Dynamics of quality of life indicators associated with weight loss in patients with metabolically healthy obesity

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Abstract: The purpose of the study was to analyse quality of life (QoL) indicators in patients with metabolically healthy obesity (MHO) associated with ≥5% weight loss.

Material and Methods — The study involved 44 females with MHO (according to the IDF criteria of the metabolic syndrome (MS), 2005) and 33 females with metabolically unhealthy obesity (MUHO) aged 19-59 years. To assess QoL, we used the SF-36 questionnaire (Medical Outcomes Study – Short Form 36).

Results — Initially QoL indicators in both groups were not significantly different statistically. The physical component of health (PHsum) in the MHO and MUHO groups averaged 53.9±6.7 & 50.6±6.3 points (p=0.032). The mental component of health (MHsum) averaged 42.1±1.8 & 45.1±1.8 points (p=0.255). The ≥5% decrease in body weight (from the initial body weight) after 6 months led to an increase in the indicators of physical role functioning by 11.2%, emotional role functioning by 11.9%, mental health by 8.8%, vitality by 12.8%, social functioning by 11.2%, emotional role functioning by 11.9%, and mental health by 9.2% (p<0.05).

Conclusion — The MHO group is characterized by higher physical component of health, without a statistically significant difference in the indicators of each of the 8 scales of the SF-36 questionnaire. A ≥5% decrease in the body mass in patients of both groups is accompanied by the increase in the indicators of QoL.

Keywords: metabolically healthy obesity, quality of life, SF-36 questionnaire.

Introduc
included patients characterized by the presence of no more than one of the following MS components: triglycerides level (TG) ≥150 mg/dl (1.69 mmol/l) or specific lipid-lowering therapy; high-density lipoprotein cholesterol level (HDL) <40 mg/dl (1.0 mmol/l) in men and <50 mg/dl (1.3 mmol/l) in women, or specific lipid-lowering therapy; systolic blood pressure (SBP) ≥130 mmHg or diastolic blood pressure (DBP) ≥85 mmHg or antihypertensive therapy; an increase in fasting plasma glucose (FPG) ≥110 mg/dl (5.6 mmol/l), or hypoglycemic therapy.

The comparison group included 33 patients with metabolically unhealthy obesity (MUHO). The age of the participants ranged from 19 to 59 years. We assessed the indicators of anthropometry, carbohydrate and lipid metabolism initially and after 6 months against the background of body weight decrease. To assess patients’ QoL, we used the non-specialized SF-36 questionnaire (Medical Outcomes Study – Short Form 36), which includes 36 questions grouped into 8 scales: physical functioning (PF), physical role functioning (PRF), bodily pain (BP), general health (GH), vitality (V), social functioning (SF), emotional role functioning (ERF), mental health (MH) [15].

**Eligibility criteria**

The eligibility criteria for the study were as follows: gender – female, age 19 to 59 years, presence of obesity (BMI ≥30 kg/m²) in combination with one of the components of the metabolic syndrome (except for waist circumference [WC]).

The non-eligibility criteria for the study were as follows: gender – male, age younger than 19 and older than 59 years, BMI less than 30 kg/m², presence of chronic inflammatory and infectious diseases, severe form of type 2 diabetes, type 1 diabetes, chronic infectious and inflammatory diseases in the acute stage, presence of acute cardiovascular events (myocardial infarction, stroke) in the medical history, severe somatic pathology, cancer, pregnancy, and lactation.

**Study setting**

The study was conducted in the Endocrinology Clinic of the University Clinical Hospital No. 2 and the Department of Endocrinology No. 1 of the Faculty of Medicine of I.M. Sechenov First Moscow State University (Moscow, Russia).

**Medical intervention**

To identify MHO phenotype, we took into consideration the MS definitions (IDF, 2005). In addition to the mandatory criterion – obesity (BMI ≥30 kg/m²), this group included patients characterized by presence of not more than one of the following MS components: TG≥150 mg/dl (1.69 mmol/l) or specific lipid-lowering therapy; HDL<40 mg/dl (1.0 mmol/l) in men and <50 mg/dl (1.3 mmol/l) in women, or specific lipid-lowering therapy; SBP≥130 mmHg or DBP≥85 mmHg, or antihypertensive therapy; an increase in FPG ≥110 mg/dl (5.6 mmol/l), or sugar-reducing therapy. The comparison group included patients with metabolically unhealthy obesity.

