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The Association Between Obesity and Quality of Life Among the Elderly

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Abstract

Background: The prevalence of obesity in the elderly is increasing worldwide. Obesity greatly impacts quality of life (QoL). The present study aimed to investigate the association between obesity and QoL among the elderly, in Tehran, Iran.

Methods: This cross-sectional study (observational) was conducted in 2014 in Tehran, Iran. A total of 421 elderly people aged ≥ 60 years old were recruited using simple random sampling methods. Height, weight, and waist circumference were measured by standard methods; body mass index (BMI) was calculated from height and weight. QoL was evaluated by the Persian language version of the SF-36 questionnaire in. The alpha value was set at 0.05 to indicate the statistical significant level. Independent samples t-tests and Chi-square tests were used for comparing the quantitative and categorical variables, respectively. One-way ANOVA, followed by Tukeys' post-hoc test, was used to compare mean scores of SF-36 scales between BMI groups. Pearson correlation coefficients were used for investigating the relationship between SF-36 scores and anthropometric parameters.

Results: The mean age of participants was 77.6±8.6 years. The frequency of obesity and overweight (BMI ≥ 25 kg/m2) was 59.4% (57.2% in males and 60.6% in females). Except for the mental health scale, for all other SF-36 scale mean scores, participants with overweight or obesity had lower scores compared to their normal-weight counterparts (p < 0.05). Additionally, subjects with underweight had significantly lower scores for the vitality scale (p < 0.05).

Conclusions: The results of present study persist on importance of preserving normal weight on improving quality of life in elderly. Although the observed association in this study was bidirectional and prospective studies are needed to investigate the cause and effect relationship.

Keywords: Quality of life, Aged, Obesity, Body mass index, Waist circumference.

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Introduction

In recent years, the proportion of individuals who are elderly is increasing in many developed and developing countries.[1] Based on the predictions of the United Nations, between 2007 to 2050 elderly populations will increase by 2-fold in size.[2] Recent studies have shown that factors such as decreased birth ratio and increased life expectancy (to 70 years), have a great impact on growing aged population.[3] Based on the results of the 1956 census conducted in Iran, about 6.2% of the Iranian population were 60 years old or greater, while in the 2006 and 2011 censuses, this number had increased to 7.3% and 8.3%, respectively.[4] Although aging and increased life expectancy in the community seems desirable, mental, physical, and physiological changes that occur commonly in the elderly can reduce quality of life (QoL). Thus, understanding the factors that may predict quality of life among the elderly is becoming increasingly important. In other words, dynamic aging is an important goal nowadays, and QoL should also be considered as an important issue along with the increased proportion of individuals who are elderly.[5,6]

QoL has different physical, mental, and social aspects and the concept of QoL has numerous and various definitions. The World Health Organization (WHO) has defined QoL as people's perception of opportunities, expectations, standards, and concerns in life.[7]

The prevalence of both obesity and overweight are increasing in developing countries,[8,9] and are one of the most important public health problems in many societies.[10] There is strong evidence to suggest a direct association between obesity and some chronic diseases, such as type 2 diabetes, cardiovascular disease, osteoporosis, respiratory apnea, and cancer.[11–14] Some studies have shown that abdominal obesity is associated with increased mortality.[15–18] The effect of overweight and obesity on physical health is well established, and it is determined that overweight and obesity can decrease the individual ability, and increase mortality, and morbidity rates and can lead to the additional treatment charges to health care systems.[7] Obesity is also associated with psychological problems.[10] A recent study found a strong association between obesity and depression, especially in women.[19] Daviglus et al., (2003) showed that body mass index (BMI) has an inverse correlation with all of the health aspects of quality of life [20] and several other studies on children and adults in different countries.[21–23] Several studies have suggested that severe weight loss, as well as higher BMI, can increase disability in the elderly population.[24–26]

Due to the aging populations the critical roles of QoL in these populations, as well as the increased prevalence of obesity and overweight worldwide, an investigation of the relationship between obesity and QoL is warranted. Since few studies have been conducted in this regard, especially in the Iranian elderly population, the present study aimed to investigate the association between obesity and QoL among the elderly population of Tehran, Iran.

