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Prevalence of Metabolic Syndrome in Professional Drivers

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Abstract

Background: Metabolic syndrome (MetS) is known as an important predictor of cardiovascular mortality, which has recently increasing among professional drivers.
Objectives: The present study was carried out to determine the prevalence of MetS and some related components among taxi and bus drivers in Zahedan, because they have the working conditions and unusual lifestyles that can increases the risk of Mets.
Methods: In a cross-sectional study, 500 male taxi and bus drivers were randomly selected. Waist circumference (WC), blood pressure, lipid profile and fasting blood sugar (FBS) levels were measured. The MetS was defined using criteria of Iranian National Committee of Obesity (INCO).
Results: The prevalence of MetS among taxi and bus drivers was 20% and 29.5%, respectively. The most frequent components contributing to MetS in taxi drivers were high triglyceride (81.4%), low HDL-C (high-density lipoprotein-cholesterol) (81.4%) and central obesity (64.4%); while in the bus drivers were central obesity (75%), high fasting blood glucose (73.3%) and high triglyceride (76.7%). By increasing age, driving duration and decreasing physical activity, odds ratio of MetS was increased.
Conclusions: The findings show that drivers are in high risk population groups for MetS and its complications. Thus, the substantial changes in lifestyle and educational programs implementation for promotion of their public health may be able to reduce the MetS risk and disease consequences.

Keywords: Drivers, Metabolic Syndrome

1. Background

Metabolic syndrome (MetS) is a growing health problem in the developing countries such as the Middle East countries, in particular, Iran. MetS is defined as the presence of three or more of the following five components: abdominal obesity, high blood pressure, increased levels of fasting blood glucose and serum triglycerides and low levels of high density cholesterol (HDL-C) (1, 2). Metabolic syndrome increases the risk of cardiovascular diseases (CVD) and type 2 diabetes (3). It has also been reported that the increasing rate of obesity/abdominal obesity contributes to occurrence of MetS (4).

The prevalence of this syndrome has been investigated in several epidemiological studies. The rate of MetS in the United States based on data from the National Health and Nutrition Examination Survey (NHNES) database was 22.9% (5, 6), in European countries was approximately 23% and in South Asian population was estimated to be 20% - 25% (7). In a nationwide study, the rate of MetS in Iranian male population according to the definition of National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) was 28.8% (8), while in the Tehran study it was 34.7% (2), and in Zahedan's population was 12% (9).

Several factors are involved in causing this syndrome, including genetic and metabolic factors, aging, environmental factors such as improper dietary intake, obesity, inactivity and job (10-12). Recently, researchers have shown that there is a link between different jobs and risk of MetS (7, 10, 11, 13), and CVD (4, 13). But the results are inconsistent. In some studies, the rates of ischemic heart disease risk factors, including obesity, high blood glucose and high triglyceride levels among bus drivers were significantly

higher than the skilled workers (13, 14). In another study, these factors did not differ significantly between taxi and bus drivers and non- drivers (4). Overall, the rate of MetS among Iranian professional drivers was estimated to be between 23 % to 37.4% (2, 8, 10). The working conditions and unusual lifestyles associated with driving such as long hours of working, physical inactivity, inadequate diet and stress in their working environment can increase the risk of MetS (4, 13, 15). Although it is difficult to control the factors of metabolic syndrome, however, lifestyle changes, physical activity and weight loss can partly contribute to preventing or controlling the blood pressure and to regulating the blood sugar and fat levels.

2. Objectives

The aim of this study was to evaluate the prevalence of metabolic syndrome and some related components among Iranian taxi and bus drivers in Zahedan, Southeast of Iran.

3. Methods

A total of 200 taxi drivers (mean age of 39.3 $\pm$ 11.7 years) from two of the largest taxi companies were randomly enrolled in this cross sectional study, as well as 300 bus drivers (mean age of 42.5 $\pm$ 10 years) that exclusively worked on suburban transport services and referred into the occupational health Service for health examination were selected.

