

## Assessment of relationship between pain, psychological status, quality of life and body mass index

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**ABSTRACT:** *Objective:* The purpose of the study is to evaluate health-related quality of life (HRQL), pain, the number of painful areas, and depression level; both to compare obesity level and these parameters, and to compare between obese and non-obese participants. *Materials (Subjects) and Methods:* 1875 voluntary patients were evaluated. Patients were grouped into 5 according to body mass index (BMI) values: Group 1:17-24.99kg/m<sup>2</sup>, Group 2:25-29.99kg/m<sup>2</sup>, Group 3:30-34.99kg/m<sup>2</sup>, Group 4:35-39.99kg/m<sup>2</sup>, Group 5: BMI more than 40kg/m<sup>2</sup>. Patients were asked to fulfill a questionnaire about demographic data and a number of painful areas (neck, shoulder, elbow, wrist, back, low back, knee, ankle, and temporomandibular joint). All patients were evaluated with visual analog scale (VAS), for pain, short form-36 (SF-36) for HRQL, Beck Depression Scale (BDS) for depression level. *Results:* We have included 1832 patients (460 male, and 1372 female) in the study: Group 1: 285(16%), Group 2: 623(34%), Group 3: 653(36%), Group 4: 190(10%), Group 5: 81(4%). When the groups was compared according to VAS scores during activity; all other groups was higher than group 1 (p<0.01). When the BDS scores were compared; depression levels were higher in group 5 than the other groups. When a number of painful areas were compared; groups 3,4,5 had higher values than groups 1,2, and group 2 had higher values than group 1 (p<0.001). *Conclusion:* This study evaluates pain level, the number of painful areas, physical HRQL, and depression levels of pre-obese and obese patients using VAS, BDS, and SF-36 scores and proves negative effects when compared to the healthy population. But this effect does not correlate with BMI levels.

*Keywords:* Obesity, Pain, Psychological status, Quality of life

### INTRODUCTION

Obesity is a worldwide problem which leads to several disorders with a prevalence of 7-15% in first world countries, but 33% in USA (1,2). It is estimated that there are nearly 300 million obese in the world, and this will suppose to reach twice in 2025 (3). Obesity causes many disorders like metabolic syndromes, hypertension, atherosclerosis, cardiac function failures,

diabetes type II, locomotor symptoms and so disaffects person's daily life (4).

Obesity can simply be explained as an increased body mass index (BMI) according to borderline measurements. BMI is calculated with the ratio of weight to the square of height and presented as kg/m<sup>2</sup> unit (5-7). The World Health Organization (WHO) has categorized BMI scores into three main groups: underweight (BMI

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< 18.5 kg/m<sup>2</sup>), normal weight (18.5 to < 25 kg/m<sup>2</sup>) and overweight ( $\geq$  25 kg/m<sup>2</sup>). Overweight is further subdivided into four groups: pre-obese (25 to <30 kg/m<sup>2</sup>), obese class I (30 to < 35 kg/m<sup>2</sup>), obese class II (35 to < 40 kg/m<sup>2</sup>) and obese class III ( $\geq$  40 kg/m<sup>2</sup>) (8).

The term "health" represents the status of wellness in social, physical, and psychological aspects (9). If obesity and health are taken under consideration then it can be said that obesity increases morbidity so decreases health-related quality of life (HRQL) and life capacity (10,11). HRQL includes physical activity, functional status, pain, viability, social life, and mental wellness. Studies have shown that when BMI increases, these components are affected so HRQL decreases (12-24).

The disruption of physical HRQL in obese patients was reported by many studies, but there have been different results about the interaction between a mental component of HRQL and obesity. Some studies claimed that obese patients have negative effects in mental HRQL when compared to the normal population (10,25,26), but the other some reported no relationship between BMI and mental HRQL (27,28). In common, it is possible to find decreases in mental HRQL with the patients of previous psychological disorders (29). Especially class III obese patients have more tendency to depression and mental HRQL decrease (30-32). It's clear that the depression level is not only affected with BMI but also age, sex, genetics, marriage status, family history, pain and other chronic diseases may alter it (33,34).

HRQL is apparently affected with pain level in obese patients due to arthrosis or soft tissue wounds (35), which leads to functional disability. It was reported that physical HRQL was more affected in obese patients with pain than without pain (36).

