



The Impact of Body Mass Index on Quality of Life in Women with Osteoporosis

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Abstract

Background: Improving the quality of life in osteoporotic women is one of the crucial goals of health systems. Hence, recognizing the factors affecting the quality of life in such patients is an important issue. The body mass index (BMI) seems to be capable of affecting quality of life. Besides, BMI is a quantitative index simple to measure.

Objectives: The purpose of this study was to examine the impact of BMI on quality of life in a group of osteoporotic women.

Methods: One hundred osteoporotic women aged 50 - 60 participated in this descriptive-analytical study. These women were referring to the internal clinic of Mousavi Hospital of Zanjan. The body mass index was calculated after measuring both height and weight. Based on the BMI, the patients were divided into three groups: BMI < 18.5 underweight, $18.5 \leq \text{BMI} < 25$ normal and BMI ≥ 25 overweight. The short form 36 (SF-36) questionnaire was employed for measuring the quality of life. Given the normal distribution of data, one-way-ANOVA and Independent *t*-test were utilized to compare the means of the three groups. In all tests, $P < 0.05$ was accepted as a significant level.

Results: Comparison groups using the one-way ANOVA test on SF-36 subscale and total QOL scores showed in all components of QOL; underweight, overweight and normal groups were significantly different ($P < 0.05$). Considering the Independent *t*-test, osteoporotic women in overweight group reported a poor quality of life as measured by the SF-36. Yet, the quality of life score in the normal group and the underweight group did not have a significant difference.

Conclusions: The results of this study demonstrated that increased BMI negatively affects quality of life. Therefore, it can be avowed that keeping the BMI low and controlling it are effective in raising the quality of life in osteoporotic women. Thus, so as to improve the quality of life in those patients, therapists ought to take greater heed of their BMI and its changes.

Keywords: Osteoporosis, Quality of Life, Body Mass Index (BMI)

1. Background

Osteoporosis is the most common metabolic bone disease (1, 2). This disease is defined as a condition which brings about loss of bone mass, degenerative change and consequently increased risk of bone fracture (3, 4). Various complications of osteoporosis, such as pain, muscle weakness, musculoskeletal changes, anxiety and fear of falling could impair physical and mental performance of these patients and significantly impact their quality of life (QOL) (3, 5, 6).

According to the World Health Organization (WHO), the quality of life is defined as the perception of his or her life situation with respect to the culture and value system in which he or she lives and the relevance of these perceptions to the goals, expectations, standards, and priorities

(7). Various studies suggest that the quality of life in osteoporotic women is lower compared to healthy women (8-10).

On the other hand, studies have shown the increase of BMI as one of the problems faced by women after menopause. This increase is associated with disabilities and pain (11). As it is known, BMI is a functional index able to simply calculate overweightness and obesity in both genders and in all ages (12, 13). However, there is no report of research on the impact of BMI on quality of life in osteoporotic women.

As we know, the purpose of rehabilitation is boosting quality of life. Therefore analyzing the effect of the BMI on quality of life in osteoporotic women is the main purpose of this study. Due to the increasing aging population and the increase of osteoporotic patients, the results

of this research can provide health-care professionals with evidence to develop more effective and cheaper programs to improve the quality of life through the proper control of BMI in these patients.

2. Methods

2.1. Participants

In this cross-sectional study, 100 osteoporotic women who referred to the internal medicine clinic of Mousavi Hospital of Zanjan, Iran, were selected. Sampling was conducted from January 2017 to January 2018. Sampling was performed randomly based on the family number registered in the electronic hospital record. Based on the sampling, women were invited to participate in the study. Their osteoporosis was diagnosed by a rheumatologist in accordance with the World Health Organization (14). All participants have the following criteria: Age over 50 years old, at least 5 years having passed since their menopause. Subjects were excluded if they had: (1) done regular exercise programs such as yoga, swimming or Pilates more than twice a week; (2) undergone effective rehabilitation programs in the last two months prior to the research; (3) had used sedative medications in the last month; (4) had pre-existing musculoskeletal conditions such as ankylosing spondylitis or lower limb surgery using a fixator.

The Ethical Committee of Shahid Beheshti University of Medical Sciences approved the study, and all participants gave informed consent before data collection began.

