*Original Article*

# Epidemiology of metabolic syndrome among women of reproductive age in Abhar City in Western Iran

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**ABSTRACT**

***Objective:*** Metabolic syndrome is a set of metabolic disorders highly related with cardiovascular diseases and has high expansion among population. The present study aimed to assess the prevalence and characteristics of the metabolic syndrome amongst women of reproductive age.

***Methodology:*** A cross sectional study was conducted using a systematic randomized sampling method. Overall, 406 women of reproductive age living in Abhar city western Iran was recruited. Data was analyzed using T-test, Fisher exact test and chi-square.

***Results:*** The prevalence rate of metabolic syndrome was 28.1%. This figure increased as the mean age and body mass index (BMI) of women increased. The common metabolic disorder was HDL < 50 (98.2%). Majority of cases with metabolic syndrome were either overweight or obese (53.5%).The most expansion of metabolic syndrome was observed in the age range of between 45 to 49 years (70.6%). There was a significance relationship between having metabolic syndrome and patients' level of education and profession ($p<0.01$).

***Conclusions:*** Obesity and old reproductive age are the main risk factors associated with metabolic syndrome. Increased prevalence of metabolic syndrome in this part of the world is going to be a major public heath concern which indicates the necessity of applications for preventive programs based on national and international guidelines.

**KEY WORDS:** Abhar, Metabolic syndrome, Reproductive age, Women.

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## INTRODUCTION

Metabolic syndrome refers to the collection of signs leading to cardiovascular disease, stroke and Type II diabetes.[1] Metabolic factors tend to aggregate in individuals, and that clustering is more harmful than having an individual single factor.[2] Mortality due to cardio-vascular disease is high in patients with metabolic syndrome mainly due to its relation to diabetes.[3] Metabolic syndrome is more prevalent in obese and overweight individuals.[4] A prevalence rate of 22% in women 20 to 70 years old,[5] and 4.2 % in patients aged 12-19 years old[6] has already been reported.

The same figures have also been revealed in Brazil and Europe.[7,8] The International Association of Diabetes has exposed that obesity and low physical activity are the main risk factors associated with

metabolic syndrome.[9] According to the Framingham study, the metabolic syndrome alone predicts 25% of all new cases of cardiovascular disease.[10] Clinical diagnosis of metabolic syndrome may be a valuable tool for identifying high risk patients.[11] and the correcting the lifestyle and drug therapy can reduce the complications associated with CVD and diabetes type II.[9]

Considering the importance of metabolic syndrome prevalence and contributing factors among reproductive age women, the present cross-sectional study was undertaken in Abhar city in western Iran.

## METHODLOGY

A descriptive cross-sectional study was undertaken in Abhar city, Zanjan Province, western Iran where according to the latest formal statistics, more than 25 thousands women of reproductive age (15-49 years) are living. Sampling was based on systematic randomized method in which 406 women of reproductive age that reported to the urban governmental health centers were recruited. Demographic data was collected using the available documented family health records. Eligible individuals were invited to the Diabetes Clinic by either written invitation or on phone for interview. Pregnant women were excluded from the study. Interviewers were supposed to complete demographic and anthropometric data through face-to-face interview.

Waist circumference (WC) was measured midway between the lower rib margin and the iliac crest using a standard measuring tape. Blood pressure was measured two times from right arm of the participants using the Richter aneroid sphygmomanometer and with a five-minute interval. Different cuffs were available for different arm sizes. A 10 mmHg or more difference between measured systolic or diastolic blood pressures led to a third measurement. Richter mercury sphygmomanometer was used to calibrate the aneroid equipment according to a clear guideline.

Body Mass Index (BMI) was also calculated in which BMI<20 $kg/m^2$, was considered "underweight", between 21 and 25 $kg/m^2$, "normal", 26-30 $kg/m^2$ "Overweight" and more than 31 $kg/m^2$ was defined as obese.

