

# Studying the Relationship Between Body Mass Index, Waist-Hip Ratio and Quality of Life Among Adult Saudi Females

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**Abstract:** Overweight and obesity are received a great concern and becoming a high priority globally. Obesity is associated with diversity of health problem as well as decline in quality of life. This study was designed to estimate the prevalence of obesity; the association between body mass index, waist-to-hip ratio and quality of life. The design used in this study was descriptive correlational design. Study subjects were convenience samples of 310 adult female recruited from female colleges in Wadi Addawasir. The data was collected using self-administered questionnaire that consisted of socio-demographic data, participants' weight perception, World Health Organization Quality of Life-Brief (WHOQOL-Brief) and anthropometric measurements included weight, height, waist circumference, hip circumference. The main findings of this study indicated that the prevalence of general obesity according to BMI was 29.7%, and abdominal obesity according to WC, and WHR were 34.2% and 35.5%, respectively. A statistically significant difference between participants' weight perception and the existing BMI,  $X^2 = 50.52$ ,  $P = 0.00$ , indicated participants misperception of their weight. The mean total score of WHOQOL-Brief scale was  $(70.01 \pm 11.31)$  and social relationships domain was the highest score, the mean =  $73.02 \pm 17.10$ , while lowest score was psychological domain, the mean =  $64.76 \pm 13.73$ . Moreover, 32.3% of subjects good quality of life, while only 3.9% had poor quality of life. A significant negative correlation was revealed between BMI, WC, WHR and total score of quality of life,  $p = -.012, .033, .012$  respectively. Moreover, the participants with increased BMI had decreased quality of life compared to those of normal BMI  $F = 3.209$ ,  $P = .023$ . Conclusion: General and abdominal obesity were highly prevalent among adult Saudi females as measured by BMI, WHR. Misperception of weight was revealed and minority of subjects had good quality of life. Obesity was associated with significant decrease in quality of life. Recommendation: Effective health education strategies are required to help in increase females' awareness and perception of their weight, thus affecting their decisions and behaviors to minimize obesity and its negative influences on their health and consequently their quality of life.

**Keywords:** Obesity, World Health Organization Quality of Life-Brief, Weight Perception, Body Mass Index, Waist Circumference, Waist-Hip Ratio

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## 1. Introduction

Obesity and overweight have become a worldwide public health threat affecting 30% of the adult people. The prevalence of obesity among adult women from the United States is 35.5% [1]. Increasing rate of obesity in developing countries has become remarkable [2]. In the Kingdom of Saudi Arabia (KSA), obesity and overweight are expected to be increasing specially among females [3]. The expected increases may be due to the development in standards of

living, decrease in activity level, unhealthy eating habits and other life style behaviors that leading to weight gain. The prevalence of overall obesity was of 35.5%, while among females, it was 28.4% [4, 5].

Overweight and obesity have various unfavorable impacts on the women's health. Overweight and obese are predisposing factors for increased risk of diabetes, hypertension, hyperlipidemia, heart diseases, low back pain,

knee osteoarthritis, cancer, endocrine problems [6-9]. Moreover, obesity negatively affects contraception, fertility, breast feeding, rates of cesarean section, as well as many other obstetrical conditions. Furthermore, obese women are at increased risk of depression as well as many types of cancer including breast, endometrial, cervical, and ovarian cancer [10]. In Saudi Arabia, obesity is main risk factor for diabetes, hypercholesterolemia, and hypertension [11].

Body mass index (BMI) is calculated by dividing body weight in kilograms by height in meters the square. Body mass index is considered as the most convenience, safe, and cost effective widely used techniques for adult population to estimate the prevalence of overweight and obesity, in addition, identifying individuals' level of risk [12]. With increasing emphases on obesity detection, especially central obesity, waist circumference and waist-hip- ratio are basic measures that recently used to measure central obesity [13-15]. Evidence from meta-analysis of studies had found association between waist circumference, waist-hip- ratio and cardiovascular diseases [16].

Quality of life (QOL) is the individual's perception of his or her position in life within the context of the culture and value systems in which he or she lives and relative to his or her objectives, expectations, patterns, and preoccupations [17]. The relation between obesity and quality of life are multidimensional [18]. Obesity and overweight are associated with many health problems that have a negative effect on different domains of quality of life [19 - 21]. Some studies indicated interaction between obesity and QOL [22-24]. In KSA, few studies were carried out about the relationship between BMI and quality of life. A study conducted about the relationship between BMI and quality of life among female adolescence [25]. Another study conducted about physical health status and quality of life among older adults [26]. Therefore, the present study was carried out to estimate the prevalence of obesity based on body mass index (BMI), waist circumference, and waist-to-hip ratio; and investigate the relationship between body mass index, waist circumference and waist-to-hip ratio and quality of life among adult Saudi Females.

