as majority of the subjects preferred to eat fried eggs cooked in butter thus leading to increased fat consumption per day. Several data relate high intake of saturated fat to obesity and increased adiposity [15]. The association between eating two or three big meals per day and high BMI was clearly indicated by the findings of the study; 55% of the subjects preferred to eat three large meals daily, while 42% were eating only two meals a day and only 2% of the subjects were eating small frequent meals. It has been highlighted in many studies that Saudis and Omanis generally indulge in three big meals mainly with rice and meat being the main food items in two meals a day [16]. Long-term studies have indicated a positive correlation between small frequent

meals and increased satiety and controlled hunger levels and decreased weight gain as compared to the traditional three large meals [17,18]. Though a large proportion of the study sample were regular breakfast eaters (67%), majority of the subjects indulged in a very heavy high calorie breakfast which includes cheese, butter, white breads, khobz, packed fruit juices and tea/coffee with added sugar. High intake of sweetened drinks and juices is believed to be contributing to increasing rates of obesity globally [19]. A noticeable 22% of the study participants revealed that they never indulged in breakfast. This finding is very well supported by the results shown by a study done on females in Saudi Arabia or where 74% of the female students either skipped breakfast or consumed it irregularly [20]. A healthy breakfast is deemed to be the most important meal of the day with proven positive impacts on overall appetite regulation [21] and reducing the risk of weight gain and type 2 diabetes [22].

A total of 65% of the subjects indulged in snacking every day, 20% consumed snacks some times and only 15% of the women never ate any type of snacks in between the meals. Several studies have strongly associated excessive intake of energy dense, sugar laden snacks like fried (chips, fries etc.), baked (biscuits, cakes, doughnuts), chocolates, sweets etc. to higher obesity rates [23]. Interestingly, a majority of the subjects reported their regular indulgence in nutrient-deficient unhealthy snacks and only a few of them reported to eat fresh fruit as snacks. These trends in eating an imbalance, low fiber diet lacking in essential nutrients have been perpetuated by an ever increasing propensity for dining out and consumption of calorie dense restaurant/fast foods [24]. Similar patterns were indicated by the subjects and eating out was observed to be a common practice among the participants with 19% eating daily, 22% eating 3-4 times a week, 40% eating 1-2 times a week while 18% indulged once a fortnight only. The frequent fast food consumption is strongly linked to increased calorie intake per day, higher weight gains and poor diet quality [25]. Low consumption of fresh fruits, vegetables and high fiber foods were the most pressing eating behaviors associated with obesity [26], and was clearly highlighted by the data showing only 29% of the subjects reported to eat fresh fruits every day, 31% ate 1-2 times a week while 35% of the subjects did not eat fruits at all. 40% of the subjects did not eat salads at all. These results are very well supported by the findings of Musaiger which indicated the preference for sweet, energy dense foods than fresh fruits and salads predominantly by obese women [27]. Our results were similar to some other studies in Australia and Spain that have reported low consumption of vegetables in overweight and obese women [28,29]. Data from WHO

(Regional Office in Cairo) indicate that 79% to 96% of adults in 6 Arab countries (Egypt, Jordan, Iraq, Kuwait, Saudi Arabia, and Syria) eat less fruit and vegetables per day [30].

Based on the nutritional assessment done by the daily nutrient intake calculations, the data clearly revealed high mean intake of calories by the subjects i.e. 2610 as compared with RDA ([www.fao.org](http://www.fao.org)) of 2000. It is highly admissible that the increased intake of calorie dense and fatty foods among most communities in the Gulf region played a crucial role in the rising prevalence of obesity. Positive connection between high calories intake and obesity was further supported by the results of WHO MONICA indicating increased obesity rates with increased calories consumption [31]. The mean carbohydrate consumption was 315 g which is within the RDA range of 275 - 375g. The Omani rice based diet has meat (lamb, chicken, and beef), eggs and full fat cheese in some form or the other as the main dishes which was interestingly proven by high protein intake which leads to obesity in the subjects. According to a study conducted in Europe [32], excessive protein intake has been positively linked with high BMI. Additionally, the subjects were consuming nearly double the amount of fat of the recommended amounts and the mean intake of fiber was reported to be in the lower range of RDA which is supported by many studies that high calorie, high fat and low fiber diet leads to obesity. Our findings are very well supported by a study suggesting a higher BMI of the participants eating a low fiber, high fat and calorie dense diet than those consuming a high fiber, well balanced diet [33]. Lack of information and motivation to eat and cook a healthy and balanced diet, easy and affordable access to nutrient deficient restaurant foods and ever increasing western influence on the traditional Omani diet were the most pressing dietary behaviors observed among the study participants.

## CONCLUSION

Indulgence in calorie dense, high fat and low nutrient diet due to ignorance and lack of knowledge about a healthy and balanced diet may be attributable for increased obesity among Omani women. Our results indicate that Nutrition education programs are urgently required to enhance Omani women's nutritional awareness that will affect their dietary behavior and pattern positively and help combat obesity in the Sultanate.

## CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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