## MATERIAL AND METHODS

We have evaluated 1875 voluntary patients in our institute between 2009 and 2013. The patients older than 18 years of age with joint pain were included in the study. The exclusion criteria were: pregnancy, neurologic deficits, serious cardiovascular or metabolic diseases, pain level more than 8 up to the visual analog scale (VAS), and antidepressant usage due to psychiatric disorders. So 1832 patients were included in the study. The local institutional ethical committee approved the study.

The patients were grouped into 5 according to

BMI values: Group 1: BMI between 17-24.99 kg/m<sup>2</sup>, Group 2: BMI between 25-29.99 kg/m<sup>2</sup>, Group 3: BMI between 30-34.99 kg/m<sup>2</sup>, Group 4: BMI between 35-35.99 kg/m<sup>2</sup>, Group 5: BMI more than 40 kg/m<sup>2</sup>.

All patients were asked to fulfill a questionnaire about demographic data (age, sex, education level, occupation), and a number of painful areas (neck, shoulder, elbow, wrist, back, low back, knee, ankle, and temporomandibular joint).

Painful areas were numbered according to the pain answers: yes or no. The Same physician measured patients' heights with a 0.5 cm sensitive wall-mounted stadiometer, and patients' weights with a 0.1 kg sensitive calibrated balance scale while the patients wearing no shoes and only light clothing. Then the BMI values were calculated. All patients were elucidated about the study and signed an informed consent form.

## Evaluation Criteria

All patients were evaluated with VAS (37,38) for pain, short form-36 (SF-36) for HRQL (39,41), Beck Depression Scale (BDS) for depression level (42-44).

**Pain:** Patients were asked to score joint pain between 0 to 10 (0: no pain, 10: worst pain ever) that happened during movements in last 7 days (37,38).

**Functional status:** The SF-36 assesses eight health domains; limitations in physical activities because of health problems; reductions in usual role activities attributable to physical or emotional problems; limitations in usual role activities because of physical health problems; bodily pain; general mental health (i.e. psychological distress and wellbeing); limitations in role activities because of emotional problems; vitality (i.e., energy and fatigue); and general health perceptions (45).

A scoring algorithm was used to transform the sum of the SF-36 item scores within each dimension to a scale ranging from 0 (poor health) to 100 (good health) (39-41).

**Depression level:** BDS is a questionnaire of 21 questions in which the patients were asked to choose the most appropriate sentences for themselves. Every question is composed of 4 sentences arranged through neutral position (0 points) to worst position (3 points). The maximum score can be 63. While a score  $\leq$  16 means normal, it is depression if  $\geq$  17 (42-44).

## RESULTS

We have included 1832 patients (460 male, and 1372 female) in the study: Group 1: 285 patients (16%),

**Table 1.** Demographical data of each group

	<b>Group 1</b> (BMI 17-24,99) n=285	<b>Group 2</b> (BMI 25-29,99) n=623	<b>Group 3</b> (BMI 30-34,99) n=653	<b>Group 4</b> (BMI 35-39,99) n=190	<b>Group 5</b> (BMI ≥ 40) n=81
Age (Mean±Sd)	49.5±11.5	49.4±14.5	51.8±11.9	51.3±11.0	51.7±8.9
Gender* (%)					
Male	26	33.6	23.4	13.2	6.2
Female	74	67.4	76.6	86.8	93.8
Education* (%)					
None	23.5	19.7	23.3	27.9	25.9
Preliminary	11.9	45.6	54.1	58.4	65.4
High school	49.4	24.3	16.6	10.5	4.9
University	15.2	10.4	6	3.2	3.8
Occupation* (%)					
House wife	20.3	62	70.8	83.7	88.9
Professional	20.7	13.6	9.2	4.1	3.5
Bodily work	41.2	17.1	12.3	6.6	5.3
Self employed	17.8	7.3	7.7	5.6	2.3

