



## Research Article

# Health-Related Quality of Life in Diabetic Women with Comparing Obese & Normal weight

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## ABSTRACT

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**Keywords:** Health Related Quality of Life, Diabetic women, Obese, Normal weight.



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**Background:** The prevalence of both obesity & diabetes are increasing all over the world & more in women. They have a negative impact not only on morbidity & mortality but also on quality of life.

**Objectives:** To assess the HRQoL with a specific comparison between obese & normal weight among women with Type 2 Diabetes Mellitus.

**Subjects and Methods:** A cross sectional study was conducted among 814 diabetic women aged 18 to 45 years. Data collection was done by interview & SF36 questionnaire. A comparison for Physical Component Summary & Mental Component Summary scores were done on the base of their Body Mass Index.

**Results:** There was a significant difference score between obese & normal patients in PCS ( $p=0.001$ ) & in MCS ( $p=0.009$ ). The normal weight patients had significantly higher PCS mean ( $\pm$ SD), in strata of ; age ( $\leq 35, >35$ )= $78.43(\pm 8.80)$ ,  $65.02(\pm 17.9)$  /socioeconomic status (poor, fair) = $69.96(\pm 20.72)$ ,  $67.50(\pm 15.71)$  /marital status (single, married, divorced or widowed)= $72.50(\pm 14.81)$ ,  $67.68(\pm 17.44)$ ,  $71.09(\pm 16.79)$  /number of children ( $\leq 2 / >2$ ) = $68.66(\pm 12.91)$ ,  $69.64(\pm 20.82)$  /smoking (smoker, nonsmoker) = $72.50(\pm 8.55)$ ,  $68.44(\pm 17.34)$  / duration of DM (5-10 year, >10 year) = $67.68(\pm 16.46)$ ,  $70.27(\pm 17.18)$  /complications of DM (one complication, > one complications) = $71.12(\pm 15.56)$ ,  $77.91(\pm 8.98)$  /treatment type (OHM, injection, both) = $64.86(\pm 18.87)$ ,  $73.67(\pm 14.49)$ ,  $60.00(\pm 10.31)$  & regularity of visit (poor, fair, good) = $66.25(\pm 9.78)$ ,  $60.31(\pm 19.73)$ ,  $72.63(\pm 14.00)$ . Also the same thing in MCS mean ( $\pm$ SD), in strata of; (SES) (poor) = $72.11(\pm 18.82)$ , number of children ( $>2$ ) = $69.20(\pm 19.66)$ , smoking (smoker) = $82.25(\pm 11.50)$ , duration of DM ( $>10$  year) = $67.55(\pm 16.3)$ , complications of DM ( $>$  one complications) = $65.81(\pm 10.17)$ , & regularity of visit (poor) = $59.86(\pm 18.46)$ .

**Conclusions:** Obese patients have a lower score as compared with normal weight patients in PCS & MCS.

## Introduction

The worldwide obesity prevalence has increased to double since 1980 & tripled in developing countries last 20 years. In Arab Gulf

countries, a significant increase in obesity among adult females with prevalence reaches up to 55% (1).

In Iraq, according to non-communicable disease (NCD) (NCD Risk Factors STEPS Survey, Iraq 2015), the prevalence of obesity among general women & men public was 42.6%, & 25.6% respectively (2). In 2016, the prevalence of obesity among adult (crude & age-standardized estimate) for female 33.8%, 37.0% & male 21%, 23.4% respectively, according to World Health Organization (WHO) (3).

At the same time, the number of diabetic adults has increased to fourfold all over the world since 1980 to 422 million, mostly living in developing countries (4). The Eastern Mediterranean Region Organization (EMRO) has the highest prevalence of diabetes in the world & there is 12% of the women with T2DM in the EMRO, which is the highest percentage of all WHO regions (5). Several studies were conducted in Iraq recently to estimate the prevalence of DM among population in general & women particularly, in 2015, a higher prevalence of DM (8.7%) was found among women as compared to (6.7%) among men (3) The International Diabetes Federation (IDF) reported that Iraq is considered as having a medium prevalence of DM in the Middle East (6). The number of women at childbearing age are 1,874,123 million in Baghdad & 8,650,895 million in Iraq, according to annual statistic report of the ministry of health (7). The burden of obesity & DM on affected women health is unique & can be especially hard because they can affect mothers, their pregnancy, & child care as well as the risk of obesity & DM for the child in the future (8).