All drivers who participated in the study were male. Inclusion criteria included at least 2 years work experience with no history of thyroid, hepatic and renal failure, cancer; no use of antihypertensive, diabetic and lipid-lowering, and corticosteroid medications in the last two years, not using diet therapy for weight gain or weight loss and/or nutritional supplements for at least three months prior to the study. A demographic form including age, education, driving experience, lifestyle related factors such as physical activity (at least 3 times a week for $\geq$ 30 minutes) (10), dietary habits and smoking was completed for each participant.

Waist circumference (WC) was measured by meter in the upper iliac crest region. It was evaluated to identify the central obesity and considered as a prognostic predictor of diabetes, hypertension, dyslipidemia and thus the occurrence of Mets (1). Blood pressure (BP) was measured after 5 minutes of rest in the sitting position. The measurement was performed on the right arm using a digital manometer (Model ALP K2; K2-231, Japan). Fasting blood samples were collected after at least 12 hours fasting. Serum levels of total cholesterol, high-density and low-density lipoprotein-cholesterol (HDL-C, LDL-C), triglyceride (TG) and fasting blood sugar (FBS) were performed by the commercial kits (Pars Azmun, Tehran, Iran) using an auto-analyzer.

The MetS was defined using criteria of Iranian National Committee of Obesity (INCO) (2). Clinical diagnosis of metabolic syndrome in Iranian adults has been proposed as the presence of three or more of the five following criteria: increased waist circumference (WC $\geq$ 95 cm (2); hyper triglyceridemia (TG $\geq$ 150 mg/dL); reduced HDL-C < 40 mg/dL, and high fasting blood sugar (FBS $\geq$100 mg/dL) (1, 2); hypertension (systolic blood pressure $\geq$ 130 mmHg and diastolic blood pressure $\geq$ 85 mmHg) (2, 9). This criterion was used in current study.

The study was carried out from August 2015 to February 2016. The protocol of study was approved by the Ethics Committee of Zahedan University of Medical Sciences (approval date 28 June 2015; number 7242). All subjects gave informed consent before taking part in the study.

3.1. Statistical Analysis

Data are presented as mean $\pm$ standard deviation (SD), frequencies, and percentages, and were analyzed using SPSS 21. Independent t-test and chi-square test were used for statistical analysis. Multivariable linear regression models were applied to test the association of independent variables of MetS including age, driving duration and physical activity. P values < 0.05 were considered statistically significant and 95% confidence interval reported where indicated.

4. Results

Table 1 shows the demographic and clinical characteristics of subjects. As can been seen, 60.5% of bus drivers and 66.3% of taxi drivers were between 30 and 50 years old. In addition, 20 % of taxi drivers and 24.2 % of bus drivers were above 50 years old. The driving history in bus drivers was more than taxi drivers (14.5 vs. 4.8 years, P < 0.0001). The frequency of cigarette smoking in taxi drivers was more than bus drivers (17.5% vs. 12.7%), but was not statistically significant (P > 0.05). In the bus drivers, mean waist circumference and blood pressure (P < 0.05) and FBS (P < 0.01) was markedly higher and the level of serum high density lipoprotein-cholesterol (HDL-C) (P < 0.0001) was markedly lower compared to taxi drivers. The levels of serum total cholesterol and low density lipoprotein-cholesterol (LDL-C) was not significantly different between two groups (P > 0.05).

