Iranian J Publ Health, Vol. 40, No.2, 2011, pp.87-95

Original Article

Housewives' Obesity Determinant Factors in Iran; National Survey - Stepwise Approach to Surveillance

*S Navadeh[1], *L Sajadi[2], A Mirzazadeh[3, 4], F Asgari[5], M Haghazali[6]*

[1]Physiology Research Center, Kerman University of Medical Sciences, Kerman, Iran
[2]Regional Knowledge Hub for HIV/AIDS Surveillance, Kerman University of Medical Sciences, Kerman, Iran
[3]Physiology Research Center, Kerman University of Medical Sciences, Kerman, Iran
[4]Dept. of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran
[5]Center for Disease Control (CDC), Ministry of Health and Medical Education, Tehran, Iran
[6]NCD Deputy of Center for Diseases Control, Shahid Beheshti University, Tehran, Iran

(Received 28 Oct 2010; accepted 16 Apr 2011)

Abstract

Background: Women suffer more from obesity than men in Iran do. In this study, we compared obesity risk and its contributors regarding the job categories as housewives (HWs) or employees to deeply explore the risk of obesity in housewives in Iran.

Methods: Based on WHO stepwise approach, in 2005, 33472 women aged 15 to 65 years old (excluding all men) were examined for the major risk factors for non-communicable diseases. Obesity was determined by Body Mass Index>30kgm^{-2} in adults (>20 years) and by girl BMI percentiles according to WHO 2007 Growth Reference 5-19 years in adolescents. We modeled obesity by logistic regression and entered all the known/potential predictors, including job categories.

Results: The participation rate was more than 99%. The weighted prevalence of overweight and obesity in HWs were 34.5% and 24.5% respectively. Employed women were about 4% and 10% less overweight and obese than the HWs, respectively ($P< 0.01$). HWs vs. employed women had the adjusted OR 1.39 (CI95%, 1.18-1.63) for obesity. Older women, with higher educational level and socioeconomic status, lower physical activities and those living in urban areas were at risk of obesity. In comparison to HWs, working as an Official Clerk (OR=0.66) associated with a decrease in odds of obesity significantly, while others did not.

Conclusion: Being as HW is an independent significant factor for obesity in women. Preventive health care programs to reduce risk of obesity in women should be applied, considering their occupation for achieving more effectiveness.

Keywords: *Women, Housewife, Occupation, Obesity, Overweight*

Introduction

Obesity is a major public health problem and becomes an important epidemic in both developed and developing countries since an increase in the risky lifestyles (1, 2). Obesity is a global problem, affecting an estimated 300 million people worldwide (3) and its prevalence in the recent decade had a rapid increase (178%) (4). Obesity substantially increases the risk of several major cancers especially postmenopausal breast cancer and endometrial cancer (5). Moreover, studies indicated that overweigh and obesity are associated with an increase in mortality and a considerable reduction in life expectancy (3, 5).

Obesity is a multi factorial phenomena and associates with age, gender, ethnicity, levels of leisure time, physical activity, education, parity, economical and marital statuses, smoking habits, alcohol consumption, family history of obesity and dietary habits in both men and women (2, 6-9). In compare to men, such determinant factors of obesity were frequently accumulated in women; the

*Corresponding author: Tel: +98-912-5385066, Fax: +98-21-22735176, Email: leily.sajadi@hivhub.ir

findings of several studies have shown that the incidence and the prevalence of obesity in women in many countries are higher than men (10-12).
Rashidi et al indicated that overweight and obesity are significant national public health problem especially among women in urban areas in Iran (13). In a large national survey carried out by the Ministry of Health in 1999, obesity was diagnosed in 28% and 15% of 40-69 yr women living in urban and rural areas, respectively (14). In 2003, the prevalence of obesity was reported as 10.4% to 14.2% in men and 27.1% to 29.1% in women, while it was indicated an increase in the trend of obesity in Iran (15, 16).
Surprisingly, studies indicated that obesity prevalence among women is about 10-15% higher than men at the same age specific group in Iran (17). Studies on women obesity regarding their job categories were conducted in some countries (11). Ersoy and Imamoglu showed that the prevalence of obesity was prominently higher in Turkish housewives (42.2%) than employed women (11.6%) (18). Women engaged in domestic duties are more often obese than employed women are, and this association persists after adjustment for age and other socio-economic variables (1).
Based on the national census reports in 2007, women included 49% of the Iranian population. Most of them living in urban areas and working as housewives (19). In this study, we explored the obesity risk of Iranian women regarding their job category as employed or housewives (HWs). In addition, we compared obesity risk of housewives with the employees according to age, dietary habits, marital status, socioeconomic status, living place and physical activity to deeply explore the main characteristics of housewives as a big portion of women in Iran.

Materials and Methods

In a cross-sectional study in 2005, more than 89,000 individuals aged from 15 to 65 yr old were examined for the major risk factors for non-communicable diseases from all over Iran, included 28 provinces in Iran. This population based national survey with one stage cluster sampling was organized under the supervision of the Ministry of Health compatible with the WHO recommended Stepwise approach to conduct a surveillance for non-communicable diseases and their risk factors. The study was carried out in all subjects who completed the informed consents.
The main dataset had 89,229 records. After checking the consistency of the data, all men (n= 44944) were omitted. Women who were employed but retired in the time of study, students, unemployed (able/unable to work), other/undefined job categories (n= 7168) in addition to pregnant women (n= 865) were excluded. Finally, the remaining participants (n=36252) included; the housewives –33472 (92.3%)- as the case group and all the others- Clerks 1663 (4.6%), Workers 268 (0.7%), Farmers 198 (0.5%) and Self-employed women 651 (1.8%) - as the control one.
The questionnaire about birth date, job category, marital status, educational level, lifestyle, and dietary habits of the subjects were filled in according to their self-reports, by face-to-face interview. Items such as owning a car, a house, the number of rooms of the house (>2) and the number of non-occupational travels during last year were interviewed. Each item was scored by one point. Socio-Economical Status (SES) score was calculated by adding all the above items and defined as very low (score = 0), low (score= 1), middle (score= 2), high (score= 3) and very high (score= 4) (6, 20). Based on governmental deviations of areas, we defined living areas as urban and rural.
The dietary section of the questionnaire included many questions about the frequency of food consumption during a routine week. Fast food and the type of oil consumed by the family were analyzed in this study.
Furthermore, body weight, height and waist circumference were measured in subjects by standard methods. After calculating body mass index (BMI), according to WHO categorization BMI was defined as underweight (BMI< 18.5 kg/m²), normal weight (18.5<BMI< 24.9 kg/m²), overweight (25<BMI< 29.9 kg/m²) and obese (BMI> 30 kg/m²) for adults (age>20 yr). According to WHO 2007 Growth Reference 5-19 yr, for ado-

lescents (age < 20 yr), girl BMI percentiles and the computed z-scores were calculated by STATA WHO do files (21). The following Cut-offs was applied:

Obesity: >+2SD
Overweight: >+1SD
Normal: ≥-2SD AND ≤+1SD
Thinness (under weight): <-2SD
Severe thinness (under weight): <-3SD

Statistical methods

We got the estimated age group specific number of population in 2005 from the National Statistical Center of Iran (22) and weighted all the estimates according to this variable. We assigned provinces code as strata, clusters code as primary sampling units and run all the analysis with survey analysis packages in Stata v.8 se. The weighted estimates of categorical variables in housewives and employed group were compared by chi square test, while numerical variables were tested by unpaired *t*-test. We reported all data as point and confidence interval 95%. In order to define the most related factors to women obesity, we modeled obesity by logistic regression and entered all the predictors (including job category) one by one in the model for calculating the crude odds ratio. Those having *P* value <0.1 remained in the model for calculating the adjusted odds ratio for obesity.

Results

Data from 36252 individuals were analyzed. More than 92% were HW. All the demographic features of both HW and Employed group are reported in Table 1. In comparison with employed group, HWs were older about 3 yr ($P< 0.001$). Near 83% of HWs were married. In HWs the educational and SES level were significantly lower than the others were ($P< 0.01$). While most of the individuals were living in urban areas, employed group lived in urban areas about 15% more than HW group.

The overall weighted prevalence of overweight and obese women was 34.2% and 23.4% respectively; these figures in HWs were 34.5% and 24.4% respectively. In contrast, overweight and obese women were seen in 30.7% and 14.5% of employed women. HWs differed from Employed group regarding all obesity indices (BMI, BMI category and waist circumference) ($P< 0.01$). Physical activity in HWs was statistically about 9% less than employed group ($P< 0.01$). Employed women used to have fast foods more than HWs. In both groups the most oil preference was saturated one. Compared to employees, HWs used more saturated oil (Table 2).

The strength of association between obesity and predictors are shown in table 3. HWs experienced obesity about 1.9 times more than the employed women did ($P< 0.001$). Aging increased the odds of obesity by 50% for each 10 yr. Women obesity decreased significantly in higher educational status. Married and divorced/widow women were prone to develop obesity three to four times more than the singles. In comparison with very low SES, having low, middle and high socio-economic status increased the risk of obesity significantly with odds ratio 1.25, 1.33 and 1.43 respectively. Women living in urban areas had higher odds (OR 1.3) for obesity. Surprisingly, those who consumed fast foods more than two times a week had lower risk for obesity. Compared to those having saturated oil preference, olive oil consumption increased the odds of obesity about 20%. Physical activity was associated with obesity significantly (Table 3).

After adjusting the effect of other factors, job (OR 1.39), age group (OR 1.38), being married (OR 2.15) and divorced/widow (OR 1.66), having middle SES (OR 1.22) and high SES (OR 1.31), living in urban areas (OR 1.37), having fast food more than two times a week (OR 0.78) and olive oil preference (OR 1.20) remained significant in the model (Table 3).

When we considered employed women in four separated categories, the percentage of obesity was 13.4% (CI95%- 11.4, 15.73) in Clerks, 14.49% (CI95%-10.13, 20.3) in Workers, 14.94% (CI95%- 9.76, 22.3) in Farmers and 16.5% (CI95%- 12.9, 20.8) in self-employees. As you can see in Fig. 1, only Clerks, adjusted OR 0.66 (CI95%- 0.53, 0.81), had the obesity percentage significantly lower than

HWs ($P< 0.001$). Compared to HWs, the adjusted OR for obesity in Workers and Farmers were 0.66 and 0.61, respectively ($P> 0.05$). The odds of obesity in Self-employed group were equal to 0.91.

Table1: Demographic variables according to women occupation status

		Housewife (n=33,472)	Employed (n=2,780)
Age (yr) (M±SD)		35.80±0.08	32.73±0.29
Marital status %			
	Single	13.39 [12.6,14.22]	32.47 [29.72,35.35]
	Married	82.37 [81.5,83.21]	63.54 [60.62,66.37]
	Divorced + Widow	4.23 [3.96,4.53]	3.987 [3.12,5.08]
Education %			
	No formal schooling	22.65 [21.9,23.41]	6.15 [5.15,7.331]
	Primary School	30.07 [29.18,30.98]	10.56 [9.079,12.25]
	Secondary School	17.6 [16.8,18.43]	8.44 [6.874,10.33]
	High School	26.22 [25.28,27.19]	35.86 [32.99,38.83]
	University degrees	3.46 [3.02,3.96]	38.99 [35.91,42.15]
Living Area %			
	Rural	30.7 [29.22,32.23]	15.19 [13.16,17.47]
	Urban	69.3 [67.77,70.78]	84.81 [82.53,86.84]
Socioeconomic status %			
	Very Low	9.40 [8.76,10.09]	8.73 [7.104,10.69]
	Low	33.72 [32.7,34.75]	27.4 [24.99,29.95]
	Middle	33.06 [32.19,33.95]	30.1 [27.47,32.87]
	High	18.51 [17.69,19.37]	25.41 [22.7,28.32]
	Very High	5.30 [4.81,5.84]	8.35 [6.878,10.12]

M-mean; SD-Standard Deviation; CI-Confidence Interval CI95% was represented in []. Categorical variables were compared by $\chi 2$, while numerics tested by *t*-test. The differences between housewives and employed group in all above characteristics were significant at 0.01 level.