Sd: Standard deviation, \* : p<0,05

**Table 2.** SF-36 scores of each group

<b>SF-36</b>	<b>Group 1</b> (BMI 17-24,99)	<b>Group 2</b> (BMI 25-29,99)	<b>Group 3</b> (BMI 30-34,99)	<b>Group 4</b> (BMI 35-39,99)	<b>Group 5</b> (BMI ≥ 40)	<b>P</b> <b>values</b>
<b>PF</b>	66.1±24.1	47.0±26.8 °	41.1±23.8 ° <sup>1</sup>	40.2±22.5 ° <sup>1</sup>	32.4±20.7 ° <sup>12</sup>	<b>0.001</b>
<b>Role</b>	48.6±43.1	36.3±45.6 °	28.4±42.3 ° <sup>1</sup>	27.6±43.6 ° <sup>1</sup>	18.2±37.2 ° <sup>1</sup>	<b>0.001</b>
<b>Pain</b>	45.1±19.3	51.2±11.4 °	52.9±12.9 °	53.7±12.9	56.5±14.3 ° <sup>12</sup>	<b>0.001</b>
<b>GH</b>	53.7±13.9	55.1±15.5	53.6±15.0	51.9±14.3	51.3±14.0	<b>0.026</b>
<b>PC</b>	53.3±13.9	47.4±18 °	43.6±16.3 ° <sup>1</sup>	42±16.6 ° <sup>1</sup>	39.6±15.1 ° <sup>1</sup>	<b>0.001</b>
<b>Energy</b>	48.2±14.0	41.3±19.2 °	41.2±18.9 °	39.1±18.1 °	38.2±19.9 °	<b>0.001</b>
<b>Social</b>	47.1±16.1	48.3±11.6	48.4±10.1	46.3±10.1	48.9±8.8	<b>0.021</b>
<b>Emotion</b>	50.5±42.6	48.7±47.5	49.9±50.7	53.6±47.5	41.9±46.2 °	<b>0.001</b>
<b>Mental</b>	42.3±14.7	41.8±14.5	40.5±14.3	40.2±14.7	38.0±13.2	<b>0.018</b>
<b>MC</b>	47±15.2	47±16.8	45±16.8	44.7±16.9	43±16.6	<b>0.024</b>

Physical function: PF, General Health: GH, Physical Component: PC, Mental component: MC

°; compared to group 1 p<0.05. <sup>1</sup>; compared to 2 p<0.05, <sup>2</sup>; compared to 3 p<0.05, <sup>3</sup>; compared to 4 p<0.05

**Table 3.** Number of painful areas, VAS, BDS scores of each group

	<b>Group 1</b> (17-24,99)	<b>Group 2</b> (25-29,99)	<b>Group 3</b> (30-34,99)	<b>Group 4</b> (35-39,99)	<b>Group 5</b> (BMI ≥ 40)	<b>P</b> <b>values</b>
<b>NPA</b>	2.4±1.1	3.6±1.9	3.9±2.1 ° <sup>1</sup>	3.8±2 ° <sup>1</sup>	4.3±1.9 ° <sup>1</sup>	<b>0,001</b>
<b>VAS*</b>	5.3±2.7	5.7±1.6	5.9±1.6	5.7±1.9,0	6.1±1.9	<b>0,01</b>
<b>BDS**</b>	14.0±10.1	13.7±7.4	14.9±6.7 ° <sup>1</sup>	15.6±8.6 ° <sup>1</sup>	17.9±7.6 ° <sup>123</sup>	<b>0,001</b>

NPA: Number of painful areas, VAS: Visual analog scale, BDS: Beck depression scale

°; for group 1 p<0,05 <sup>1</sup>; for group 2 p<0,05 <sup>2</sup>; for group 3 p<0,05 <sup>3</sup>; for group 4 p<0,05

Group 2: 623 patients (34%), Group 3: 653 patients (36%), Group 4: 190 patients (10%), and Group 5: 81 patients (4%).

Age, sex, the occupational and educational status of each group are summarized in table 1. While no significant difference was apparent among ages; sex, occupational and educational status had statistically significant differences.

Table 2 summarizes the mean values of SF-36 scores. When physical component took into account; group 2 was worse than group 1, and groups 3,4,5 were worse than groups 1,2 statistically ( $p < 0.001$ ). And according to a mental component, there was no statistically significant difference among all groups ( $p > 0.05$ ).