Materials and Methods

The present cross-sectional study was performed to evaluate the QOL and its association with obesity in elderly people who are covered by health houses in Zone five of Tehran, Iran.

Participant recruitment started in November 2013 and was completed in April 2014. A total of 421 elderly (both males and females) at the age of 60 years old and above who were willing to participate in this study and complete the study steps were been selected by simple random sampling method (based on population proportion in each center).[27]After presenting the potential information about the study procedure, signed inform consent was obtained from participants. Participant's with presence of cognitive impairment or developmental disability, Alzheimer's disease, using antidepressant drugs, and unwillingness to participate in the study were excluded (28 subjects). A socio-demographic questionnaire containing information about marital status (married, widowed, divorced, and single), living status (living alone with other persons), educational level, employment status (working at home) and current smoking status was completed by each participant.

Anthropometric measurements were performed using standard methods. Weight of participants was measured with a digital scale with an accuracy of 0.1 kg (TANITA, BC-418, Japan) with light clothes and without shoes, and height was measured in the relaxed position with freely hanging arms using a SecaStadiometer with an accuracy of 0.5 cm. Waist circumference (WC) was obtained using a non-elastic tape at the mid-point of the last rib and the iliac crest to the nearest 0.5 cm. BMI was calculated by dividing weight (in kg) by height (in m) squared.

According to World Health Organization guidelines,[28]BMI was categorized into four groups: underweight (<18.5 kg/m^2), normal weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2) and obesity (≥ 30 kg/m^2). WC more than 88 cm in women and 102 cm in men were classified as abdominal obesity.[29]

Quality of life (QoL) was measured with the multidimensional 36-item Short Form Health Survey (SF-36) questionnaire (Persian language version). The SF-36 questionnaire is a self-reported method which measures health in eight dimensions.[22]This questionnaire is considered to be an appropriate tool for gathering physical, mental, emotional, and general information.[30]The validity and reliability of the questionnaire in Iranian elderly have been established.[31,32]

The questionnaire consists of 36 items with 8 sections (physical function, role limitation related to physical problems, role limitation related to emotional problems, bodily pain, general health, vitality, social function, and mental health).[33]In total, the questionnaire is used for the mental, physical and general evaluation of the QOL.[34]For scoring the SF-36 questionnaire, the Likert method (0 to 100) was used. Zero points represent the lowest and 100 points represents the highest QoL.

Continuous data was expressed as mean±standard deviation, and categorical variables were presented as numbers and percentages. The alpha value was set at 0.05 to indicate the statistical significant level for comparisons. The one-sample Kolmogorov-Smirnov test was used to determine if data were normally distributed. Independent samples t-tests and Chi-square tests were used to compare quantitative and categorical variables, respectively. One way ANOVA followed by Tukey post-hoc test

was used to compare mean scores of SF-36 scales between BMI groups. Pearson correlation coefficient was used for investigating the relationship between obtained SF-36 scores and anthropometric parameters. All data entry and statistical analysis was performed using SPSS version21 (SPSS Inc., Chicago, IL).

Results

In this cross-sectional study, 421 elderly participants (aged 60 and over) were examined. From this population, 131 participants (31.1%) were men. The mean age of the participants was 77.6±8.6 (range 60–93) years. As shown in Table 1, the mean of BMI and WC were 27.7±4.8 (kg/m^2) and 96.2±28.5 cm, respectively. No significant differences were found between men and women for BMI (p=0.12) but, women had a relatively greater WC than men (P = 0.04). Only a few participants lived alone (18.7%) at the time of data collection. The percent of married participants was approximately 2-fold greater than unmarried participants. Only 12.1 percent of studied population had university education. Most participants (74.5%) were unemployed and were not currently smokers (80.8%).

