

Self-perception: Does Obesity Influence Quality of Life

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Research

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Abstract

Background: The number of obese and overweight people around the world rapidly grows and takes on epidemic proportions. Obesity has become one of the leading causes of death although it can be prevented. The **aim** of this research is to determine the influence of body weight on quality of life and to investigate our patients' consciousness about their body weight and its impact on their quality of life.

Methods: The cross-sectional study was conducted by interviewing 1067 respondents, using the WHOQOL-BREF questionnaire.

Results: Out of 1067 patients, 684 were females. 65.5 % of patients had BMI ≥ 25 kg/m². 21.7 % of 699 patients who had BMI ≥ 25 kg/m² think that their increased body weight doesn't affect their health, 27.9 % of respondents think that their overweight is unrelated to physical activity, 41.8 % of respondents have no problems purchasing the clothes due to their weight and 31.6 % of respondents with BMI ≥ 25 kg/m² think that it doesn't affect their quality of life.

Conclusion: Quality of life is significantly better in respondents with BMI < 25 kg/m². The alarming result is that slightly less than half of respondents think that overweight doesn't affect their health and don't understand the seriousness of the problem.

Background

Obesity has become one of the leading causes of mortality even though it is preventable through the vision of public health. More than 1.9 people worldwide were overweight and at least 650 million were obese in 2016. The prevalence of obesity and overweight was highest in the WHO Regions of the Americas (62% of overweight in both genders, and 26% of obese) and lowest in the WHO Region of South East Asia (14% of overweight in both genders and 3% of obese). In the WHO Regions of Europe, the Eastern Mediterranean and the Americas over 50% of women were overweight. For all three of these regions, roughly half of overweight women were obese (23% in Europe, 24% in the Eastern Mediterranean, 29% in the Americas). In all WHO regions women were more likely to be obese than men (1-2).

Obesity is associated with numerous chronic conditions such as hyperlipidemia, non-insulin-dependent diabetes, hypertension and coronary artery disease (1-2) and contributes to higher morbidity and mortality (3-4).

Less is known about the impact of obesity on status and health-related life quality (HRQoL) (2,4-5). HRQoL is an important health outcome used to measure how health conditions affect an individual's subjective assessment of physical, social and psychological well-being (5). Numerous published studies indicate that obesity impairs HRQoL and that higher obesity degrees are associated with greater impairment (2).

The discussion about the potential dangers of extreme underweight has received disproportionate attention in cultures where obesity and overweight are far more prevalent (6). The number of obese and overweight people in developed and developing countries around the world rapidly grows and takes epidemic proportions due to the imbalance between diet and physical activity (7).

It remains controversial whether or not obesity is associated with impaired mental HRQoL. Studies in Asian countries reported that excess weight was related to worse physical but not mental HRQoL, while being underweight correlated with worse overall HRQoL (5).

Body mass index (BMI), a measure showing the status of nutrition in adults, is the most commonly used tool for the correlation of risk of developing health problems with the body weight. It's defined as the ratio of weight in kilograms

and the person's square of height in meters (kg/m^2). Values of recommended BMI are the same for both genders (8). Cardiovascular risk is significantly lower in BMI $<25 \text{ kg}/\text{m}^2$ compared to the higher values of BMI (9). The risk of mortality of all causes, cardiovascular diseases, cancer or other diseases, is higher through the range of moderate and severe obesity for men and women in all age groups (10). Insulin resistance, elevated blood parameters of lipid metabolism and sympathetic nervous system disorders are considered to be associated with obesity (11). Numerous epidemiological studies in different countries worldwide have shown that, related to socio-economic conditions and diet, there is a direct correlation between the concentration of blood cholesterol and mortality caused by coronary heart disease (12). Obesity is also a significant factor for the development of insulin resistance (13).

Previous research works examined the impact of body weight on quality of life, but in the available literature we found very little data related to the consciousness and self-perception of patients when it comes to overweight.

The **aim** of this research is to determine the influence of body weight on quality of life and to investigate our patients' consciousness about their body weight and its impact on their quality of life.

Ethical considerations: The approval for the research conduction has been obtained from the Ethical Committee of Health Care Center Mostar. After explaining the purpose and aims of the research, only the patients' oral consent was obtained for inclusion in the study.