When two groups were compared according to VAS scores during activity; groups 2,3,4,5 were higher than group 1 ( $p < 0.01$ ). When the BDS scores were compared; depression levels were higher in group 5 than groups 1,2,3,4 and in groups 3,4 than groups 1,2 ( $p < 0.001$ ). When a number of painful areas were compared; groups 3,4,5 had higher values than groups 1,2, and group 2 had higher values than group 1 ( $p < 0.001$ ). Table 3 summarizes the number of painful areas, VAS and BDS scores.

## DISCUSSION

This present study deals with 1832 patients which were grouped into 5 according to BMI scores. While groups were homogenous in ages, they were different in sex, occupation, and educational status. Female patients crowded in each group. Higher the educational status increased, lower the obesity rates decreased. Most pre-obese and obese ones were housewives. While there was no difference for mental components among groups, physical components were worse in pre-obese and obese gradually, than healthy ones via SF-36 scoring for HRQL. Pain intensity was higher in obese population than healthy ones according to VAS scoring. A likely number of painful areas were increasing with weight. When depression levels were evaluated with BDS class III obese patients got the worst scores.

Most of the previous studies have investigated the relationship between BMI and HRQL. But in this study we aimed to evaluate HRQL, pain level, the number of painful areas, and depression level; both to compare obesity level and these parameters, and to compare between obese and non-obese ones.

Obesity is a rapidly increasing social problem that affects life quality, psychological wellness, and func-

tional capability via causing several morbidities. The term "life quality" can be depicted as the self-sufficiency of any person in work or self-activities despite the physical, psychological or economic burden of a specific illness (46). Obesity diminishes the activity, so decreases work success and influences the physical HRQL negatively (13,14).

Gaining fat after puberty is more common in girls than boys. Pregnancy and lactation are natural fat-collection periods. So, in general, obesity is more frequent among females. Less activity, less collaboration in work disaffects females' HRQL more than males (48-50).

Facing with food all the day for a housewife inevitably increases fat intake. Besides overworking with heavy weight increases pain, and decreases HRQL. Even hard occupation may stir up pain, the scores of pain, depression level, the number of painful areas, and physical HRQL are worse in obese and pre-obese patients which in terms supports the thought of weight-effect over degenerative pain. Our study also proved female dominance for obesity in all BMI groups.

Several studies have reported negative impacts of lower socioeconomic and educational status on HRQL (51-53). Our results also support the illation of poorer scores in less-educated patients. It can be concluded that malnutrition and uncontrolled weight are more common in less educated people, that's because education builds up sensitivity and consciousness against malnutrition.

SF-36 is an easy and reliable method to assess HRQL (54,55) which is proven to be consistent and valid (56). It shows general health status in mental and physical forms (57,58). Many studies have used SF-36 for evaluating health condition in obese patients (59-61). We also preferred to utilize SF-36 within the lightings of the literature.

Two systematic reviews about HRQL in obese patients in 1995 and 2001 reported a strict relation between BMI and physical/mental HRQL (25,62). A metanalysis including 8 studies about life quality in obese patients with SF-36 showed that BMI influences the physical quality of lie in all obese patients, but the mental quality of life is just worse in class III obese patients (63). This analysis reported better mental HRQL in overweight people than the normal population. The reason is not yet fully understood (48). Obesity decreases physical HRQL scores, but this is

not in direct proportion probably due to other factors affecting HRQL rather than BMI. Similar results were found in our study.

BMI and mental HRQL relation are a debatable issue. Some studies have reported worse HRQL scores when BMI increased (25,64,65), but others reported no significant relationship (21,66,67). Doll et al. concluded that emotional wellness is not affected with obesity level (13). But if the patient has any chronic disease this changes.

Wadden and Stunkard reported bad psychological status in obese patients especially when comorbidity exists (25). Depressive emotion and/or high anxiety levels are the most common psychological disorders among obese patients (70), which later on increase physical symptoms and functional disturbance (50). Psychopathology can be accepted as the main factor that affects physical and psychological HRQL components (71-73). We also observed a negative effect of obesity on psychological status.

Simon et al. reported anxiety and eating disorders in 25% of obese patients (74). Carpenter et al. showed increased the prevalence of major depression, suicide attack, and suicidal thoughts in overweight females; but in contrary these were decreasing in males with weight (48). Moreira et al. reported obesity itself is an independent risk factor for increasing the prevalence of depressive symptoms and serious emotional disorders for females in Brazil (75). Female gender, alcohol abuse, and obesity levels were proven to be specific risk factors for psychopathologic disorders; but not only for obese patients, non-obese patients are also at risk in the existence of these factors (76). In our study, alcohol abuse was not common among females mostly due to cultural obligations.

