The Prevalence and Associated Factors of Central obesity in Northern Iran

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Background: The main objective of this study was to evaluate the prevalence of central obesity and some related factors in the north of Iran (Golestan province) in 2006.

Method: This was a population –based cross-sectional study that comprised 2471 subjects (1250 males and 1221 female), using stratified cluster sampling. Interviewers recorded the data using the multidimensional questionnaire and anthropometric indexes. Waist circumference ≥102 and ≥88 cm categorized as central obesity for men and women respectively. SPSS 16.0 software was used for statistical analysis.

Results: The mean and standard deviation of age was 39.2±14.28 years and waist circumference was 87.1±13.7 cm in men and 90.2±15.8 cm in women, respectively. In total, the prevalence of central obesity was 32.01% and it was significantly higher in women (57.2%) than in men (15.8%), in urban area (40.5%) than in rural areas (31.9%) and in uneducated people (52.3%) than in college educated people (19.9) (P=0.001). Logistic regression analysis revealed that central obesity was significantly associated with age, urbanization, parity and illiteracy (P<0.05).

Conclusion: Central obesity was the most serious health problem in the north of Iran and it was more prevalent in women than men. Socio-demographic factors such as younger age (between 15-25 and 25-35 years), urbanization, marital status and illiteracy were associated with central obesity. Further studies are necessary to establish the association between central obesity and racial differences in this area.

Keywords: Central obesity, Adults-Socio-demographic, Iran

Introduction

There are various risk factors, which are responsible for the weight gain and obesity in human. Both the metabolic and behavioral factors such as leptin and life style can effect on overweight and obesity.[1]

According to the Word Health Organization report, obesity has been increase in world[2] and previous study has been introduced obesity as a health problem in Iran.[3]

Waist circumference (WC) is an indicator to determine the central obesity[4] and it is considered as a risk factor for cardiovascular disease.[6,7]

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Golestan province is located in the north of Iran (south east of Caspian Sea). Of 1,600,000 populations in this area, 66.39% were 15-64 years old, whereas 43.9% and 56.1% were living in urban and rural areas, respectively. Agriculture is the main job in the rural area. Different ethnic groups such as Fars (native), Turkman and Sistani are living in this region.[8]

Due to the logistic limitation, no study was conducted yet on the central obesity in the north of Iran. Therefore, the present study was planned and performed to determine the central obesity status and its related risk factors in this area.

Patients and Methods

This was a population-based cross-sectional study conducted in Golestan Province (north of Iran) in 2006. We enrolled 2471 subjects (1250

males and 1221 females), using stratified cluster sampling based on age and sex. Interviewers recorded the data using the multidimensional questionnaire and anthropometrics indexes.

WC was measured to the nearest 0.5 cm at the superior border of the iliac crest. Others data such as physical activity and socio-demographic parameters were collected by questionnaire. Central obesity was defined according to the WHO criteria[2]: WC ≥ 102 cm and ≥ 88 cm in men and women, respectively.The economic status was categorized based on the home ownership, number of the rooms in the house, owning of the private car, structure of the house, and the number of the family members specifying one score to each one. Accordingly, the economic status of study population was classified

as low (1score), moderate (2-3 score), and good (≥4 score). Physical activity was categorized into four categories based on daily work and activity including low physical activity (activity that requires extension of the muscular-skeletal system and moving from a place to another place), moderate physical activity (activity that requires sometimes increased respiratory rate like cleanliness, gardening, building painter, etc.), high physical activity (activity that requires very increased reparatory rate like manual labor, building labor, porter, etc.), and combine activity (a combination of above activities) .

Statistical analysis

SPSS 16.0 software was used for the statistical analysis, using chi-square test for comparing fre-

Table 1. The distribution of Central Obesity based on demographic characteristics and lifestyle-related factors in north of Iran in 2006.