Methods

The research has been designed as cross-sectional and was conducted by interviewing respondents using the two questionnaires. The first questionnaire included basic information about the patient: age, gender, work and marital status, body weight and height, BMI, self-assessment of the body weight's impact on the health and quality of life. The second questionnaire evaluated the quality of life (WHOQoL-BREF). We have conducted the pilot study on 232 respondents with the purpose of the questionnaire validation, and based on those answers the questionnaire was updated.

Interviewing was conducted during one month of September 2019 in 10 outpatient clinics of Health Care Center Mostar. All the patients who visited the outpatient clinic in that period were interviewed, regardless of the reason for the visit. Patients with severe mental illnesses (severe depression, schizophrenia, mental retardation or impaired development), cancer (within 5 years of illness development), impaired cognition, pregnant women, handicapped patients and people who did not want to participate were excluded from the study. Overall, 1300 questionnaires were distributed, and 1067 were valid for analysis. The response rate was 82.08 %.

Respondents were divided into categories by gender, age in decades (from 30 to 70 and more), education degree (elementary, high school, college and faculty), marital status (married or other) and working status (employed, unemployed/employment bureau, retired). Results were observed in all individual groups.

Respondents were provided with an informational sheet to be familiarized with the research aims to which they have given their consent. The researcher filled the socio-demographic data (age, gender, education degree, working and marital status) based on patient's statement. Further, anthropometric measurements, height and weight, were performed and BMI was calculated. Respondents were categorized by BMI into the following groups: BMI $<18.5 \text{ kg}/\text{m}^2$, BMI $18.5 - 24.9 \text{ kg}/\text{m}^2$, BMI $25 - 29.9 \text{ kg}/\text{m}^2$, BMI $30 - 34.9 \text{ kg}/\text{m}^2$ and BMI $>35 \text{ kg}/\text{m}^2$ (14).

To evaluate the quality of life, the World Health Organization WHOQoL-BREF questionnaire, consisting of 26 questions with structured responses on a Likert scale of five points, was used. The questionnaire was self-administered, based on the perception of the last two weeks. Of the 26 questions, 24 questions comprise the physical, psychological, social and

environmental domains and the other two assess the perception of quality of life and patient's health (15-16). The physical domain includes the questions related to daily activities such as pain and discomfort, energy and fatigue, sleep and rest, dependence on the medications, work and mobility. The psychological domain consists of questions regarding the positive and negative feelings, meaning of life, self-esteem, body image, physical appearance, personal beliefs and ability to concentrate. The domain of social relationship is related to personal relationships, social support and sexual activity. The environmental domain investigates the physical security and safety, financial resources, physical and home environment, availability of health and social care, leisure activities, opportunities for new information and skills acquisition as well as opportunities for recreation and transport and participation in those.

Statistical analysis

The collected data were analyzed in Microsoft Excel 2007 (Microsoft Corporation, Redmond, WA, USA) and SPSS for Windows (version 17.0., SPSS Inc. Chicago, Illinois, USA). Descriptive analyses were performed including absolute frequencies, relative frequencies (percentages, %), means (M) and standard deviations (SD). Cronbach's alpha (internal consistency index) was used to estimate the reliability of the WHOQoL-BREF (Cronbach's alpha values of 0.70 and over were deemed acceptable). Pearson's correlation coefficient was used to investigate the correlation between BMI and QoL domains.

Independent t-test and ANOVA were used to investigate the difference in QoL regarding participants' socio-demographic characteristics. Original scores of QoL domains were used for statistical analyses. The level of significance was set at $p < 0.05$. P values that cannot be expressed up to three decimal places are shown as $p < 0.001$.

The Cronbach's alpha coefficient of WHOQoL-BREF in general and of their domains was adequate: 0.935 for all 26 questions, 0.928 for 24 questions, 0.862 for Physical health domain, 0.843 for Mental health domain, 0.686 for Social relationship domain and 0.810 for Environmental health domain. There are statistically significant correlations between overall QoL, overall health and all QoL domains (Table 1).