Table 2: Obesity indices, physical activity, and dietary habits in both housewives and employed women

		Housewife (n=33,472)	Employed (n=2,780)
BMI (M ± SD)		26.68 ± 0.06	25.06 ± 0.12
	Under Weight%	3.46 [3.09,3.87]	4.05 [3.02,5.42]
	Normal %	37.37 [36.46,38.29]	50.15 [47.24,53.07]
	Overweight%	34.59 [33.71,35.48]	31.13 [28.58,33.80]
	Obese %	24.57 [23.72,25.44]	14.66 [12.93,16.58]
Waist Circumference (M±SD)		89.24 ± 0.16	84.82 ± 0.41
Physical Activity%			
	No	78.25 [77.29,79.19]	69.52 [66.54,72.34]
	Yes	21.75 [20.81,22.71]	30.48 [27.66,33.46]
Fast Food (per week)%			
	No time	68.78 [67.77,69.78]	60.67 [57.35,63.89]
	Once	19.86 [19.02,20.72]	22.01 [19.23,25.07]
	Twice	7.502 [6.977,8.063]	10.23 [8.435,12.35]
	Three & more times	3.857 [3.487,4.265]	7.094 [5.494,9.115]
Oil %			
	Saturated vegetable	80.97 [79.96,81.95]	68.12 [65.05,71.04]
	Unsaturated vegetable	18.12 [17.18,19.09]	31.02 [28.1,34.09]
	Lard or suet	.8505 [.706,1.024]	.8444 [.4987,1.426]
	Margarine	.0613 [.0288,.1308]	.017 [.0024,.1206]

M-mean; SD-Standard Deviation; CI-Confidence Interval CI95% was represented in []. Categorical variables were compared by $\chi 2$, while numerics tested by *t*-test.
The differences between housewives and employed group regarding all above variables were significant at 0.01 level.

Table 3: The association of different factors with obesity in women; a logistic regression model

	Crude OR (CI 95%)	Adjusted OR (CI 95%)
Job		
Employed¥	1	1
Housewife	1.91 (1.65, 2.23)*	1.39 (1.18, 1.63)*
Age group	1.55 (1.51, 1.59)*	1.38 (1.33, 1.43)*
Education	0.76 (0.73, 0.79)*	0.87 (0.83, 0.91)*
Marital Status		
Single¥	1	1
Married	3.59 (3.08, 4.19)*	2.15 (1.84, 2.51)*
Divorced + Widow	4.36 (3.44, 5.52)*	1.66 (1.30, 2.13)*
Socioeconomic Status		
Very Low¥	1	1
Low	1.25 (1.06, 1.48)*	1.13 (0.95, 1.33)
Middle	1.33 (1.11, 1.58)*	1.22 (1.02, 1.45)*
High	1.43 (1.18, 1.72)*	1.31 (1.08, 1.57)*
Very High	1.29 (1.05, 1.58)	1.13 (0.92, 1.39)
Living Area		
Rural¥	1	1
Urban	1.30 (1.17, 1.45)*	1.37 (1.21, 1.55)*
Fast food (per week)		
No time ¥	1	1
Once	0.90 (0.81, 1.01)	1.01 (0.90, 1.13)
Twice	0.91 (0.80, 1.04)	1.07 (0.93, 1.23)
Three & more times	0.61 (0.49, 0.75)*	0.78 (0.63, 0.96)*
Oil		
Saturated vegetable ¥	1	1
Unsaturated vegetable	1.22 (1.09, 1.36)*	1.20 (1.08, 1.34)*
Lard or suet	0.84 (0.59, 1.19)	0.74 (050, 1.08)
Margarine	0.85 (0.17, 4.16)	0.73 (0.15, 3.50)
Physical Activity		
No¥	1	1
Yes	0.86 (0.78, 0.94)*	0.99 (0.89, 1.09)

OR-Odds Ratio; CI-Confidence Interval; ¥ Baseline group; * $P< 0.01$

Age group was entered in the model with 10 years interval from 15 to 65 years old. Education varies in five ordinal categories from illiterate to university degree.

All the variables were entered in the model to calculate the adjusted odds ratio.

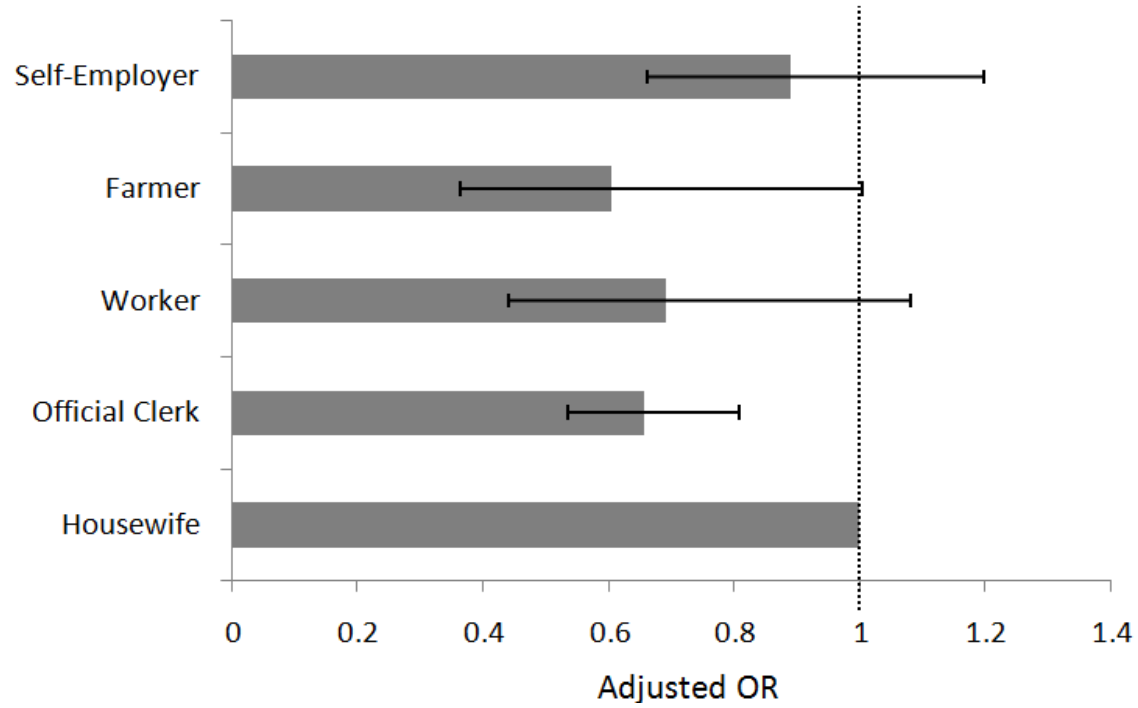

Fig. 1: The point estimation and confidence interval 95% of adjusted OR for obesity. Housewife was reserved as the baseline group (OR=1). Adjustment was performed regarding all the significant factors reported in Table 3

Discussion

Based on findings, the weighted prevalence of overweight and obesity among HWs was 34.5% and 24.5%, respectively. Both overweight and obesity prevalence were about 4% and 10% less common among employed women than HWs. After adjustment for the potential confounders such as age, physical activity, and other unhealthy life styles, living as a housewife remains a significant independent risk factor for obesity among women.