2.2. Instrument

The tape measure and digital weights were employed to measure height and weight, respectively. Moreover, the short form (SF-36) questionnaire was utilized to assess the quality of life in patients. SF-36 is a validated and widely used questionnaire to assess health related quality of life (HRQOL). The SF-36 item in the questionnaire are grouped into eight subscale scores: (a) physical functioning, (b) role limitations caused by physical problem bodily pain, (d) general health, (e) energy vitality, (f) social functioning, (g) role limitations caused by emotional problems, and (h) mental health. The subscale scores range from 0 to 100 with a higher score indicating a better QOL. Total quality of life score is obtained from summing up individual scores for all groups. Translation and validation of Iranian version of the SF-36 were done by Montazeri and colleagues. In assessing the internal consistency (to test reliability), the Cronbach α coefficient for all eight quality of life and marital satisfaction in medical staff in Iran SF-36 scales ranged from 0.77 to 0.90 expect the vitality scale ($\alpha = 0.65$) (15).

2.3. Procedure

At the outset, the demographic information (height-weight-age) was collected, then, the SF-36 questionnaire was completed for the qualified persons by the researcher through interviewing the subjects. Height, weight, and body mass index were measured then. In order to measure the height, the person was asked to stand up next to a special strip meter mounted on the wall with no shoes exercising a ruler aligned with the person's head placed parallel to the surface. The person's height was measured and recorded in centimeters. Afterwards, the weight was measured in kilograms using a standard digital scale. The subjects were asked to stand on the weighing scale with no shoes and no cloths except for underwear and the number indicated on the scale was recorded by the examiner.

BMI = weight divided by squared height in meters. Based on BMI, participants were placed in one of the three main groups, as follows: BMI < 18.5 underweight, 18.5 \leq BMI < 25 normal and BMI \geq 25 overweight.

2.4. Statistical Analysis

After completing the evaluations, the collected data were entered into SPSS software (version 19), and statistical analyses were performed. Since samples were in normal distribution based on Kolmogorov-Smirnov test, one-way ANOVA was utilized for comparison groups on SF-36 subscales, and comparison of total QOL score. Independent *t*-test was used for pairwise comparison. In all tests, $P < 0.05$ was considered as a significant level.

3. Results

This study was conducted with 100 osteoporotic women in three groups. Twenty three women were in the underweight group with mean age of 69.30 ± 5.28 , mean weight 48.79 ± 4.51 , mean height (157.28 ± 6.27). Forty four women were in the normal group; mean age (59.52 ± 7.49), mean weight (59.52 ± 7.49), mean height (157.59 ± 5.69) and 33 women were in the overweight group; mean age (62.36 ± 6.09), mean weight (61.74 ± 11.58), mean height (153 ± 10.88).

The result of one-way ANOVA test for comparison groups on SF-36 subscale showed that in all aspects of quality of life underweight, normal and overweight group were significantly different $P = 0.000$ in addition, in all aspects the overweight group is lower than normal and underweight $P < 0.005$. Considering these findings, a poor QOL measuring by SF-36 was in overweight group. The result of one-way ANOVA and Independent *t*-test is reported in Table 1.

Table 1. Comparison of Underweight, Normal and Overweight Groups for the SF-36 Subscales^a

SF-36 Subscales	Normal	Underweight Group	Overweight Group	P Value	Comparison Independent t-Test
Physical functioning	73.20 ± 18.07	77.96 ± 21.81	69.00 ± 16.91	0.000*	Over-w < under-w, 0.000**; over-w < normal, 0.000**
Social functioning	72.12 ± 18.80	75.09 ± 18.82	58.00 ± 15.77	0.001*	Over-w < under-w, 0.000**; over-w < normal, 0.000**
Role limitations physical health	76.9 ± 35.51	78.60 ± 31.61	67.20 ± 28.31	0.000*	Over-w < under-w, 0.000**; over-w < normal, 0.000**
Role limitations emotional problems	69.91 ± 41.78	72.90 ± 38.70	49.98 ± 39.81	0.000*	Over-w < under-w, 0.000**; over-w < normal, 0.000**
Mental health	67.80 ± 15.09	69.76	48.01 ± 20.01	0.0000*	Over-w < under-w, 0.000**; over-w < normal, 0.000**
Vitality	64.20 ± 16.40	67.12 ± 13.05	49.95 ± 18.05	0.000*	Over-w < under-w, 0.000**; over-w < normal, 0.000**
Bodily pain	71.16 ± 18.05	74.82 ± 16.71	50.15 ± 20.72	0.000*	Over-w < under-w, 0.000**; over-w < normal, 0.000**
General health	62.59 ± 15.08	63.54 ± 14.81	49.65 ± 16.05	0.000*	Over-w < under-w, 0.000**; over-w < normal, 0.000**

^aValues are expressed as mean ± SD.

