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Original Article

Frequency of metabolic syndrome and its associated factors in health care workers

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ABSTRACT

Background: In recent decades, metabolic syndrome is one of the most important public health risk factors. Having this in mind, the present study was conducted to evaluate the frequency of metabolic syndrome and its associated risk factors in healthcare workers.
Method: This study is a cross-sectional study conducted on 410 healthcare workers in a teaching hospital in Iran. Demographic, occupational, and psychosocial characteristics were assessed using questionnaire. Assessment of metabolic syndrome of hospital staff was performed at workplace during their medical examination.
Results: The frequency of metabolic syndrome was found to be 22.4%. This relationship was found among blood pressure and occupational stress, despite the fact that there was no significant relationship between metabolic syndrome and occupational stress. Higher age, having shift work, and inactivity were associated with metabolic syndrome.
Conclusion: Considering the high frequency of metabolic syndrome among Iranian healthcare workers, it is advised that effective management should be employed to correct the occupational and psychosocial factors associated with this syndrome.

1. Introduction

In recent decades, metabolic syndrome is one of the most important public health risk factors, mainly related to type 2 diabetes and cardiovascular disease [1]. The National Cholesterol Education Program's Adult Treatment Panel III (ATP III) identified metabolic syndrome as a multiplex risk factor for cardiovascular disease (CVD) that deserves more clinical attention [2]. The ATP III guidelines state that metabolic syndrome may be diagnosed when a person has three or more of the five components. These components are central obesity, an elevated triglyceride (TG) level, a reduced high density lipoprotein (HDL)-cholesterol level, elevated blood pressure, and an elevated fasting glucose concentration. Importantly, the ATP III definition includes waist circumference as the measure of obesity [3].

Although the main causes of metabolic syndrome are not correctly identified, but it is indirectly affected by genetic factors such as age, dementia, pro-inflammation, and hormonal changes, while central obesity and insulin resistance are two important factors in the prevalence of this syndrome and insulin resistance is sometimes recognized as the basis for it [4–6].

Stress-related diseases are widespread throughout the world and many people are disabled due to stress. Stress is psychological and physiological responses to environmental factors. They are dangerous and unpleasant. Occupation is one of the most important sources of stress in people's lives. For each person, the job is a source of social identity, needs, and an opportunity for social communication. Therefore, it is a major source of stress [7]. Over the past decades, considerable improvements have taken place in the economic, political, technological and social landscape, which have contributed to changes in the nature of work and the way in which people work. Psychosocial risks, that attract the attention of researchers in the field of occupational safety and health, are practitioners and policymakers.

Stress and especially occupational stress is one of the most important factors in increasing the prevalence of metabolic syndrome components. Consequently, in the United States, the prevalence of cardiovascular disease (CVD) in occupations such as firefighting is estimated to be up to 45% [8]. Work-related

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psychological hazards can have a harmful effect on employees' health.

Different studies have found different results concerning the association or lack of relationship between job stress and metabolic syndrome. These studies were conducted among different occupations, but the frequency of metabolic syndrome and its relationship with occupational stress among hospital staff are less discussed [9,10].

Increasing the prevalence of obesity, metabolic syndrome, type 2 diabetes, and cardiovascular events in developing countries, including Iran, shows that there is an urgent need to adopt well-designed health policies through public intervention programs that will address the nutritional status and health in the community and improve the psychosocial factors of the workforce. One of the most important areas for health promotion in the health sector is health care industry, and it has a significant role for public health services. In this regard, the hospital staff, especially the nursing group, is considered as a stressful occupational group [11,12].

The prevalence of metabolic syndrome in healthcare workers had been given less attention and few studies have been conducted in this field in Iran. Therefore, decision was made to investigate the frequency of metabolic syndrome in healthcare workers and to investigate the factors affecting it, especially psychosocial factors and job stress.

2. Materials and methods

This cross-sectional study was conducted in one of the teaching hospitals of Tehran University of Medical Sciences. This study was conducted in 2016–2017 for 18 months.