Table1 Correlations between overall QoL, overall health and four domains of WHO QoL-BREF

		Overall Health	Physical Health	Mental Health	SocialRelationship	Environment
OverallQoL	R	.588**	.555**	.639**	.484**	.596**
	p	<0.001	<0.001	<0.001	<0.001	<0.001
	N	1066	1066	1063	877	1031
OverallHealth	R		.690**	.622**	.431**	.510**
	p		<0.001	<0.001	<0.001	<0.001
	N		1067	1064	877	1032
PhysicalHealth	R			.722**	.555**	.621**
	p			<0.001	<0.001	<0.001
	N			1064	877	1032
PsychologicalHealth	R				.667**	.691**
	p				<0.001	<0.001
	N				874	1029
Socialrelationship	R					.550**
	p					<0.001
	N					862
R-Pearson Correlation						
**.Correlation is significant at the 0.01 level (2-tailed)						

Results

Participant characteristics

Out of 1067 patients, 383 were males and 684 females. Most of the patients were older than 50 years, had a high school degree and were married and retired (Table 2). BMI ≥ 25 kg/m² was found in 65.5 % of patients. Only 8 patients had a BMI < 18 kg/m² so they were merged with patients with a normal BMI for the purpose of the analysis. BMI in range 18.5-24.9 kg/m² was found in 360 patients (BMI < 25 kg/m² overall 368 patients), 426 patients were overweight (BMI 25-29.9 kg/m²), BMI 30-34.9 kg/m² had been determined in 213 patients, and BMI > 35 kg/m² in 60 patients.

Table2 Socio-demographic data

	Number(%)ofpatients			BMI (kg/m ²)		
	total	BMI<25	BMI≥25	25-29.9	30–34.9	>35
Gender						
M	383(35.9)	109(29.6)	274(39.2)	167(39.2)	86(40.4)	21(35.0)
F	684(64.1)	259(70.4)	425(60.8)	259(60.8)	127(59.6)	39(65.0)
Age						
30-40	171(16.0)	102(27.7)	69(9.9)	46(10.8)	21(9.9)	2(3.3)
41-50	165(15.5)	70(19.0)	95(13.6)	64(15.0)	23(10.8)	8(13.3)
51-60	249(23.3)	68(18.5)	181(25.9)	108(25.4)	59(27.7)	14(23.3)
61-70	236(22.1)	63(17.1)	173(24.7)	95(22.3)	53(24.9)	25(41.7)
>70	246(23.1)	65(17.7)	181(25.9)	113(26.5)	57(26.8)	11(18.3)
Education						
Elementary school	142(13.3)	28(7.6)	114(16.3)	54(12.7)	45(21.1)	15(25.0)
Highschool	605(56.7)	212(57.6)	393(56.2)	236(55.4)	122(57.3)	35(58.3)
College	320(30.0)	128(34.8)	192(27.5)	136(31.9)	46(21.6)	10(16.7)
Employment						
Unemployed	245(23.0)	101(27.4)	144(20.6)	81(19.0)	48(22.5)	15(25.0)
Employed	359(33.6)	152(41.3)	207(29.6)	138(32.4)	57(26.8)	12(20.0)
Retired	463(43.4)	115(31.2)	348(49.8)	207(48.6)	108(50.7)	33(55.0)
Marriage						
Yes	654(61.3)	218(59.2)	436(62.4)	270(63.4)	132(62.0)	34(56.7)
Other	413(38.7)	150(40.8)	263(37.6)	156(36.6)	81(38.0)	26(43.3)

The impact of body weight on the perception of ...

... **health**: Out of 699 respondents with BMI ≥ 25 kg/m², 21.7% think that their excessive weight does not affect their health, 22% that it has mild impact on their health, 35.9 % that it has moderate impact, and 20.3% think that it has high impact on their health.

... **physical activity**: 27.9% respondents think that their overweight is unrelated to the physical activity, 24.7% that it has a weak correlation, 32 % moderate correlation, and 15.3% of them think that overweight has a strong impact on their physical activity.

... **choice when buying clothes**: 41.8% of respondents do not have problems due to their overweight when buying clothes, 37.8% sometimes have a problem, 12.6% usually have a problem, while 7.9% of respondents always have a problem when buying clothes due to their excessive weight.