To measure the biochemical factors of the participants, they were instructed to fast for 10 hours before taking blood samples. The samples were taken after making an appointment with eligible subjects by trained laboratory technicians. The collected serum samples were transferred to a provincial reference laboratory approved by the Iran's National Reference Laboratory. The blood samples were centrifuged for ten minutes at 1500 rpm to provide a serum sample and kept cool in a refrigerator at the temperature of 4 to 8 C° for a maximum of 48 hours. Samples were kept frozen at -20 C°, if the distance between centrifuging site and the referral provincial laboratory was long or the transfer time to it was supposed to take longer than 48 hours. Uniform testing kits from the same batch number produced by an Iranian company, Pars Azmoun, were used to test the samples.

The modified NCEPATP-III criteria were used to determine the different aspects of metabolic syndrome. According to the modified NCEP criteria, the presence of any three of the following five factors is required for a diagnosis of Metabolic Syndrome: abdominal obesity, hypertriglyceridaemia (triglycerides ≥1.7 mmol/L); low HDL cholesterol (HDL cholesterol ≤1.03 mmol/L for men and ≤1.29 mmol/L for women); elevated blood pressure (Systolic blood pressure ≥130 mmHg and/or diastolic blood pressure ≥85 mmHg or current use of antihypertensive drugs); impaired fasting glucose (fasting plasma glucose ≥5.6 mmol/L). Diagnosis of diabetes was based on fasting plasma glucose (FPG) >126 mg/dl and/or a 2 h plasma glucose >200 mg/dl25.

The modified NCEP ATP III suggested the cut-off points of waist circumference should be ethnic specific where individuals of Asian origin should use the cut-off of 90 cm in men and 80 cm in women. The IDF criterion uses ethnic-specific waist circumference cut-off points as a requirement for diagnosis. Similar to the modified NCEP ATP III criteria, IDF recommends cut-off levels of 90 cm in men and 80 cm in women for central obesity. For both criteria, the recommended cutoff for Asians was used (90 cm in men and 80 cm in women) as there are no national cut-off values specific for Iranian population.[12,13]

A written consent form was obtained from all participants and they were free to take part and to withdraw the study whenever they wish. This study was approved by the local Ethical Committee. Data analyzed by SPSS version 17 and probability values equal or less than 0.05 were considered statistically significant.

## RESULTS

Overall, 406 women in the age range of 15-49 years were enrolled in this study. According to the criteria, 28.1% (n=114) were diagnosed as metabolic

syndrome (exposed). Mean age ± standard deviation in exposed and non-exposed groups was 36.4 ± 7.9 and 31.2± 7.5 years respectively. Mean BMI was also 29.59 and 26.08 kg/m$^2$ in both groups respectively (p<0.01).

Almost one in two obese participants (45.7%) had metabolic syndrome, whilst this figure was almost one in ten (9.3%) amongst those with normal BMI (Table-I). Table-II illustrates the Correlation between metabolic variables. The most common metabolic disorder was HDL <50 (94.6%). The prevalence of metabolic syndrome was significantly associated with the participants' knowledge and job. Small number of participants (2.7%) had no syndrome criteria, 27.6% had one, 41.6% had two, 20.7% had three, 6.7% had four and 7% had all five symptoms of metabolic syndrome (Table-III). The age group of 45-49 years had the highest rate of metabolic syndrome (Table-IV). Family history of obesity and hypertension was observed in 40.4% of patients.

The prevalence rate of metabolic syndrome was 28.1%. This figure was increasing as the mean age and body mass index (BMI) of women were increased. The common metabolic disorder was HDL < 50 (98.2%). Majority of cases with metabolic syndrome were either overweight or obese (53.5%). The most increase of metabolic syndrome was observed in the age range of between 45 to 49 years (70.6%). There was a significance relationship between having metabolic syndrome and patients' level of education and profession (p<0.01).