HRQoL is defined as an individual's subjective perception of both positive & negative aspects of life that are influenced by health status. It is a multidimensional concept that usually includes subjective evaluations of physical functioning, mental health, & social role functioning (9)

Any diabetic patient will consider the success of clinical care is meaningful only to the extent that they affect physical, emotional, & social well-being. Besides, healthcare providers realize that obesity & DM can affect the quality of life negatively. This perceived quality of life can strongly affect a patient's commitment to active DM self-management, which is the cornerstone of DM control (10). In recent years, given the current overweight, obesity & DM epidemic, they are important to determine the impact of overweight & obesity on HRQoL of diabetic patients. HRQoL has been increasingly also recognized as an approach to health assessment, that if neglected, could lead to a lack of motivation for any effort required to improve optimal outcomes for all diabetic women & strengthen their capacity to prevent DM complications (11,12).

## Subjects and Methods

A cross sectional study with analytic components was conducted in the only two diabetic centers in Baghdad, the Specialized Center for Endocrinology and Diabetes in Al-Russafa side, and The National Center for Diabetes Research and Treatment in Al-Karkh side, Baghdad, Iraq, a convenient sample of diabetic women who met the criteria, from 1st November 2017 to 1st March 2018. Any woman between 18-45 years, (The participants in the study were obese and non-obese diabetic patients) diagnosed as T2DM and registered in the above two centers for at least one year with the complete data file & agree to participate in this study. Pregnant or

lactating woman. Illiterate, woman with chronic diseases & receiving medications that interfere with body weight were be excluded

The sample size of this study was 814 diabetic women which was determined by using the following equation (13)

$$\text{Sample size } (n) = \frac{Z^2 [P(1-P)]}{E^2}$$

- Z= 1.96
- P=Proportion = considered as 0.5 to increase sample size
- E= level of error= 0.05

The estimated sample size = 384. Final numbers were multiplied by 2 for valid comparison of both groups (obese and normal weight). 10% was added to the final number to address the problem of incomplete or insufficiently completed questionnaires.

Data was collected from each patient by direct interview, Patients' medical records & The SF-36 questionnaire (Arabic Version) of the health survey for quality of life measures were used (14-16). The validity & reliability of the Arabic version of the SF-36 questionnaire were assessed by several previous studies (17,18). This variable was measured after scoring SF-36 questionnaire items. It is a three steps process.

The first step, 36 items were labeled for 2, 3, 5 & 6 categorical answer which was scored (0-100), these numeric values are given to each answer for all items and recorded per the scoring given all items are scored. So that the lowest and highest possible scores are 0 and 100, respectively. A high score defines a more favorable health state. Scores represent the percentage of total possible score achieved

The second step, forming 8 domains from averaging items related to each domain after scoring items.

The third step calculation of PCS and MCS score.

HRQoL in (PCS) consists of four domains: Physical functioning, Role limitations due to physical health problems, Pain, General health. HRQoL in (MCS) also contains four domains: Energy, Social functioning, Role limitations due to emotional problems, Emotional wellbeing.

Domain scores represent the average for all items in the domain that the respondent answered (14,19,20).

The PCS & MCS were made & scored to achieve a number of advantage, in addition to reducing the SF36 from eight domains to two summary component without substantial loss of information. Each components summary scores were calculated by taking the mean for its related domains. Higher PCS & MCS scores indicate better health status.

Categorical classification of (PSC & MSC) into good, fair & poor was done as follow:

- 1- Good: patients with more than mean + 1 SD score.
- 2- Fair: patients with the mean  $\pm$  1SD score.
- 3- Poor: patients with less than mean - 1 SD score (21)

The analysis was done by:

Descriptive: Frequency & percentage. Mean & SD.

Analytic: Independent t-test for detecting the difference between the means of two independent groups.

ANOVA was used to detect the difference among the means of the three groups.

