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## Obesity in Relation to Type 2 Diabetes Mellitus Patients in the Sulaimani Diabetic Center

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### Abstracts

**Background:** Overweight and obesity affect over half the world's population and diabetes rates are climbing to 20% of all adults in many Middle Eastern, Asian, and Latin American countries. The twin epidemics of obesity and diabetes already represent the biggest public health challenge of the 21st century and It is estimated that at least half of all diabetes cases would be eliminated if weight gain in adults could be prevented.

**Objective:** The main aim is to assess the relationship between obesity and type 2 diabetes mellitus, furthermore to assess the relationship between different body mass index (BMI) levels and medical investigations, and identify somatic symptoms that are associated with BMI.

**Patients and methods:** Cross – sectional study based on questionnaire survey and medical examination of 311 patients who attended the Sulaimani Diabetic Centre, Sulaimani, Iraq. The questionnaire consist of questions about socio-demographic characteristics, somatic symptoms, and measurement of (height, weight) and body mass index (BMI) . Overweight, defined as ( $BMI \Rightarrow 25Kg/m^2$ ), and obesity ( $BMI \Rightarrow 30Kg/m^2$ ). The relationship between BMI levels and sex, laboratory investigations (fasting plasma glucose, cholesterol) was explored in addition to that the mean of BMI and somatic symptoms was explored too.

**Results:** In this study 26.4% were males and 73.6% females. Mean of both age and BMI were 52.9 years,  $28.8Kg/m^2$  respectively. Sex was significantly associated with BMI ( $P < 0.05$ ) and higher proportion of both male and female were overweight, obese respectively. No significant relationship among laboratory investigations and levels of BMI. Backache ( $P < 0.001$ ), breathlessness ( $P < 0.05$ ) and sleep disturbance ( $P < 0.05$ ) were significantly related to mean BMI while abdominal pain, palpitation and urinary incontinence did not show any significant relation.

**Conclusions:** Females diabetic patients are more obese while males are overweight.

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### Introduction:-

The prevalence of obesity is rising to epidemic proportions worldwide. In some countries, an astonishing half of the population is overweight.<sup>(1)</sup> Being overweight or obese seriously increases an individual's risk of developing other health problems such as type 2 diabetes mellitus, coronary heart disease, stroke and some forms of cancer. Overweight and obesity are the most common conditions in general practice and are generally managed in association with diabetes, hypertension and metabolic syndrome. However, obesity is a complex, multi-factorial condition and requires generalized interventions to prevent it among the adult population.<sup>(2)</sup>

In men and women, the more overweight an individual is, the greater the risk of developing type 2 diabetes. The means by which excessive body fat causes type 2 diabetes is not clearly defined, but it appears that excess fat increases insulin resistance, raising blood glucose levels and the likelihood of developing diabetes. People with a greater amount of abdominal fat have a higher risk of developing the condition.<sup>(3)</sup> BMI is one of the keys of anthropometric measurements are important to evaluate the degree of obesity.<sup>(4)</sup>

### Objectives:-

I) The main aim of this study is to identify the relationship between obesity and type 2 Diabetes mellitus patients who attended the Diabetic Centre in Sulaimani city.

- II) Identify the relationship between BMI levels and certain laboratory investigations (fasting plasma glucose, cholesterol).
- III) Identify somatic symptoms related to BMI.

### Patients and Methods:-

This cross – sectional study was conducting at Sulaimani Diabetic Center, and 311 patient samples with type 2 diabetes mellitus were included, for the period between March and June 2009 when presenting for periodic routine visits at Sulaimani diabetic center.

The study proposal was approved by the ethical committee at the faculty of medicine, Sulaimani University. Permission was taken from responsible authorities and consultations clinic before data collection.

### Measurements

The study consisted of Two parts: (1) a questionnaire and (2) a medical examination, the questionnaires subdivided into: (a) questions on socio-demographic characteristics and (b) somatic symptoms of the patients.