Table-I: Anthropometric measurements and clinical characteristics

| *Characteristics* | *Metabolic Syndrome, Mean(SD)* | | *All, Mean(SD)* |
|---|---|---|---|
| | *Yes* | *No* | |
| Age(year) | 36.4(7.9) | 31.2(7.5) | 32.7(7.9) |
| Weight(kg) | 72.7(10.4) | 63.9(11.1) | 66.4(11.6) |
| Height(cm) | 29.6(4.34) | 26.1(4.4) | 27.1(4.6) |
| BMI(kg/m2) | 101.9(8.4) | 91.3(11.0) | 94.3(11.4) |
| WC(cm) | 114.0(15.9) | 101.4(12.2) | 104.9(14.5) |
| BP(sys) | 75.1(11.9) | 65.9(10.1) | 68.5(11.4) |
| BP(dys) | 92.5(22.9) | 81.5(9.3) | 84.5(15.3) |
| FBS | 191.7(104.1) | 89.9(44.4) | 118.5(80.8) |
| TG | 32.2(8.3) | 41.1(16.1) | 38.6(14.9) |
| HDL | 156.9(5.8) | 156.5(5.7) | 156.6(5.7) |

WC: Waist Circumference. TG: Triglyceride.
HDL: High Density Lipoprotein

## DISCUSSION

In this study according to ATP criteria, the prevalence of metabolic syndrome in women of reproductive age was 28.1% which is compatible with previous studies conducted in this country[14,15] but is not consistent with the corresponding rate in Europe.[16] The prevalence of metabolic syndrome was 23% in the American women with a linear association with age.[9] In Asia, this figure was 11% in China.[13] The discrepancy in prevalence rates of metabolic syndrome across the world with different ethnic groups is can probably due to their different nutrition patterns.[2] Although hereditary factors play an important role in creating metabolic syndrome, higher prevalence in this country might be referred

Table-II: Correlations of metabolic variables

| | *BP(Sys)* | *BP(Dys)* | *WC* | *BMI* | *FBS* | *HDL* | *TG* |
|---|---|---|---|---|---|---|---|
| BP(Sys) | - | 0.553 | 0.273 | 0.261 | 0.163 | 0.03 | 0.203 |
| | | 0.000 | 0.000 | 0.000 | 0.000 | p=0.5 | 0.000 |
| BP(Dys) | - | - | 0.299 | 0.280 | 0.71 | 0.04 | 0.209 |
| | | | 0.000 | 0.000 | p=0.115 | 0.38 | 0.000 |
| WC | - | - | - | 0.775 | 0.143 | 0.092 | 0.256 |
| | | | | 0.000 | 0.004 | 0.063 | 0.000 |
| BMI | - | - | - | - | 0.145 | 0.124 | 0.274 |
| | | | | | p=0.004 | p=0.013 | 0.000 |
| FBS | - | - | - | - | - | 0/045 | 0.177 |
| | | | | | | 0.36 | 0.000 |
| HDL | - | - | - | - | - | - | 0.386 |
| | | | | | | | 0.000 |
| TG | - | - | - | - | - | - | - |

Table-III: Demographic factors associated with metabolic syndrome

| *Variables* | | *Metabolic Syndrome, n (%)* | | *p value* |
|---|---|---|---|---|
| | | *Yes* | *No* | |
| Age groups (years) | 15-24 | 8(11.3) | 63(88.7) | 0.000 |
| | 25-34 | 34(22.2) | 119(77.8) | |
| | 35-44 | 48(32.4) | 100(67.6) | |
| | 45-49 | 24(70.6) | 10(29.4) | |
| BMI status | Underweight | 1(4.2) | 23(95.8) | |
| | Normal | 10(9.3) | 98(90.7) | 0.000 |
| | Overweight | 61(33.9) | 119(66.1) | |
| | Obese | 42(45.7) | 50(54.3) | |
| Education level | Illiterate | 53(34.6) | 100(65.4) | 0.000 |
| | Primary | 38(38.4) | 61(61.6) | |
| | Diploma | 19(16.7) | 95(83.3) | |
| | Undergraduate | 3(25) | 9(75) | |
| | Postgraduate | 1(3.6) | 27(96.4) | |
| Job status | Housewife | 108(30.3) | 249(69.70) | 0.037 |
| | Employed | 5(12.2) | 36(87.8) | |
| | Unemployed | 1(14.3) | 6(85.7) | |