Characteristics		N	Waist Circumference (cm) Mean (SD)	P Value	Central Obesity N	%	P Value
location*	Urban	1149	90.7(15.2)	0.001	470	41.0	0.001
	Rural	1322	87.0(14.3)		421	32.0	
Sex**	Male	1250	87.1(13.7)	0.001	197	15.8	0.001
	Female	1221	90.3(15.8)		694	57.2	
Marital Status	Married	1842	91.4(14.1)	0.001	771	42.1	0.001
	Single	532	78.6(12.4)		60	11.3	
Economic status***	Poor	259	86.6(13.4)		79	30.5	
	Moderate	2124	89.0(14.9)	0.05	778	36.8	0.376
	Good	88	89.4(15.1)		34	38.6	
Age groups (year)****	15-25	494	77.1(10.7)		40	8.1	
	25-35	486	86.7(13.5)		146	30.1	
	35-45	495	91.8(14.5)	0.001	211	42.9	0.001
	45-55	500	94.7(13.7)		250	50.5	
	55-65	496	93.1(14.2)		244	49.4	
Education *****	Illiterate	731	92.9(14.3)		380	52.3	
	0-12 years schooling	1594	86.8(14.8)	0.001	482	30.4	0.001
	College	146	88.1(13.6)		29	19.9	
Physical Activity	Low	631	89.7(15.0)		249	39.7	
	Moderate	1068	88.3(15.0)	0.04	396	37.3	0.025
	Severe	104	87.7(12.6)		21	20.2	
	Combine	123	85.9(14.7)		38	30.9	
Total		**2471**	**88.7(14.8)**		**791**	**32.01**	

*Central obesity up to 9% is more among urban than rural population; ** The prevalence of central obesity among women is approximately 4 fold more than men; ***There is no statistical signification; **** The prevalence of central obesity among 45-55 years age group is more than other age groups; *****The prevalence of central obesity among 0-12 years schooling groups is lower than other groups.

quencies and *t*-test and ANOVA for comparing the means. Logistic regression analysis was applied in order to estimate the odds ratio (OR) of obesity considering the socio-demographic factors at 95% significant level. A p.value of less than 0.05 was considered statistically significant.

Results

Mean and standard deviation of age of the subjects was 39.2±14.3 years and 22.4% of them were single. About 53.5% of subjects were living in rural area. The values for WC were 88.7±14.8 cm (mean±SD), and it has been showed significantly more in women than men, in urban area than rural area and in married subjects than single subjects (P=0.001). WC has a positive correlation with age (P=0.001) and it was significantly increased in uneducated people than in educated people(P=0.001).

WC was negatively correlated with physical activity (P=0.04) and increased up to 3.22 cm for ten years increase in age. The prevalence of central obesity was 32.0% and it was approximately three times more prevalent in women than in men and four times more in married subjects than in single subjects. Central obesity markedly increased with age and it was prevalent five times more in 45-55 years age group than in 15-25 years age group. (Table 1)

Logistic regression was used to identify variables that contribute to obesity morbidity. The results showed that location area (OR=1.5, 95% CI=1.3-1.7), gender (OR=7.1, 95% CI=5.9-8.6) ,marital status (OR=4.7, 95% CI=2.1-10.5), age group (OR=0.09, 95% CI=0.06-0.13 in 15-25 year age group) and educational level (OR=4.4, 95% CI=2.9-6.8 in illiterate people) were significantly associated with central obesity, while physical activity and economic status were not. (Table 2)

Discussion

The results of this study were discussed from two aspects: central obesity and some related fac-

Table 2. Odds Ratios and 95% CI resulted from logistic regression for central obesity among adult in the north of Iran in 2006.

Criteria		OR (95% CI)	P value
Residential area	Rural (Ref)	1	0.001*
	Urban	1.5(1.3-1.7)	
Gender	Men (Ref)	1	0.001*
	Women	7.1(5.9-8.6)	
Marital status	Single(Ref)	1	0.001*
	Married	4.7(2.1-10.5)	
Economic status	Good (Ref)	1	
	Moderate	0.76(0.57-1.00)	0.051
	Poor	0.70(0.42-1.16)	0.167
Age group (year)	55-65 (Ref)	1	
	15-35	0.09(0.06-0.13)	0.001*
	25-35	0.44(0.34-0.57)	0.001*
	35-45	0.77(0.60-0.99)	0.038
	45-55	1.04(0.81-1.37)	0.750
Educational Level	College(Ref)	1	
	Illiterate	4.4(2.9-6.8)	0.001*
	1-12 years schooling	1.8(1.2-2.7)	0.009*
Physical activity	Combine (Ref)	1	
	Low	0.68(0.45-1.03)	0.670
	Moderate	0.75(0.50-1.12)	0.165
	Severe	0.77(0.96-3.26)	0.069

CI=Confidence Interval; Ref=Reference Category ; * Statistical difference is significant.

tors. The prevalence of central obesity was 32.1% (57.2% in women and 15.8% in men). Other studies showed that central obesity is a health problem in Iran. The prevalence of central obesity reported in Gorgan (north of Iran) was 39.1%,[9] in Ahvaz (south of Iran) was 21.2%[10] and in whole of Iran was 9.7%[11]. Another study in Iran reported the prevalence of central obesity among 12.9% and 54.5% of adult men and women, respectively.[12] One study in Tehran[13] revealed the prevalence of central obesity up to 93% in women and 74.1% in men.