... **quality of life:** 31.6% of respondents with BMI ≥ 25 kg/m² think that overweight does not affect the quality of life, 26.5% think that it has a mild impact on quality of life, 29.2% think that it has a moderate impact, while 12.7% think that overweight has a high impact on quality of life.

Comparison of the quality of life in two BMI groups (BMI <25 kg/m² and BMI ≥ 25 kg/m²)

Significant difference regarding the BMI has been found in all domains of the WHOQoL-Bref questionnaire as well as in the assessment of the quality of life and satisfaction with health (Table 3). Significantly, respondents with BMI <25 kg/m², assess their quality of life as better and are more satisfied with their physical and mental health, social relations and environment than respondents with BMI ≥ 25 kg/m².

A significant negative correlation in the group with BMI <25 kg/m² has been found between BMI and psychological health (Table 3). In subgroups of respondents with BMI ≥ 25 kg/m², a significant negative correlation has been found between BMI and all four domains of quality of life (physical and psychological health, social relations and environment), as well as between BMI and assessment of quality of life and satisfaction with health. A negative sign of the correlation coefficient indicates that an increase in body weight has a negative impact on all domains of quality of life.

Table3 Comparison of Quality of Life and correlation with BMI according to BMI classification

BMI (kg/m ²)		Overall QoL	Overall Health	QoL Domains			
				Physical Health	Mental Health	Social Relationship	Environment
<25	M(SD)	3.8(0.7)	3.8(0.8)	27.1(4.9)	23.1(3.8)	12.0(2.1)	30.2(5.0)
≥25	M(SD)	3.6(0.8)	3.4(0.8)	25.5(5.0)	21.7(4.1)	11.1(2.3)	29.1(5.0)
	t-test (pvalue)	5.285 (<0.001)	7.919 (<0.001)	5.200 (<0.001)	5.713 (<0.001)	5.443 (<0.001)	3.390 (0.001)
<25	R	0.008	-0.006	-0.088	-0.103*	-0.109	-0.045
	p	0.875	0.907	0.094	0.050	0.056	0.398
	N	368	368	368	367	311	361
≥25	R	-0.149**	-0.112**	-0.189**	-0.177**	-0.119**	-0.136**
	p	<0.001	0.003	<0.001	<0.001	0.005	<0.001
	N	698	699	699	697	566	671
A:<25	M(SD)	3.8(0.7)	3.8(0.8)	27.1(4.9)	23.1(3.8)	12.0(2.1)	30.2(5.0)
B:25.01-30	M(SD)	3.6(0.7)	3.4(0.8)	26.2(4.7)	22.1(3.9)	11.2(2.2)	29.6(4.9)
C:30.01-35	M(SD)	3.5(0.8)	3.3(0.9)	24.7(5.1)	21.2(4.3)	11.0(2.4)	28.4(4.9)
D:>35	M(SD)	3.4(0.9)	3.1(0.8)	23.4(5.7)	20.3(4.7)	10.5(2.6)	27.9(5.3)
	ANOVA F statistic (pvalue)	13.044 (<0.001)	23.307 (<0.001)	17.187(<0.001)	16.151(<0.001)	11.850(<0.001)	7.733 (<0.001)
	PostHoc test	A-B;A-C; A-D;B-C	A-B;A-C; A-D;B-D	A-B;A-C; A-D;B-C; B-D	A-B;A-C; A-D;B-D	A-B;A-C; A-D;	A-C; A-D;B-C
25.01-30	R	-0.049	-0.001	-0.037	-0.062	-0.045	0.025
	p	0.311	0.991	0.450	0.202	0.398	0.618
	N	426	426	426	425	353	411
30.01-35	R	-0.062	0.016	-0.064	-0.084	-0.088	-0.126
	p	0.366	0.820	0.353	0.225	0.266	0.074
	N	212	213	213	212	160	200
>35	R	-0.277*	-0.203	-0.170	-0.312*	-0.115	-0.185
	p	0.032	0.120	0.193	0.015	0.414	0.156
	N	60	60	60	60	53	60

M(SD) – Mean(Standard Deviation); R – Pearson Correlation;

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

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

Characteristics of participants with BMI $\geq 25\text{kg/m}^2$

Among the obese (BMI $> 25\text{kg/m}^2$) there are significantly more women ($\chi^2 = 32.619$, $df = 1$, $p < 0.001$), persons over the age of 50 ($\chi^2 = 82.381$; $df = 4$; $p < 0.001$), with a high school degree ($\chi^2 = 93.657$; $df = 2$; $p < 0.001$) and married ($\chi^2 = 42.817$; $df = 1$; $p < 0.001$).