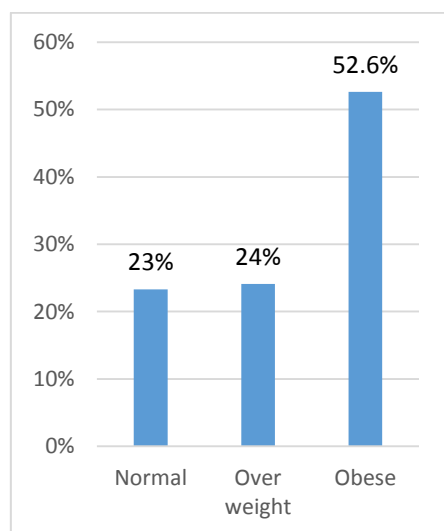
Binary logistic regression analysis was used. (95 % CI) was calculated by logistic regression to find the effect of each variable independently from others.

Bivariate analysis was used, to achieve the objectives of this study & compare the result of HRQoL in obese women with that of normal weight women,.

(To increase the validity of the results, & to overcome subjectivity of HRQoL measuring tool, variables with a highly significant (P value  $\leq 0.01$ ) difference / association were selected & considered as significant, & later on entered into the binary logistic equation.)

**Results**

Fig.1. shows that the prevalence of obesity, overweight & normal weight among those women were 52.6% (428 patients), 24.1% (196 patients) & 23.3% (190 patients) respectively, Fair score was observed in 62% of PCS & 53% of MCS of patients HRQoL (PCS, MCS) assessment among diabetic women Regarding PCS, 62% of diabetic women have a fair score, good score constitute of 20%, and poor score constitute of 18%. Regarding MCS, 53% of diabetic women have a fair score, good score constitute of 20%, and poor score constitute of 27%.



**Figure1:** Prevalence of obesity as compared to overweight

Tab.1. shows that, the obese patients had the lowest difference mean ( $\pm$ SD) significantly in comparison with the other two groups in the total study sample & Patients with; less than 35 years, good SES, less than 5 years duration of DM, no complications, good regularity of visit, single treatment either oral or injection had a higher score than their counterparts,

**Table 1:** The Physical Component Summary score of Health-related quality of life, Mean ( $\pm$ SD) scores according to variables classification of the study sample.

Variables	No	%	PCS scores M ( $\pm$ SD)	P-Value	
Total	814		56.44 ( $\pm$ 18.77)		
BMI	Normal weight	190	23.3	68.55 ( $\pm$ 18.12)	0.001

Variables	No	%	PCS scores M ( $\pm$ SD)	P-Value	
Age	Overweight	196	24.1	55.92 ( $\pm$ 18.93)	0.001
	Obese	428	52.6	51.31 ( $\pm$ 17.93)	
	$\leq 35$	116	14.3	69.02 ( $\pm$ 19.34)	
SES	$> 35$	698	85.7	54.35 ( $\pm$ 17.74)	0.001
	Poor	370	45.5	54.19 ( $\pm$ 17.33)	
	Faire	343	42.1	56.79 ( $\pm$ 19.82)	
Marital status	Good	101	12.4	63.50 ( $\pm$ 19.79)	0.058
	Single	42	5.2	64.34 ( $\pm$ 19.30)	
	Married	688	84.5	56.02 ( $\pm$ 18.84)	
Number of children	Widow& divorced	84	10.3	55.98 ( $\pm$ 16.25)	0.054
	No children	94	11.5	59.35 ( $\pm$ 19.69)	
	$\leq 2$ child	202	24.8	58.73 ( $\pm$ 19.73)	
Smoking	$> 2$ child	518	63.6	55.02 ( $\pm$ 19.27)	0.045
	Smoker	45	5.5	49.66 ( $\pm$ 16.43)	
	Nonsmoker	769	94.5	56.84 ( $\pm$ 19.62)	
Duration of DM	$< 5$ years	292	35.9	60.07 ( $\pm$ 19.21)	0.002
	5-10years	351	43.1	54.17 ( $\pm$ 19.80)	
	$> 10$ years	171	21.0	54.90 ( $\pm$ 19.98)	
Complications of DM	No complication	432	53.1	61.46 ( $\pm$ 18.81)	0.001
	One complication	275	33.8	52.93 ( $\pm$ 18.67)	
	More than one complications	107	13.1	45.21 ( $\pm$ 18.53)	
Treatment type	OHM	421	51.7	58.53 ( $\pm$ 18.17)	0.001
	Injection	235	28.9	58.61 ( $\pm$ 19.55)	
	Both	158	19.4	47.65 ( $\pm$ 19.62)	
Regularity of visit	Poor	101	12.4	53.16 ( $\pm$ 18.32)	0.002
	Faire	312	38.3	55.43 ( $\pm$ 19.56)	
	Good	401	49.3	59.11 ( $\pm$ 18.96)	

