Metabolic Syndrome: A Common Problem among Office Workers

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Abstract

Background: Metabolic syndrome (MSx) is associated with several health problems. Workers are an important part of any organization.

Objective: To determine the prevalence of MSx and related variables among office workers.

Methods: This cross-sectional study evaluated 1488 office workers in Qom province, Central Iran, by using a multi-stage cluster sampling. Diagnosis of MSx was based on blood HDL-cholesterol, triglyceride, and fasting blood sugar (FBS) levels and waist circumference, and blood pressure.

Results: The overall prevalence of MSx was 35.9% (95% CI 33.5% to 38.3%), higher in men (37.2%) than in women (20.6%), and increased with age. The most common laboratory findings of MSx were hypertriglyceridemia (45.9%) and low HDL-cholesterol level (45.5%). Office workers with MSx had a significantly (p<0.001) higher body mass index than those without MSx. Lack of regular leisure time physical activity (p=0.003), and low intake of fruits (p=0.02) were associated with MSx.

Conclusion: The prevalence of MSx was very high among office workers. Workplace health improvement programs through identifying and preventing MSx are necessary for improvement of staff's health.

Keywords: Metabolic syndrome; Prevalence; Occupational exposure; Obesity abdominal; Hyperlipidemias; Iran

Introduction

Metabolic syndrome (MSx) is a serious public health concern that describes a cluster of disorders.[1,2] Although there is no consensus on definition of MSx, several variables including large waist circumference, high fasting blood sugar (FBS), abdominal obesity, low HDL-cholesterol level, hypertriglyceridemia, and hypertension are major risk factors for MSx.[1] The prevalence of MSx based on Adult Treatment Panel III (ATP III) criteria, varies from 7% to 58% from place to place.[3] In Iran, 30% to 45% of adults suffer from MSx.[4] However, the prevalence categorized according to occupational groups is not yet known in Iran.[5]

There are many controversies on MSx complications. Based on several studies, MS is related to chronic kidney disease, obstructive sleep apnea syndrome, cerebral atrophy, which may trigger depres-

sion and cognitive impairment, hormonal imbalance, and genetic predisposition.[6-9] Therefore, identifying MSx risk factors and prevention of its occurrence is a high priority for human health.[10]

According to the Statistical Center of Iran, there were 4 540 045 office workers in 2011 in Iran. These included 15% of all staff employed in the public sector.[11] Workers are an important part of any organization.[10] MSx is a considerable risk for health, not only because it increases the risk of type 2 diabetes and cardiovascular disease but also for the medical expenses it imposes on health care system.[9,12] Workplace, which directly influences the physical, mental, economic, and social well-being of employees, is considered important environmental and social determinants of health.[13]

The first step in planning and policy making for MSx prevention is determining the prevalence of MSx and identifying its risk factors. We, therefore conducted this study to assess the prevalence of MSx and its associated risk factors in a group of office workers.

Materials and Methods

In a cross-sectional study, 1488 office workers of Qom province, Central Iran, were assessed at their working places in public offices between 2012 and 2013. At the beginning, more than 66 709 employees were working as office workers in this province. We used stratified random sampling for selection of our participants. At first stage, a list of all public offices and their personnel was prepared. Then, they were categorized based on their gender (92% men and 8% women). Within each gender group, we assigned a number to each participant and using a random number table, we selected the participants. Using a stratified sampling method, we selected 1630 office workers (1500 men and 130 women) from

the list. The only inclusion criterion was being an office worker resident in Qom province at least for six months. Pregnant and lactating women were excluded from the study. Informed written consent was obtained from all participants after they received written and verbal information about the study objectives.

All participants completed a comprehensive data sheet that included demographic data, medical history, and life style consisting of smoking status (current smoker/non-smoker), leisure time physical activity, eating behavior, and job strain. Physical activity was determined by questions about regular walking, swimming, climbing stairs, riding bicycle, aerobic exercise, household activities (*eg*, vacuum cleaning, gardening), heavy exercise (*eg*, football) and resistance exercise (*eg*, weight lifting).

Regular eating behavior were assessed by asking straight forward question about salt overuse, eating breakfast, eating fruit, preference for fatty food. Examples of questions were "do you eat fruit more than three times per week?" and "if you have a choice between boiled and fried dishes, do you prefer fried or greasy ones?"

Job strain was assessed by Persian version of self-reported job content questionnaire (JCQ) based on demand-control model.[14,15] In this model, job strain is classified as four category: "high strain" characterized as high demand and low control, "active" with high demand and control, "passive" with low demand and control, and "low strain" with low demand and high control. In the study of Choobineh, *et al*, validity of the questionnaire was approved; it had a Cronbach's α between 0.64 and 0.85 for all subscales.[15]

In response to questions about smoking status, physical activity, eating breakfast and fruit, and preference for fatty food, participants were able to select "yes" or "no."