Table-IV: Clinical factors associated with metabolic syndrome

| *Variables* | | *Metabolic Syndrome, n (%)* | | *p value* |
|---|---|---|---|---|
| | | *Yes* | *No* | |
| Diabetes | No | 110(27.4) | 291(72.6) | 0.02* |
| | Yes | 4(80) | 1(20) | |
| Hypertension | No | 75(20.5) | 290(79.5) | 0.000 |
| | Yes | 39(95.1) | 2(4.9) | |
| Central obesity | No | 68(26.6) | 188(73.4) | 0.42 |
| | Yes | 46(30.7) | 104(69.3) | |
| F.Hx of Obesity | No | 68(26.9) | 185(73.1) | 0.49 |
| | Yes | 46(30.1) | 107(69.9) | |
| F.Hx of diabetes | No | 87(28.5) | 218(71.5) | 0.79 |
| | Yes | 27(26.7) | 74(73.3) | |
| F.Hx of hypertension | No | 46(30.1) | 107(69.9) | 0.49 |
| | Yes | 68(26.9) | 185(73.1) | |
| F.Hx of hyperlipidemia | No | 36(30.5) | 82(69.5) | 0.54 |
| | Yes | 78(27.1) | 210(72.9) | |

F.Hx: Familial History.
* Fisher exact test.

to the people's life style with low mobility and high-fat foods accompanied by increased consumption of fast foods.

In the present study, the trend of metabolic syndrome was significantly correlated with the women's age that is consistent with previous studies.[14-17] The prevalence of metabolic syndrome in the late reproductive age (45-49 years), was maximum of 70.6%, and the most common symptom was <HDL< 50, which confirms the recent reports in Iran.[15,18] However, central obesity was more prevalent in the present study and consisted with a study from similar population[19], which could be due to inappropriate dietary patterns and wrong nutritional habits.

In the present study the prevalence of metabolic syndrome in obese women was higher that is similar to previous studies[14,20,21], which indicates the necessity of the educational and interventional programs. Metabolic syndrome was more frequently observed in housewife women who usually have not enough mobility and physical activity. They should be aware of adverse effects of metabolic syndrome to do regular exercises and activities at home.

The rate of metabolic syndrome was significantly different among women with different educational backgrounds which could be due to correct information and culture of having a healthy diet. Approximately one third of women of reproductive age in this area are suffering from metabolic syndrome. This is going to be a major health concern and indicates the necessity of an active public health program to reduce the factors influencing the prevalence. Pay more attention to the life style and increasing the public knowledge on healthy life style can be a suitable intervention.

The present study was limited in terms of NCEPATP-III criteria in which we obligatorily modified the criteria based on cut off point for Asian populations. The preventive programs must be taken seriously and the suggested preventive moves such as reducing weight and healthy and suitable nutrition and more physical activities based on national and international guidelines can be considered as most effective measures in reducing the prevalence of metabolic syndrome.

## REFERENCES

1. Meigs JB, Wilson PW, Nathan DM, D Agostino RB Sr, Williams K, Haffner SM. Prevalence and characteristics of the metabolic syndrome in the San Antonio Heart and Framingham Offspring. Diabetes 2003;52:2160-7.
2. Kimm MH, Kim MK, Choi BY, Shin YJ. Prevalence of metabolic syndrome and its association with cardiovascular disease in Korea. J Korean Med Sci 2004;19:195-201.
3. Marek H Dminiczak. Metabolic syndrome editorial comment. Curr Opin Lipidol 2003;14;329– 32.