Tab.2. shows that, the obese patients had the lowest difference mean ( $\pm$ SD) of MCS scores significantly in comparison with the other two groups in the total study sample. The comparison of MCS HRQoL scores according to study variables (age, SES, marital status, number of children, smoking, duration of disease, complications, treatment type & regularity of visit) revealed a statistically significant difference with strata of complications of DM & regularity of visit. Patients with no complications of DM, or with a good regularity of visit had a higher score than their counterparts.

**Table 2:** The Mental Component Summary score of Health related quality of life Mean ( $\pm$ SD) scores according to variables classification of the study sample

Variables	No	%	MCS scores M ( $\pm$ SD)	P-Value	
Total	814		61.28 ( $\pm$ 19.06)		
BMI	Normal weight	190	23.3	65.57 ( $\pm$ 19.62)	0.002
	Over weight	196	24.1	61.85 ( $\pm$ 18.11)	
	Obese	428	52.6	60.47 ( $\pm$ 17.99)	
Age	$\leq 35$	116	14.3	65.02 ( $\pm$ 20.02)	0.06
	$> 35$	698	85.7	60.66 ( $\pm$ 18.44)	
	Poor	370	45.5	60.93 ( $\pm$ 19.97)	
SES	Faire	343	42.1	60.86 ( $\pm$ 18.91)	0.37
	Good	101	12.4	64.03 ( $\pm$ 17.92)	
	Single	42	5.2	63.17 ( $\pm$ 16.61)	
Marital status	Married	688	84.5	61.31 ( $\pm$ 19.52)	0.74
	Widow& divorced	84	10.3	60.11 ( $\pm$ 19.31)	
	No children	94	11.5	57.93 ( $\pm$ 18.87)	
Number of children	$\leq 2$ child	202	24.8	62.44 ( $\pm$ 19.33)	0.22

Variables	No	%	MCS scores	P-Value	
Smoking	> 2 child	518	63.6	61.44 (±18.91)	0.15
	Smoker	45	5.5	56.94 (±20.42)	
Duration of DM	Nonsmoker	769	94.5	61.54 (±18.90)	0.37
	<5years	292	35.9	62.67 (±20.21)	
	5-10years	351	43.1	60.45 (±19.66)	
Complications of DM	>10years	171	21.0	60.62 (±16.95)	0.001
	No complications	432	53.1	64.16 (±19.77)	
	One complications	275	33.8	59.25 (±19.54)	
Treatment type	More than one complications	107	13.1	54.89 (±18.09)	0.04
	OHM	421	51.7	62.69 (±18.82)	
	Injection	235	28.9	61.27 (±19.51)	
Regularity of visit	Both	158	19.4	57.57 (±18.71)	0.001
	Poor	101	12.4	58.33 (±16.50)	
	Faire	312	38.3	58.42 (±17.06)	
	Good	401	49.3	64.01 (±19.82)	

In order to predict the effect of study variables on the HRQoL score (as an outcome), a binary logistic regression analysis was used. Only variables that appeared to have a highly statistical significant difference ( $p = \leq 0.01$ ) in mean of PCS & MCS scores between different variables strata.