Health care workers (410) from the total hospital staff who were referred to the hospital's occupational health clinic for periodic examinations were enrolled in the study. The selection of these staff for inclusion in the study was done randomly. Workers who had any physical or mental illness, including trauma and stress-related disorders were excluded from the study.

All subjects were interviewed and they went through a medical examination and completed the checklists and questionnaires. The study was approved by the ethics committee of the Tehran University of Medical Sciences. Participants were given a written informed consent before the study. Demographic information and occupational characteristics were recorded on the questionnaire.

A blood sampling from the population was conducted in the hospital laboratory. Anthropometric measurements, including height and weight, waist, neck and hip circumferences were performed. Persons with minimum coverage without footwear were measured with a scale at the clinic of occupational medicine. The height of the participants was measured on a scale, while the scapulars were normal and without shoes. In order to measure the waist in its closest area, the person was made to stand and at the end of the normal exhalation the measurement was taken using a meter tape, without pressure on the body (between twelve ribs and iliac crest). The hip circumference of the most prominent part was measured without using any unbreakable strain, thus using a non-elastic tape measure of 1 cm accuracy. All measurements were taken by one person in order to control the measurement bias. To measure blood pressure, the person will have to sit for 15 min and then be treated by a physician. For this purpose, a mercuric barometric device for measuring systolic and diastolic pressure was used. The cuff of the barometer is closed on the right arm and placed in the heart of the person. The pressure was increased by 30 mmHg when the radial pulse was cut. Blood pressure was taken twice in 30 s intervals and the median was recorded. 15 cc blood was taken from the subjects. All sampling was done in fast condition.

Psychosocial factors of the work were evaluated using questions from the short version (QPSNordic 34+) of the General Nordic Questionnaire for Psychosocial Factors at Work (QPSNordic). QPSNordic 34 + has 37 questions of five options, ranging from never [1] to always [5]. According to the questionnaire, scores 1 to 2.5 were considered as a low level of stress (first level), scores 2.5 to 3.5 were considered as the average level (second level), and scores 3.5 to 5 were considered as a high level of stress (third level).

Nordic questionnaire was chosen to examine the level of job stress, because it included various variables such as job demands, role expectations, social interactions, control at work, and leadership.

In this study, a short version of Nordic psychosocial questionnaire was used in Persian language. In previous studies, reliability and validity analyses were performed on this questionnaire [13].

Analyses were performed using SPSS version 22. Chi square test was used to determine the association between two qualitative variables, while independent sample *t*-test was used to evaluate the difference between quantitative variables both in exposed and non-exposed groups. P value < 0.05 was considered as a significant association.

3. Results

This study population consists of 410 health care workers. More than two third 286 (69.8%) of the population were female and the majority of them were shift workers, of whom 70.9% were in rotating shifts. In this study, four types of job titles were considered: nurse, emergency workers, office workers, and others. Most of the workers were nurses and they work in clinical settings. Out of all the participants, 66% had low physical activity.

Subjects 92 (22.4%) who have three or more components of metabolic syndrome according to ATP III guidelines were diagnosed as having metabolic syndrome. The baseline characteristics of the study population are shown in Table 1.

The findings showed that in terms of the level of occupational stress in the subjects, 112 (27.3%) of the subjects were at first level of

Table 1
Baseline characteristics of study population and metabolic syndrome components.

		N (%)
Gender	Male	124 (30.2)
	Female	286(69.8)
Marital status	Single	125(30.5)
	Married	285(69.5)
Educational level	<12th grade	102(24.9)
	≥12 grade	308(75.1)
Shift work	No	56(13.7)
	Yes	352(85.9)
Job title	Clinical nurse	320(78.0)
	Emergency	123(30.0)
	Office workers	72(17.6)
	Others	90(22.0)
Physical activity	<1/week	270(66.0)
	1–2 week	90(22.0)
	2/week	49(12.0)
Metabolic syndrome components		
High blood pressure		169(41.2)
Elevated triglyceride		83(20.2)
Reduced HDL cholesterol		234(51.7)
High fasting plasma glucose		95(23.2)
Central obesity		80(19.5)
Metabolic syndrome		92(22.4)
		Mean ± SD
Age		33.43 ± 8.51
Working history		9.25 ± 7.65

stress and 22 (19.6%) had metabolic syndrome, 279 (68%) of the subjects were in the second level and 19 (4.6%) of them were in the third level of occupational stress, of whom 67 (24%) of the second level and 3 (15.8%) of the third level had metabolic syndrome, respectively.