Anthropometry criteria including height, weight, and waist circumference, blood pressure, serum lipid profile, and fasting blood sugar (FBS) were measured. All measurements were made by two trained nurses and a general practitioner. Waist circumference was measured at the umbilical level using a non-elastic tape, while the subject stood balanced on both feet with the feet touching each other and both arms hanging freely. Arterial blood pressure was measured two times in sitting position by a sphygmomanometer. All participants rest at least 15 minutes before the first measurement and 30 minutes between the two measurements. The mean of the two measurements was considered the final blood pressure.

Blood samples were collected from the antecubital vein between 6:00 and 8:00 am, after 14 hours of fasting. All tests were done in a pathobiology lab, by two trained specialists with standard laboratory techniques and negative controls were run to assure the quality. Serum FBS, triglycerides, and HDL-cholesterol were analyzed by enzymatic method (BS 400 machine, Mindray Co, Germany) and kits of Pars Azmoon Co, Iran.

Weight was measured with a light clothes and no footwear. BMI was calculated as the weight in kilogram divided by the square of the height in meter. Those with a BMI >25 kg/m^2 were considered "at risk."

The Adult Treatment Panel III (ATP III) criteria were used for the diagnosis of MSx. The diagnosis was made if at least three of the five following criteria existed 1) waist circumference ≥102 cm for men and ≥88 cm for women; 2) serum triglycerides level ≥150 mg/dL; 3) serum HDL-cholesterol level ≥40 mg/dL in men and ≥50 mg/dL in women (or consuming antihyperlipemic drugs); 4) systolic blood pressure (SBP) ≥130 mm Hg or diastolic blood pressure (DBP) ≥85 mm Hg or being on antihypertensive drugs; 5) FBS ≥100 mg/dL or use of antidiabetic drugs.

Statistical Analysis

Continuous variables are presented as mean (SD). Categorical variables are presented as absolute and relative frequencies or prevalence. Associations between categorical variables were tested by χ^2 test. Differences in quantitative biochemical and clinical parameters were tested by one-way ANOVA. All reported p values are based on two-sided tests with a significance level of 0.05.

Results

Of 1630 office workers who were invited to participate in this study, 1488 (1372 men and 116 women) completed the survey that translated to a response rate was 91.3%. The mean age of office workers was 36.0 (SD 7.7). The median length of service of the workers was 11.0 (IQR 7.0 to 17.0) years. Most (88.9%) of the participants were married, 75.8% were permanent employees, and 55.9% had university education. The sociodemographic characteristics of the office workers are shown in Table 1.

Using ATP III guideline, 534 of 1488 participants had MSx—an overall prevalence of 35.9% (95% CI 33.5% to 38.3%). The prevalence in men (37.2%) was significantly (p<0.001) higher than that in

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TAKE-HOME MESSAGE

- Compared to many parts of the world, the prevalence of MSx in Iran is very high.

- MSx occurs more frequently in male office workers than females.

- The most common laboratory findings of MSx are hypertriglyceridemia and low HDL-cholesterol level.

- MSx is associated with higher BMI, lack of physical activity, and inadequate fruit consumption.

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Table 1: Characteristics of the studied workers. Values are mean (SD).

Parameter	With MSx n=534	Without MSx n=954	All n=1488	p value
Age (yrs)	38.2 (8.1)	34.7 (7.2)	36 (7.7)	<0.001
BMI (kg/m²)	28 (3.9)	25.2 (3.5)	26.2 (3.9)	<0.001
Waist circumference (cm)				
Men	95.7 (9.3)	87.2 (8.2)	90.3 (9.5)	<0.001
Women	99.6 (9.3)	81.3 (9.2)	85.1 (11.8)	<0.001
HDL-cholesterol (mg/dL)				
Men	38.95 (5.5)	40 (6.7)	39.3 (6)	0.001
Women	41.8 (5.6)	43.2 (9.2)	42.1 (6.5)	0.51
Triglycerides (mg/dL)	208.5(119.9)	147.7 (95.7)	169.3 (108.9)	<0.001
Ststolic blood pressure (mm Hg)	120.5 (13.9)	108.8 (9.9)	115.9 (13.1)	<0.001
Diastolic blood pressure (mm Hg)	81.3 (10.2)	72.5 (8)	78.1 (9.6)	<0.001
FBS (mg/dL)	97.1 (33.7)	83.5 (8.6)	88.3 (22.3)	<0.001

women (20.6%). BMI ≥25 kg/m² was observed in 420 (78.7%) office workers with MSx and 517 (54.2%) of those without MSx (p<0.001). Workers with MSx was significantly (p<0.001) older than those without (38.2 [SD 8.1] *vs* 34.7 [SD 7.2] years). University education was significantly associated with MSx.

From the five criteria for MSx, hypertriglyceridemia (45.9%) and low HDL-cholesterol level (45.5%) were the most common ones, followed by hypertension (21.1%), high waist circumference (13.7%) and high FBS (8.5%).

