World Journal of Medical Sciences 7 (1): 17-22, 2012
ISSN 1817-3055

Prevalence of Metabolic Syndrome among Fars Ethnic Women in North East of Iran

[1]Abdoljalal Marjani, [2]Sharabe Hezarkhani and [3]Najme Shahini

[1,2]Department of Biochemistry and Biophysics,
Biochemistry and Metabolic Disorders Research Center, Gorgan Faculty of Medicine,
Golestan University of Medical Sciences, Gorgan, Golestan province, Iran
[2]Department of Enocrinology, Gorgan Faculty of Medicine,
Golestan University of Medical Sciences, Gorgan, Golestan Province, Iran
[3]General Practitioner, Gorgan Faculty of Medicine,
Golestan University of Medical Sciences, Gorgan, Golestan Province, Iran

Abstract: The metabolic syndrome is described by the clustering of several risk factors for cardiovascular disease. This study aimed to assess the metabolic syndrome among Fars ethnic women in Gorgan, Capital City of Golestan province, North East of Iran. The study conducted on the hundred and sixty Fars women (20-40years) who were referred to the Health Centers in Gorgan. Metabolic syndrome was diagnosed using Adult Treatment Panel-III (ATP-III) guidelines. The mean triglyceride, total cholesterol, waist circumferences and fasting blood glucose levels were significantly higher in the subjects with metabolic syndrome, but the mean HDL-cholesterol was lower ($p< 0.05$). The prevalence of metabolic syndrome was 20.62%. High abdominal obesity and low HDL-cholesterol level are the most frequent characteristics in comparison to other metabolic components. According to our results, 13.75%, 5.62%and 1.25% had three, four and five criteria for metabolic syndrome, respectively. Low HDL-cholesterol and high waist circumference were the most usual factors of metabolic abnormality among women. Prevalence of cardiovascular diseases might be increased. We have shown some related factors of metabolic syndrome in these women to predict metabolic syndrome in these ethnic groups and help to prevent cardiovascular disease.

Key words: Gorgan • Metabolic Syndrome • Fars Ethnic Women

INTRODUCTION

The prevalence of the metabolic syndrome is increased generously by the epidemic increase of obesity whole around the world. The metabolic syndrome is described by the clustering of several risk factors for cardiovascular disease (CVD) such as hypertension, dyslipidaemia, obesity (particularly central obesity), insulin resistance and high fasting plasma glucose [1] Metabolic syndrome was initially observed in 1923 by Kyln [2], who described the clustering of hypertension, hyperglycemia and gout as the syndrome. Subsequently, several other metabolic abnormalities have been associated with this syndrome, including obesity, microalbuminuria and abnormalities in fibrinolysis and coagulation [3]. In 1988, Gerald Reaven reintroduced the concept of Syndrome X for the clustering of cardiovascular risk factors like hypertension, glucose intolerance, high triglycerides and low high density lipoprotein (HDL) concentration [4]. The syndrome has been given several names, including the 'metabolic syndrome', the 'insulin resistance syndrome', the 'plurimetabolic syndrome' and the 'deadly quartet' [4]. In 1998, world health organization (WHO) proposed a unifying definition for the syndrome and chose to call it the 'metabolic syndrome' rather than the 'insulin resistance syndrome' [5]. This name was selected primarily because it was the cause of all the components of the syndrome. In 2001, the Third Report of National Cholesterol Education Program Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) (ATP III) emphasized the importance

Corresponding Author: Abdoljalal Marjani, Department of Biochemistry and Biophysics, Biochemistry and Metabolic Disorder Research Center, Gorgan Faculty of Medicine, Golestan University of Medical Sciences, Gorgan, Golestan province, Iran. Tel/Fax: +98(171)4421651.

of the metabolic syndrome and provided a working definition of this syndrome for the first time [6]. Differences in genetic background, diet, levels of physical activity, age and sex structure all influence the prevalence of both metabolic syndrome and its components [7]. The prevalence of metabolic syndrome in adult population worldwide varies from 8 to 24.2% [8,9] in males and from 7 to 46.5% [10,11] in females. The importance of the metabolic syndrome in general populations as a predictor of vascular disease has been confirmed by a number of large prospective epidemiologic studies [12-14]. In the United States, the metabolic syndrome has become common [9]. Some studies show about increasing prevalence of metabolic syndrome in Asia [15]. In our area, we do not have enough data on the adult women metabolic syndrome in Gorgan (South East of Caspian Sea), Iran. Therefore, it is very important to set up a study on women with a risk of metabolic syndrome. The present study aimed to assess the metabolic syndrome among Fars women in this area.