The results of one-way ANOVA showed that there were significant differences between obese, normal and underweight groups in total QOL score ($P < 0.000$, $F = 21.28$) (Table 2).

Post hoc test was used to track differences between groups. The results showed that the mean of total quality of life score in the overweight (48.03 ± 15.51) group was significantly lower than the normal (65.95 ± 14.98) and underweight (62.60 ± 13.9) group. The results are shown in Table 3.

4. Discussion

In this study we compare osteoporotic women in three group based on BMI. Comparison groups on SF-36 subscale showed that in all aspects of QOL, the underweight, normal and overweight group were significantly different. Overweight women reported poor quality of life Table 1. Comparison of total QOL score also showed that the overweight group obtained the lowest total quality of life score, but there was no significant difference between the total QOL scores in the normal and underweight ones (Table 2). The study of Karakashidou et al., which compared the body mass index in patients with records of falling accidents and no falling accidents, indicates that the BMI is much higher in the group who experienced falling. They introduced the high BMI as the factors affecting the walking status (16); albeit they only examined walking, not the quality of life, but falling down can indirectly impact the quality of life. Apart from this study, no other studies have been conducted upon the impact of BMI on the lives of osteoporotic

women (17). Although many studies have been conducted in healthy women, some of which indicate that overweight women have lower quality of life (18, 19). Furthermore, other studies in a group of menopause women suggest that women whose weight remains consistent in eight years, enjoy a better quality of life compared to those gaining weight (20). In contrast, according to another study, there was no relation between BMI and quality of life in post menopause women but in that study, the participants were only post menopause women and their osteoporosis condition wasn't investigated. Other studies also showed a significant relationship between exercise and quality of life in postmenopausal women. The results of a study in Greece showed that women who exercise more than one hour a week had a higher quality of life than women who did not (21, 22). Nonetheless, the quality of life is a difficult variable to be measured since it is utterly subjective, based on patients' reports and a complex concept. In the meantime, mental status can affect the quality of life as well. In the current study, the SF-36 questionnaire is opted for owing to its simplicity, brevity, easy scores as well as its proven validity and reliability in Iran.

This study had some limitations, as suggested by previous research there are eight specific questionnaires for assessing the quality of life in osteoporosis patients which are more appropriate for examining different aspects in such patients (23). Yet, these questionnaires were not translated in Persian and had not been validated either; thus, sadly, it was not possible for the researchers to use these special questionnaires. Also, we compared our participants in overweight, normal, and underweight groups

Table 2. One-Way Analysis of Variance for Comparing Quality of Life Score in Three Groups of Underweight, Normal and Overweight

Group	Mean	Standard Deviation	F	P Value
Underweight	62.60	13.99	21.286	< 0.000
Normal	65.95	14.98		
Overweight	48.03	15.51		

Table 3. Post Hoc Test Results

Group	Group	Mean Difference	P Value
Underweight	Normal	-1.10	0.947
	Overweight	21.805	0.000
Normal	Overweight	22.911	0.000

but based on BMI classification there was seven groups. Therefore, another larger study using specialized questionnaires on evaluating the quality of life in all groups based on BMI is recommended.

In conclusion, the study showed that BMI impacts the quality of life in osteoporotic women. Therefore, respecting the prominence of quality of life, it is recommended that therapists consider some indispensable programs to lessen the BMI amount and to take heed of controlling it in such patients along with any other treatment plans.

Supplementary Material

Supplementary material(s) is available [here](#) [To read supplementary materials, please refer to the journal website and open PDF/HTML].

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Footnotes

Authors' Contribution: Study concept and design: Fateme Sangtarash and Farideh Dehghan Manshadi; analysis and interpretation of data: Fateme Sangtarash, Alireza Sadeghi, and Farideh Dehghan Manshadi; drafting of the manuscript: Fateme Sangtarash; critical revision of the manuscript for important intellectual content: Ahmad Jalilvand, Farideh Dehghan Manshadi, and Alireza Sadeghi; statistical analysis: Ahmad Jalilvand and Fateme Sangtarash.