Recent studies indicated that overweight prevalence among women is varied from 32.3% to 69.7% (1, 17) and obesity from 10% to 46.4% (5, 12, 23) in different countries worldwide. In comparison to mentioned studies, Iranian women are at high risk for developing obesity. This could be partly explained by the fact that a big portion of women living in Iran is unemployed as housekeeper/housewife.

Lower educational level and socioeconomic status were reported to be risk factors for women's obesity in different studies (1, 6, 12, 20). Similar to other studies, we found that HWs had lower educational level and socioeconomic status than the employed group. Educational level is inversely related with unhealthy dietary habits and physical activities (18). This could partly explain the higher risk of obesity in HWs. Surprisingly in comparison with lower SES, we found women at middle to high SES level, experienced an increased the risk of obesity. SES is a complex multidimensional indicator. There are many methods for calculating SES and they mostly should be adapted for local settings before being applied. As mentioned in details in the material method, we have calculated the SES according to some basic variables from the database. To check its predictability, we have examined the SES against living areas and educational level and found it a valid predictor. However, the relationship between SES and the obesity is not easy to be explained since it is much related to educational level and lifestyle.

Regarding healthy diets, employed women reported more fast food consumptions during a week. It

can be a part of their specific life style with more hours being outdoors and having limited time to serve domestic prepared foods. This was reported also by other studies (18). We found that more fast food consumption related with lower risk of obesity. It could be explained by reverse causality, which could be happened in all cross-sectional studies. Furthermore, Iranian domestic foods are mostly consisting of rice and bread (24). The high caloric carbohydrate foods that are served by housewives at home, increase the risk of obesity. As an alternative explanation of such findings, the underreporting of the food consumption in obese/overweight people was more than the normal group. This misclassification of the exposure has been reported in other nutritional epidemiological studies (25, 26).

In our study, more than 80% of HWs cooked foods with saturated vegetable oil while this percentage decreased to 68% in employed women. It could be the effect of the higher educational level in employed women and their positive attitudes towards oil preference. In general population, mostly in Iranian ancient families, it is mostly believed that solid oils are much better than the liquid ones (27). Although the mass media in Iran has tried hard to change this misconception, the results indicated that more effective preventive programs are still required. Unexpectedly, we found that those unsaturated vegetable oil consumers were at higher risk of obesity. With the available data, we could not explain it completely. However, many people believe that unsaturated vegetable oils not only are safe for cardio-vascular disease but also they would not increase the risk of obesity. Consequently, they use it without limitation. In similar to findings from other countries, adults' knowledge on fat consumption is not effective and mostly they underestimate their fat consumption (28). However, this miss understanding on such kind of oils and other potential relevant factors should be deeply explored in further studies.

We found that even after adjusting for main contributors such as SES, educational level, physical activities and even dietary status, living in urban areas increased the risk of obesity in both HWs and employed women. Urbanization was reported as a very important factor for many non-communicable disease such as diabetes, coronary heart disease and obesity (20). It is mainly because of the transition from a traditional lifestyle (with more physical activities and healthier diets) to modern/westernized lifestyle in Iran that happened during these decades especially in urban areas. Therefore, women especially HWs in urban areas needed behavioral interventions for preventing obesity.

Compare to other factors, marriage had the greatest association with obesity. The effect of marriage on obesity considerably confounded with other factors such as age, educational level, and SES. In line with findings from other studies, married or divorced/widow women had an increased risk of obesity (18).

When we divided employed groups into four subgroups, only clerks had a lower risk of obesity in compare to HWs. Although workers, farmers and Self-employed women had lower risk of obesity, but the difference was not statistically significant. It is mostly because of the sample size in sub-groups. Further confirmatory studies, focusing on these subgroups are recommended.

Since we have acquired an existing national database on NCD risk factors, our analysis was restricted to the variables, which have been collected in the survey. We were not able to explore the effect of menopause on the prevalence and risk pattern of our study. Moreover, as like of other cross-sectional surveys, reverse causality threats our findings. There is possibility that none obese women have a higher chance of being recruited; although we do not think it could be very popular act in Iran with our context.

In conclusion, the HWs' lifestyle is a potential risk factor for obesity in women. Being as HW is accompanying with several lifestyle related factors, which can be explained completely by routine obesity determinant factors. To have effective public interventions, this fact should be taken into account. Other related factors of obesity in HWs are aging, being married, living in urban areas, having less educational level and physical activity, although the whole risk is not complained all by these factors.

More exploratory behavioral analysis should be done among this high-risk group for obesity in Iran.

Ethical Considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors.

Acknowledgments

We should thank the office for Non-Communicable Disease Risk Factor Surveillance (especially Dr Alikhani) for their technical and finical support for this study. The authors declare that there is no conflict of interests.