Table 1. Characteristics of the study population by gender

Characteristics	Men N=131	Women N=290	Total N= 421	P.V*
Age (years) (mean±SD)	76.7 (6.2)	78.9 (9.3)	77.6 (8.6)	0.32
BMI (kg/m2) (mean±SD)	26.3 (4.2)	28.7 (3.6)	27.7 (4.8)	0.12
WC (cm) (mean±SD)	92 (24.3)	98.5 (31.5)	96.2 (28.5)	0.04
Living status (N(%))				
Alone	30 (22.9)	49 (16.8)	79 (18.7)	0.05
With others	101 (77.0)	241 (83.2)	342 (81.3)	0.07
Marital status (N(%))				
Married	88 (67.1)	192 (66.2)	280 (66.5)	0.09
Not married [c]	43 (32.9)	98 (33.7)	141 (33.5)	0.24
Education level (N(%))				
Illiterate	28 (21.3)	42 (14.4)	70 (16.6)	0.36
Less than guidance	25 (19.2)	95 (32.7)	120 (28.5)	0.06
Guidance and diploma	57 (43.5)	123 (42.4)	180 (42.7)	0.47
university education	21 (16.0)	30 (10.4)	51 (12.1)	0.32
Occupation (N(%))				
Working	73 (55.7)	34 (11.7)	107 (25.4)	0.002
At home	58 (44.2)	256 (88.2)	314 (74.5)	<0.001
Current smoker (N(%))				
Yes	67 (51.2)	14 (4.8)	81 (19.2)	<0.001
No	64 (48.8)	276 (95.2)	340 (80.8)	<0.001

[c]Including widowed, divorced, and single subjects.
* Independent t-Test was used for quantitative variables and χ2 test for qualitative variables.

Table 2 presents QoL scores as measured by the SF-36, according to BMI classifications in men and women, separately. In general, men had higher scores than women. Social functioning in normal-weight men was the highest scored scale, while general health in obese women was the scale with the lowest score.

Among men with obesity, the mean scores for physical functioning (P < 0.01), role physical (P < 0.01), physical pain (P< 0.001), general health (P < 0.05), vitality (P < 0.01) and social functioning (P < 0.05) scales were significantly lower than men with normal weight. As compared to men with normal weight, subjects with under and overweight showed no significant difference on role emotional and mental health scales. With the exception of physical functioning and mental health, in

Table 2. Information[b] about the QoL scores by BMI classification, N= 421[a]

Scales	BMI (kg/m^2) in Men N=131				BMI (kg/m^2) in Women N=290			
	Under weight (N= 7)	Normal weight (N= 49)	Overweight (N= 53)	obese (N= 22)	Under weight (N= 11)	Normal weight (N= 103)	Overweight (N= 123)	Obese (N= 53)
PF	66.6 (22.4)	68.2 (29.3)	68.6 (21.1)	67.3 (25.2)[d]	61.6 (7.8)	64.8 (31.3)	63.2 (20.9)	63.1 (19.8)
RP	59.5 (27.9)	61.4 (31.4)	59.1 (31.9)	58.2 (24.5)[d]	53.2 (19.4)	57.2 (18.9)	44.3 (31.4)[d]	42.7 (23.4)[d]
BP	72.1 (23.6)	71.7 (30.1)	69.3 (26.4)	67.2 (41.6)[e]	68.8 (28.3)	67.2 (32.3)	67.5 (21.3)	62.6 (37.6)[c]
GH	57.6 (17.2)	56.2 (18.4)	55.7 (27.8)[c]	54.3 (21.1)[c]	54.3 (23.2)	53.2 (18.7)	53.7 (19.1)	42.3 (21.6)[d]
VT	57.6 (27.2)[c]	63.1 (23.9)	61.1 (19.3)	53.2 (26.7)[d]	55.3 (31.2)[c]	59.4 (25.3)	58.7 (18.4)	48.6 (29.2)[e]
SF	79.3 (11.3)	81.2 (14.5)	80.3 (14.2)	78.5 (18.9)[c]	74.3 (25.2)	77.4 (27.3)	79.3 (36.8)[c]	73.4 (33.1)[c]
RE	65.3 (36.2)	64.3 (38.2)	65.1 (36.2)	63.6 (48.2)	56.7 (38.3)	58.3 (28.5)	53.2 (31.2)[e]	54.7 (28.9)[e]
MH	63.2 (21.4)	62.6 (23.6)	62.4 (27.4)	58.4 (21.8)	61.7 (28.4)	63.6 (26.3)	65.4 (28.4)	63.4 (31.6)

[a]One-wayANOVA: mean QoL scores for normal BMI people were compared with mean QoL scores in other BMI categories.

[b]Reported mean (SD). Scale range for all measures is 0-100 and higher score indicates better outcome.