All patients were given recommendations for lifestyle modification concerning nutrition and physical activity. Patients with multiple ineffective attempts to reduce body weight using diet therapy in their medical history were additionally prescribed pharmacotherapy for obesity: sibutramine (Reduxin®) – LLC Ozone, Russian Federation, orlistat (Xenical®) - F. Hoffmann-La Roche Ltd, Switzerland.
Quality of life depends on many associated diseases that are not limited to manifestations of cardiovascular pathology, carbohydrate and lipid metabolism disorders [17]. The level of high density lipoproteins in the MHO group was statistically significantly lower in the MHO group (p<0.05) when compared with the MUHO group. The level of triglycerides was statistically significantly higher in the MHO group (p=0.018) compared with the MUHO group. The level of total cholesterol and fasting glucose was statistically significantly lower in the MHO group (p<0.05) when compared with the MUHO group. The level of lipase, and C-peptide, and triglycerides were initially statistically significantly lower in the MHO group (p<0.05) when included into the study. The level of high density lipoproteins in the MHO group was statistically significantly higher than in the MHO patients (p=0.018) when compared with the MUHO group.

Table 2. Amount of change (Δ) for QoL indicators in the MHO and MUHO groups in patients with ≥5% weight loss over 6 months

<table>
<thead>
<tr>
<th>Parameter</th>
<th>MHO (n=44)</th>
<th>MUHO (n=33)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>∆MH</td>
<td>∆SF</td>
<td>∆BP</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>5.0±0.1</td>
<td>5.2±0.9</td>
<td>5.7±2.1</td>
</tr>
<tr>
<td>Total cholesterol (mg/dl)</td>
<td>5.1±0.2</td>
<td>5.3±0.9</td>
<td>5.7±2.1</td>
</tr>
<tr>
<td>HDL (mg/dl)</td>
<td>1.4±0.1</td>
<td>1.3±0.3</td>
<td>1.3±0.3</td>
</tr>
<tr>
<td>LDL (mg/dl)</td>
<td>3.3±0.1</td>
<td>3.9±0.9</td>
<td>3.9±0.9</td>
</tr>
<tr>
<td>Basal insulin (µU/ml)</td>
<td>13.6±1.5</td>
<td>17.1±1.9</td>
<td>19.1±1.1</td>
</tr>
<tr>
<td>HOMA Index</td>
<td>3.0±0.4</td>
<td>4.4±0.6</td>
<td>4.6±3.2</td>
</tr>
<tr>
<td>C-peptide (pmol/L)</td>
<td>1132.7±89.6</td>
<td>573.4±106.1</td>
<td>1503.3±7.3</td>
</tr>
</tbody>
</table>

Table 3. Dynamics of QoL indicators (Δ) in 6 months accompanied by ≥5% body weight loss

<table>
<thead>
<tr>
<th>QoL indicators</th>
<th>MHO (n=28)</th>
<th>MUHO (n=21)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodily function</td>
<td>7.5%*</td>
<td>14.6%</td>
<td></td>
</tr>
<tr>
<td>Physical role functioning</td>
<td>11.6%*</td>
<td>24.6%*</td>
<td></td>
</tr>
<tr>
<td>General health</td>
<td>7.9%</td>
<td>14.0%</td>
<td></td>
</tr>
<tr>
<td>Vitality</td>
<td>6.9%</td>
<td>19.7%</td>
<td></td>
</tr>
<tr>
<td>Social functioning</td>
<td>12.8%*</td>
<td>27.8%</td>
<td></td>
</tr>
<tr>
<td>Emotional role functioning</td>
<td>11.9%*</td>
<td>39.5%*</td>
<td></td>
</tr>
<tr>
<td>Mental health</td>
<td>8.8%*</td>
<td>9.2%*</td>
<td></td>
</tr>
</tbody>
</table>

* statistically significant difference (p<0.05).

We performed comparative analysis of the initial indicators of anthropometry, lipid, carbohydrate metabolism and major QoL parameters. These indicators were assessed in dynamics in patients who reduced body weight by ≥5%.

In the course of observation, which lasted 6 months, we performed comparative analysis of the initial indicators of anthropometry, lipid, carbohydrate metabolism and major QoL parameters. These indicators were assessed in dynamics in patients who reduced body weight by ≥5%.

When assessing quality of life of patients with metabolically healthy obesity, it is necessary to consider the fact that this term refers exclusively to manifestations of cardiovascular pathology, carbohydrate and lipid metabolism disorders [17]. Quality of life depends on many associated diseases that are not considered as MHO criteria.