Tab. 3.shows that, the normal BMI (OR=0.365; P=0.001; 95% CI for OR=0.230-0.579), age with less than 35 years (OR=0.135; P=0.001; 95% CI for OR=0.047-0.388) & with no complications (OR=0.295; P=0.001; 95% CI for OR=0.157-0.553) were found to be protective factor against poor PCS of HRQoL. The patients with poor SES (OR=2.497; P=0.001; 95% CI for OR=1.423-4.382) & poor regularity of visit (OR=2.945; P=0.001; 95% CI for OR=1.476-5.873) were found to be positively associated with poor PCS of HRQoL. In this multivariate analysis, duration of DM (P=0.282) & treatment type (P=0.140) were not found to be a significant associated with the PCS of HRQoL, after adjustment of other variables.

**Table 3:** Binary logistic regression for Physical Component score with significant study variables

Variables	AOR	(95% C.I.)	P-Value	
BMI	0.365	0.230	0.579	0.001
Age	0.135	0.047	0.388	0.001
Complications of DM	0.295	0.157	0.553	0.001
SES	2.497	1.423	4.382	0.001
Regularity of visit	2.945	1.476	5.873	0.002
Duration of DM	1.374	0.770	2.452	0.282
Treatment type	0.656	0.374	1.148	0.140

Tab.4. shows that, The patients with no complications (OR=0.502; P=0.001; 95% CI for OR=0.344-0.732), among diabetic women was found to be a protective factor against poor MCS of HRQoL. In this multivariate analysis, BMI (P=0.1) & regularity of visit (P=0.032) found to be not a significant associated with MCS of HRQoL after adjusting of the variables.

**Table 4:** Binary logistic regression for Mental Component score with significant study variables.

Variables	AOR	(95% C.I.)	P-Value	
BMI	0.800	0.614	1.044	0.100
Complications of DM	0.502	0.344	0.732	0.001
Regularity of visit	1.655	1.04	2.453	0.032

Tab.5 shows that, after categorization of PCS scores to obese and normal weight values, (Bivariate analysis) there was a statistically significant difference, between normal weight & obese patients who had a higher score, in PCS the normal weight patients had statistical significantly higher PCS score in all variable's classification except in patients with; good SES, had no children, with less than 5 years of DM duration or had no complications.

**Table 5:** The difference between Physical Component Summary scores Mean (±SD) scores in obese and normal weight women according to study variables.

Variable	Normal weight		Obese		95% CI of difference		P-Value	
	No	PCS M (±SD)	No	PCS M (±SD)	LL	UL		
Total no=618	190	68.55 (±19.12)	428	51.31 (±17.93)	0.001			
Age	≤35	50	78.43 (±8.80)	46	61.65 (±19.69)	10.46	23.09	0.001
	>35	140	65.02 (±17.9)	382	50.06 (±19.88)	11.24	18.67	0.001
	Poor	80	69.96 (±20.10)	198	46.96 (±20.72)	17.63	28.35	0.001
SES	Faire	75	67.50 (±15.71)	188	53.90 (±19.39)	8.77	18.40	0.001
	Good	35	67.58 (±12.04)	42	60.14 (±19.40)	-0.30	15.18	0.059
	Single	20	72.50 (±14.81)	18	53.33 (±16.99)	8.69	29.63	0.001
Marital status	Married	150	67.68 (±17.44)	368	51.70 (±19.20)	12.37	19.59	0.001
	Widow& divorced	20	71.09 (±16.79)	42	46.99 (±19.34)	13.22	34.97	0.001
	No children	40	66.17 (±15.47)	36	56.14 (±15.46)	-1.53	18.51	0.041
Number of children	≤ 2 child	70	68.66 (±12.91)	88	53.82 (±19.70)	9.34	20.33	0.001
	> 2 child	80	69.64 (±20.82)	304	50.01 (±17.98)	14.26	25.00	0.001
	Smoker	5	72.50 (±8.55)	28	47.67 (±19.14)	16.23	33.40	0.001
Smoking	Nonsmoker	185	68.44 (±17.34)	400	51.56 (±17.92)	13.57	20.18	0.001
	<5years	90	63.12 (±19.96)	146	52.40 (±17.16)	-1.23	22.67	0.078
	5-10years	85	67.68 (±16.46)	174	47.09 (±18.57)	15.81	25.36	0.001
Duration of DM	>10years	15	70.27 (±17.18)	108	55.53 (±18.42)	9.75	19.74	0.001
	No complications	130	57.98 (±18.96)	198	52.29 (±19.00)	-1.44	12.81	0.11
	One complication	45	71.12 (±15.56)	156	54.94 (±18.62)	12.14	20.23	0.001
Complications Of DM	More than one complications	15	77.91 (±8.98)	74	39.51 (±18.57)	32.01	44.79	0.001
	Treatment	OHM	95	64.86	234	54.86	5.15	14.84