The results showed that job stress, detected by Nordic psychosocial questionnaire (QPS nordic 34+), was not related to the prevalence of metabolic syndrome. A significant relation was observed between high blood pressure and job stress (p value = 0.002) when separating data from components of metabolic syndrome (Table 2).

The score of job stress in people with metabolic syndrome was almost the same as those who did not have this syndrome (2.75 in comparison with 2.73).

Table 3 shows the determination whether metabolic syndrome was associated with each content areas of Nordic psychosocial questionnaire. Significant association was found between leadership (one of the content areas of QPS Nordic 34+) and metabolic syndrome. Unfortunately, this relation was not observed in other content areas of the questionnaire.

The relationship between metabolic syndrome and some of the demographic and occupational factors was included in the study and it was significant and this action was performed using logistic regression analysis (Table 4). It was observed that increase in age, having shift work, lack of physical activity, and critical job titles were significantly associated with metabolic syndrome.

4. Discussion

The prevalence of metabolic syndrome in the present study of hospital staff was 22.4%, while the prevalence of metabolic syndrome in Iranian population was reported to be 10.1% among adults [14]. A cohort study that examined the cross-sectional and longitudinal relationship between type D personality and metabolic syndrome in a working population shows the prevalence of this syndrome among workers with a personality type D to be about 40% [15]. In a study in Italy, which was conducted among night shift healthcare workers, the prevalence of this syndrome was 9% [16]. In another study in Germany, on health workers, 1.7% of the population had metabolic syndrome [19].

The relationship between metabolic syndrome and mental disorders, such as depression and anxiety, has been consistently reported [17–19]. In a Finnish study on general population [20] and a Japanese research report [21], psychosocial distress was measured using the general health questionnaire and the result showed an increase in the risk of developing a metabolic syndrome. Some studies were conducted and the relationship between stress and labor associated with metabolic syndrome was measured [10,22], but the result showed the cause and effect relationship between the two is still uncertain.

Studies on the association between metabolic syndrome and psychosocial factors have different outcomes. Some articles discuss the relationship between psychosocial factors and metabolic syndrome among different occupations in different societies, including a study on large population in Norway; here, there was no relationship between anxiety and depression with metabolic syndrome [23]. A coherent study that examined the cross-sectional and longitudinal relationship between type D personality and metabolic syndrome in a working population did not support the role of the metabolic syndrome as a mediator mechanism and this study also showed that further research is needed to explore the potential ways of linking personality D to cardiovascular diseases [24].

In another study, the relationship between work-induced stress, cortisol, and reactive protein (CRP) in the prediction of metabolic syndrome (MTS) that increased labor stress, resulting in hypercortisolemia and CRP, has been associated with the spread of metabolic syndrome in middle aged workers in Jordan [25]. Studies which had been performed in Iran on mental health in nurses show that 43% of the cultivars referred to the prevalence of mental health problems [26].

Despite the lack of relationship between job stress and metabolic syndrome in the present study, which might be due to the lack of job stress among the study population and its associated with one of the metabolic components, that is, high blood pressure. This study showed that there is a high relationship between work stress and hypertension.

In a study to evaluate the association between job strain and

Table 2
Association between components of metabolic syndrome and Nordic questionnaire.

		Nordic questionnaire	P value
		Mean ± SD	
FBS	<110	2.73 ± .39	0.65
	≥110	2.75 ± .43	
TG	<150	2.73 ± .39	0.56
	≥150	2.75 ± .42	
Bp	<130/85	2.66 ± .39	0.002
	≥130/85	2.98 ± .4	
HDL	>40 Male; >50 Female	2.74 ± .4	0.74
	<40 Male; <50 Female	2.73 ± .4	
Waist circumstances	>102 Male; > 88Female	2.72 ± .4	0.42
	>102 Male; > 88Female	2.76 ± .35	

Table 3
Association between Nordic questionnaire and its'subscales with metabolic syndrome.