As shown in Table 2, MetS was found in 59 (20%) of taxi drivers. The most frequent components contributing to MetS included high triglycerides (81.4%), low HDL-C (81.4%)

Table 1. Demographic and Clinical Characteristics[a]

Groups	Taxi Drivers	Bus Drivers	P Value
Age, y	39.3 ± 11	42.5 ± 10	0.056
Age, y, No. (%)			0.053
< 30	39 (19.5)	28 (9.4)	
30 - 50	121 (60.5)	197 (66.3)	
> 50	40 (20)	72 (24.2)	
Driving duration, y (range)	4.8 (1 - 40)	14.5 (1 - 44)	0.0001
Smoking, No. (%)			0.056
Yes	35 (17.5)	29 (12.7)	
No	165 (82.5)	271 (90.3)	
Physical activity, min, No. (%)			0.0001
≤ 30	15 (7.5)	42 (14)	
> 30	64 (32)	27 (9)	
At all	121 (60.5)	231 (77)	
WC, cm	89 ± 11.3	95 ± 15.2	0.04
Blood pressure, mmHg			0.03
Systolic	119.5 ± 16.1	121.4 ± 12	
Diastolic	73.3 ± 11.7	75.9 ± 7.2	0.05
FBS, mg/dL	91 ± 37.7	98 ± 20.2	0.01
Cholesterol, mg/dL	180 ± 38	175 ± 40	0.061
Triglyceride, mg/dL	176 ± 96.7	143.6 ± 85.7	0.0001
LDL-C, mg/dL	97.6 ± 35	101.4 ± 33.2	0.06
HDL-C, mg/dL	46.7 ± 7.5	39.5 ± 8.4	0.0001

Abbreviations: FBS, fasting blood sugar; HDL-C, high density lipoprotein-cholesterol; LDL-C, low density lipoprotein-cholesterol; WC, waist circumference.
[a]Values are expressed as mean ± SD unless otherwise indicated.

and central obesity (64.4%). Hypertension (28.8%) and high FBS (35.6%) were the least common components contributing to MetS in taxi drivers.

Moreover, the metabolic syndrome was found in 60 (29.5%) of bus drivers. The most common components contributing to MetS, in the bus drivers were central obesity (75%), high -FBS (73.3%) and high triglycerides (76.7%), followed by hypertension (53.3%) and low HDL-C level (50.3%).

The rate of MetS was considerably elevated in those aged 30-50 years in both groups (57.6% in taxi drivers and 58.3% in bus drivers; $P > 0.05$).

According to driving experience, the prevalence of MetS in two groups was higher among those who had > 5 years driving experience (79.76% in taxi drivers and 98.3% in bus drivers; $P < 0.001$).

The occurrence of MetS based on the frequency of smoking was not statistically significant between two groups (28.6% in taxi drivers and 20.7% in bus drivers; $P > 0.05$).

Assessment of physical activity showed that the prevalence of MetS in two groups was higher among those who had no physical activity per week (59.3% in taxi drivers and 88.3% in bus drivers; $P < 0.001$).

Correlation of MetS with some risk factors was evaluated by logistic regression, and presented in Table 3. The findings indicated that there was a significant positive correlation between age and MetS in both groups ($P < 0.05$) and a significant positive correlation between driving duration and MetS only in bus drivers ($P < 0.05$). A significant negative correlation was found between physical activity and MetS in both groups ($P < 0.05$). Risk of MetS for age in bus drivers was 3.6 (95% CI; 2.3 - 5.1; $P = 0.035$) compared to 1.4 (95% CI; 0.7 - 2.5; $P = 0.04$) in taxi drivers; and also for low physical activity was 3 (95% CI; 2.4 - 3.8; $P = 0.03$) in bus drivers compared to 1.7 (95% CI; 1.6 - 1.8; $P = 0.03$) in taxi drivers. Odds ratio of MetS for driving duration was 1.3 (95% CI; 0.91 - 1.85; $P=0.05$) in bus drivers in comparison with 0.86 (95% CI; 0.72 - 1; $P = 0.068$) in taxi drivers.