References

1. Martinez-Ros MT, Tormo MJ, Navarro C, Chirlaque MD, Perez-Flores D (2001). Extremely high prevalence of overweight and obesity in Murcia, a Mediterranean region in south-east Spain. *Int J Obes Relat Metab Disord*, 25 (9):1372-80.
2. Ali SM, Lindstrom M (2006). Socioeconomic, psychosocial, behavioural and psychological determinants of BMI among young women: differing patterns for underweight and overweight/obesity. *Eur J Public Health*, 16(3): 325-31.
3. Fontaine KR, Redden DT, Wang C, Westfall AO, Allison DB (2003). Years of Life Lost Due to Obesity. *JAMA*, 289 (2): 187-93.
4. Barquera S, Tovar-Guzman V, Campos-Nonato I, Gonzalez-Villalpando C, Rivera-Dommarco J (2003). Geography of diabetes mellitus mortality in Mexico: an epidemiologic transition analysis. *Archives of Medical Research*, 34 (5): 407-14.
5. Hu FB (2003). Overweight and obesity in women: health risks and consequences. *J Womens Health (Larchmt)*. 12 (2): 163-72.
6. Ersoy C, Imamoglu S, Tuncel E, Erturk E, Ercan I (2005). Comparison of the factors that influence obesity prevalence in three district municipalities of the same city with different socioeconomical status: a survey analysis in an urban Turkish population. *Prev Med*, 40(2): 181-8.
7. Hajian-Tilaki KO, Heidari B (2007). Prevalence of obesity, central obesity and the associated factors in urban population aged 20-70 years, in the north of Iran: a population-based study and regression approach. *Obes Rev*, 8 (1): 3-10.
8. Azadbakht L, Mirmiran P, Shiva N, Azizi F (2005). General obesity and central adiposity in a representative sample of Tehranian adults: prevalence and determinants. *Int J Vitam Nutr Res*, 75 (4): 297-304.
9. Santos AC, Barros H (2003). Prevalence and determinants of obesity in an urban sample of Portuguese adults. *Public Health*, 117(6): 430-7.
10. Kamadjeu RM, Edwards R, Atanga JS, Kiawi EC, Unwin N, Mbanya JC (2006). Anthropometry measures and prevalence of obesity in the urban adult population of Cameroon: an update from the Cameroon Burden of Diabetes Baseline Survey. *BMC Public Health*, 6: 228.
11. Caban AJ, Lee DJ, Fleming LE, Gomez-Marin O, LeBlanc W, Pitman T (2005). Obesity in US workers: The National Health Interview Survey, 1986 to 2002. *Am J Public Health*, 95 (9): 1614-22.
12. Fouad M, Rastam S, Ward K, Maziak W (2006). Prevalence of obesity and its associated factors in Aleppo, Syria. *Prev Control*, 2 (2): 85-94.
13. Rashidi A, Mohammadpour-Ahranjani B, Vafa MR, Karandish M (2005). Prevalence of obesity in Iran. *Obes Rev*, 6 (3): 191-2.
14. Ghassemi H, Harrison G, Mohammad K (2002). An accelerated nutrition transition in Iran. *Public Health Nutr*, 5 (1A): 149-55.
15. Akhvan-Tiab A, Klishadi R, Sadri GH, Sabet B, Toloui R, Baghai AH (2003). Healthy heart project. Prevalence of obesity in central part of Iran. *J Gazvin Univ of Med Sci*, 26: 27-35.

16. Azadbakht L, Mimiran P, Mehrabi Y, Azizi F (2003). A survey of trend of obesity prevalence in Tehranian Adults during 1999-2001. Tehran Lipid Study. Proceeding of 2nd congress of prevention of non-communicable diseases, Tehran. *J Med Res Shahid Beheshti Univ Suppl,* 27(4): 131.
17. Bahrami H, Sadatsafavi M, Pourshams A, Kamangar F, Nouraei M, Semnani S, et al. (2006). Obesity and hypertension in an Iranian cohort study; Iranian women experience higher rates of obesity and hypertension than American women. *BMC Public Health,* 6: 158**.**
18. Ersoy C, Imamoglu S (2006). Comparison of the obesity risk and related factors in employed and unemployed (housewife) premenopausal urban women. *Diabetes Res Clin Pract,* 72(2): 190-96.
19. Statistical Center of Iran. *Annual Satatistical Report of Iran* (visited at 20 Feb 2008) http://www.sci.org.ir/portal/faces/public/sci/ sci.negahbeiran), Statistical Center of Iran.
20. Jacoby E, Goldstein J, Lopez A, Nunez E, Lopez T (2003). Social class, family, and life-style factors associated with overweight and obesity among adults in Peruvian cities. *Prev Med,* 37(5): 396-405**.**
21. World Health Organization (1998). Obesity: Preventing and Managing the Global Epidemic. Geneva.
22. Statistical Centre of Iran (2005). Statistical Yearbook 1382 (March 2003-March 2004). Tehran: Statistical Centre of Iran Department of Publication and Information.
23. Belahsen R, Mziwira M, Fertat F (2004). Anthropometry of women of childbearing age in Morocco: body composition and prevalence of overweight and obesity. *Public Health Nutr,* 7(4): 523-30.
24. Hormozdiari H, Day NE, Aramesh B, Mahboubi E (1975). Dietary factors and esophageal cancer in the Caspian Littoral of Iran. *Cancer Res,* 35 (11 Pt.2): 3493-98**.**
25. Duvigneaud N, Wijndaele K, Matton L, Philippaerts R, Lefevre J, Thomis M, et al (2007). Dietary factors associated with obesity indicators and level of sports participation in Flemish adults: a cross-sectional study. *Nutr J,* 6: 26.
26. Ojala K, Vereecken C, Valimaa R, Currie C, Villberg J, Tynjala J, et al. (2007). Attempts to lose weight among overweight and non-overweight adolescents: a cross-national survey. *Int J Behav Nutr Phys Act,* 4: 50.
27. Kelishadi R, Sadry G, Hashemi Pour M, Sarraf Zadegan N, Ansari R, Alikhassy H, et al. (2003). Lipid profile and fat intake of adolescents: Isfahan healthy heart program- Heart health promotion from children. *Koomesh Journal of Semnan University of Medical Sciences,* 4-3 (4): 167-76.
28. Glanz K, Brug J, Van Assema P (1997). Are awareness of dietary fat intake and actual fat consumption associated?--a Dutch-American comparison. *Eur J Clin Nutr,* 51(8): 542-7.