- The socio-demographic variables included, in addition to age and sex, place of residence: urban, rural area. Occupation: sedentary employment, occupation included physical activity, no work Need clarifications? Marital status: single, married, divorced & widow. Family history of both diabetes mellitus and obesity: no history, +ve 1<sup>st</sup> degree relative, +ve

2<sup>nd</sup> degree relative, +ve 1<sup>st</sup> and 2<sup>nd</sup> degree relative.

- The symptom questionnaire consisted of 6 somatic yes/no questions about the presence of symptoms during the previous months.

The somatic symptoms were: abdominal pain, palpitation, backache and joints pain, breathlessness, sleep disturbances and urinary incontinence.

- Medical Examination: blood pressure (BP): systolic (SBP) and diastolic (DBP), fasting plasma glucose, fasting serum cholesterol. The thresholds of the variables systolic (SBP) (less than 130 mmHg), diastolic (DBP) (less than 85mmHg), fasting plasma glucose (90 – 130 mg/dl = 5 – 7.2 mmol/l), serum cholesterol (less than 250 mg/dl = 6.47 mmol/l) are based on therapeutic targets for diabetic patients

#### Outcome variable:-

The outcome variable of body mass index (BMI) for patient required calculate the weight and height, so that weight had been measured while the patient minimally clothed without shoes using digital weight scale and recorded. While height was measured in standing position without shoes using tape measure while the shoulder in normal state, then BMI was calculated by dividing the weight (Kg) by the height(m) squared and categorized on the basis of the World Health Organization (WHO) classification <sup>(6)</sup>, Underweight was defined as (BMI < 18.5 Kg/m<sup>2</sup>), normal weight (BMI 18.5 – 24.9 Kg/m<sup>2</sup>), Overweight (BMI ≥ 25 – 29.9 kg/m<sup>2</sup>) and obesity as (BMI ≥ 30 kg/m<sup>2</sup>).

#### Excluded samples

- ❖ Patient diagnosed as type 1 diabetes mellitus.
- ❖ Patient with BMI ≤ 18.5mg/m<sup>2</sup> (underweight).
- ❖ Child and adolescent age patient.

#### Statistical methods

Data were entered, processed, and analysis carried out using Microsoft office Excel 2007 and SPSS (statistical package of social science) program version 16.

Chi-squared test was carried for significance association among the levels of BMI and medical investigations. The independent – samples t-test of significance association between the mean of BMI and somatic symptoms' – value < 0.05 was considered statistically significant.

#### Results:-

##### 1. Socio-demographic characteristics:

In this study which included 311 patients with type 2 diabetes mellitus, 82 (26.4%) males and 229 (73.6%) females. The highest frequency of socio-demographics characteristics was in residency 87.1 % (urban area), while the lowest frequency was in marital status 0.3 % (divorced) as shown in (Table 1). The mean age of patients was 52.9 years and ranged from 35 to 79 years. The mean BMI for the patients was 28.8 as shown in (Table 2).

##### 2. BMI in relation to type 2 diabetes mellitus patients

In this study a substantially higher proportion of males were overweight (BMI=25-29.9) compared with females, but the pattern was opposite for obesity (BMI ≥30). However, it may be noted that there is no so much higher proportion of males with normal weight (BMI < 25) than females as shown in (Table 3).

##### 3. BMI in relation to fasting plasma glucose and lipids

The levels of BMI measured for the group of poor control medical investigations of patients was not significantly for both fasting plasma glucose and fasting plasma cholesterol as shown in (Table 4).

##### 4. BMI and somatic symptoms

The mean BMI among patients with backache, breathlessness and sleep disturbances was significantly higher than patients without these symptoms (Table 5). However, the level of BMI measured for the group level among symptomatic and non-symptomatic patients was not significantly related to any of the reported symptoms?