## 2. Aim of the Study

Estimate the prevalence of obesity and investigate the relationship between body mass index, waist circumference, waist-to-hip ratio and quality of life.

## 3. Research Questions

- (1). What is the prevalence of obesity in adult Saudi females?
- (2). How the adult Saudi females perceive their weight?
- (3). How the adult Saudi females score their quality of life?
- (4). What is the relationship between BMI, waist circumference, and waist-to-hip ratio as measures of obesity and quality of life?

## 4. Subjects and Methods

### 4.1. Design

A descriptive correlational design was used in this study

### 4.2. Subjects

The subjects of the study were convenience sample of 310 non-pregnant Saudi nationality females, age range 20 to 60 years, not subjected to any therapeutic method of weight control. The subjects were recruited from female colleges in Wadi Al-Dawasir (K.S.A) from september-2015 to Jan 2016. The subject with chronic diseases and pregnancy were excluded from the study.

The subjects who met the study criteria were asked to complete self-administered questionnaire. Any questions or inquiries about the questionnaire and the study were clarified by the researcher. The confidentiality of participants' data was assured; after detailed explanation of the purpose and the nature of the study that was provided by the researcher. Informed consent was obtained from each subject accept to participate in the study.

### 4.3. Tool of the Study

Structured self-administered questionnaire was used for data of this of study.. The questionnaire included three parts. Part 1: socio-demographic data as age, education level, marital status, occupation, living situation. This part is ended by a question about how the participant perceived their weight. This question included four responses (underweight, normal weight, overweight and obese). The participants' responses used to assess their perception about their weight when compared with actual measurement of weight. Part 2: Arabic version of WHOQOL-Brief self-administered questionnaire that developed by WHOQOL group, 1998, was used to evaluate the quality of life for each participant. WHOQOL-Brief consists of 26 questions that represented four domains of quality of life. These four domains were physical health domain included 7 items, psychological domain included 6 items, Social relationships domain included 3 items, and environmental domains included 8 items. The other 2 items was used to represent the overall quality of life and general health. Each question has five responses scored from 1-5 (1, 2, 3, 4, 5) 1 indicated lower score and 5 indicated higher score [27]. This score was transformed to a 0 to 100 scale in five responses (0, 25, 50, 75, and 100), according to WHOQOL Manual-Body, 2005, to be used for interpretation and comparison [28]. Part 3: Anthropometric measurements included weight, height, waist circumference, hip circumference were measured to be used for assessing obesity.

According to WHO protocol, 2008, weight was measured using calibrated digital scale for each subject without shoes and with light wear. Height was measured using non stretching tape measure for each barefoot participant. Weight and height for all subjects were measured using the same instruments. Waist circumference was measured using non stretching tape measure at the level of umbilicus, midpoint between the lower

margin of the last rib and the top of the iliac crest. The subject was in the standing position, arms at the side and with light wear. Hip circumference measured using non stretching tape measure around the widest portion of the buttocks. The subject was in standing position with feet close together, arms at the side and with light wear. Waist and hip measurement were used to calculate Waist-to-hip ratio (WHR) by dividing waist measurement by hip measurement (W/H) [29].

Weight and height were used to calculate Body mass index (BMI) by dividing weight in kilograms by the square of height in meter. According to the Report of a WHO Consultation on Obesity, 1998, the cut-off points that used to classify BMI were underweight (less than 18.5 kg/m<sup>2</sup>), normal weight (18.5 – 24.9 kg/m<sup>2</sup>), overweight (25.0 – 29.9 kg/m<sup>2</sup>), obese (30.0 kg/m<sup>2</sup> and over). For WC, the cut-off points were < 80 cm for normal weight, 80 – 87.9 cm for overweight, and ≥88 cm for obesity. While the cut-off points for WHR were < 0.80 for normal weight, 0.80 – 0.84 for overweight, and ≥0.85 for obesity [30].

The reliability of questionnaire used for data collection was tested on the data of 20 subjects that exclude from the study. Reliability cronbach's Alpha = 0.89.