Iranian J Publ Health, Vol. 40, No.2, 2011, pp.96-101

Original Article

The Relationship between Obesity and Quality Of Life in School Children

*F Khodaverdi [1], *F Alhani [2], A Kazemnejad [3], Z Khodaverdi [4]*

[1]*Dept. of Physical Education, Faculty of Human sciences, Payame Noor University, Tehran, Iran*
[2] *Dept. of Nursing, Faculty of Medicine, Tarbait Modares University, Tehran, Iran*
[3]*Dept. of Biostatistics, Faculty of Medicine, Tarbait Modares University, Tehran, Iran*
[4]*Dept. of Motor behavior, Faculty of Human sciences, Tarbiat Moallem University, Tehran, Iran*

(Received 6 Nov 2010; accepted 16 Apr 2011)

Abstract

Background: To determine relationships between healths related quality of life and body mass index in children aged 9-11 years old.

Methods: This cross sectional study was conducted on 240 children 9-11 year olds who were selected via multi stage cluster sampling design from primary schools in the Shahre Qods of the Tehran, Iran in 2007. Pediatric Quality of Life inventory was completed by child self report with measured height and weight used to determine body mass index percentile/weight classification. Obesity was defined as body mass index (BMI) $\geq 95^{th}$ percentile for age and gender and one way analyses of variance (ANOVA) was used for data analyses.

Results: Physical, social and school functioning was significantly lowered for obese when compared to normal weight children ($P<.05$). The impairment in QOL in the community-based sample of elementary school children was less marked than clinical sample of obese. Obese children maintain emotional health.

Conclusion: These results highlight the importance in considering dimensions of quality of life at further understanding obesity in children.

Keywords: *Body mass index, Children obesity, Quality of Life, Iran*

Introduction

Childhood obesity is a worldwide epidemic, with prevalence rates doubling or tripling over the past 15 yr (1). Iran has followed this trend with about 13.3%-24.8% overweight and 7.7% - 8% obese children and adolescents (2, 3). Overweight children are more likely to become overweight adults (4, 5). The negative consequences of obesity as a chronic disease in adults have repeatedly been confirmed (6, 7), but even among children, there is an increase in postural weakness and joint complaints as well as an increased prevalence of hypertension and type 2 diabetes (8). In addition to increased co-morbidity, psychosocial limitations play an important role in the lives of these children (9).Also they display significantly lower Quality of Life (QOL) than normal weight children of similar ages (10-13). Quality of life (QOL) can be defined as a multidimensional construct that reflects one's self-perceptions of enjoyment and satisfaction with life (14). Assessing childhood QOL can provide insights into a child's self-rating of physical, social, emotional, and school functioning(10, 16), but most QOL researches with children have been conducted with individuals experiencing weight related distress significant enough to seek treatment (15). Community samples are generally not heavy nor do they demonstrate the degree of impairment seen in treatment samples

∗**Corresponding author:** E-mail: alhani_f@modares.ac.ir

(16, 17). To our knowledge, three prior studies (16-18) have been performed in community samples of elementary school children, on how weight affects the quality of life.
The primary purpose of the present study was to evaluate the relationship between QOL and obesity in schoolchildren, aged 9 to 11 yr. We hypothesized that with an increasing body mass index (BMI) the children would be reported as having decreasing levels of QOL.

Materials and Methods

Participants

This cross sectional study was conducted on 240 children 9-11 yr olds who were selected via multi stage cluster sampling design from primary schools in the Shahre Qods of the Tehran, Iran in 2007, based on school, grade (3 through 5) and student (ages ranged between 9-11 yr). Accordingly, ten schools, eight students from each grade and 24 students from each school were randomly selected.

Questionnaire

The Pediatric Quality of Life Inventory (Peds QL) is a modular instrument for measuring health-related QOL in children and adolescents aged 2-18 yr (19, 20).In repeated reliability and validity tests, the Peds QL has consistently had high reliability scores (α= 0.71-0.89) and has also been able to distinguish between healthy children and those with chronic diseases (14). The Peds QL is consisting of 23 items in four domains: physical, emotional, social and school. The instructions ask how much of a problem each item has been during the last month. A five-point response scale in used (0=never, 1= almost never, 2= some times, 3= often, 4= always). Items are reverse-scored and linearly transformed to a 0–100 scale (0= 100, 1= 75, 2= 50, 3= 25, 4= 0), so that higher scores indicate better QOL. A total scale score, derived by the mean of all 23 items, was calculated to provide an overall measure of the QOL (19). The Peds QL English version was forward translated into Persian by two independent translators and then discussed by a translation committee, which combined the translations into one version. The forward translated version was then back-translated into English, independently, by two other translators, and the Persian version with acceptable reliability score (α= 0.88) subsequently was approved for use.

Anthropometry

Height was measured to the nearest 0.5 cm using a portable stadiometer. Weight was measured to the nearest 0.1 kg using scales. BMI was calculated as weight (kg)/ height (m^2). BMI percentiles for age and sex were categorized in to the following 4 group: (1) obese (BMI≥95^{th} percentile), (2) over weight (BMI≥85^{th} <95^{th} percentile), (3) Normal weight BMI≥5^{th} <85^{th} percentile), and (4) underweight (BMI<5^{th}Percentile) (21).

Ethical Issues

Approval to conduct the study was obtained from the research Ethics Committee of the Tarbiat Modares University. Written informed consent was obtained from the parents of the participating children and oral consent from children. Furthermore, the children and their parents also were informed that they had the right to withdraw from the study at any time and were assured of the confidentiality of the study.

Statistical analyses

For the primary analyses, weight status was used as the independent variables while physical, emotional, social, school and total QOL scores were used as the dependent variables. SPSS version 13.0 was used for data analyses. One way analyses of variance (ANOVA) was used to test for significant overall mean differences among the weight category groups. Univariate generalized liner models were used to determine the estimated marginal means of the Peds QL scales adjusted for the children's age and sex as covariates. Differences among the groups were adjusted for multiple comparisons using the Bonferroni method. Finally, Pearson's correla-

tion coefficient tests were used to test the correlation between QOL scores and BMI. *P*-values <0.05 were considered as statistically significant.