**Table 1: Frequency and percentages of Socio-demographic characteristics.**

| Population characteristics                               | No. | %    |
|----------------------------------------------------------|-----|------|
| <b>Sex</b>                                               |     |      |
| Male                                                     | 82  | 26.4 |
| Female                                                   | 229 | 73.6 |
| <b>Residency</b>                                         |     |      |
| Urban area                                               | 271 | 87.1 |
| Rural area                                               | 40  | 12.9 |
| <b>Occupation</b>                                        |     |      |
| Sedentary employment                                     | 34  | 10.9 |
| Occupation included physical activity                    | 229 | 73.6 |
| No work                                                  | 48  | 15.5 |
| <b>Marital status</b>                                    |     |      |
| Single                                                   | 6   | 1.9  |
| Married                                                  | 257 | 82.6 |
| Divorced                                                 | 1   | 0.3  |
| Widow                                                    | 47  | 15.2 |
| <b>Family history of diabetes mellitus</b>               |     |      |
| No history                                               | 127 | 40.8 |
| +ve 1 <sup>st</sup> degree relative                      | 162 | 52.1 |
| +ve 2 <sup>nd</sup> degree relative                      | 19  | 6.1  |
| +ve 1 <sup>st</sup> and 2 <sup>nd</sup> degree relatives | 3   | 1.0  |
| <b>Family history of obesity</b>                         |     |      |
| No history                                               | 179 | 57.6 |
| +ve 1 <sup>st</sup> degree relative                      | 119 | 38.3 |
| +ve 2 <sup>nd</sup> degree relative                      | 11  | 3.5  |
| +ve 1 <sup>st</sup> and 2 <sup>nd</sup> degree relatives | 2   | 0.6  |

**Table 2: Mean of age, BMI, and medical examination.****Total No. = 311**

|                                     | Mean  | Median | Minimum | Maximum | Std. Deviation |
|-------------------------------------|-------|--------|---------|---------|----------------|
| <b>Age</b>                          | 52.9  | 53     | 35      | 79      | 8.687          |
| <b>BMI</b>                          | 28.8  | 28.3   | 18.5    | 48.9    | 4.8265         |
| <b>Systolic blood pressure</b>      | 125.1 | 120    | 90      | 220     | 19.731         |
| <b>Diastolic blood pressure</b>     | 80.6  | 80     | 60      | 130     | 11.344         |
| <b>Fasting plasma glucose*</b>      | 185.9 | 180    | 75      | 427     | 63.148         |
| <b>Fasting plasma cholesterol**</b> | 221.3 | 210    | 108     | 378     | 45.438         |

\* Reference value for Fasting plasma glucose less than 130 mg/dl.

\*\*Reference value for Fasting plasma cholesterol 150-250 mg/dl.

**Table 3: Body mass index (BMI) levels according to sex of patients**

| BMI           | Sex       |      |      |        |      |
|---------------|-----------|------|------|--------|------|
|               | Total No. | Male |      | Female |      |
|               |           | No.  | %    | No.    | %    |
| Normal weight | 64        | 21   | 25.6 | 43     | 18.8 |
| Overweight    | 136       | 46   | 56.1 | 90     | 39.3 |
| Obese         | 111       | 15   | 18.3 | 96     | 41.9 |

P – Value &lt; 0.005

**Table 4: Body Mass index (BMI) in relation to medical investigations**

| BMI       | Total No. | Fasting plasma glucose*  | Fasting plasma Cholesterol** |
|-----------|-----------|--------------------------|------------------------------|
|           |           | Poor control (>130mg/dl) | Poor control (>250mg/dl)     |
|           |           | No. (%)                  | No. (%)                      |
| < 25      | 64        | 52 (81.2)                | 19 (29.7)                    |
| 25 – 29.9 | 136       | 100 (73.5)               | 22 (16.2)                    |
| ≥ 30      | 111       | 92 (82.9)                | 26 (23.4)                    |