MATERIALS AND METHODS

This cross sectional study was performed in the Biochemistry and Metabolic Disorders Research Center of Gorgan, Golestan province (South East of Caspian Sea, North East of Iran) in 2011. The study group included 160 Fars adult women (women who speak only Persian language) who were referred to the different Health Centers in Gorgan. All the included subjects provided an informed consent. Data were collected by trained interviewers. First of all, a questionnaire was completed at each Health Center by trained interviewers. Demographic information is achieved by a questionnaire. The exclusion criterion was the coexistence of any other serious illness. Exclusion criteria included having hormone replacement therapy, taking drugs such as anti-diabetes and anti-hypertensive anti-lipidemic agents and smokers. A venous blood sample was collected from all the subjects who came after 8-12-hours in the morning after an overnight fast. The samples were centrifuged for 10 minutes at 3000 rpm. The serum was used for estimating fasting blood glucose, triglycerides, total cholesterol, LDL-cholesterol and HDL-cholesterol concentrations, by biochemical kit using spectrophotometer techniques (Model JENWAY 6105 UV / VIS) in the Biochemistry and Metabolic Disorders Research Center (Gorgan Faculty of Medicine). Adult women considered to have metabolic syndrome if they had any three or more of the following, according to the ATP III Criteria: [6]

Abdominal Obesity: Waist Circumference >88 cm

Hypertriglyceridaemia: Serum triglycerides level > 150 mg/dl

Low HDL-Cholesterol: < 50 mg/dl

High Blood Pressure: SBP > 130 mmHg and/or DBP > 85 mmHg or on treatment for hypertension.

High Fasting Glucose: Serum glucose level > 110 mg/dl or on treatment for diabetes.

Weight was then measured, while subjects were minimally clothed without shoes, using digital scales. Height was measured in standing position using tape meter while the shoulder was in a normal position. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Those with a BMI of 25.0-29.9 Kg/m^2 were classified as overweight, whilst those with a BMI• 30 Kg/m2 were defined as obese. Subjects with BMI greater than 45 Kg/m2 were considered very obese [16]. Waist circumference was measured at the point halfway between the lower border of ribs and the iliac crest in a horizontal plane [17]. Systolic and diastolic blood pressure was measured in sitting position from the right hand. The results were reported as percentages and mean ± SD. The statistical analysis was done with SPSS-16 version software. The results were evaluated by using independent student t and Chi square tests. Statistical significance was considered at $P < 0.05$.

RESULTS

A total of hundred and sixty Fars women (Women who speak only Persian (Farsi) language) were studied. The mean age of the subjects was 53.65±9.50 years (range 20-40 years). Table 1 shows the baseline data of the subjects with and without the metabolic syndrome. The mean triglyceride, total cholesterol and fasting blood glucose levels were significantly higher in the subjects with metabolic syndrome, but the mean HDL-cholesterol was lower ($p< 0.05$). There were significant differences in the waist circumferences of subjects with the metabolic syndrome. There were no significant differences in the other parameters in subjects with and without the metabolic syndrome. Table 2 shows prevalence of metabolic syndrome and the components of metabolic syndrome in Fars ethnic group. The frequency of metabolic syndrome was 20.62%. The prevalence of

Table 1: Baseline data of Fars women (Total subjects, subjects with and without metabolic syndrome).