#### 4.4. Data Analysis

Statistical analysis was carried out for the data collected from 310 subjects who completed the data collection tool. The data was coded, entered, and cleaned, then analyzed using SPSS version 17.0 statistical software packages. Descriptive statistics in the form of frequencies and percentages mean and standard deviation was to represent quantitative variables and number and percent for qualitative variables. Chi-square test used to compare categorical variables. Pearson correlation coefficient was used to test the association between BMI, WC, HC, and WHR, and rating quality of life score item and total score of quality of life. ANOVA test was used to compare mean of total score of quality of life and BMI categories, followed by Post hoc tukey test to find which of MBI categories were differed in mean total score of quality of life. Statistical significant was considered, if P value < 0.05.

## 5. Results

The study sample was 310 female subjects who agreed to

participate in the study and who provided complete data. The data collected was used to estimate the prevalence of obesity and examine the relationship between body mass index, waist circumference and waist-to-hip ratio and quality of life.

**Table 1.** Socio-demographics Characteristics of the Study Population (n =310).

Participant characteristics	Frequency	Percent
Age:		
20-	212	68.4
30-	62	20.0
40+	36	11.6
Mean ±SD	28.27±7.89	
Educational level:		
Middle school	9	2.9
High school	23	7.4
Bachelor students	207	66.8
University graduates and post	71	22.9
Material status:		
Single	175	56.5
Married	114	36.8
Divorced	20	6.5
Widowed	1	.3
Occupation		
Employee	103	33.2
Students	207	66.8
Living situation:		
Nuclear family	250	80.65
Extended family	60	19.35
Rating personal Weight		
Underweight	34	11.0
Normal weight	118	38.1
Over weight	75	24.2
Obese	83	26.8

Socio-demographics characteristics of study subjects are shows in table 1, more than two thirds of subjects 212 (68.4%) were younger than 30 years of age, with mean age of 28.27±7.89 years. About two thirds of subjects 207 (66.8%) were bachelor level of education, more than have of them were single (56.5%), only (33.2%) were employee and (66.8%) were students. The majority of participant 250 (80.65%) live in nuclear family. Regarding the participant perception of their weight, 24.2% and 26.8% of subjects describe their weigh as overweight and obese respectively.

**Table 2.** Prevalence of overweight and obesity among study population, based on body mass index, waist circumference, and waist –hip ratio.

	BMI		WC		Waist-hip ratio	
	No	%	No	%	No	%
Underweight	18	5.8				
Normal weight	107	34.5	121	39.0	130	41.9
Over weight	93	30.0	83	26.8	70	22.6
Obese	92	29.7	106	34.2	110	35.5
Rang	16.73-58.75		57.00 -130.00		.60-1.21	
Mean ±SD	27.12 ± 6.30		82.60±12.87		0.82±0.82	

Table 2 illustrate an estimation of the prevalence of overweight and obesity according body mass index, waist

circumference, and waist –hip ratio. Based on BMI, the prevalence of overweight and obesity were 30.0% and 29.7% respectively, with mean BMI 27.12 ± 6.30 kg/m<sup>2</sup>, which

indicating general obesity. The prevalence of overweight and obesity based on WC were 26.8% and 34.2% respectively, with mean WC  $82.60 \pm 12.87$ . While, the prevalence of overweight and obesity based on WHR were 22.6% and 35.5% respectively, with mean WHR  $0.82 \pm 0.82$ . This finding provides answer to the first research question.

**Table 3.** Mean total score of quality of life domains among study population ( $n = 310$ ).

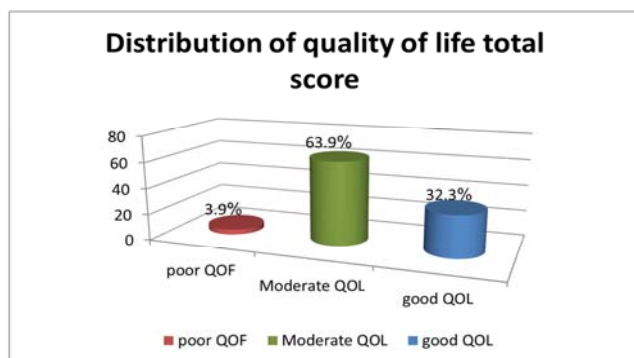
Quality of life domains	Mean $\pm$ SD
How would you rate your quality of life?	$74.44 \pm 17.47$
How satisfied are you with your health?	$68.95 \pm 21.33$
Quality of life domains	
Total score of physical health domain	$71.98 \pm 12.46$
Total score of psychological domain	$64.76 \pm 13.73$
Total score of social relationships domain	$73.02 \pm 17.10$
Total score of environment domain	$66.94 \pm 14.01$
Total score of WHOQOL-Brief scale	$70.01 \pm 11.31$

