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Comparison of Indicators of Metabolic Syndrome in Iranian Smokers

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Abstract

***Background*:** Worldwide non communicable diseases are increasingly recognized as a major cause of morbidity and mortality. The metabolic syndrome is a common metabolic disorder that results from the increasing prevalence of obesity.The disorder is defined in various ways. This study determine the comparison of indicators of metabolic syndrome in Iranian smokers population.

***Materials and Methods*:** A total of 1,024 Iranian subjects aged 30 to 70 participated in this cross sectional study. Standard questionnaire was completing regarding smoking habits, medications, past medical history, physical activity, blood pressure, fasting blood suger, total cholestrol HDL and triglycerides. The diagnosis of metabolic syndrome was based on the IDF criteria.

***Results*:** As defined by the modified IDF criteria, (45.9%) had the MS at baseline assessment. The risk of incidence of the metabolic syndrome among smokers was significantly (p<0.008) greater than nonsmokers. Among men without the MS at entry, body weight gain, compared with never smokers, was significantly (p<0.007) higher in smokers who had quit smoking. It is important for the prevention of the MS not only to quit smoking but also to prevent weight gain after smoking cessation.

***Conclusion*:** Although many cardiovascular diseases (CVDs) can be treated or prevented many people die from CVDs. Reducing the rate of cigarette smoking, body weight, blood pressure, blood cholesterol, and blood glucose all have a benefit impact on major biological cardiovascular risk factors. Behaviors such as stopping smoking, taking regular physical activity and eating a healthy diet promote health and have no known harmful effects.

Introduction

Today, NCDs (noncommunicable diseases), such as cardiovascular diseases, cancers, chronic respiratory diseases and diabetes represent a leading threat to human health and development. These four diseases are the world's biggest killers, causing an estimated 35 million deaths each year - 60% of all deaths globally - with 80% in low- and middle-income countries. These diseases are preventable. Up to 80% of heart diseases, stroke, and type 2 diabetes and over a third of cancers could be prevented by eliminating shared risk factors, mainly tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol [1, 2]. Exacerbated by a modern lifestyle of poor nutrition and physical inactivity, the rising trend of obesity has affected of all ages [3].

The MetS (Metabolic syndrome) is a multiplex risk factor for ASCVD (Atherosclerotic Cardiovascular disease) [4]. Obesity and overweight, arterial hypertension, inadequate physical activity, hypercholesterolemia and addiction comprise the five main risk factors, accounting for 68% of the risk factor burden, 11% of the total burden of disease, and 1.6 million disability-adjusted life years [5, 6]. Cigarette smoking has become an important public health challenge, and it has been reported that 23.4% of men and 1.4% of women are current smokers in Iran [7]. Cigarette smoking is also a strong risk factor for atherosclerosis and cardiovascular disease in a dose-dependent manner. Therefore, smoking may also be considered as an important modifiable risk factor for metabolic syndrome [8].

A growing body of evidence also indicates that tobacco smoke is independently associated with insulin resistance and that the insulin resistant condition may contribute to the accelerated atherosclerosis that leads to excessive cardiovascular disease in adult smokers [3]. Tobacco smoke is clearly associated with dyslipidemias (increased LDL (Low density Lipoprotein) and decreased HDL (High density Lipoprotein) [9, 10]. Endothelial dysfunction and a hypercoagulable state [11]. The MetS, characterized by a clustering of abdominal obesity, hyper triglyceridemia, (increased LDL and decreased HDL), elevated blood pressure (BP) and high fasting glucose, has been associated with an increased risk for the development of diabetes and CVD (Cardiovascular disease) as well as an increased mortality from CVD and from all other causes [12, 13]. Due to the importance of the issue the present study attempt to ccomparison the indicators of metabolic syndrome in Iranian smokers.