Variable	Normal weight	Obese	95% CI of difference	P-Value
type	(±18.87)	(±16.76)		
Injection	85 73.67 (±14.49)	84 46.96 (±17.65)	21.28 32.14	0.001
Both	10 60.00 (±10.31)	110 47.06 (±20.04)	8.315 17.54	0.001
Poor	25 66.25 (±9.78)	48 51.53 (±19.76)	7.08 22.34	0.001
Faire	50 60.31 (±19.73)	172 50.52 (±18.99)	2.53 17.05	0.008
Good	115 72.63 (±14.00)	208 51.91 (±16.90)	16.88 24.56	0.001

Tab.6. shows that, after categorization of PCS scores to obese and normal weight values, (Bivariate analysis)

There was a statistically significant difference, between normal weight & obese patients who had a higher score, in MCS

Poor SES, more than 2 children, smoker, more than 10 years of DM duration, more than one complication and poor regularity of visit found to have statistically significant higher scores of MCS among normal weight than obese patients.

**Table 6:** The difference between Mental Component Summary scores Mean (±SD) scores in obese and normal weight women according to study variables

Variables	Normal weight		Obese		95% CI of difference		P-Value	
	No	MCS M (±SD)	No	MCS M (±SD)	LL	UL		
Total No = 618	190	65.57 (±18.62)	428	60.77 (±18.99)			0.009	
Age	≤35	50	69.99 (±20.87)	46	61.50 (±16.13)	-0.90	17.88	0.07
	>35	140	63.98 (±18.72)	382	60.69 (±15.00)	-0.66	7.26	0.10
SES	Poor	80	72.11 (±18.82)	198	56.22 (±19.11)	10.54	21.22	0.001
	Faire	75	59.58 (±18.48)	188	63.94 (±18.64)	-9.89	1.18	0.12
Marital status	Good	35	63.43 (±19.02)	42	68.06 (±17.43)	-13.35	4.09	0.29
	Single	20	62.93 (±15.04)	18	62.23 (±19.91)	-10.83	12.24	0.90
Number of children	Married	150	65.97 (±19.21)	368	61.04 (±18.22)	-0.89	8.96	0.037
	Widow & divorced	20	65.15 (±19.60)	42	57.80 (±19.50)	-3.62	18.32	0.18
Smoking	No children	40	55.89 (±17.87)	36	62.82 (±17.41)	-15.68	1.81	0.11
	≤ 2 child	70	66.95 (±19.67)	88	62.98 (±18.18)	-2.62	10.56	0.23
Duration of DM	> 2 child	80	69.20 (±19.66)	304	59.89 (±17.28)	4.12	14.48	0.001
	Smoker	5	82.25 (±11.50)	28	51.78 (±20.22)	20.30	40.63	0.001
Complication of DM	Nonsmoker	185	65.11 (±18.71)	400	61.40 (±17.46)	-0.12	7.29	0.05
	<5years	90	66.42 (±20.43)	146	63.29 (±19.44)	-2.89	9.15	0.30
Treatment type	5-10years	85	62.27 (±19.68)	174	49.16 (±18.22)	-23.76	12.45	0.036
	>10years	15	67.55 (±16.3)	108	57.73 (±17.24)	5.19	14.44	0.001
OHM	No complication	130	68.24 (±20.68)	198	62.49 (±19.43)	-1.06	10.45	0.036
	One complication	45	57.75 (±19.34)	156	61.23 (±19.81)	-10.21	4.24	0.30
Injection	More than one complication	15	65.81 (±10.17)	74	55.23 (±19.55)	3.26	17.90	0.006
	OHM	95	66.89 (±19.29)	234	62.88 (±17.60)	-1.03	9.06	0.11
Both	Injection	85	64.46 (±17.98)	84	58.94 (±19.73)	-0.54	11.58	0.07
	Both	10	62.37 (±20.95)	110	57.69 (±18.91)	-14.11	23.47	0.59