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References

- Vasikaran S, Eastell R, Bruyere O, Foldes AJ, Garnero P, Griesmacher A, et al. Markers of bone turnover for the prediction of fracture risk and monitoring of osteoporosis treatment: A need for international reference standards. *Osteoporos Int.* 2011;22(2):391-420. doi: [10.1007/s00198-010-1501-1](#). [PubMed: [21184054](#)].
- Sanfelix-Genoves J, Hurtado I, Sanfelix-Gimeno G, Reig-Molla B, Peiro S. Impact of osteoporosis and vertebral fractures on quality-of-life. A population-based study in Valencia, Spain (The FRAVO Study). *Health Qual Life Outcomes.* 2011;9:20. doi: [10.1186/1477-7525-9-20](#). [PubMed: [21470396](#)]. [PubMed Central: [PMC3080275](#)].
- Barrett-Connor E, Siris ES, Wehren LE, Miller PD, Abbott TA, Berger ML, et al. Osteoporosis and fracture risk in women of different ethnic groups. *J Bone Miner Res.* 2005;20(2):185-94. doi: [10.1359/JBMR.041007](#). [PubMed: [15647811](#)].
- Pfeifer M, Sinaki M, Geusens P, Boonen S, Preisinger E, Minne HW, et al. Musculoskeletal rehabilitation in osteoporosis: A review. *J Bone Miner Res.* 2004;19(8):1208-14. doi: [10.1359/JBMR.040507](#). [PubMed: [15231006](#)].
- Kanis JA, Borgstrom F, De Laet C, Johansson H, Johnell O, Jonsson B, et al. Assessment of fracture risk. *Osteoporos Int.* 2005;16(6):581-9. doi: [10.1007/s00198-004-1780-5](#). [PubMed: [15616758](#)].
- Chow SB, Moffat M. Relationship of thoracic kyphosis to functional reach and lower-extremity joint range of motion and muscle length in women with osteoporosis or osteopenia: A pilot study. *Top Geriatr Rehabil.* 2004;20(4):297-306. doi: [10.1097/00013614-200410000-00009](#).
- Addington-Hall J, Kalra L. Who should measure quality of life? *BMJ.* 2001;322(7299):1417-20. doi: [10.1136/bmj.322.7299.1417](#). [PubMed: [11397754](#)]. [PubMed Central: [PMC1120479](#)].
- Martin AR, Sornay-Rendu E, Chandler JM, Duboeuf F, Girman CJ, Delmas PD. The impact of osteoporosis on quality-of-life: the OFELY cohort. *Bone.* 2002;31(1):32-6. doi: [10.1016/s8756-3282\(02\)00787-1](#). [PubMed: [12110409](#)].
- Fechtenbaum J, Cropet C, Kolta S, Horlait S, Orcel P, Roux C. The severity of vertebral fractures and health-related quality of life in osteoporotic postmenopausal women. *Osteoporos Int.* 2005;16(12):2175-9. doi: [10.1007/s00198-005-2023-0](#). [PubMed: [16220230](#)].
- Adachi JD, Loannidis G, Berger C, Joseph L, Papaioannou A, Pickard L, et al. The influence of osteoporotic fractures on health-related quality of life in community-dwelling men and women across Canada. *Osteoporos Int.* 2001;12(11):903-8. doi: [10.1007/s001980170017](#). [PubMed: [11804016](#)].
- Lovejoy JC. The menopause and obesity. *Prim Care.* 2003;30(2):317-25. doi: [10.1016/s0095-4543\(03\)00012-5](#). [PubMed: [14567150](#)].