Parameters	Total number of subjects	Subjects with metabolic syndrome	Subjects without metabolic syndrome	P-value
All women, No. (%)	160 (100)	33 (20.62)	127(79.38)	-
Age (years)	32.54±6.54	34.06±5.09	32.07±6.81	0.07
BMI, kg/m^2	27.03±5.32	28.63±4.96	26.61±5.35	0.052
WC, cm	93.98±13.12	99.89±9.14	92.44±13.59	<0.0001
SBP, mmHg	112.61±14.53	114.85±15.43	112.03±14.29	0.323
DBP, mmHg	69.91±10.51	70.30±10.95	69.81±10.43	0..815
FBS, mg/dl	110.18±61.14	150.2±101.69	88.43±36.03	0.002
TG, mg/dl	113.99±73.38	220.64±82.74	86.27±36.10	<0.0001
T-Chol, mg/dl	182.03±56.33	219.71±49.80	177.07±54.73	0.029
HDL-Chol, mg/dl	44.0±13.39	38.22±16.24	45.50±12.18	0.005
LDL-Chol, mg/dl	116.21±39.51	116.69±35.33	116.08±30.66	0.933

BMI: Body mass index, WC: waist circumference, WHR: waist to hip ratio, SBP: systolic blood pressure, DBP: diastolic blood pressure, FBS: fasting blood glucose, TG: triglyceride, T-CHOL: total cholesterol, HDL-CHOL: HDL-cholesterol and LDL-CHOL: LDL-cholesterol

*P value less than 0.05 was considered significant.

Table 2: Prevalence of metabolic syndrome and the components of metabolic syndrome in Fars women (n=160)

	Number	%
Metabolic syndrome	33	20.62
Fasting Blood Sugar >110 mg/dl	23	14.30
High Density Lipoprotein-cholesterol < 50 mg/dl	47	29.37
Triglyceride > 150 mg/dl	32	20
Waist circumference > 88 cm	55	34.37
Systolic blood pressure >130 mmHg/ Diastolic blood pressure>85 mmHg	5	3.12

Table 3: Distribution of Fars women with and without metabolic syndrome by age

Age groups in years	Subjects with MS(n=33)	Subjects without MS(n=127)
20-24 n (%)	1 (3.03)	25 (19.68)
25-29 n (%)	6 (18.18)	26 (20.47)
30-34 n (%)	8 (24.24)*	14 (11.02)
35-40 n (%)	18(54.54)	62 (48.81)

MS: Metabolic Syndrome

*P value less than 0.05 was considered significant.

Table 4: Number of subjects accomplishing the criteria of metabolic syndrome

Parameters	Subjects(n=160)
3 criteria n (%)	22 (13.75)
4 criteria n (%)	9(5.62)
5 criteria n (%)	2(1.25)
Total criteria n (%)	33(20.62)

central obesity, high triglyceride level, low High Density Lipoprotein-cholesterol level, high blood pressure and high fasting glucose were 34.37%, 20%, 29.37%, 3.12% and 14.30%, respectively. Low HDL-cholesterol level (29.37%) and high abdominal obesity (34.37%) are the most frequent characteristics in comparison to other metabolic components. Table 3 shows Fars women with and without metabolic syndrome by the age. The most age distribution was in ages between 35-40 years. The prevalence of metabolic syndrome was the highest in ages 35-40 years. There was increased frequency of metabolic syndrome from age 25-29 years in Fars women. The prevalence of metabolic syndrome was high in ages 30-34 years when compared subjects with and without metabolic syndrome. Table 4 shows number of subjects accomplishing the criteria of metabolic syndrome. According to our results, 13.75%, 5.62%and 1.25% had three, four and five criteria for metabolic syndrome, respectively.

DISCUSSION

This study shows that 20.62% of this population has metabolic syndrome. Differences in the prevalence of metabolic syndrome can result from different interpretation of the syndrome, sociological and environmental, genetic factors and life style. Study in Italy showed that a prevalence of metabolic syndrome was 3-3.5% (on the basis of the presence of all five criteria) [18]. Studies among Korean and Chinese populations showed that prevalence of metabolic syndrome were 13.8% [19] and 17.8% for females, respectively [20]. Eshtiaghi *et al*. showed that prevalence of metabolic syndrome was 18.3% [21]. In our study the prevalence of the metabolic syndrome is higher than some other studies were done in