The comorbidity structure in patients from both groups has an almost equal frequency of allergic reactions and pathology of the gastrointestinal tract occurrence. Gynecological pathology was the most wide-spread one, i.e. it was observed in 50% of patients with MHO and in 70% of patients with MUHO, joint pathology was detected in 6.7% of patients with MUHO and was not detected in patients with MHO. Arterial hypertension in metabolically healthy patients is statistically less significant compared with metabolically unhealthy patients: 17.9% and 78.1% (p<0.001), as well as carbohydrate metabolism disorders: 53.2% and 45.2% (p<0.001) (Figure 1 and Figure 2).
Initially, in the MHO group indicators of physical functioning, physical role functioning, general health, vitality and social functioning were slightly higher than in the MUHO group, while the parameters of emotional role functioning and mental health were lower than in the MUHO group, however, there were no statistically significant differences revealed – p>0.05 (Figure 3). The physical health component (PHsum), which comprises the scales of physical functioning, role functioning conditioned by physical condition, bodily pain and general health status in the MHO and MUHO groups, initially amounted to 53.9±6.7 (39.9 to 69.3) and 50.6±6.3 (36.9 to 60.3) with a statistically significant difference (p=0.032). The indicator of the mental health component (MHsum), which comprises the scales of mental health, role functioning conditioned by emotional state, social functioning, and vitality, in these groups was initially 42.1±1.8 (12.4 to 63.7) and 45.1±1.8 (15.4 to 59.5) points (p=0.255).

In 6 months’ time, a decrease in body weight of 5% or more was observed in 28 people in the MHO group (63.6%), and in 21 patients (63.6%) in the MUHO group. In general, all QoL indicators in both groups associated with ≥5% weight loss after 6 months increased (Table 2, Figure 4).

In the MHO group indicators of physical functioning increased by 7.5%, physical role functioning – by 11.6%, vitality – by 12.8%, social functioning – by 11.2%, emotional role functioning – by 11.9%, mental health – by 8.8% from the original ones (p<0.05). In the MUHO group we observed a statistically significant (p<0.05) increase in indicators of physical role functioning – by 24.6%, role-based emotional functioning – by 39.5%, and mental health – by 9.2%, which was accompanied by a clinically significant decrease in body weight (Table 3).

We carried out analysis of the dynamics of quality of life indicators in patients whose body weight was not reduced by the time of the second visit. In the MHO group (n=2), we observed a slight decrease in the indicators of vitality, emotional role functioning, and mental health. In the MUHO group (n=6), all QoL indicators increased slightly (Figure 5).

No undesirable effects were observed in the course of the study.
Discussion

At the point of time when our study was carried out, there had already been data available from five foreign investigations evaluating quality of life indicators in patients with metabolically healthy obesity.

In a large population-based Health Survey, which included 10,477 participants, when using the SF-12 quality of life questionnaire, patients with metabolic comorbidity demonstrated lower quality of life associated with health than those who did not have one, regardless of BMI. However, the quality of life decreases significantly in obese people with an increase in BMI even in the absence of metabolic comorbidity [14]. The statistically significantly higher frequency of arterial hypertension and carbohydrate metabolism disorders, as well as the high frequency of gynecological pathology and joint pathology in patients with MUHO, which the present study has revealed, make a certain contribution to the decrease in QoL indicators in this group of patients.