4. Eckel RH, Grundy SM, Zimmet PZ. The metabolic syndrome. Lancet 2005;(365):1415–28.
5. Ford ES, Giles WH, Dietz WH. Prevalence of metabolic syndrome among US adults. Finding From the Third National Health Nutrition Examination Survey. JAMA 2002;(287):356–56.
6. Cook S, Weitzman M, Auinger P, Ngyuen M, Dietz WH. Prevalence of a metabolic syndrome phenotype in adolescents. Arch Pediatr Adolese Med 2003;157:821–827.
7. Alvarez MM, Vieira ACR, Moura AS, Veiga GV. Insulin resistance in Brazilian adolescent girls. Association with over weight and metabolic disorders. Diabet Res Clin Pract 2006;16(3):404-409.
8. Molnar D, The prevalence of the metabolic syndrome and type 2 diabetes mellitus in children and adolescents. Int J Obes 2004;28:70–74.
9. Steven M. Heffner, MD "Risk constellation in patients with metabolic syndrome: Epidemiology, Diagnosis, Treatment patterns. The American J Medicine 2006;119(5A):3S–9S.
10. Grundy SM, Brewer HB, Cleeman JI, Smith SC Jr, Lenfant C, National Heart and Blood institute, American Heart Association. Definition of metabolic syndrome: Report of National Heart, lung and Blood Institute / American Heart Association conference on scientific issues related to definition. Circulation 2004;109:433–38.
11. Reilly MP, Rader DJ. The metabolic syndrome: More than the sum of its parts? Circulation 2003;108:1546–51.
12. Malekzadeh R, Mohamadnejad M, Mrat Sh. Obesity pandemic: An Iranian perspective. Arch of Iranian Med 2005;8:1-7.
13. Moy F.M, Bulgiba A, The modified NCEP ATP III criteria maybe better than the IDF criteria in diagnosing Metabolic Syndrome among Malays in Kuala Lumpur. BMC Public Health 2010, 10:678
14. Dhanaraj E., Bhansali A, Jaggi S, Dutta P, Jain S, Tiwari P. Ramarao P. Predictors of metabolic syndrome in Asian north Indians with newly detected type 2 diabetes. Indian J Med Res 129, May 2009, pp 506-514
15. Azizi F. Salehi P, Etemadi A, Zahedi-asl S. Prevalence of metabolic syndrome in an urban population: Tehran lipid and glucose study. Diabetes Res Clin Pract 2004;61:29-37.
16. Villegas R, Perry IJ, Creagh D, Hinchion R, O Halloran D. Prevalence of the metabolic syndrome in middle-aged men and women. Diabetes Care 2003;26:3198-9.
17. Azadeh Z, Hadaegh F, Azizi F. Prevalence of metabolic syndrome in Iranian adult population, concordance between the IDF with the ATPIII and the WHO definition. Diabetes Research and Clinical Practice 2007;77(2):251-57.
18. Kime Hee. Prevalence of the metabolic syndrome among Korean adults using the new international Diabetes Federation definition and the new abdominal obesity criteria for the Korean people. Diabetes Research and Clinical Practice 2007;77(1):99-106.
19. Ebrahimi H, Rajaee F, Esmailian R. Prevalence of metabolic syndrome at women in productivity age at Shahreza city. Circulation 2006:89:301-305.
20. Alexander CM. The coming of age of the metabolic syndrome. Diabetes Care 2003;26:3180-81.
21. Kip KE, Marroquin OC, Kelley DE, Johnson BD, Kelsey SF, Show LJ, et al. Clinical importance of obesity versus the metabolic syndrome in cardiovascular risk in women: A report from the women's ischemia syndrome Evaluation (WISE) study. Circulation 2004;109:706-13.