[c]p-value<0.05, [d]p-value<0.01, [e]p-value<0.001

Abbreviation: PF, Physical functioning; RP, Role physical; BP, Bodily pain; GH, General health; VT, Vitality; SF, Social functioning; RE, Role emotional; MH, Mental health; BMI, body mass index.

Table 3. The association between the SF-36 scores and obesity in the study population, N= 421

Scales	BMI (kg/m^2)		Waist circumference (cm)	
	r	P.V[*]	r	P.V[*]
PF	-0.25	0.004	-0.29	0.002
RP	-0.10	0.03	-0.24	<0.001
BP	-0.31	<0.001	-0.01	0.30
GH	-0.07	0.09	-0.22	0.01
VT	-0.19	0.02	-0.23	<0.001
SF	-0.02	0.41	-0.08	0.24
RE	-0.37	0.01	-0.11	0.04
MH	-0.07	0.28	-0.08	0.3

*Pearson correlation was used.

Abbreviation: PF, Physical functioning; RP, Role physical; BP, Bodily pain; GH, General health; VT, Vitality; SF, Social functioning; RE, Role emotional; MH, Mental health; BMI, body mass index.

all other SF-36 scale mean scores, women with obesity had lower QoL compared to women with normal weight. Also, underweight women, just as in men, had lower mean scores on vitality (P<0.05), than those with normal weight. Moreover, as compared with normal-weight women, those with overweight showed significant differences in role physical (P<0.01), social functioning (P<0.05) and role emotional (P<0.001) (Table 2).

Results of correlation analyses showed that anthropometric indices had an inverse correlation with all the aspects of QoL in this research (Table 3). There was no correlation between social function, mental health, and general health with BMI and also between bodily pain and WC.

Discussion

With regarding the growing aging population, QoL becomes one of the more highlighted issues in the health care systems and health sector policies. QoL is associated with different factors that obesity is one of the most important predictive variables. In the present study, obesity was correlated to the physical component of QoL, but not with all scores of the mental components.

Previous studies have reported that obesity is associated with lower QoL (21–23, 35–45). A study conducted on 88 elderly women (mean age of 71 ± 5years) showed that higher

BMI is associated with lower physical function in the 18 movement physical tests.[35] In a study on participants aged 65 or higher (n = 3605) in Spain, it was found that most of the participants with poor physical function were in obese group (BMI of 30 or over). [43] Honglei et al (2002)., found a linear relationship between waist circumference and disability in elderly women.[46] However, in some studies, lower BMI was correlated with lower QOL.[47–49] In a study conducted by Sach et al., underweight patients were estimated to be 2.48 times more likely to be anxious or depressed according to the SF-6D.[48] The significant lower SF-6D score for underweight patients was due to their likelihood of having problems on the role limitations dimension. On the other hand, some underweight persons may have lost weight due to underlying illness; thus, the temporal nature of the relationships among underweight, QoL, and chronic disease are more complex.[50]

Obesity and overweight are important predictors of type two diabetes, higher systolic and diastolic blood pressure, and insulin resistance.[51] Moreover, the potent correlations between obesity and gallbladder diseases, arthritis, specific cancers (prostate, breast, colon),[52,53] sleep disorders[54,55] and respiratory problems[56] could influence QoL.[10] In a review of the literature by manutiand et al.(2012) difficulty in daily activity increased with greater BMI.[57] As shown in another study, lower QoL scores were associated with aging.[58] It seems that aging can cause increases in

the prevalence of lower QoL indices, such as chronic diseases, decreased energy and physical strength and the loss of social relationships. Obesity is known to be associated with the risk of many chronic diseases that are highly prevalent among the elderly.[37,50,59]

The relationship between weight and QoL in the mental aspect has been shown in some studies.[21,39]Lijing et al., evaluated the correlation between BMI and quality of life in 3981 men and 3099 women and found that obesity is associated with low total and physical (but not mental) quality of life.[46] The results of another study indicated that lower psychological domain of QoL is associated with increasing BMI levels.[60]

The previous results on the relationship between obesity and QOL in the mental and social function aspects are inconsistent.[61,62]While some studies show an inverse relationship between the QOL in mental and social function aspects and obesity,[22,37,39,41]some studies found no relationship.[21,42]Ford et al., showed that obesity has great impact on the mental component than the physical component, and also indicated that there is a direct and significant relationship between BMI and unhealthy mental conditions.[23]Some of observed inconsistencies are related to design of studies and study population. It's possible that recent weight loss or weight gain changed the BMI class of some participants and there is not enough time to develop adverse effects, especially in the social and mental domains.[50]It should be mentioned that the absence or presence of other diseases can also impact QoL and the obtained scores.