Comparison of quality of life in respondents of four BMI groups

Significant difference regarding the BMI has been found in all domains of WHOQoL-Bref questionnaire (physical and psychological health, social relations and environment), as well as in the assessment of quality of life and satisfaction with health (Table 3).

Analyzing the correlation in subgroups of respondents with BMI $\geq 25\text{ kg/m}^2$, significant negative correlation has been determined only in respondents with BMI $> 35\text{ kg/m}^2$ between BMI and quality of life and BMI and psychological health (Table 3).

Quality of life in respondents with BMI $\geq 25\text{kg/m}^2$ – differences by socio-demographic characteristics

Analyzing the quality of life in respondents with BMI $\geq 25\text{ kg/m}^2$, we have found a significant difference regarding the gender in psychological health (better rates are determined in women). Regarding the age, education degree and working status, there is a significant difference in all four domains of quality of life (physical and psychological health, social relations and environment) as well as in assessment of quality of life and satisfaction with health (younger respondents are more satisfied, with a higher education degree and work for those who are employed). Regarding marital status, we have not found a significant difference only in satisfaction with health (married respondents are more satisfied) (Table 4).

Table 4 Differences in the quality of life in patients with BMI ≥ 25 regarding socio-demographic characteristics

	M (SD)					
	Overall QoL	Overall Health	Physical Health	Mental Health	Social Relationship	Environment
Gender						
M	3.60 (0.73)	3.43 (0.84)	25.59 (4.84)	22.08 (4.12)	11.20 (2.27)	29.45 (4.90)
F	3.54 (0.78)	3.34 (0.85)	25.40 (5.07)	21.41 (4.09)	11.04 (2.29)	28.86 (5.03)
t test (p value)	1.114 (0.266)	1.387 (0.166)	0.474 (0.636)	2.093 (0.037)	0.822 (0.411)	1.485 (0.138)
Age						
A: 30-40	3.84 (0.68)	3.75 (0.81)	28.28 (4.70)	23.49 (4.09)	12.04 (2.36)	30.26 (4.55)
B: 41-50	3.74 (0.76)	3.56 (0.73)	27.12 (3.49)	23.41 (3.49)	12.34 (1.70)	30.09 (4.72)
C: 51-60	3.51 (0.74)	3.43 (0.72)	25.98 (4.33)	21.43 (3.81)	11.03 (2.11)	29.04 (4.81)
D: 61-70	3.52 (0.79)	3.32 (0.88)	25.10 (5.04)	21.16 (4.38)	10.62 (2.34)	28.75 (5.44)
E: >70	3.47 (0.75)	3.15 (0.93)	23.40 (5.41)	20.80 (4.00)	10.24 (2.22)	28.44 (4.93)
ANOVA F statistic (p value)	4.731 (0.001)	8.470 (<0.001)	18.268 (<0.001)	11.119 (<0.001)	16.810 (<0.001)	2.807 (0.025)
Post hoc test	A-C; A-E	A-C; A-D; A-E; B-E; C-E;	A-C; A-D; A-E; B-D; B-E; C-E; D-E;	A-C; A-D; A-E; B-C; B-D; B-E;	A-C; A-D; A-E; B-C; B-D; B-E;	A-D; A-E; B-D; B-E;
Education						
A: Elementary school	3.46 (0.81)	3.21 (0.96)	23.14 (5.56)	20.18 (4.62)	10.25 (2.66)	26.94 (5.33)
B: High school	3.49 (0.76)	3.33 (0.84)	25.44 (4.94)	21.41 (4.11)	11.16 (2.14)	28.75 (4.84)
C: College	3.78 (0.68)	3.57 (0.74)	26.94 (4.11)	23.08 (3.32)	11.41 (2.27)	31.09 (4.37)
ANOVA F statistic (p value)	10.621 (<0.001)	8.053 (<0.001)	22.082 (<0.001)	20.693 (<0.001)	7.188 (0.001)	27.590 (<0.001)
Post-hoc test	A-C; B-C	A-C; B-C	A-B; A-C; B-C	A-B; A-C; B-C	A-B; A-C	A-B; A-C; B-C