Some researchers note lower QoL indicators in patients with MHO compared with people with normal body weight, both metabolically healthy and unhealthy, especially in females [12]. Yang Y. et al. used data from the Fifth Korean National Health and Nutrition Examination Survey (KNHANES Qual Life Res 123 V-2). The researchers identified 4 groups of patients: metabolically healthy and unhealthy with normal body weight, as well as groups with metabolically healthy and unhealthy obesity (average BMI of 27.3±0.1 and 28.1±0.1 kg/m², respectively). To assess QoL they used the EuroQol-5D questionnaire (EQ-5D). The lowest indicators of the QoL physical scale were in metabolically unhealthy males with normal body weight (BMI=22.1 kg/m²), which indicates that unhealthy metabolic status has a greater effect on the QoL than obesity. Interestingly, in females, a decrease in the quality of life was more influenced by an increase in body weight than an unhealthy metabolic status [12]. The study conducted in Germany discovered that QoL parameters conditioned by physical condition are at their highest in metabolically healthy people without excess weight, slightly lower in the MHO group, and even lower in metabolically unhealthy patients with normal body weight, and at the lowest in metabolically unhealthy people with obesity. In the MHO and MUHO groups, the overall physical health indicator for women was 49.2 (47.8 to 50.6) and 44.1 (43.1 to 45.1) points, respectively. The influence of additional factors, including age, educational status, health-related behavior, and underlying diseases on the QoL was more pronounced in women than in men [3]. In our study, the physical health component (PHsum) in the MHO and MUHO groups was initially 53.9±6.7 (39.9 to 69.3) and 50.6±6.3 (36.9 to 60.25) with a statistically significant difference (p=0.032). As for the mental health component (MHealth), initially in these groups it was 42.1±1.8 and 45.1±1.8 points (p=0.255). In a study by L.M. Donini et al., there were no statistically significant differences between the MHO and MUHO groups, both in terms of the total physical health (PHsum) 58.4±2.14 and 59.5±1.94 (p=0.33) and general mental health (MHealth) 57.8±20.1 and 61.4±17.7 (p=0.27) (an abridged version of the SF-36 questionnaire was used) [13].

In our study, we received the lowest number of points in terms of general health in both MHO and MUHO groups: 47.6±1.17 and 41.67±2.71, but without a statistically significant difference (p=0.087). This indicator was the lowest one out of eight evaluated using the SF-36 questionnaire in both groups under study. 68 women with MHO and 126 women with MUHO (taking into account the MS criteria from 2005) took part in a 2017 study conducted in Finland. Korhonen PE et.al also found the greatest decrease in terms of general health points for MHO and MUHO: 62.4±17.1 and 57.5±17.7, respectively, but with statistically significant differences between the groups (p=0.023) [7].

In our study, we have found that, despite the statistically significant differences in most metabolic indicators between the MHO and MUHO groups during the first visit, the main parameters of their quality of life did not differ significantly statistically. None of the groups showed a decrease in QoL parameters of less than 20 points on any scale, which indicates absence of a pronounced decrease in the quality of life.

The relatively low indicator of general health in the MHO group (less than 50 points) was correlated with the indicator of physical and social role functioning (more than 70 points), which indicates that in the state of general health in these patients practically does not limit their physical and social activity.

At the same time, in MHO patients whose body weight was not reduced over 6 months, there was a decrease in the parameters of vitality, role functioning, and mental health.

The statistically significantly higher frequency of arterial hypertension and carbohydrate metabolism disorders, as well as the high frequency of gynecological pathology and joint pathology in patients with MUHO, which the present study has revealed, make a certain contribution to the decrease in QoL indicators in this group of patients.

Conclusion

According to our study, we observed higher quality of life indicator, which reflects the overall physical health component in the patient group with metabolically healthy obesity. For the general mental health component, a statistically significant difference in the indicator between the MHO and MUHO groups was not revealed. For each of the scales of the SF-36 questionnaire individually, no statistically significant difference was found between the groups of patients under study. In the MHO group, alongside with a 25% decrease in body weight, there was an increase in indicators of vitality, emotional role functioning and mental health alongside with an increase in social functioning. A ≥25% decrease in body weight in patients with metabolically healthy obesity and in patients with complicated obesity is accompanied by an increase in the QoL. This determines the need for weight loss, regardless of the phenotype of obesity.

Conflict of interest

Some results of this study was presented on Joint Event on 12th International Conferences on Childhood Obesity and Nutrition & 3rd World Congress on Diabetes and Obesity (March 18-19, 2019, Rome, Italy) and published abstract in J Obes Weight Loss Ther 2019, https://www.omicsonline.org/conference-proceedings/2165-7904-C1-091-020.pdf, and on VIII All-Russian Diabetes Congress with international participation “Diabetes - a pandemic of the XXI century” (February, 2018, Moscow, Russia) and published as abstract in the collection of abstracts of the Congress https://raes.org.ru/sites/default/files/all/%D0%9C%D0%B8%D1%85%20%D0%B8%20%D0%B8%20%D0%B8%20%D0%B9%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20%20...
Ethical approval

The clinical study within the framework of the dissertation (thesis) was approved by the Interuniversity Ethics Committee under the Association of Russian Medical Pharmaceutical Universities (Minutes No. 10 of a meeting of the Interuniversity Ethics Committee under the Association of Russian Pharmaceutical Universities from 17 Nov, 2011).

References