\* = P – value= 0.171

\*\* = P – value = 0.080

**Table 5: Mean Body mass index (BMI) in relation to somatic symptoms**

| Symptoms              | Mean BMI    |       | P-value (mean) |
|-----------------------|-------------|-------|----------------|
|                       | Symptomatic |       |                |
|                       | Yes         | No    |                |
| Abdominal pain        | 28.26       | 28.98 | NS             |
| Backache, joints pain | 29.25       | 27.78 | < 0.001        |
| Palpitation           | 29.45       | 28.49 | NS             |
| Breathlessness        | 30.79       | 28.35 | < 0.05         |
| Sleep disturbance     | 29.35       | 28.52 | < 0.05         |
| Urinary incontinence  | 29.47       | 28.68 | NS             |

**Discussion:-**

In this study 56.1% and 39.3% of men and women were overweight respectively, while among obesity? It was 18.3% and 41.9% respectively. This results were significantly related to the levels of BMI and consistent with study was done in Turkmenistan (2001)<sup>(5)</sup>, they found that the prevalence of obesity and overweight ranged from 5.4% - 22.8% among men respectively and from 36.6% -17.1% among women. While another study in Uzbekistan (2004)<sup>(6)</sup>, found that consideration? BMI  $\geq$  30Kg/m<sup>2</sup> the prevalence of obesity was 7.21% in men and 21.25% in women.

Regarding medical investigations (fasting plasma glucose and fasting plasma cholesterol), they were not significant to the levels of BMI, these results were not to go with other studies done in Sweden (2008)<sup>(2)</sup>, and in Canada (2002)<sup>(7)</sup>, they found that high levels of fasting plasma glucose, lipid had increased for obesity. Another study done in United State (2007)<sup>(8)</sup>, found that a significant increasing trend towards higher prevalence of dyslipidemia as BMI increased. Regarding the somatic symptoms; the backache, joints pain, breathlessness and sleep disturbance were significantly and independently related to the mean BMI. Backache, joints pain symptoms were in line with those studies done in Japan (2002)<sup>(9)</sup> and Australia (2002)<sup>(10)</sup>, were found a significant association between having a musculoskeletal disorder and the obesity. One possible explanation for this increased risk is the sedentary life style and immobilization, which could be related to complaints from musculoskeletal organs. Breathlessness symptom was in line with study done in Brazil (2008)<sup>(11)</sup>, it was found a significant breathlessness complaint in obese respondents with a BMI between 35 and 49.99 kg/m<sup>2</sup>. One possible explanation for this condition is deleterious effects on ventilatory mechanics caused by obesity, due to probable lung compression and reduction of the diaphragm mobility in the chest, as the diaphragm is pressed upwards due to the expanded abdominal volume of obese individuals. Sleep disturbance symptom was in line with study done in United state (2000)<sup>(12)</sup>, it was found that obesity is a strong correlate of sleep-disordered breathing. Abdominal pain symptom was

inconsistent with those studies done in Sweden (2005)<sup>(13)</sup>, and United state (2004)<sup>(14)</sup>, were they found a positive relationship between BMI and the prevalence of frequent upper and lower abdominal pain. Palpitation symptom was inconsistent with study was done in United State (2004)<sup>(15)</sup>, it was found that obesity is an important, potentially modifiable risk factor for cardiac dysrhythmia. Urinary incontinence symptom was inconsistent with a study done in United State (2009)<sup>(16)</sup>, which found obesity was an established and modifiable risk factor for urinary incontinence.

Sex was significantly related to the BMI and higher proportion of males were overweight compared to females but the pattern was opposite for obesity.

There is no significant relationship between medical investigations (fasting plasma glucose and fasting plasma cholesterol) and BMI.

The following somatic symptoms (backache, joints pain, breathlessness and sleep disturbance) were significantly and independently related to the mean of BMI.

Employment of dietician and establishing a dietetics room in the Diabetic Centre for health education and for establishing plans for implementing system for monitoring overweight, obesity, dietary habits and physical activity of patients.

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