Employment						
A: Unemployed	3.53 (0.69)	3.45 (0.68)	25.76 (4.44)	21.38 (3.88)	11.19 (2.29)	28.28 (4.53)
B: Employed	3.76 (0.75)	3.61 (0.78)	27.57 (3.91)	23.16 (3.78)	11.87 (2.07)	30.35 (4.70)
C: Retired	3.46 (0.77)	3.21 (0.91)	24.11 (5.31)	20.91 (4.17)	10.49 (2.26)	28.66 (5.22)
ANOVA F statistic (p value)	10.359 (<0.001)	16.147 (<0.001)	34.572 (<0.001)	20.818 (<0.001)	21.640 (<0.001)	9.859 (<0.001)
Post-hoc test	A-B; B-C	A-C; B-C	A-B; A-C; B-C	A-B; B-C	A-B; A-C; B-C	A-B; B-C
Marriage						
Yes	3.63 (0.76)	3.40 (0.83)	25.88 (4.91)	22.10 (4.01)	11.38 (2.12)	29.44 (4.93)
Other	3.46 (0.76)	3.34 (0.87)	24.81 (5.03)	20.97 (4.18)	10.53 (2.52)	28.49 (5.04)
t test (p value)	2.944 (0.003)	0.989 (0.323)	2.778 (0.006)	3.528 (<0.001)	4.177 (<0.001)	2.378 (0.018)
M (SD) – mean (standard deviation)						

Discussion

In the investigated sample, 34.5% of respondents had a normal body weight, which is not a departure from the results published in the Report of the health condition of the population in the Federation of Bosnia and Herzegovina from 2018 (17). Unlike our results, the Swiss state that 76.3% of young men in their sample have a normal body weight (3). In Japan there are 75.7% of those with normal body weight (5), Turks 35.8% (2), Americans (Pennsylvania) 42% of women and 53% of men (18), and Serbs 46.6% of men and 22.1% of women (19). Such differences are the result of dietary habits and culture and differences in lifestyle associated with risky behavior.

More than a fifth of our respondents are not aware of the problem with their obesity, which is better than the results published by Muda et al. (20). They found that 66.7% of their respondents (housewives) assessed their health as very good or good, and more than half said that obesity symbolizes happiness. This difference may be a result of a different sample. Tchicaya et al. suggest a significant improvement in both physical and mental health in subjects reporting weight loss compared to those who did not lose weight (21). More than 31% of respondents think that overweight does not affect the quality of life. However, Yan et al. proved that compared to normal-weight persons, obese men and women had a higher prevalence of most chronic diseases. Underweight individuals, especially men, also had more comorbidities, although not significantly (2–3, 22). Similarly, Kunzova et al. have found that being male, besides the increasing age, was the main determinant for poor metabolic health regardless of the obesity status (23). Our results show that respondents with BMI <25 kg/m² assess the quality of life as better, they are more satisfied with health in general and are more satisfied with their physical and psychological health, social relations and environment.

As it has been shown in the research of Dinc et al. we found the poorer quality of life in all domains for respondents with BMI >35 kg/m² (2). They state that obesity may have an independent impact on HRQOL in a representative sample of the population with high obesity (2).

The proportion of respondents with the highest education degree is largest in the subgroup of respondents with normal BMI. In researches conducted in Japan and Turkey, most of the respondents with the highest education level had BMI <25 kg/m² (13,16). We can assume that people with a higher degree of education are more aware of the consequences of risky behavior and are more receptive to healthier dietary habits and physical activity.