Table 2. Prevalence of Metabolic Syndrome and Some Risk Factors[a]

Groups	Taxi Drivers	Bus Drivers	P Value
MetS	59 (20)	60 (29.5)	0.01
Age, y			NS
< 30	6 (10.2)	1 (1.7)	
30 - 50	34 (57.6)	35 (58.3)	
> 50	19 (32.2)	24 (40)	
Driving experience, y			0.001
≤ 5	12 (20.3)	1 (1.7)	
> 5	47 (79.7)	59 (98.3)	
Smoking	10 (28.6)	6 (20.7)	0.89
Physical activity, min			0.001
≤ 30	7 (11.9)	7 (10)	
> 30	17 (28.8)	2 (1.7)	
At all	35 (59.3)	53 (88.3)	
High WC	38 (64.4)	45 (75)	0.01
Hypertension	17 (28.8)	32 (53.3)	0.0001
High FBS	21 (35.6)	44 (73.3)	0.0001
High triglyceride	48 (81.4)	40 (76.7)	0.051
Low HDL-C	48 (81.4)	16 (50.3)	0.0001

Abbreviations: FBS, fasting blood sugar; HDL-C, high density lipoprotein-cholesterol; WC, waist circumference.
[a]Values are expressed as No. (%).

Table 3. Correlation of MetS with Some Risk Factors by Logistic Regression

Model	Groups					
	Taxi Driver			Bus Drivers		
	Standardized Coefficients		OR (95% CI)	Standardized Coefficients		OR (95% CI)
	Beta	P Value		Beta	P Value	
Age	0.027	0.04	1.4 (0.7 - 2.5)	0.081	0.035	3.6 (2.3 - 5.1)
Physical activity	-0.132	0.03	1.7 (1.6 - 1.8)	-0.119	0.03	3 (2.4 - 3.8)
Driving duration	0.047	0.068	0.86 (0.72 - 1)	0.046	0.05	1.3 (0.91 - 1.85)

Abbreviations: OR (95% CI), odd's ration (95% confidence interval); MetS, metabolic syndrome.

5. Discussion

The results of the present study demonstrated that the prevalence of MetS in taxi drivers and professional bus drivers was 20% and 29.5%, respectively. The relationship between occupational factors and metabolic syndrome (MetS) has been assessed in a few surveys (4, 7, 10-13, 16). The rate of MetS in Iranian professional drivers was estimated to be from 23% to 35.9% (7, 10, 11), while in the general population of Iran it has been reported to be from 12% to 34.7% (2, 9, 17). An unequal variation in the rate of MetS has been reported in other countries from about 4% to 63.7% (18, 19). It seems that these variations can be related to the culture differences, job and also lifestyle of our study sample (4, 7, 10, 20).

In accordance with previous reports (1), our findings demonstrated that the majority of the drivers with metabolic syndrome simultaneously had at least three components of the syndrome. Each component of MetS increases the risk of diabetes and cardiovascular diseases (CVD) (3, 7).

The rate of MetS components varies in different populations (9). The present study showed that in comparison with the taxi drivers, the rates of central obesity and high FBS were more common than other components of

MetS. Similar to our study, some studies conducted among professional drivers have shown that the central obesity is more common than the other components of MetS (7, 10). It has been obviously established that the long working hours in a fixed sedentary position, unhealthy diet, irregular timing of diet and less leisure time for exercise causes most of these individuals to be obese (7, 10, 11).

Moreover, some studies have confirmed that central obesity is often associated with increasing rate of hypertension, insulin resistance, diabetes and dyslipidemia (1, 21-23). Our findings indicate that almost half of the bus drivers had high blood pressure, which is consistent with the results of a study performed on truck drivers in Mazandaran province (24).

Furthermore, the professional drivers with high waist circumference had a higher rate of hypertension and high FBS (data not shown), which suggests central obesity, as one of the most important MetS predictors is associated with high risk of CVD (1, 4).