Variables	Normal weight	Obese	95% CI of difference	P-Value	
Regularity of visit	Poor	25 59.86 (±18.46)	48 50.63 (±20.05)	8.92 11.54	0.001
	Faire	50 60.26 (±20.36)	172 60.29 (±18.09)	-8.14 8.45	0.99
	Good	115 69.50 (±17.98)	208 61.26 (±17.17)	-2.74 13.21	0.68

## Discussion

HRQoL is an important outcome measure for chronic disease, burden & evaluation of efficacy intervention & has received increasing attention. T2DM is considered an important chronic disease. Obesity is one of the well-known adjustable risk factors, not only associated with about 80% of diabetics but also may modify HRQoL of patients (22).

Early onset of obesity in individuals had a higher risk of developing T2DM compared to older, (23). In our study showed that 52.6% & 24.1% of diabetic women were obese & overweight respectively, this means that 76.7% of the study sample had BMI ≥ 25 kg/m2. The above prevalence of obesity is higher than the prevalence of obesity among women in the general population in Iraq. According to NCD Risk Factors STEPS Survey, Iraq 2015, the prevalence of obesity among general women public was 42.6% (2). Several other studies, approximately agreed with this study. In Iran in 2016, (24) & Saudi Arabia in 2013 (25). This finding partially agreed with two national studies conducted on diabetic adults in Basra/Iraq, (26, 27).

HRQoL is an important patient-reported outcome in the DM study. Poor HRQoL is related to worse outcomes in diabetic patients, including poor response to treatment, disease progression and cardiovascular disease (28). The current study showed that the majority of diabetic women had a fair HRQoL score. Although there are many studies assessed the HRQoL of diabetic patients, most of these studies used different tools & methods. But the outcome of all these studies are a measurement of HRQoL among their studies sample, so the result of some studies might not directly match our result. In comparing with two national studies conducted in Iraq, the first one was done in Mosul & showed that the highest percentage of diabetic adults had a good score for a physical domain 42% & for a psychological domain 43% for total sample. But this national study showed that the highest percentage of diabetic women for the physical domain 42.6% was a poor score & for a psychological domain 36.6% was a fair score. The researcher concluded that quality of life of patients with T2DM was fair to good. T2DM, significantly affected the physical domain especially in females (29). The other study that was done in Hilla, found the same result of Mosul study (21). In a study done in Iran in 2016, among women with T2DM, the results showed that their HRQoL ranged from low to moderate level (24). A study was conducted in India in 2017 also found that most diabetic adults had a moderate quality of life score (28).

The discussion of this study's variables was done based on the result of (logistic regression), in order to have an adjustment for the effect of these variables & have a valid conclusion about exposure and outcome. Only five variables (age, BMI, SES, complications, regularity of visit) were significantly associated with PCS & only one variable (complications of DM) was significantly associated with MCS. In the current study, there was a significant negative association between BMI & PCS, but not associated with MCS of HRQoL. This might explain to the effect BMI more on the musculoskeletal system of women, & at the same time, there was

psychological & social adjustment capacity in most patients, although, physical dysfunctional exists (30). This finding was supported by studies that were conducted on the general population as, in Beirut Arab University 2018, (31) & Iran 2013(32).

In DM patients, there was variation in studies around the world about the association of BMI with PCS & MCS. In German 2012, a cross-sectional study included T2DM patients with BMI $\geq$ 25 kg/m<sup>2</sup>, found that BMI had negatively associated with both PCS & MCS (33).

While in studies conducted in Botswana 2018 (34), India 2017 (28) they found that there was no association of PCS & MCS or all domains of HRQoL with BMI among diabetic patients. Also, no association of BMI with HRQoL domains among diabetic women of all ages was found in a study in Iran conducted 2016. (24) This might be explained due to different methodology & sampling technique used in these studies or different socio cultural environments of these countries & includes both genders with different age or using different tools for measuring HRQoL. (34) While in Iranian study, might be explained due to a high prevalence of obesity & overweight among women may lead to disappearing effect of BMI.