Results

QOL was measured in 240 children (120 boys) with mean (SD) age 10(0.82) yr (rang 9-11 yr), mean (SD) BMI 18.14 (4.10). The general characteristics of the study population are given in Table 1 based on the BMI categories 7.1%of the children were under weight, 64.6% were of normal weight, 13.8% were over weight, and 14.6% were obese. QOL scores for the child self-reported are shown in Table 2. Results showed obese children significantly lower physical, social, school functioning and total score Peds QL than normal weight children. (*P*< 0.05). Table 3, shows estimated marginal mean (SD) Peds QL scores after adjustment for age and sex. Among the weight categories there were no significant differences in QOL scores by sex (*P*= 0.13). As in the univariate analyses, the decreases in total, physical, social, and school Peds QL scores in obese children remained significant even after adjustment. However, only physical Peds QL scores was lower for overweight compared to normal weight children, while social, school, emotional and total Peds QL scores did not differ between them. Correlation analyses between BMI and Peds QL scores showed that physical functioning had the strongest negative correlation(r= -0.178; *P*< 0.01), followed by social functioning (r= -0.163; *P*< 0.05).

Table 1: General characteristics of the 240 children in the community-based sample

Variable	Value
Female	120(50)
Age, mean(SD),yr	10.0(.82)
Height ,mean(SD),cm	136.37(8.63)
Weight ,mean(SD).kg	34.25(10.62)
BMI ,mean(SD)	18.14(4.11)
BMI groups	
Under weight	13.10(.94)
Normal weight	16.33(1.55)
Overweight	21.24(1.19)
Obese	25.68(3.25)

Abbreviation: BMI, body mass index

Table 2: The mean (SD) scores for each of the Peds QL scales by weight category

	Obese Mean (SD)	Over weight mean(SD)	Normal weight mean(SD)	Under weight mean(SD)	*P* value
Physical	74.91(12.39)	76.33(15.06)	83.37(12.4)	74.27 (16.37)	.000
Emotional	71.14(21.79)	77.88(20.69)	78.97(19.5)	71.76(26.68)	.105
Social	79.42(16.83)	82.12(21.97)	88.03(14.6)	80.29(20.65)	.003
School	84.71(15.47)	90.90(14.16)	91.00(11.3)	86.47(14.65)	.014
Total	79.30(12.74)	81.80(15.31)	85.34(11.7)	78.19(17.48)	.005

Table 3: Estimated marginal mean Peds QL by weight category, adjusted for age

	Obese mean(SE)	Over weight mean(SE)	Normal weight mean(SE)	Under weight mean(SE)	*P* value
Physical	74. 65 (2.19)	76. 27(2. 27)	83. 45(1. 05) †‡§	74. 19 (3.162)	.000
Emotional	70. 86 (3. 45)	77. 47 (3. 58)	79. 17 (1. 64)	71. 2 6(4. 98)	.105
Social	70. 86 (3. 45)	77. 47 (3. 58)	79. 17 (1. 64) ‡	71. 2 6(4. 98)	.003
School	84. 47 (2. 07)	90. 28 (2. 15)	91. 27 (. 99) ‡	85. 69 (2. 99)	.014
Total	79. 05(2. 11)	81. 34 (2. 20)	85. 56 (1. 01) ‡	77. 62 (3. 05)	.005

†Significant difference between participants who were normal weight and those who were overweight: *P*<.05 ‡Significant difference between participants who were normal weight and those who were obese: *P*<.05

§Significant difference between participants who were normal weight and those who were under weight: *P*<.05

Discussion

This study describes variation of generic measurements of QOL in a sample of school-aged children across various BMIs. The decrease in QOL was no significant for over weight children but more marked for those who were obese. These finding are less dramatic than the much lower scores reported for children attending clinics. Because QOL is multidimensional, it is feasible that some dimensions may be more affected by over weight or obesity. Obese children differed from who was normal weight, most strongly on physical, social, and school functioning scores, while emotional functioning seemed unaffected. Williams et al. (16) used the Peds QL 4.0 to assess QOL in a community-based sample of obese children and reported that total score, physical health, and social functioning decreased significantly as weight increased in a community sample of children. Using a similar sample of school-aged children, Friedlander et al. (17), found that overweight children had significantly lower scores on psychosocial, physical functioning and global QOL when compared to healthy-weight children. In another school aged children, Fiveash (18) assessed physical and psychosocial consequences of obesity on self-perceived quality of life and observed significantly lower scores for social functioning in obese children than their under weight, normal weight and over weight peers. Study of clinical sample of severely obese children and adolescents concluded that obese children were over five times more likely to report poor quality of life scores when compared to healthy-weight children (10).

The consequences of Pinhas-Hamiel et al. (12) demonstrated significantly lower quality of life related to physical functioning and social domains. Finally, in recent study of clinical sample of obese children, physical health was significantly impaired in the obese clinical sample relative to control children (11).

However, the impairment in QOL in the community-based sample of obese children by previous studies (16-18), and the present study, was less marked than clinical sample of obese (10-13). Obese and overweight children in our study had impaired physical functioning. We observed that the BMI was inversely correlated with physical functioning. This supports the idea that the diminished ability to move with increasing weight leads to a decrease in caloric expenditure with the potential consequence of a further mismatch in energy balance leading to additional weight (10).

This finding elucidates the limitations associated with excess weight (e.g., difficultly running, doing chores) for obese and overweight children, even they are not as heavy as treatment seeking populations. Although Fiveash(18) didn't show different in physical functioning Peds QL among weight groups. This may be owing to his sample including African American children. Studies of African Americans indicate that they tend to be more satisfied with their physical appearance compared to white girls even if they are larger than their white counterparts (22, 23). Obesity is one of the most stigmatizing and least socially acceptable conditions in childhood (10). Indeed, obese school aged children are more likely to be the victims of bullying behavior (24). Obese children commonly suffer discrimination and teasing from their peers (9, 25, 26). In keeping previous studies, the obese children in our study demonstrate impairment in social domain when compared Social functioning QOL, however, remained consistent across weight categories, except for the obese children, suggesting the modest decrease in weight (i.e., shifting from obese to over weight) may improve social well being. The differences in emotional QOL scores across weight category were not significant; obese children who maintain their emotional health are of specific interest. These resilient children who 'do well 'despite being different and experiencing some degree of physical and social difficulties may hold the key to efforts aimed at understanding the nature and determinants of invulnerability and to develop preventive interventions

to promote well-being in obese children(27). Further more, obese children were more likely to report impaired school functioning. It is consistent with a study in Thailand, which reported that overweight children and adolescents in grades seven through nine were twice as likely to have low grads in math and language as healthy children and adolescents (28).