	Metabolic syndrome	Mean ± SD	P value
Nordic total	No	2.73 ± .39	0.67
	yes	2.75 ± .42	
Perception of group work	No	2.63 ± .81	0.18
	yes	2.76 ± .73	
Organizational culture	No	3.06 ± .58	0.33
	yes	3.13 ± .6	
leadership	No	2.54 ± 1.03	0.005
	yes	2.91 ± 1.21	
Social interactions	No	2.39 ± .82	0.54
	yes	2.58 ± .91	
mastery	No	2.35 ± .86	0.50
	yes	2.28 ± .96	
Predictability	No	2.75 ± 1.11	0.24
	yes	2.59 ± 1.29	
Control at work	No	2.58 ± .6	0.28
	yes	2.58 ± .65	
Role expectations	No	2.46 ± .71	0.61
	yes	2.5 ± .8	
Job demands	No	3.01 ± .81	0.11
	yes	2.86 ± .82	

Table 4
Odds ratios and 95% confidence intervals calculated by logistic regression analysis to identify the association of demographic and occupational characteristics with metabolic syndrome.

Variables	B	P value	Odds Ratio(95% C.I.)
Age	.080	.000	1.08(1.050–1.11)
Sex	-.493	.101	.61(.33–1.10)
Job title(1)	1.414	.000	4.11(2.11–8)
Shift work(1)	1.381	.002	3.97(1.67–9.45)
Physical activity		.012	
Physical activity(1)	.308	.345	1.36(.718–2.58)
Physical activity(2)	−1.513	.008	.22(.07–.67)
Constant	−5.271	.000	.005

ambulatory blood pressure measurements within a sample of the Belgian Job Stress Project; it was observed that the mean ambulatory blood pressure was significantly higher in workers with job strain as compared to others [27].

In another study on healthy workers, a high relationship was observed between stress and hypertension [19]. The association between metabolic syndrome and individual factors is influenced by increase in age, lack of physical activity, critical job title, and having shift work.

In the present study population, analysis of the results showed physical activity less than once a week significantly increased metabolic syndrome and physical activity more than twice a week reduced metabolic syndrome. Different articles have examined the relationship between metabolic syndrome and physical activity. In a study on a European population, it has been shown that moderate to high physical activity reduces the risk of metabolic syndrome [28]. Another study among US adults showed that inactivity and sedentary behavior causes the prevalence of metabolic syndrome [29].

The present study showed that having more vital occupational titles, such as nurses and emergency department staff, had more metabolic syndrome than office jobs and other non-vital occupations.

The risk of many diseases increases, changes or accelerates as age increases. Age increases the prevalence of metabolic syndrome and causes the following conditions to increase: obesity, insulin resistance, inflammation, stress, and high blood pressure.

In a study that examined age-related effects on metabolic syndrome components, the researchers found that fasting blood glucose and systolic blood pressure had a linear relationship with increase in age [30].

In the present study, the result also showed that having shift workers among hospital workers can increase the prevalence of metabolic syndrome. Similar to this finding, differences in eating habits among everyday workers and occupational workers may justify part of the relationship. In addition, disrupting the circadian rhythm in shift workers may lead to increased metabolic syndrome.

In a study of workers in Belgium who had a rotating shift, it was found that shift workers had metabolic syndrome more than day workers [31].

With reference to the relationship between the leadership pattern and prevalence of metabolic syndrome in the present study, a study among Canadian acute care hospital showed that the leadership empowerment behaviors significantly affect employees' understanding of empowerment components (information, support, resources, and opportunities) [32].

The present study is the first study to examine the prevalence of metabolic syndrome and its related factors in health workers in Iran. It is a cross-sectional study and as such no causal relationship could be proven. Also, the sample was limited to a teaching hospital which limits generalizability of the results.

In considering the high prevalence of metabolic syndrome in the study population and the association of factors such as shift work and physical activity with this syndrome, advising management on their strategies to remedy these issues is recommended.

Conflicts of interest

None declared.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2018.10.013.

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