In the investigated sample, we had more obese respondents who were married, unlike Wu et al. who state that a greater number of his subjects with central obesity were not married. The author himself explains this result with a greater number of elderly subjects who are prone to central obesity (22). Numerous studies show that married respondents enjoy better health than those who were never married (24). The study conducted in nine European countries showed interesting results indicating that average, never married respondents had a lower BMI than married respondents. In our research, we have not found statistically a significant difference between married and others (not married, widowed). Married respondents reported stronger preferences for regional/unprocessed and organic/fair trade food and paid less attention to the dietary convenience or dietary fat and body weight. Men who were married exercised less. Despite the differences in behavior, only attention to dietary fat and body weight predicted BMI differently for married men and men who have never been married. It can be concluded that despite more favorable eating-related behavior, married individuals had higher BMI values than respondents who have never been married, but those differences were small. The relation between BMI and marital status cannot be fully described by a single explanation. Obesity interventions could benefit from considering specific weight-related behavior in married individuals versus individuals who have never been married (24).

Respondents with normal BMI assessed their quality of life better compared to those with high BMI in all categories. The results of our research are one more confirmation of correlation of BMI and quality of life (2,16-18, 20). In the group of obese respondents, the worst results were found in those with the highest BMI values, in the assessment of the quality of life and psychological domain. Vasiljevic et al. report that impaired psychological health does not have an impact on BMI but contrary, a high BMI leads to the impairment of psychological health, emotional changes and isolation. Also, Hayes et al. concluded that compared to weight loss, gaining weight was more strongly associated with HRQOL, implicating a greater need for preventative measures to manage obesity (25).

Conclusion

Although it is widely held opinion that overweight people are also happier, the results of our research did not support this position. There is a strong negative correlation between BMI and quality of life in all domains. The alarming result of our research is that nearly half of our respondents do not understand the problem of obesity and do not see an increased BMI as a problem. This is what should be the goal for health professionals - to explain the impact of obesity on the development of various diseases and to raise the awareness on this problem.

Abbreviations:

WHO – World Health Organisation

HRQoL - Health-related life quality

BMI - Body mass index

Declarations

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Consent for publication: I have consent from all coauthors

Availability of supporting data: all data (questioners) is stored

Competing interests: Not applicable

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Authors' information (optional)

References

1. Obesity and overweight. Available from: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight> Accessed 6 Mar 2020.
2. Dinç G, Eser E, Saatli GL, Cihan UA, Oral A, Baydur H, Ozcan C. The relationship between obesity and health-related quality of life of women in a Turkish city with a high prevalence of obesity. *Asia Pac J Clin Nutr.* 2006;15(4):508–
3. Yan LL, Daviglius ML, Liu K, Pirzada A, Garside DB, Schiffer L, Dyer AR, Greenland P. *BMI and health-related quality of life in adults 65 years and older.* *Obes Res.* 2004;12(1):69–76.
4. Dey M, Gmel G, Mohler-Kuo M. Body mass index and health-related quality of life among young Swiss men. *BMC Public Health.* 2013;13:1028. doi: 10.1186/1471-2458-13-1028.
5. Takahashi Y, Sakai M, Tokuda Y, Takahashi O, Ohde S, Nakayama T, Fukuhara S, Fukui T, Shimbo T. The relation between self-reported body weight and health-related quality of life: A cross-sectional study in Japan. *J Public Health (Oxf).* 2011;33(4):518–
6. Goossens G. The Metabolic Phenotype in Obesity: Fat Mass, Body Fat Distribution, and Adipose Tissue Function. *Obesity Facts.* 2017;207–
7. Urek R, Crnević-Urek M, Čubrilo-Turek M. Obesity - a global public health problem. *Acta Med Croat* 2007;61:161–
8. Center for Disease Control and Prevention. Body Mass Index (BMI) Available at: <https://www.cdc.gov/healthyweight/assessing/bmi/index.html> Accessed 21 Mar 2020.
9. Brown C, Higgins M, Donato K, Rohde F, Garrison R, Obarzanek E et al. Body Mass Index and the Prevalence of Hypertension and Dyslipidemia. *Obesity Research.* 2000;8(9):605–