The studies conducted in various countries on the link between occupation and cardiovascular diseases have shown that the risk of some CVD factors is significantly high among bus driver (4, 14, 25, 26). A historical cohort showed that bus drivers had an insignificant difference in ischemic heart disease mortality compared with the general population (27). Despite all of these studies, in a study (4) IHD was not significantly different between the bus drivers and control subjects. Some studies have also confirmed that the prevalence of coronary heart disease and its risk factors including hypertension, smoking and job stress in taxi drivers is higher than non-drivers (13, 28).

In the present study, the rate of hypertension in taxi drivers was similar to other studies (4, 28) and regarding the bus drivers it was similar to Iranian drivers in Ghazvin (10), but was dissimilar to some previous studies (11, 14, 29).

The rate of high triglycerides among bus drivers in our study was found to be lower than a study performed on Iranian long distance drivers in (10, 13, 14) and higher than other studies (4, 11, 28). The rate of high FBS among both taxi and bus drivers was higher (4, 11, 28), and the rate of low HDL-C was lower when compared to previous studies (4, 11). A study performed on an Iranian adult population revealed that the low HDL-C level was the major abnormality contributing to metabolic syndrome in Amol, while it was the least frequent component in Zahedan (9). The other study has also reported that Indians have a significantly lower level of HDL-C than Chinese subjects, suggesting that these variations might be related to difference in diagnostic criteria, different definitions for determination of the syndrome, age groups and dietary intakes and lifestyle such as smoking, physical activity, and stressful environment, drug addiction, overtime work, irregular sleep quality, obesity and alcohol (4, 7, 9-11, 24, 30).

Previous studies have reported that consuming high-calorie foods cooked with high saturated fat in inter-city restaurants, low physical activity, driving experience and aging can lead to metabolic syndrome and some risk factors related to it in professional drivers (4, 7, 9-11, 24, 31). Evaluation of food habits of the drivers in our study showed that the increased daily consumption of red meat, rice and foods containing high saturated fat, and low consumption of vegetables and fruits among bus drivers were markedly higher than taxi drivers (data not shown). This finding was similar to a study conducted in bus drivers in West Azerbaijan province in Iran (7). There is evidence that physical inactivity is common in bus and truck drivers (7). Assessment of physical activity in the present study showed that most of the drivers in both groups had no activity, and the prevalence of MetS among inactive subjects was higher. IN addition, the rate of MetS based on age groups showed the highest prevalence was at drivers aged 31 - 50 years old and the difference was statistically significant. In previous studies, the high rate of MetS among general population was reported at age 50 or older (1). Since in this study, the majority of drivers were in the age group of 30 - 50 years, this may potentially explain a higher prevalence risk of metabolic syndrome in this age group.

The driving duration is also one of the risk factors that indirectly relates to MetS (11). The present study showed that the prevalence of MetS in taxi and bus drivers was markedly higher among those who had > 5 years driving experience. Evaluation of food habits and relationship between MetS and driving duration, physical inactivity and age, in particular, among bus drivers which had a higher odds ratio than taxi drivers, suggested that occupation and lifestyle such as sedentary inactive life, number of work hours, high calorie and high fat diets and poor in fiber by increasing body fat could contribute to occurrence of Mets and mainly affect the increasing of cardiovascular events in drivers' population (7). There are numerous reasons for risk of MetS in professional drivers, which need to be further studied. This study had several limitations (1) it was the cross-sectional study, (2) we did not have a control group of general population (3) we did not assess the daily exercise and stress risk factors in drivers.

5.1. Conclusions

The findings suggest that drivers are in high risk population groups for MetS and its related complications, which may be harmful for both drivers and community because of their vital role in transportation and traffic sectors. Thus, the substantial changes in lifestyle and educational program implementation for promotion of their

public health may be able to reduce the MetS risk and disease consequences.

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Footnotes

Authors' Contribution: Farzaneh Montazerifar and Mansour Karajibani were equally involved in writing of manuscript and experimental design. Farzaneh Montazerifar and Alireza Dashipour have performed data analysis. Bardia Pirmoradi, Zahra Torki, and Maryam Moradpour conducted data collection.

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