Table 3 provides detailed description about how the study subjects score their quality of life base on mean score of 26 items of WHOQOL-Brief scale as well as the mean total score of quality of life domains (physical health domain, psychological domain, social relationships domain environment domain). As shows in the table, the mean score of how the participants rated their quality of life and their satisfaction with their health were  $74.44 \pm 17.47$  and  $68.95 \pm 21.33$  respectively. The mean total score of the four domains from highest to lowest score were social relationships domain ( $73.02 \pm 17.10$ ), physical health domain ( $71.98 \pm 12.46$ ), environment domain ( $66.94 \pm 14.01$ ), and psychological domain ( $64.76 \pm 13.73$ ). The mean of total score of WHOQOL-Brief scale was ( $70.01 \pm 11.31$ ). The findings in this table in addition to finding in figure (1) revealed an answer to the third research question.

**Table 4.** Comparison between perception of weight and actual BMI among study population.

Actual BMI	Weight Perception				Total	X <sup>2</sup>	P
	Underweight	Normal weight	Over weight	Obese			
Underweight							
No	3	4	9	2	18		
%	8.8%	3.4%	12.0%	2.4%	5.8%		
Normal weight							
No	5	42	13	47	107		
%	14.7%	35.6%	17.3%	56.6%	34.5%		
Over weight							
No	8	33	26	26	93	50.52	0.00
%	23.5%	28.0%	34.7%	31.3%	30.0%		
Obese							
No	18	39	27	8	92		
%	52.9%	33.1%	36.0%	9.6%	29.7%		
Total							
No	34	118	75	83	310		
%	100%	100.0%	100.0%	100.0%	100.0%		

Table 4: illustrates Comparison between perception of weight and actual BMI among study population. As can be seen clearly from the table, there was significant difference between participants' perception of their weight and the actual BMI as measured by the research at the time of data collection,  $X^2 = 50.52$ ,  $P = 0.00$ , that indication participants misperception of their weight. This result shows how the Saudi females perceive their weight, which answers the second research question.



**Figure 1.** Distribution of quality of life total score.

Figure 1 displays frequency distribution of participants' total score of WHOQOL-Brief scale. As can be seen, 63.9% of participants had moderate quality of life, 32.3% of them has good quality of life, while only 3.9% had poor quality of life.

**Table 5.** Correlations between age, body mass index, waist circumference, and waist -hip ratio and rating quality of life score, total score quality of life.

	Rating quality of life item score		Total score of quality of life	
	r	p	r	p
BMI	-.232**	.000	-.143*	.012
WC	-.193**	.001	-.121*	.033
WHR	-.154**	.007	-.142*	.012

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

As shows in table 3, Pearson correlation test revealed significant negative correlation between BMI and rating quality of life item and total score of quality of life,  $P = .000$  and  $.012$ , respectively. This finding indicated that, as BMI increases the quality of life decreases. Moreover, a significant negative correlation between WC, WHR, and rating quality of life item,  $P = .001$  and  $.007$ , respectively. Also, a significant negative correlation between WC, WHR

and total score quality of life  $P = .033$  and  $.012$ , respectively. This finding indicated that, as WC and WHR increase the

quality of life decreases, the findings provide answer to the fourth research question.

**Table 6.** Comparison of total quality of life means score among categories of body mass index, waist circumference and waist-hip ratio.

Totals score of quality of life					
BMI	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1205.502	3	401.834		
Within Groups	38318.775	306	125.225	3.209	.023
Total	39524.277	309			
Waist circumference	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	724.092	2	362.046		
Within Groups	38800.185	307	126.385	2.865	.059
Total	39524.277	309			
Waist-hip ratio	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	525.519	2	262.760		
Within Groups	38998.758	307	127.032	2.068	.128
Total	39524.277	309			

Table 6 provides the results of one way analysis of variance (Anova) that carried out to compare mean score of total quality of life among various categories of BMI, WC and WHR. The findings revealed statistically significant difference between categories of body mass index in total quality of life mean score,  $f = 3.209$ ,  $P = .023$ . Post hoc test that conducted after significant anova indicated that the total quality of life mean score was significantly lower among obese participant (mean  $68.05 \pm 10.13$ ) compared to the participant with normal body mass index (mean  $72.30 \pm 12.07$ ). These results suggested that as body mass index increases the total quality of life mean score decreases. This finding is another support to fourth question's answer.