Materials and Methods

In this cross-sectional study, a total of 1,024 Iranian subjects living in Hamedan,who referred to educational hospital in Hamedan during the period of 6 months starting from March 2010 and lasting until August randomly participated in this cross sectional study. Only the field data set, which excluded the private information such as name and insurance number, was uses for the study. All participants were informed of the nature of the screening and all signed the questionnaire. The data for 331 male smokers and 693 healthy males non smokers aged between 30 to 70 years were obtained through a standard questionnaire comparising parts on smoking habits, medications, past medical history, phisical activity, blood pressure, fasting blood suger, total cholestrol HDL, triglycerides. The questionneres were completed at interviews by well-trained nurses.

The subjects were asked if they currently smoked cigarettes. When the answer was ”yes”, they were classified as current smokers and further questions were asked regarding the average number (pieces) of cigarettes smoked per day and their age at the time started smoking. When the answer was “no”, further question was asked as to if they had ever smoked continuously. When the answer was "no", they were classified as non-smokers and the answer was “yes”, they were classified as previous smokers. Based on answers to the questions, the cumulative amount of cigarette consumption was expressed as the Brinkman Index (BI: number of cigarettes consumed per day multiplied by years of smoking).

The overnight fasting serum levels of HDL cholesterol, triglycerides and plasma glucose were measured and the atherogenic index was calculated as follows: (Total cholesterol-HDL cholesterol) /HDL cholesterol).

The lipid variables examined were total, LDL and HDL cholesterol. They were recorded in milligrams per deciliter. According to the National Heart, Lung, and Blood Institute, the following cut-points for desired HDL-cholesterol levels were established for adolescents: above 40 mg/dL for males and above 50 mg/dL for females. For elevated total cholesterol and LDL-C levels, cut points were established Equal or more than 150 mg/dl [14]. Blood pressure of each participant was measured after resting at least 15 minutes in the sitting position. The anthropometric parameters were evaluated using the respective parameters such as height, body weight, waist circumference and hip circumference. The waist circumference was measured at the umbilical level and the hip was measured at the widest MetS was defined using the IDF (International Diabetes Foundation) and NHLBI (National Heart, Lung, and Blood Institute); AHA (American Heart Association) World Heart Federation; International Atherosclerosis Society; and International Association for the study of obesity criteria (Table 1) [14].

Data are expressed as mean±SD (standard deviation) values. Relationship between metabolic syndrome and cigarette smoking was tested using χ^2-test and logistic regression analysis. Effects of metabolic syndrome and cigarette smoking on atherogenic Index were analyzed by SPSS-11.5, ANOVA and Scheffe’s F test: at $p<0.05$.

Results

The 331 men (32.3%) were classified as current smoker (Table 3). The results of the data analysis showed that prevalence of metabolic syndrome as defined by IDF (≥ 3 of following abnormalities) was 45.9 % and the relationship between metabolic syndrome and cigarette smoking was, $p=0.008$ (Table 3). The prevalence increased from 7.3% among participants aged less than 40 years to 39.7% for participants aged 50-70 years. The study shows that among 1024 Iranian subject 45% (29.2% smokers mean 1.13±0.3 cm and 20.2 nonsmokers, with a mean of 94.01±0.2) had a waist circumference in excess of 90 cm. Among men without the MS at entry, body weight gain, compared with never smokers, was significantly ($p=0.007$) higher in smokers who quit smoking. It is important for the prevention of the MetS not only to quit smoking but also to prevent weight gain after smoking cessation.

The overall prevalence of metabolic syndrome components was closely linked to cigarette smoking. Smokers had a statistically higher rate of low HDL-C than non smokers (35.4% vs 26.8% mean HDL 48.8±21.01 mg/dl vs 36.0±13.1 mg/dl). In smokers TG>150, were 39% vs 18.9% (mean TG in smokers 165±91.9 mg/dl $p=0.012$). Although, FBS level higher than 110 mg/dl in smokers 15.9% vs 21.4% (mean FBS 116.12 ± 69.55 mg/dl in smokers $p=0.06$) but there were no statistically significant differences in the prevalence of high level FBS. Smokers had higher diastolic blood pressure than the non smokers group 85.7 (11.2%) vs. 69.3 (6.1%) $p=0.003$). The atherogenic index in male smokers with metabolic syndrome were significantly higher than nonsmokers. The overall, number of cigarettes consumed per day was closely linked to the metabolic syndrome ($p=0.001$).