Lack of regular leisure time physical activity (p=0.003) and low intake of fruits (p=0.02) were associated with MSx (Table 2).

Discussion

We found an overall prevalence of MSx of 35.9% (37.2% in men and 20.6% in women) among office workers of Qom province,

Central Iran. Our findings were similar to results of other studies performed on general population of Iran. For example, the prevalence in adult population of Tehran, the Capital of Iran and one of the nearest cities to Qom, was 30%; it was 45% in Khorasan province, northeastern Iran.[16,17]

The prevalence of MSx in our study was much higher than those reported in other parts of the world where the reported prevalence varied from 6.1% in Jiangnan, China, to 40.9% in Istanbul, Turkey.[18,19] For various reasons, the prevalence of MSx varies from place to place. The observed differences would be due to the variation in the frequencies of the components of MSx round the globe. Other factors such as genetic background, diet and nutrition, levels of physical activity, distribution of population age and sex, and body habitus can also affect the prevalence of MSx components and thus MSx. Moreover, there are several diagnostic criteria for MSx. Examples are ATP III, WHO, IDF, and NCEP

Table 2: Life style and MSx

Variables	With MSx (n=534)	Without MSx (n=954)	All (n=1488)	p value
Lack of physical activity	238 (44.5%)	351 (36.8%)	589 (39.6%)	0.003
Salt overuse	125 (23.4%)	213 (22.3%)	338 (22.7%)	0.51
low intake of fruits	21 (3.9%)	18 (1.9%)	39 (2.6%)	0.02
No breakfast	17 (3.1%)	38 (4.0%)	55 (3.7%)	0.4
Preferences for fatty food	281 (52.6%)	480 (50.3%)	761 (51.1%)	0.2
Smoking	54 (10.1%)	73 (7.6%)	127 (8.5%)	0.09
Job strain				
High strain	113 (25.8%)	238 (24.9%)	351 (23.6%)	
Active	118 (26.9%)	179 (18.7%)	297 (19.9%)	0.2
Low strain	96 (21.9%)	176 (18.4%)	272 (18.3%)	
Passive	111 (25.3%)	223 (23.4%)	334 (22.4%)	

criteria. Depending on what criteria are used for the diagnosis of MSx, the prevalence could be different even for the same population. For example the cutoff point for waist circumference in NCEP is higher than that in IDF.[20,21]

In the present study, MSx occurred more frequently among male office workers than females. The literature shows conflicting results regarding the sex distribution of MSx. Some researchers reported that MSx was more common in men.[10,22,23] However, some studies reported a higher prevalence in women.[24,25]

We found that workers with MSx had a higher mean age than those without. Other surveys conducted in Iran and other countries also showed the increasing trend in the prevalence with age.[19,25] Advancing age would affect all the contributing factors[26] including systolic and diastolic blood pressure,[27] FBS in non-diabetic subjects,[28] and waist circumference in the absence of weight gain[29]. Therefore, it is wise to take age into account in the management of persons with MSx.[30]

We found that the most common laboratory findings in MSx were hypertriglyceridemia and low HDL-cholesterol level; nearly half of the office workers had abnormal triglycerides or HDL-cholesterol levels. These findings were in accordance with another study.[31] This would underline the importance of HDL-cholesterol and triglycerides, however in another study high waist circumference followed by hypertension were the most common abnormalities observed in those with MSx.[10]

We also showed that BMI had significant association with the development of MSx; workers with MSx had a significantly higher BMI than those without, which was in line with the findings of Park, *et al*, who found that BMI was the most sensitive marker among the factors associated with MSx.[32]

Based on Kohli and Greenland, lack of physical activity increases the risk of obesity, diabetes, and hypertension. In other words, it increases the risk for MSx.[33] We

also found that lack of physical activity was associated with MSx, which was consistent with findings of several previous studies.[23,34]

Workers with MSx were less likely to consume fruits. Eating breakfast and interest in fatty food were not significantly different between studied workers with and without MSx. Esmaillzadeh, *et al*, also reported that higher consumption of fruit was associated with a lower risk of MSx. Fruit consumption may reduce the risk of MSx through the beneficial combination of antioxidants, fiber, potassium, magnesium, and other phytochemicals.[35,36]

Many studies have shown a link between stress and MSx. Nonetheless, there are contradictory results on the association between work-stress and MSx.[37] We found no significant association between work-stress and MSx.

The present study had some limitations including the cross-sectional nature of the study that hampers any causal inferences. Furthermore, we only studied office workers and thus, the results cannot be generalized to other occupational groups.

In conclusion, we found that the prevalence of MSx in office workers was very high, though not significantly different with that in the general population. To prevent MSx, we need to develop strategic plans to help office workers to increase their regular leisure time physical activity and fruit consumption.

Acknowledgements

Conflicts of Interest: None declared.

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