10. Calle E, Thun M, Petrelli J. Current Literature: Body-Mass Index and Mortality in a Prospective Cohort of U.S. Adults. *Nutrition in Clinical Practice*. 2000;15(1):50–
11. Buettner HJ, Mueller C, Gick M, Ferenc M, Allgeier J, Comberg T, et al. The impact of obesity on mortality in UA/non-ST-segment elevation myocardial infarction. *Eur Heart J* 2007;28:1694–
12. Vrhovac B. *Interna medicina*. 4th ed. Zagreb: Naklada LJevak; 2008.
13. Salzer B, Trnka Z, Sucic M. Obesity, lipoproteins and physical activity. *Biochemia Medica*. 2006;;37–
14. Center for Disease Control and Prevention. Defining Adult Overweight and Obesity Available at: <https://www.cdc.gov/obesity/adult/defining.html> Accessed 18 Apr 2020.
15. Roncada C, Dias CP, Goecks S, Cidade SE, Pitrez PM. Usefulness of the WHOQOL-BREF questionnaire in assessing the quality of life of parents of children with asthma. *Rev Paul Pediatr*. 2015;33(3):268–
16. Pibernik-Okanović M. Psychometric properties of the World Health Organisation quality of life questionnaire (WHO-QOL-100) in diabetic patients in Croatia. *Diabetes Res. Clin. Pract.* 2001;51:133–143.
17. Zdravstveno stanje stanovništva iz zdravstvena zaštita u Federaciji Bosne i Hercegovine, 2017. godina. Institute for Public health. Available from: <http://www.zzjzfbih.ba/wp-content/uploads/2018/10/Zdravstveno-2017..pdf>
18. Stenholm S, Koster A, Alley DE, Houston DK, Kanaya A, Lee JS, Newman AB, Satterfield S, Simonsick EM, Visser M, Harris TB, Ferrucci L. Health, Aging, and Body Composition Study. Joint association of obesity and metabolic syndrome with incident mobility limitation in older men and women - results from the Health, Aging, and Body Composition Study. *J Gerontol A Biol Sci Med Sci*. 2010 Jan;65(1):84–
19. Vasiljevic N, Ralevic S, Marinkovic J, Kocev N, Maksimovic M, Milosevic GS, Tomic J. The assessment of health-related quality of life in relation to the body mass index value in the urban population of Belgrade. *Health Qual Life Outcomes*. 2008;6:106. DOI: 10.1186/1477-7525-6-106.
20. Muda WA, Kuate D, Jalil RA, Nik WS, Awang SA. Self-perception and quality of life among overweight and obese rural housewives in Kelantan, Malaysia. *Health Qual Life Outcomes*. 2015;13:19. DOI: 10.1186/s12955-015-0210-z.
21. Tchicaya A, Lorentz N, Demarest S, Beissel J, Wagner DR. Relationship between self-reported weight change, educational status, and health-related quality of life in patients with diabetes in Luxembourg. *Health Qual Life Outcomes*. 2015;13:149.
22. Wu S, Wang R, Jiang A, Ding Y, Wu M, Ma X, Zhao Y, He J. Abdominal obesity and its association with health-related quality of life in adults: A population-based study in five Chinese cities. *Health Qual Life Outcomes*. 2014 Jun 13;12:100. DOI: 10.1186/1477-7525-12-100.
1. Kunzova S, Maugeri A, Medina-Inojosa J, Lopez-Jimenez F, Vinciguerra M, Marques-Vidal P. Determinants of Metabolic Health Across Body Mass Index Categories in Central Europe: A Comparison Between Swiss and Czech Populations. *Front Public Health*. 2020;8:108. doi: 10.3389/fpubh.2020.00108. eCollection 2020.
24. Mata J, Frank R, Hertwig R. Higher body mass index, less exercise, but healthier eating in married adults: Nine representative surveys across Europe. *Soc Sci Med*. 2015 Aug;138:119– DOI: 10.1016/j.socscimed.2015.06.001.
25. Hayes M, Baxter H, Müller-Nordhorn J, Hohls JK, Muckelbauer R. The longitudinal association between weight change and health-related quality of life in adults and children: a systematic review. *Obes Rev*. 2017;18(12):1398-1411. doi: 10.1111/obr.12595.