It is suggested that people with obesity tend to have lower self-esteem, higher anxiety and poorer self-image,[63,64]which are important factors in reducing the social aspect of QOL in people with obesity.[65]However, some studies have reported that the impact of obesity on physical aspects is more than of psychological components.[23]In addition, the social component of QoL, self-esteem and body image may be more related to age, and so not reflecting the QoL.[43]

Our study has some limitations. Many diseases such as diabetes, hyperlipidemia, and endocrine disorders are obesity-related diseases are also prevalent in older adults and greatly affect QoL. These variables were not considered as confounding variables in present study. Furthermore, QoL assessment was self-reported method by SF-36 questionnaire, which reflects participants' experiences and expectations in life that may be affected by environmental and cultural conditions. The cross-sectional design of study can lead to observing bidirectional associations, and we cannot determine temporality in assessing causality (exposure and outcome) between obesity and QoL. Another limitation of the study was that participants were recruited from health homes. The center's members benefit from some services like sport and educational programs which can affect the QoL, and the obtained results haven't sufficient generalizing power. It is suggested that future studies be performed on the general elderly population.

Finally, according to the findings of the present study we can conclude that obesity and overweight are associated with QoL. Due to the increased rates of obesity and rising life expectancy,

weight management in this sector of the population seems to be of great importance.

Acknowledgment

Conflict of Interest

The authors declare that they have no conflict of interests.

References

1. Heydari J, Rouhani S, Mohammadpour RA. Aging populations' quality of life: an emerging priority for public health system in Iran. Life Science Journal 2012;9:1304-9

2. Darjani A, Mohtasham-Amiri Z, Mohammad Amini K, Golchai J, Sadre-Eshkevari S, Alizade N. Skin disorders among elder patients in a referral center in Northern Iran (2011). Dermatol Res Pract 2013;2013:1-4. doi:10.1155/2013/193205

3. Aghanuri A, Mahmoudi M, Asadi M, Mortaji F, Salehi H, Djafarian K. Quality of life and its relationship with quality of diet among elderly people in urban areas of markazi province, Iran. Arak Medical University Journal 2013;15:1-11.

4. Guyatt GH, Cook DJ. Health status, quality of life, and the individual. Jama 1994;272:630-1. doi:10.1001/jama.1994.03520080072047

5. Farzianpour F, Foroushani AR, Badakhshan A, Gholipour M, Roknabadi EH. Quality of life for elderly residents in nursing homes. Glob J Health Sci 2015;8:127-35. doi:10.5539/gjhs.v8n4p127

6. Lee TW, Ko IS, Lee KJ. Health promotion behaviors and quality of life among community-dwelling elderly in Korea: a cross-sectional survey. Int J Nurs Stud 2006;43:293-300. doi:10.1016/j.ijnurstu.2005.06.009

7. Visscher T, Seidell J, Menotti A, Blackburn H, Nissinen A, Feskens E, et al. Underweight and overweight in relation to mortality among men aged 40–59 and 50–69 years the seven countries study. Am J Epidemiol 2000;151:660-6.

8. Friedrich MJ. Epidemic of obesity expands its spread to developing countries. Jama 2002;287:1382-6. doi:10.1001/jama.287.11.1382-JMN0320-2-1

9. Popkin BM, Adair LS, Ng SW. Global nutrition transition and the pandemic of obesity in developing countries. Nutr Rev 2012;70:3-21. doi:10.1111/j.1753-4887.2011.00456.x

10. Giuli C, Papa R, Bevilacqua R, Felici E, Gagliardi C, Marcellini F, et al. Correlates of perceived health related quality of life in obese, overweight and normal weight older adults: an observational study. BMC Public Health 2014;14:1-8. doi:10.1186/1471-2458-14-35