Pain is obviously a negative factor for HRQL in obese patients due to excessive loading on the musculoskeletal system. Barofsky et al. reported better HRQL levels in patients who do not have pain than painful ones (36). Vertical overload to the spinal system increases subchondral degenerative sclerosis and intradiscal pressure, then spondylosis and lumbar hyperlordosis develop (81). In physically active population, a relationship between fatty mass and musculoskeletal injury and pain has been reported (82-84). In obese patients, load-increasing-activities like walking stimulates locomotor pain (85).

We observed that a reason for immobilization in obese people was this motion-stimulated pain. Some-

how it forms a vicious circle: pain induces immobilization, immobilization eases fat-gain, fat-gain increases BMI, and higher the BMI higher the complaints.

Not only lower extremity joints but also upper extremities can be affected in obese patients (35,83,86,87). Lately, some studies have proved increased fracture and osteoarthritis risk, and negative effects on soft tissues like tendon, fascia and cartilage in obese patients (35,88). The level of pain and number of painful areas also increase with obesity level, but interestingly not only in weight-bearing lower extremities but also in other joints (89,90). We also found similar results, which in terms may prove a systemic interrelationship of pain and inflammatory mediators in all body.

Hooper et al. reported decreased pain levels in patients who were undergone surgery to lose weight (91). Apart from current studies so far, our study does not only evaluate pain level but it also searches the number of painful areas. And we found higher numbers in higher weights. So any attending physician must be aware of coexistence of obesity and increased pain in overweighted patients in terms of prophylactic medicine like weight control, exercise, and modification of daily activities.

In our study, we didn't observe a relationship between BMI level and mental HRQL. This may be due to lacked sensitivity of measurement methods for mental HRQL in overweight patients (68). Besides some cultures accept obesity as a symbol of happy life (69). Every year overweight prevalence increases so the society begins to concede it normal, which in terms eases self-acceptance of weight.

We found the direct relationship between BMI and depression levels in our female dominant study. Likely, Sullivan et al. reported distinctive anxious and depressive symptoms in females who have BMI scores  $\geq 35$  kg/m<sup>2</sup> (77). Obesity, depression level, and life quality have a reversible relationship within each other. More fat obese patients lose, more decreased depression levels and higher HRQL they get (15,78-80).

This study apart from the previous ones has a unique specification: taking into account of the number of painful areas. So looking for the relationship between groups and number of painful areas is one of the aims of this study. More or the less it was hypothesized that obese people have more pain, more painful areas, lower life qualities, and lower mental conditions.



Our study has some limitations: groups are not homogeneous for age, sex, and educational status. If they were homogenous, then BMI could be evaluated as an independent risk factor for HRQL, pain level, the number of painful areas, and depression level. The other limitation is overlooking for comorbid diseases in the patients because comorbidities can affect HRQL, pain, and depression levels apparently.

### Limitations

The patients with wide range of diagnosis and severe diseases such as inflammatory arthritis were included in the study. But the patients with severe pain (VAS > 8) were excluded from the study according to exclusion criteria's. So the influence of the severe pain scores on mood changes was shifted. Another limitation of this study is that the participants were not evaluated about their dietary habits and there were no evaluation criteria according to their anthropometric parameters.

### CONCLUSION

This study evaluates pain level, the number of painful areas, physical HRQL, and depression levels of pre-

obese and obese patients using VAS, BDS, and SF-36 scores and proves negative effects when compared to the healthy population. But this effect does not correlate with BMI levels. This may be because of heterogeneity of groups for age, sex, and educational status. An increased number of overweight and obese patients in the population may ease normalization of this condition. But this is for sure that obesity disaffects physical HRQL and increases depression level, pain level and a number of painful areas. These factors build a fast circle triggering each other. The way to break this circle is weight control. If pain level and the number of painful areas decrease, then physical HRQL improves and depression level diminishes. All pre-obese and obese patients must be considered under these risk factors and therapeutic regimens should include prophylactic precautions.

**Acknowledgment:** No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article. We confirm that this manuscript has not been published elsewhere and is not under consideration by another journal.

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