12. Himes JH. Challenges of accurately measuring and using BMI and other indicators of obesity in children. *Pediatrics*. 2009;**124** Suppl 1:S3–22. doi: [10.1542/peds.2008-3586D](https://doi.org/10.1542/peds.2008-3586D). [PubMed: [19720665](https://pubmed.ncbi.nlm.nih.gov/19720665/)].
13. Shah NR, Braverman ER. Measuring adiposity in patients: The utility of body mass index (BMI), percent body fat, and leptin. *PLoS One*. 2012;**7**(4). e33308. doi: [10.1371/journal.pone.0033308](https://doi.org/10.1371/journal.pone.0033308). [PubMed: [22485140](https://pubmed.ncbi.nlm.nih.gov/22485140/)]. [PubMed Central: [PMC3317663](https://pubmed.ncbi.nlm.nih.gov/PMC3317663/)].
14. Watts NB, Lewiecki EM, Miller PD, Baim S. National Osteoporosis Foundation 2008 clinician's guide to prevention and treatment of osteoporosis and the World Health Organization fracture risk assessment tool (FRAX): What they mean to the bone densitometrist and bone technologist. *J Clin Densitom*. 2008;**11**(4):473–7. doi: [10.1016/j.jocd.2008.04.003](https://doi.org/10.1016/j.jocd.2008.04.003). [PubMed: [18562228](https://pubmed.ncbi.nlm.nih.gov/18562228/)].
15. Montazeri A, Goshtasebi A, Vahdaninia M, Gandek B. The Short Form Health Survey (SF-36): Translation and validation study of the Iranian version. *Qual Life Res*. 2005;**14**(3):875–82. doi: [10.1007/s11136-004-1014-5](https://doi.org/10.1007/s11136-004-1014-5). [PubMed: [16022079](https://pubmed.ncbi.nlm.nih.gov/16022079/)].
16. Karakasidou P, Skordilis EK, Dontas I, Lyritis GP. Postural profile and falls of osteoporotic women. *J Back Musculoskelet Rehabil*. 2012;**25**(1):55–66. doi: [10.3233/BMR-2012-0310](https://doi.org/10.3233/BMR-2012-0310). [PubMed: [22398267](https://pubmed.ncbi.nlm.nih.gov/22398267/)].
17. Pratelli E, Cinotti I, Pasquetti P. Rehabilitation in osteoporotic vertebral fractures. *Clin Cases Miner Bone Metab*. 2010;**7**(1):45–7. [PubMed: [22461291](https://pubmed.ncbi.nlm.nih.gov/22461291/)]. [PubMed Central: [PMC2898006](https://pubmed.ncbi.nlm.nih.gov/PMC2898006/)].
18. Lebrun CE, van der Schouw YT, de Jong FH, Pols HA, Grobbee DE, Lamberts SW. Relations between body composition, functional and hormonal parameters and quality of life in healthy postmenopausal women. *Maturitas*. 2006;**55**(1):82–92. doi: [10.1016/j.maturitas.2006.01.008](https://doi.org/10.1016/j.maturitas.2006.01.008). [PubMed: [16497451](https://pubmed.ncbi.nlm.nih.gov/16497451/)].
19. Castelo-Branco C, Palacios S, Ferrer-Barriendos J, Cancelo MJ, Quereda F, Alberich X, et al. Impact of anthropometric parameters on quality of life during menopause. *Fertil Steril*. 2009;**92**(6):1947–52. doi: [10.1016/j.fertnstert.2008.09.016](https://doi.org/10.1016/j.fertnstert.2008.09.016). [PubMed: [18980762](https://pubmed.ncbi.nlm.nih.gov/18980762/)].
20. Moilanen JM, Aalto AM, Raitanen J, Hemminki E, Aro AR, Luoto R. Physical activity and change in quality of life during menopause—an 8-year follow-up study. *Health Qual Life Outcomes*. 2012;**10**:8. doi: [10.1186/1477-7525-10-8](https://doi.org/10.1186/1477-7525-10-8). [PubMed: [22269072](https://pubmed.ncbi.nlm.nih.gov/22269072/)]. [PubMed Central: [PMC3311608](https://pubmed.ncbi.nlm.nih.gov/PMC3311608/)].
21. Giannouli P, Zervas I, Armeni E, Koundi K, Spyropoulou A, Alexandrou A, et al. Determinants of quality of life in Greek middle-age women: A population survey. *Maturitas*. 2012;**71**(2):154–61. doi: [10.1016/j.maturitas.2011.11.013](https://doi.org/10.1016/j.maturitas.2011.11.013). [PubMed: [22177978](https://pubmed.ncbi.nlm.nih.gov/22177978/)].
22. de Azevedo Guimaraes AC, Baptista F. Influence of habitual physical activity on the symptoms of climacterium/menopause and the quality of life of middle-aged women. *Int J Womens Health*. 2011;**3**:319–28. doi: [10.2147/IJWH.S24822](https://doi.org/10.2147/IJWH.S24822). [PubMed: [22114524](https://pubmed.ncbi.nlm.nih.gov/22114524/)]. [PubMed Central: [PMC3220314](https://pubmed.ncbi.nlm.nih.gov/PMC3220314/)].
23. Madureira MM, Ciconelli RM, Pereira RM. Quality of life measurements in patients with osteoporosis and fractures. *Clinics (Sao Paulo)*. 2012;**67**(11):1315–20. doi: [10.6061/clinics/2012\(11\)16](https://doi.org/10.6061/clinics/2012(11)16). [PubMed: [23184210](https://pubmed.ncbi.nlm.nih.gov/23184210/)]. [PubMed Central: [PMC3488992](https://pubmed.ncbi.nlm.nih.gov/PMC3488992/)].