11. Flegal KM, Kit BK, Orpana H, Graubard BI. Association of all-cause mortality with overweight and obesity using standard body mass index categories: a systematic review and meta-analysis. Jama 2013;309:71-82. doi:10.1001/jama.2012.113905

12. Lavie CJ, De Schutter A, Patel DA, Romero-Corral A, Artham SM, Milani RV. Body composition and survival in stable coronary heart disease: impact of lean mass index and body fat in the "obesity paradox". J Am Coll Cardiol 2012;60:1374-80. doi:10.1016/j.jacc.2012.05.037

13. Neeland IJ, Turer AT, Ayers CR, Powell-Wiley TM, Vega GL, Farzaneh-Far R, et al. Dysfunctional adiposity and the risk of prediabetes and type 2 diabetes in obese adults. Jama 2012;308:1150-9. doi:10.1001/2012.jama.11132

14. Vucenik I, Stains JP. Obesity and cancer risk: evidence, mechanisms, and recommendations. Ann N Y Acad Sci 2012;1271:37-43. doi: 10.1111/j.1749-6632.2012.06750.x

15. Adams KF, Schatzkin A, Harris TB, Kipnis V, Mouw T, Ballard-Barbash R, et al. Overweight, obesity, and mortality in a large prospective cohort of persons 50 to 71 years old. N Engl J Med 2006;355:763-78. doi:10.1056/NEJMoa055643

16. Guh DP, Zhang W, Bansback N, Amarsi Z, Birmingham CL, Anis AH. The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis. BMC public health 2009;9:1-20. doi:10.1186/1471-2458-9-88

17. Must A, Spadano J, Coakley EH, Field AE, Colditz G, Dietz WH. The disease burden associated with overweight and obesity. Jama 1999;282:1523-9.

18. Panel NOEIE. on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults—the evidence report. Obes Res. 1998;6(Suppl 2):51S-209S.

19. Arterburn D, Westbrook EO, Ludman EJ, Operskalski B, Linde JA, Rohde P, et al. Relationship between obesity, depression, and disability in middle-aged women. Obes Res Clin Pract 2012;6:e197-e206. doi:10.1016/j.orcp.2012.02.007

20. Daviglus ML, Liu K, Yan LL, Pirzada A, Garside DB, Schiffer L, et al. Body mass index in middle age and health-related quality of life in older age: the Chicago heart association detection project in industry study. Arch Intern Med 2003;163:2448-55. doi:10.1001/archinte.163.20.2448

21. Le Pen C, Lévy E, Loos F, Banzet MN, Basdevant A. " Specific" scale compared with" generic" scale: a double measurement of the quality of life in a French community sample of obese subjects. J Epidemiol Community Health. 1998;52:445-50. doi:10.1136/jech.52.7.445

22. Doll HA, Petersen SE, Stewart-Brown SL. Obesity and physical and emotional well-being: associations between body mass index, chronic illness, and the physical and mental components of the SF-36 questionnaire. Obes Res 2000;8:160-70. doi:10.1038/oby.2000.17

23. Ford ES, Moriarty DG, Zack MM, Mokdad AH, Chapman DP. Self-Reported Body Mass Index and Health-Related Quality of Life: Findings from the Behavioral Risk Factor Surveillance System. Obes Res 2001;9:21-31. doi:10.1038/oby.2001.4

24. Ebrahim S, Wannamethee SG, Whincup P, Walker M, Shaper AG. Locomotor disability in a cohort of British men: the impact of lifestyle and disease. Int J Epidemiol 2000;29:478-86. doi:10.1093/ije/29.3.478

25.Harris T, Kovar MG, Suzman R, Kleinman JC, Feldman JJ. Longitudinal study of physical ability in the oldest-old1989;79:698-702.

26. Pinsky JL, Branch LG, Jette AM, Haynes SG, Feinleib M, Cornoni-Huntley JC, et al. Framingham disability study: relationship of disability to cardiovascular risk factors among persons free of diagnosed cardiovascular disease. Am J Epidemiol 1985;122:644-56.