The prevalence of central obesity reported 39.2% in Rio de Janeiro,[14] 24.1% in Egypt,[15] 30.5% in Australian adult people,[16] 42% in Croatia[17] and 31.5% and 64.4% among Omanian male and female, respectively.[18]

The association between socio-demographic factors with central obesity in our study and others studies is similar. [9,19-21] The association between low physical activity and central obesity was shown in a study from Iran[14] and others countries[23,24]. The inverse association between educational level and obesity has been shown in other studies from Iran [14,24,25] and Oman[19].

Because of immigration from rural to urban areas and changing in lifestyles in developing countries, obesity and central obesity tended to increase.[25] For example, over a less than five years period, the trend of obesity and overweight significantly increased among adults in Tehran.[13]

In our study, the pattern of central obesity has markedly tended to increase with age. Similar results were reported in the other part of Iran.[13,26,27]

Age has been considered as a predictor factor for central obesity in some published studies.[19,20,28,29]

Migration from villages to city has occurred during last decades due to socio-economic factors and it seems to resulted in lifestyle changes and consequently increased the central obesity rate in Iran. On the other hand, the changes of lifestyles may be resulted to low physical and occupational activities in urban area compared with rural area. Besides, some factors such as ethnicity, local food behaviors, lifestyle and utilizing high calorie diet may be also considered as predictors for central obesity in the north of Iran.

The results of this study indicated a high prevalence of central obesity in the northern population of Iran. The economic status was not associated with central obesity, but illiteracy was recognized as a risk factor for central obesity morbidity. Also, urbanization, marital status and older age are predictors for it.

Acknowledgements

References

1 Auwerx J, Staels B. Leptin. *Lancet* 1998;**351**:737-42. [9504534]

2 WHO. Obesity: preventing and managing the global epidemic. Report of a WHO consultation. *World Health Organ Tech Rep Ser* 2000;**894**:1-253. [11234459]

3 Rashidi A, Mohammadpour -Ahranjani B, Vafa MR, Karandish M. Prevalence of obesity in Iran. *Obes Rev* 2005;**6**:191-2. [16045632]

4 Licata G, Argano C, Di Chiara T, Parrinello G, Scaglione R. Obesity: a main factor of metabolic syndrome? *Panminerva Med* 2006;**48**:77-85. [16953145]

5 Ito H, Nalasuga K, Ohshigma A, Maruyama T, Kaji Y, Harada M, et al. Detection of cardiovascular risk factor by indices of obesity obtained from anthropometry and dual-energy x- ray absorptiometry in Japanese individuals. *Int J Obes Relat Metab Disord* 2003;**27**:232-7. [12587004]

6 Lapidus L, Bengstsson C, Larsson B, Pennert K, Rybo E, Sjöström L. Distribution of adipose tissue and risk of cardiovascular disease and diet: a 12 year follow up of participants in the population study of women in Gothenburg. Sweden. *Br Med J* 1984;**289**:1257-61. [6437507]

7 Bray GA, Gray DS. Treatment of obesity: an overview. *Diabetes Metab Rev* 1998;**4**:653-79. [3069397]

8 Statistical Center of Iran. Population and Housing Census.2006; Available at: www.sci.org.ir. Accessed March 11, 2011.

9 Veghari G.R., Mansourian AR. Obesity Among Mothers In Rural Golestan-Iran (south east of Caspian sea). *Iranian J Publ Health* 2007;**36**:71-6.