Italy, Korea, China and Iran [18-21], but our study is not in agreement with the studies were done by Ainy [22], Deilbert [23], Figueiredo Neto [24] and Heidari *et al* [25]. They have shown that prevalence of metabolic syndrome were 53%, 23%, 24% and 449%, respectively. Studies in Greece and USA have shown that prevalence of metabolic syndrome was similar in both genders [26, 9]. Some other studies in Turkey, India, Iran, African Americans, Mexican Americans have shown that women to be much more frequently affected [9, 27], while in France and Australia the metabolic syndrome was found to be more common among men [27]. Study on the components of metabolic syndrome showed that the most frequent changes of components of metabolic syndrome was abdominal obesity (frequency of 34.37%), which is not in agreement with the findings in USA [28], Turkey [29], Italy [30], Canada [31], UK [32] and Iranian population [33-34] that the most common found was high prevalence of low HDL-cholesterol. Some studies have reported that waist circumference is positively associated with the risk of cardiovascular occurrences [35-36]. Study of Despres *et al* showed that extra fat mass rather than excess body weight was highly correlated with abnormal metabolism [37]. Our study showed that women with metabolic syndrome had high abdominal obesity. Our results showed that waist circumference was elevated among Fars women with metabolic syndrome. It was been also shown that women were overweight. Changes in central obesity can cause metabolism abnormality and influence health [38]. It is important to reduce the risk of cardiovascular disease among these women. It suggests that among women with metabolic syndrome, blood glucose and blood lipid profile monitoring and changing their life style leading to weight loss by diet and sport [25]. D espite lifestyle changes such as an increas e in high-fat, high-carbohydrate intake and a decrease in physical activity due to economical alterations in Iran, the metabolic syndrome in women remain an important problem. Study has been shown that 76.3% of females in Iran had physical inactivity [39]. Iranian women mostly do less physical activity and overweight and obesity are more common between them [40]. The reasonable interpretation for our results is that Fars women in this area maybe had lower physical activity. Our study has shown the prevalence of metabolic syndrome and the components of metabolic syndrome in Fars ethnic women in Gorgan. Low HDL-cholesterol and high waist circumference were the most usual factors of metabolic abnormality among women. Prevalence of cardiovascular diseases might be increased. We have shown some related factors of metabolic syndrome in these women to predict metabolic syndrome in these ethnic groups and help to prevent cardiovascular disease.

ACKNOWLEDGMENTS

This study was supported by Golestan University of Medical Sciences. We thank all our colleagues in the Department of Biochemistry, Biochemistry and Metabolic Disorders Research Center and Health Centers.

Competing Interest: The authors have no conflicts of interest.

Funding: The study was funded by research deputy of Golestan University of Medical Science

REFERENCES

1. Miranda, P.J., R.A. DeFronzo, R.M. Califf and J.R. Guyton, 2005. Metabolic syndrome: definition, pathophysiology and mechanisms. Am Heart J., 149: 33-45.
2. Kylin, E., 1923. Studien ueber das Hypertonie-Hyperglykamie-Hyperurikamiesyndrom. Zentrallblatt fuer Innere Medizin, 44: 105-27.
3. Isomaa, B., P. Almgren, T. Tuomi, B. Forsen, K. Lahti M. Nissen, *et al*., 2001. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes Care, 24: 683-9.
4. Reaven, G.M. and Banting Lecture 1988. Role of insulin resistance in human disease. Diabetes, 37: 1595-607.
5. Alberti, K.G. and P.Z. Zimmet, 1998. Definition, diagnosis and classification of diabetes mellitus and its complications. Part I: diagnosis and classification of diabetes mellitus, provisional report of a WHO Consultation. Diabet Med., 15: 539-53.
6. Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults. Executive Summary of The Third Report of The National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation and Treatment of High Blood Cholesterol in Adults Adult Treatment Panel III). JAMA, 2001. 285: 2486-97.
7. Cameron, A.J., J.E. Shaw and P.Z. Zimmet, 2004. The metabolic syndrome: prevalence in worldwide populations. Endocrinol Metab. Clin. N. Am., 33: 351-75.