Although the reasons for absenteeism were not investigated, increased school absenteeism has been documented in children and adolescents with other chronic diseases including diabetes and asthma (29, 30). Missed school days may subsequently lead to decreased school performance. The main strength of this study was the use of a valid and reliable instrument for assessment of QOL. There are several limitations of the present study including the inability to evaluate causality, the narrow age range of the sample and small sample size of schoolchildren who were selected on the Shahre Qods (a small part of Tehran-Iran). Therefore, the result of the present study should only be extrapolated to the wider community of schoolchildren with caution. Further studies in other samples and setting are necessary to confirm generalizability of our finding.

In conclusion obese children have decreased in scores of several QOL domains, suggesting the importance in considering such domains in programs aimed at further understanding obesity in children. Further more, the understanding of resilience of obese children in emotional domain may assist in defining approaches to the management of childhood obesity.

Ethical Considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors.

Acknowledgements

We are grateful to children who participated in this study, their families and the staff of the primary schools for their cooperation. The authors declare that there is no conflict of interests.

References

1. Dietz WH. Overweight in childhood and adolescence (2004). *N Engl J Med*, 350: 855–57.
2. Dorosty AR, Siassi F, Reilly JJ. Obesity in Iranian children (2002). *Arch Dis Child*, 87: 388-91.
3. Kelishadi R, Hashemipour M, Sarraf-Zadegan N, et al (2003). Obesity and associated modifiable risk factors in Iranian adolescents: IHHP-HHPC. *Inter Pediatr*, 45(4): 435-42.
4. Rossner S. Childhood obesity and adulthood consequences (1998). *Acta Paediatr*, 87: 1-5.
5. Serdula MK, Ivery D, Coates RJ, et al. (1993). Do obese children become obese adults? A review of the literature. *Prev Med*,22: 167-177.
6. Hubert HB, Feinleib M, McNamara PM, Castelli WP (1983). Obesity as an independent risk factor for cardiovascular disease: a 26-year follow-up of participants in the Framingham Heart Study. *Circulation*, 67: 968–77.
7. McGill HC Jr, McMahan CA, Herderick EE, et al (2002). Obesity accelerates the progression of coronary atherosclerosis in young men. *Circulation* Jun 11, 105(23): 2712-18.
8. Sinha R, Fisch G, Teague B, et al. (2002). Prevalence of impaired glucose tolerance among children and adolescents with marked obesity. *N Engl J Med*, 346: 802–10.
9. Dietz WH (1998). Health consequences of obesity in youth: childhood predictors of adult disease. *Pediatre*, 101: 518-25.
10. Schwimmer JB, Burwinkle TM, Varni JM (2003). Health-related quality of life of severely obese children and adolescents. *JAMA*, 289: 1813–19.
11. Hughes AR, Farewell K, Harris D, Reilly JJ (2007). Quality of life in a clinical sample

of obese children. *International Journal of Obesity*, 31: 39–44.
12. Pinhas-Hamiel O, Singer S, Pilpel N, et al. (2006) Health-related quality of life among children and adolescents: associations with obesity. *International Journal of Obesity*, 30: 267-72.
13. Ravens-Sieberer U, Redegeld M, Bullinger M (2001). Quality of life after in-patient rehabilitation in children with obesity. *International Journal of Obesity*, 25: Suppl 1, S63–S65.
14. Varni JW, Burnwinkle TM, Seid M (2006). The PedsQL 4.0 as a school population healthmeasure: Feasibility, reliability,and validity. *Quality of Life Research*, 15: 203–15.
15. Kolotkin RL, Crosby RD, Williams GR (2002). Health-related quality of life varies among obese subgroups. *Obes Res*, 10: 748 –56.
16. Williams J, Wake M, Hesketh K,Maher E, waters E (2005). Health-related quality of life of overweight and obese children. *JAMA*, 293: 70–6.
17. Friedlander SL, Larkin EK, Rosen CL, Palermo TM, Redline S (2003). Decreased quality of life associated with obesity in school-aged children. *Arch Pediatr Adolesc Med*, 157: 1206 –11.
18. Fiveash LB (2003). The relationship among obesity, QOL, and health care in African American school children [PhD thesis]. The University of Alabama at Birmingham.
19. Varni JW, Seid M, Rode CA (1999). The PedsQLt: Measurement model for the Pediatric Quality of Life Inventory. *Med Care*, 37: 126-39.
20. The Peds QL measurement model for the Pediatric Quality of Life Inventory. http://www.pedsql.org/translations.html
21. National Center for Health Statistics. CDC Growth Charts: United States. Available at: http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm
22. Kimm SY, Barton BA, Berhane K, et al. (1997). Selfe esteem and adiposity in black and white girls:the NHLBI Growth and Health Study. *Ann Epidemiol*, 7: 550-60.
23. Brown KM, Mcmahon RP, Biro FM, et al (1998). Changes in self esteem in black and white girls between the ages of 9 and 14 years. The NHLB Growth and Health Study. *J Adolescent Health*, 23: 7-19.
24. Janssen I, Craig WM, Boyce WF, Pickett W (2004). Associations between overweight and obesity with bullying behaviors in school-aged children. *Pediatrics*, 113: 1187–94.
25. Brylinsky JA, Moore JC (1994). The identification of body build stereotypes in young children. *J Res Pers*; 28: 170–81.
26. Hill AJ, Silver EK (1995). Fat, friendless and unhealthy: 9 year old children's perception of body shape stereotypes. *Int J Obes Relat Metab Disord*, 19: 423–30.
27. Dulmus CN (2004). *Rapp-Paglicci LA*. Prevention and resilience, In: Rapp-Paglicci LA. eds, Dulmus CN, Wodar JS. Handbook of Preventive Interventions for Children and Adolescents. Wiley: US, pp: 3-11.
28. Mo-suwan L, Lebel L, Puetpaiboon A, Junjana C (1999). School performance and weight status of children and young adolescents in a transitional society in Thailand. *Int J Obes Relat Metab Disord*, 23: 272-77.
29. Vetiska J, Glaab L, Perlman K, Daneman D (2000). School attendance of children with type 1 diabetes. *Diabetes Care*, 23: 1706-707.
30. Diette GB, Markson L, Skinner EA, et al. (2000), Nocturnal asthma in children affects school attendance, school performance and parent's work attendance. *Arch Pediatr Adolesc Med*, 154(9): 923-28.