27. Abdollahi S, Zeinali F, Azam K, Toupchian O, Djafarian K. Identifying major dietary patterns among the elderly in Tehran health homes. Jundishapur J Health Sci 2015;7:26-34. doi: 10.17795/jjhs-30395

28. Organization WH. Physical status: The use and interpretation of anthropometry In: Report of a WHO Expert Committee, ed. WHO technical report series. 1995;854.

29. World Health Organization. Obesity: preventing and managing the global epidemic. Geneva: World Health Organization; 2000. 253p. report no :894.

30. Ruano C, Henriquez P, Bes-Rastrollo M, Ruiz-Canela M, del Burgo C, Sánchez-Villegas A. Dietary fat intake and quality of life: the SUN project. Nutrition journal 2011;10:1-8. doi:10.1186/1475-2891-10-121

31. Eshaghi SR, Farajzadegan Z, Babak A. Healty lifestyle assessment questionnaire in elderly: translation, reliability and validity. payesh. 2010;9(1):91-9. (persian)

32. Eshaghi R, Babak A, Manzori L, Merasi MR. The nutritional status of the elderly and their associated factors in isfahan. Journal of ageing 2007;2:340-5. (Persian)

33. McHorney CA, Ware JE JR, Raczek AE. The mos 36-item short-form health survey (SF-36): ii. psychometric and clinical tests of validity in measuring physical and mental health constructs. Med Care 1993:247-63.

34. Faubel R, Lopez-Garcia E, Guallar-Castillón P, Balboa-Castillo T, Gutiérrez-Fisac JL, Banegas JR, et al. Sleep duration and health-related quality of life among older adults: a population-based cohort in Spain. Sleep. 2009;32:1059-68.

35. Apovian CM, Frey CM, Wood GC, Rogers JZ, Still CD, Jensen GL. Body mass index and physical function in older women. Obes Res 2002;10:740-7. doi:10.1038/oby.2002.101

36. Coakley EH, Kawachi I, Manson JE, Speizer FE, Willet WC, Colditz GA. Lower levels of physical functioning are associated with higher body weight among middle-aged and older women. Int J Obes Relat Metab Disord 1998;22:958-65.

37. Fontaine KR, Barofsky I. Obesity and health-related quality of life. Obes Rev 2001;2:173-82. doi:10.1046/j.1467-789x.2001.00032.x

38. Heo M, Allison DB, Faith MS, Zhu S, Fontaine KR. Obesity and quality of life: mediating effects of pain and comorbidities. Obes Res 2003;11:209-16. doi:10.1038/oby.2003.33

39. Katz DA, McHorney CA, Atkinson RL. Impact of Obesity on Health-related Quality of Life in Patients with Chronic Illness. J Gen Intern Med 2000;15:789-96. doi: 10.1046/j.1525-1497.2000.90906.x

40. Kolotkin RL, Meter K, Williams GR. Quality of life and obesity. Obes Rev 2001;2:219-29. doi:10.1046/j.1467-789X.2001.00040.x

41. Kushner RF, Foster GD. Obesity and quality of life. Nutrition. 2000;16:947-52.

42. Lean ME, Han TS, Seidell JC. Impairment of health and quality of life using new US federal guidelines for the identification of obesity. Arch Intern Med 1999;159:837-43. doi:10.1001/archinte.159.8.837

43. López-García E, Banegas Banegas JR, Gutiérrez-Fisac JL, Pérez-Regadera AG, Gañán LD, Rodríguez-Artalejo F. Relation between body weight and health-related quality of life among the elderly in Spain. Int J Obes Relat Metab Disord 2003;27:701-9. doi:10.1038/sj.ijo.0802275

44. Sternfeld B, Ngo L, Satariano WA, Tager IB. Associations of body composition with physical performance and self-reported functional limitation in elderly men and women. Am J Epidemiol 2002;156:110-21. doi:10.1093/aje/kwf023

45. Jia H, Lubetkin EI. The impact of obesity on health-related quality-of-life in the general adult US population. J Public Health (Oxf) 2005;27:156-64. doi:10.1093/pubmed/fdi025

46. Chen H, Bermúdez OI, Tucker KL. Waist circumference and weight change are associated with disability among elderly Hispanics. J Gerontol A Biol Sci Med Sci 2002;57:M19-25. doi:10.1093/gerona/57.1.M19