8. Gupta, A., R. Gupta, M. Sarna, S. Rastogi, V.P. Grupta and K. Kothari, 2003. Prevalence of diabetes, impaired fasting glucose and insulin resistance syndrome in an urban Indian population. Diabetes Res. Clin. Pract, 61: 69-76.
9. Ford, E.S., W.H. Giles and W.H. Dietz, 2002. Prevalence of the metabolic syndrome among US adults: findings from the Third National Health and Nutrition Examination Survey. JAMA, 287: 356-9.
10. Balkau, B., M. Vernay, L. Mhamdi, M. Novak, D. Arondel, S. Vol, *et al*., 2003. The D.E.S.I.R Study Group. The incidence and persistence of the NCEP (National Cholesterol Education Program) metabolic syndrome. The French D.E.S.I.R. study. Diabetes Metab, 29: 526-32.
11. Ramachandran, A., C. Snehalatha, K. Satyavani, S. Sivasankariand and V. Vijay, 2003. Metabolic syndrome in urban Asian Indian Adults-a population study using modified ATP III criteria. Diabetes Res. Clin Pract, 60: 199-204.
12. Shepherd, J., S.M. Cobbe, I. Ford, C.G. Isles, A.R. Lorimerand Mac P.W. Farlane, *et al*, 1995. Prevention of coronary heart disease with pravastatin in men with hypercholesterolemia. West of Scotland Coronary Prevention Study Group. N. Engl. J. Med., 333: 1301-7.
13. Downs, J.R., M. Clearfield, S. Weis, E .Whitney, D.R. Shapiroand PA. Beerc, *et al*, 1998. Primary prevention of acute coronary events with lovastatin in men and women with average cholesterol levels: results of AFCAPS/ TexCAPS. Air Force/Texas Coronary Atherosclerosis Prevention Study. JAMA, 279: 1615-22.
14. Ballantyne, C.M., A.G. Olsson, T.J. Cook, M.F. Mercuri, TR. Pedersen and J. Kjekshus, 2001. Influence of low high-density lipoprotein cholesterol and elevated triglyceride on coronary heart disease events and response to simvastatin therapy in 4S. Circulation, 104: 3046-51.
15. Meigs, J.B., 2000. "Invited commentary: insulin resistance syndrome? Syndrome X? Multiple metabolic syndrome? A syndrome at all? Factor analysis reveals patterns in the fabric of correlated metabolic risk factors," American Journal of Epidemiology, 10: 908-912.
16. World Health Organization. Prevention and Management of the Global Epidemic of Obesity. Report of the WHO Consultation on Obesity. WHO: Geneva, 1998 (Technical Report Series, No. 894).
17. Dalton, M., A.J. Cameron, P.Z. Zimmet, J.E. Shaw, D.D. Jolley, D.W. Dunstan and T.A. Welborn, 2003. AusDiab Steering Committee. Waist circumference, waist-hip ratio and body mass index and their correlation with cardiovascular disease risk factors in Australian adults. J. Intern Med., 254: 555-63.
18. Trevisan, M., J. Liu, F.B. Bahsas and A. Menotti, 1998. "Syndrome X and mortality: a population-based study. Risk Factor and Life Expectancy Research Group," American J. Epidemiol., 10: 958 966.
19. Kim, H.M., J. Park, S.Y. Ryue and J. Kim, 2007. The effect of menopause on the metabolic syndrome among Korean women. The Korean National Health and Nutrition Examination Survey, 2001. Diabetes Care, 30: 701-6.
20. Gu, D., K. Reynolds, X. Wu *et al.*, 2005 "Prevalence of the metabolic syndrome and overweight among adults in China," The Lancet, 9468: 1398-1405.
21. Eshtiaghi, R., A. Esteghamati and M. Nakhjavani, 2010. Menopause is an independent predictor of metabolic syndrome in Iranian women. Matutritas, 65: 262-266.
22. Ainy, E., P. Mirmiran, S. Zahedi Asl and F. Azizi, 2007. Prevalence of metabolic syndrome during menopausal transition Tehranian women. Tehran Lipid and Glucose Study (TLGS). Matutritas, 58: 150-5.
23. Deibert, P., D. Konig, M.Z. Vitolins, U. Landmann, I. Frey, Zahradnik, *et al.*, 2007. effect of weight loss intervention on anthropometric measures and metabolic risk factors in pre- versus postmenopausal women. Nutr. J., 6: 31.
24. Figueiredo Neto, J.A., E.D. Figueredo, E.D. Barbosa, F. Barbosa Fde, G.R. Costa and V.J. Nina *et al*., 2010. Metabolic syndrome and menopause: Cross-sectional study in Gynecology clinic. Arq. Bras. Cardiol, 95: 339-45.
25. Heidari, R., M. Sadeghi, M. Talaei, K. Rabiei, N. Mohammadifard and N. Sarrafzadegan, 2010. Metabolic syndrome in menopausal transition: Isfahan Healthy Heart Program, a population based study. Diabetol Metab. Syndr, 2: 59.
26. Athyros, V.G., E.S. Ganotakis, M. Bathianaki, I. Monedas, I.A. Goudevenos, A.A. Papageorgiou, *et al.*, 2005. MetS-Greece Collaborative Group. Awareness, treatment and control of the metabolic syndrome and its components: a multicentre Greek study. Hellenic J. Cardiol., 46(6): 380-386.