Complications of DM are the most powerful variable influencing HRQoL. Diabetic patients, especially those with complications have a poor HRQoL & increased risk of mortality (28,35,36). The above result as, the presence of DM complications were associated with both PCS & MCS, agreed with a number of another studies that were conducted among diabetic patients, in Botswana 2018 (34), south India 2017 (28) & UAE 2011 (35). The explanation for this finding is that, as diabetic patients with time have more complications, this would lead to deteriorating their health by changing health behaviors, treatment commitment plans, & lowering patient's ability to self-care. And patients of multiple complications are more likely to receive multiple, but mostly ineffective care.(36). Our study had been found that age was negatively associated with only PCS, but not MCS of HRQoL. This result agreed with several studies conducted among diabetic patients like, in Botswana 2018, (34) & Delhi in 2017 (28). Our finding disagreed with study Lithuania 2013, (37).

Obesity & T<sub>2</sub>DM have increased in all socio-demographic categories (38). The current study found that SES was positively associated with only PCS. This might be explained by the vital role of SES in improving the quality of life of not only DM patients but in the general public. This result is in agreement with a study done in Egypt 2016. (39) Other two studies were conducted among diabetics in India and found that the total lower HRQoL score had a significant association with lower SES (40, 41).

The current study found that there was a significant positive association between regularity of visit with only PCS. This might be explained that patients with good regular visits have better glycemic control & hence, less risk of complications. Hu M. & his colleague found that frequent follow-up visit was associated with better quality of life & clinical indicators of T2DM patients (42). But this finding disagreed with two studies that were done in Iran 2016 & in Singapore 2011 (24,43).

In Comparison of HRQoL between Normal weight and Obese Diabetic Women, there was a significant difference in the mean score of PCS among most of variables' strata. The obese patients had a significantly lower difference means as compared to normal weight in all variable's strata, except for good SES, had no children,

less than 5 years duration, and had no DM complications. This might clearly high light the effect of obesity among most of the strata of variables on PCS. Good SES, means the availability of good conditions from all aspects as, education, occupation, own property, and lead to an improvement in HRQoL of patients. Having no children leads to decrease duties on woman & have more time for self-care. (44) DM duration of less than 5 years, and the patients have no complications, mean a good DM control (35,45) & hence, less impact on the physical component of HRQoL. These strata may have a positive impact on general health that reduces the effect of obesity on PCS of HRQoL.

On the contrary, there was no significant difference in the mean score of MCS of HRQoL among most of variables strata. This might high light that there is less effect of obesity on MCS not only among the variables but also among the different strata of that variables. The few significant strata of this study's variables were poor SES, having more than 2 children, smoker, more than one complications & poor regularity of visit, found to have a significant difference between obese & the corresponding strata in normal-weight women. Poor strata in MCS were found to have more impact on MCS score. This might be explained to the association of poor SES with more challenges in different life aspects in providing the needs of life, which add further burden on the affected women (46).

The other significant strata with MCS further highlighted the impact of stress, workload & eventually difficulty to cope with a daily need. This may give additive effect with obesity that led to a decrease in the mean score of MCS HRQoL.

## Conclusion

The prevalence of obesity & overweight among diabetic women is high. PCS & MCS, of diabetic women have a fair score; Diabetic patient with no complications is a significant associated with increase MCS score of HRQoL. It is the only factor that affects both PCS & MCS of HRQoL. Obese diabetic women have significantly lower scores as compared to normal weight patients in both PCS & MCS.

Obese patients have a significantly lower difference means of PCS in all variables strata, except for good SES, had no children, less than 5 years duration, and had no DM complications.

There are no significant differences in the mean score of MCS among most of variables strata between obese & normal weight patients, except for poor SES, having more than 2 children, smoker, more than 10 years duration, more than one complications & poor regularity of visit.

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## Conflict of Interest

No conflict of interest

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