Regarding WC, Anova results showed that no significant difference in mean score of total quality of life among different cut of points of WC,  $f = 2.865$ ,  $P = .059$ . Regarding WHR, Anova results revealed no significant difference in mean score of total quality of life among different cut of points of WHR,  $f = 2.068$ ,  $P = .128$ .

## 6. Discussion

The current study was carried out to estimate the prevalence of obesity and investigate the association between body mass index, waist circumference, waist-to-hip ratio and quality of life among Saudi Females. The data were collected from eligible 310 subjects who agree to participate in the study, who met the inclusion criteria and who provide complete data.

The mean age of study population was  $28.27 \pm 7.89$ . The prevalence of obesity based on BMI, WC, and WHR were 29.7%, 34.2% and 35.5% respectively, that results general and abdominal obesity. These findings were supported by the previous studies. [31] found that the prevalence of obesity based on body mass index was 30.6% among adult Saudi females. Similarly, [3] reported that prevalence of obesity among Saudi females 44% and 33.5% respectively. The current findings also were supported by other studies. [32] reported that about 48% of adult women in Iran were overweight or obese based on body mass index and 43.4% of women had abdominal obesity. Additionally, [33] found that

prevalence of obesity was 36% among Tanzania women.

The perception of one's body-weight is an essential determinant of weight-related behaviors [34]. Overweight individuals who do not recognize themselves as overweight might be unaware to involve in weight control behaviors [35]. Misperception of body-weight can be a predisposing factor for obesity. The results of current study shown a significant difference between participants' perception of their weight and the actual BMI,  $X^2 = 50.52$ ,  $P = 0.00$ , that indicated participants misperception of their weight. The study findings were constant with the findings of [36] in study carried out in Dammam in the eastern province of KSA, reported that many severely obese women considered themselves as normal weight. In an another study conducted among university female students in Riyadh (KSA) by [37] who found that 17.4% of the obese and 54.2% of the overweight perceived themselves as of normal weight. Similarly, [38] found that only 23% of university Saudi females showed an agreement between their actual, perceived, and ideal body shape. Moreover, Alfa et al. (2012) in Tanzania reported that 38% of overweight women perceived themselves as overweight or obese.

Quality of life (QOL) is individual's perception of daily life quality. WHOQOL-Brief scale was used to assess the quality of life of study population. The results of current study indicated that the mean score of how the participants rated their quality of life and their satisfaction with their health were  $74.44 \pm 17.47$  and  $68.95 \pm 21.33$  respectively. Social relationships domain was the highest score, the mean =  $73.02 \pm 17.10$ , while lowest score was psychological domain, the mean =  $64.76 \pm 13.73$ . The mean of total score of WHOQOL-Brief scale was ( $70.01 \pm 11.31$ ). Moreover, 63.9% of participants had moderate quality of life, 32.3% of them has good quality of life, while only 3.9% had poor quality of life. This result was to some extent different from those of [25], they reported that 67.8% adolescent Saudi females had good quality of life, 25.9% had moderate quality of life, while only 6.3% had poor quality of life, and the difference might be due to age difference between current study sample and their study sample.

Regarding the relationship between BMI, WC, and WHR

and total score of quality of life as illustrated by Pearson correlation test, significant negative correlation was revealed between BMI, WC, and WHR, rating quality of life score item as well as total score quality of life as clearly presented in table 5. These findings indicating that quality of life decreases as BMI increase. The current results in congruent with [25] revealed significant decrease in quality of life among adolescent Saudi females with increased body mass. Similarly, [39] reported negative correlation between BMI and total score of quality of life among adult males and females in Brazil. Moreover, other studies were supported to the present study; the findings of [40] indicated negative association between body mass index, waist-hip ratio, body fat and health-related quality of life among Greek healthy adult males and females. [41], revealed significantly lower quality of life among adult population of high waist-hip ratio. On the other hand, the current study results of one way analysis of variance (Anova) revealed that WC, and WHR had not indicating significant effect of the total quality of life. This result might be due to that plumpness body shape is culturally considered as a preferred characteristic of feminine beauty in Arab societies as illustrated by [42].

## 7. Conclusion

General and abdominal obesity were highly prevalent among adult Saudi females as measured by BMI, WHR. Misperception of weight was revealed and minority of subjects had good quality of life. Obesity was associated with significant decrease in quality of life.

## Recommendation

Effective health education strategies are required to help in increase females' awareness and perception of their weight, thus affecting their decisions and behaviors to minimize obesity and its negative influences on their health and consequently their quality of life.

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