47. Hopman WM, Berger C, Joseph L, Barr SI, Gao Y, Prior JC, et al. The association between body mass index and health-related quality of life: data from CaMos, a stratified population study. Qual Life Res 2007;16:1595-603. doi:10.1007/s11136-007-9273-6

48. Sach TH, Barton GR, Doherty M, Muir KR, Jenkinson C, Avery AJ. The relationship between body mass index and health-related quality of life: comparing the EQ-5D, EuroQol VAS and SF-6D. Int J Obes (Lond) 2007;31:189-96. doi:10.1038/sj.ijo.0803365

49. Wee HL, Cheung YB, Loke WC, Tan CB, Chow MH, Li SC, et al. The association of body mass index with health-related quality of life: an exploratory study in a multiethnic Asian population. Value Health 2008;11:S105-14. doi: 10.1111/j.1524-4733.2008.00374.x

50. Yan LL, Daviglus ML, Liu K, Pirzada A, Garside DB, Schiffer L, et al. BMI and health-related quality of life in adults 65 years and older. Obes Res 2004;12:69-76. doi:10.1038/oby.2004.10

51. Panel NOEIE. on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults—the evidence report. Obes Res. 1998;6(Suppl 2):51S-209S.

52. Malnick SDH, Knobler H. The medical complications of obesity. Qjm 2006;99:565-79. doi:10.1093/qjmed/hcl085

53. Bray GA. Complications of obesity. Ann Intern Med 1985;103:1052-62. doi:10.7326/0003-4819-103-6-1052

54. Lam JC, Mak JC, Ip MS. Obesity, obstructive sleep apnoea and metabolic syndrome. Respirology 2012;17:223-36. doi:10.1111/j.1440-1843.2011.02081.x

55. Ryan S, Crinion SJ, McNicholas WT. Obesity and sleep-disordered breathing—when two 'bad guys' meet. QJM 2014;107:949-54. doi:10.1093/qjmed/hcu029

56. Rabec C,Lucas Ramos P, Veale D. Respiratory complications of obesity. Arch Bronconeumol2011;47:252-61. doi: 10.1016/j.arbres.2011.01.012

57. Backholer K, Wong E, Freak-Poli R, Walls HL, Peeters A. Increasing body weight and risk of limitations in activities of daily living: a systematic review and meta-analysis. Obes Rev 2012;13:456-68. doi:10.1111/j.1467-789X.2011.00970.x

58. Manuti B, Rizza P, Pileggi C, Bianco A, Pavia M. Assessment of perceived health status among primary care patients in Southern Italy: findings from a cross-sectional survey. Health Qual Life Outcomes 2013;11:1-9. doi:10.1186/1477-7525-11-93

59. Friedman MA, Brownell KD. Psychological correlates of obesity: moving to the next research generation. Psychol Bull 1995;117:3-20. doi:10.1037/0033-2909.117.1.3

60. Pimenta FB, Bertrand E, Mograbi DC, Shinohara H, Landeira-Fernandez J. The relationship between obesity and quality of life in Brazilian adults. Front Psychol 2015;6:1-7. doi:10.3389/fpsyg.2015.00966

61. Flegal KM, Graubard BI, Williamson DF, Gail MH. Excess deaths associated with underweight, overweight, and obesity. Jama 2005;293:1861-7. doi:10.1001/jama.293.15.1861

62. Hu FB, Willett WC, Li T, Stampfer MJ, Colditz GA, Manson JE. Adiposity as compared with physical activity in predicting mortality among women. N Engl J Med 2004;351:2694-703. doi:10.1056/NEJMoa042135

63. Han TS, Tijhuis MA, Lean ME, Seidell JC. Quality of life in relation to overweight and body fat distribution. Am J Public Health 1998;88:1814-20. doi:10.2105/AJPH.88.12.1814

64. Fitzgibbon ML, Stolley MR, Kirschenbaum DS. Obese people who seek treatment have different characteristics than those who do not seek treatment. Health Psychol 1993;12:342-5.

65. Wee CC, Davis RB, Huskey KW, Jones DB, Hamel MB. Quality of life among obese patients seeking weight loss surgery: the importance of obesity-related social stigma and functional status. J Gen Intern Med 2013;28:231-8. doi: 10.1007/s11606-012-2188-0