27. Cameron, A.J., J.E. Shaw and P.Z. Zimmet, 2004. The metabolic syndrome: prevalence in worldwide populations. Endocrinology and metabolism clinics of North America. Metabolic Syndrome: Part 1, 33: 351-376.
28. Heiss, G., I. Tamir, C.E. Davis, *et al.*, 1980. "Lipoprotein-cholesterol distributions in selected North American populations: the lipid research clinics program prevalence study," Circulation, 2: 302-315.
29. Onat, A., G. Surdum-Avci, M. Senocak, E. Ornek and Y. Gozukara, 1992.. "Plasma lipids and their interrelationship in Turkish adults," Journal of Epidemiology and Community Health, 5: 470-476.
30. The Research Group ATS-RF2 of the Italian National Research Council, "Distribution of some risk factors for atherosclerosis in nine Italian population samples," American J. Epidemiol., 1981. 113: 338-346.
31. MacLean, D.R., A. Petrasovits, P.W. Connelly, M. Joffres, B. O'Connor and J.A. Little, 1999. "Plasma lipids and lipoprotein reference values and the prevalence of dyslipoproteinemia in Canadian adults. Canadian Heart Health Surveys Research Group," Canadian J. Cardiol., 4: 434-444.
32. Mann, J.I., B. Lewis, J. Shepherd, *et al.*, 1988. "Blood lipid concentrations and other cardiovascular risk factors: distribution, prevalence and detection in Britain," British Medical J., 6638: 1702-1706.
33. Sharifi, F., S.N. Mousavinasab, R. Soruri, M. Saeini and M. Dinmohammadi, 2008. "High prevalence of low high-density lipoprotein cholesterol concentrations and other dyslipidemic phenotypes in an Iranian population," Metabolic Syndrome and Related Disorders, 3: 187-195.
34. Azizi, F., A. Esmaillzadeh and P. Mirmiran, 2004. "Obesity and cardiovascular disease risk factors in Tehran adults: a populationbased study," Eastern Mediterranean Health J., 6: 887-897.
35. De Koning, L., A.T. Merchant, J. Pogueand and S.S. Anand, 2007. Waist circumference and waist-to-hip ratio as predictors of cardiovascular events: meta-regression analysis of prospective studies. Eur. Heart J., 28: 850-6.
36. Hu, G., J. Tuomilehto, K. Silventoinen, C. Sarti, S. Männistöand and P. Jousilahti, 2007. Body mass index, waist circumference and waisthip ratio on the risk of total and type-specific stroke. Arch Intern Med., 167: 1420-7.
37. Despres, J.P., I. Lemieuxand and D. Prud'homme, 2001. Treatment of obesity: need to focus on high risk abdominally obese patients. BMJ, 322: 716-720.
38. Lobo, R.A., 2008. Metabolic syndrome after menopause and the role of hormones. Maturitas, 60: 10-18.
39. WHO Global infobase, "Iran: Most recent national survey (s) for chronic, non-communicable diseases risk factors," https://apps.who.int/infobase/report.aspx.
40. Mirmiran, P., F. Mohammadi and F. Allahverdian and S. Azizi, 2001. "Measurement of total energy requirement in adults: prospective Tehran Lipid and Glucose Study, Pajouhandeh," Journal of Shahid Beheshti University of Medical Sci., 6: 157-166 (Persian).