10 Amani R. Comparison between bioelectrical impedance analysis and body mass index methods in determination of obesity prevalence in Ahvazi women. *Eur J Clin Nutr* 2007;**61**:478-82. [17063145]

11 Kelishadi R, Alikhani S, Delavari A, Alaedini F, Safaie A, Hojatzadeh E. Obesity and associated lifestyle behaviors in Iran: findings from the First National Non-communicable Disease Risk Factor Surveillance Survey. *Public Health Nutr* 2008;**11**:246-51. [17625028]

12 Janghorbani M, Amini M, Willett WC, Mehdi Gouya M, Delavari A, Alikhani S, et al. First nationwide survey of prevalence of overweight, underweight, and central obesity in Iranian adults. *Obesity* 2007;**15**:2797-808. [18070771]

13 Azadbakht L, Mirmiran P, Shiva N, Azizi F. General obesity and central adiposity in a representative sample of Tehranian adults: prevalence and determinants. *Int J Vitam Nutr Res* 2005;**75**:297-304. [16229347]

14 Ramos de Marins VM, Varnier Almedia RM, Pereira RA, Barros MB. Factors associated with overweight and central body fat in the city of Rio de Janeiro: results of a two stage random sampling survey. *Public Health* 2001;**115**:236-42. [11429722]

15 Al-Riyami AA, Afifi MM. Prevalence and correlates of obesity and central obesity in Omani Adults. *Saudi Med J* 2003;**24**:641-6. [12847595]

16 Dalton M, Cameron AJ, Zimmet PZ, Shaw JE, Jolley D, Dunstan DW, et al. Waist circumference, waist-hip ratio and body mass index and their correlation with cardiovascular disease risk factors in Australian adults. *J Intern Med* 2003;**254**:555-63. [14641796]

17 Tucak-Zorić S, Curcić IB, Mihalj H, Dumancić I, Zelić Z, Cetina NM, et al. Prevalence of metabolic syndrome in the interior of Croatia: the Baranja region. *Coll Antropol* 2008;**32**:659-65.[18982734]

18 Abolfotouh MA, Soliman LA, Mansour E, Farghaly M, El-Dawaiaty AA. Central obesity among adults in Egypt: prevalence and associated morbidity. *East Mediterr Health J* 2008;**14**:57-68. [18557452]

19 Al-Nuaim AA, Bamgboye EA, al-Rubeaan KA, al-Mazrou Y. Overweight and obesity in Saudi Arabian adult population, role of socio-demographic variables. *J Community Health* 1997;**22**:211-23. [9178120]

20 Sibai AM, Hwalla N, Adra N, Rahal B. Prevalence of and covariates of obesity in Lebanon: finding from the first epidemiological study. *Obes Res* 2003;**11**:1353-61. [14627756]

21 Musaiger AO. Overweight and obesity in the Eastern Mediterranean Region: can we control it? *East Mediterr Health J* 2004;**10**:789-93. [16335765]

22 Gutierrez-Fisac JL, Guallar-Castillon P, Diez-Ganan L, Lopez Garcia E, Banegas JR, Rodriguez Artalejo F. Work- related physical activity is not associated with body mass index and obesity. *Obes Res* 2002;**10**:270-6. [11943836]

23 Lahti-Koski M, Pietinen P, Heliovaara M, Vartiainen E. Association of body mass index and obesity with physical activity, food choices, alcohol intake and smoking in the 1982-1997. *Am J Clin Nutr* 2002;**75**:809-17. [11976153]

24 Maddah M, Eshraghian MR, Djazayery A, Mirdamadi R. Association of body mass index with educational level in Iranian men and women. *Eur J Clin Nutr* 2003;**57**:819-23. [12821881]

25 Ghassemi H, Harrison G, Mohammad K. An accelerated nutrition transition in Iran. *Public Health Nutr* 2002 ;**5**:149-55. [12027278]

26 Yoo KY, Kim H, Hang D, Ha M, Park SK, Lee BO, Cho SH. Female sex hormones and body mass in adolescent and post menopausal Korean women. *J Korean Med Sci* 1998;**13**:241-6. [9681801]

27 Ghaderipour M, Mohamifard N, Asghari S, Naderi GA. Prevalence of obesity and Cardiovascular risk factors in Esfahan. *J Ghazvin Univ Med Sci* 2003;**26**:26-64.

28 Musaiger AO, Al-Mannai MA. Weight, height, body mass index and prevalence of obesity among the adult population in Bahrain. *Ann Hum Biol* 2001;**28**:346-50. [11393341]

29 Kac G, Velasquez-Melendez G, Coelho MA. Factors associated with central obesity among childbearing-age women. *Res Saude Publica* 2001;**35**:46-61. [11285517]