Table 1. IDF and AHA/ NHLBI Criteria for Clinical Diagnosis of the Metabolic Syndrome

Criteria	
Elevated waist circumference	≥ 90 in men & ≥ 80 women (Asian)
Elevated triglycerides	≥ 150 mg/dl
Reduced HDL-C	< 40 mg/dl in males; <50 mg/dl in Females
Elevated blood pressure	Systolic ≥ 130 and / or diastolic ≥ 85 mm Hg
Elevated fasting glucose (most patients with type 2 diabetes mellitus will have the metabolic syndrome by the proposed criteria)	≥ 100 mg/dl

Table 2. Clinical profile of subjects

Number of subjects	1024
Age (yr)	34.8±8.1
Height (cm)	176±6.6
Weight (kg)	71.4±15.2
Waist circumference (cm)	85.1±11.4
Hip circumference (cm)	99.04±8.8
SBP (mmHg)	12.6±14.7
DBP (mmHg)	76±14.5
Triglyceride (mg/dl)	128±83.5
HDL cholesterol (mg/dl)	42.4±11.11
Blood Sugar (mg/dl)	87.2±18

Table 3. Relationship between metabolic syndrome and cigarette smoking

	Metabolic syndrome (-)	Metabolic syndrome (+)
Current smoker	1.8	24.3
Non smoker	47.2	10.4
Previous Smoker	5.1	11.2

p=0.008 by χ^2 test

Discussion

The present study is showing that the relationship between metabolic syndrome, defined by the new criterion of metabolic syndrome in Asian people [14], and cigarette smoking. Metabolic syndrome has important clinical and public health implications because it is a common disorder in Iran [3, 5]. Previous studies documented that the metabolic syndrome is important risk factor for diabetes, coronary heart disease and stroke [15]. Our study shows new and important information about the relationship between the metabolic syndrome criteria and cigarette smoking in a large sample of population. Both smoking and the metabolic syndrome have each been recognized as independent risk factors for cardiovascular disease and type II diabetes [8, 16].

This study showed that, MetS is a constellation of interrelated abnormalities that increase the risk for cardiovascular diseases where insulin resistance is the major underlying metabolic abnormality.

We found that prevalence of metabolic syndrome increased from 5.4% among participants aged less than 40 years to 38.4% for participants aged 50-70 years. Some studies have identified that the prevalence increases from 6.7% among participants aged 20 through 29 years to 43.5% and 42.0% for participants aged 60 through 69 years and 70 years or older, respectively [17]. Nearly half of the cardiovascular deaths result directly from CAD. CAD primarily occurs in patients over the age of 40, although younger men and women can be affected [18].

Several studies have reported that chronic smoking is associated with insulin resistance and the prevalence of the metabolic syndrome [19]. The results from the present study are consistent with results from previous epidemiologic studies (Table 3).

This study shows that prevalence of metabolic syndrome components is closely linked to cigarette smoking. Numerous cross-sectional studies have reported that cigarette smoking is negatively associated with body weight and BMI [20]. However, several prospective studies have reported conflicting results regarding weight change in relation to smoking cessation in women. In the present study, sustained smokers showed more weight gain than nonsmokers. This may be because sustained smokers were physically less active and the majority of them had already smoked for a long period of time at baseline [19]. Moreover, there is some evidence that smokers are at a greater risk of becoming insulin resistant and having hyper insulinemia than nonsmokers. Nakanishi et al investigated the relationship between metabolic syndrome by using the modified National Cholesterol Education Program definition (NCEP) and cigarette smoking in 3,649 middle-aged Japanese male office workers [21]. Ishizaka reported, using the modified NCEP definition as well that there is the association between metabolic syndrome and cigarette smoking in 5,033 Japanese, and that metabolic syndrome was an independent risk factor for carotid plaque [22]. Sufficient control of low density lipoprotein (LDL) serum level, less than 100 mg/dl, is one of the highly recommended secondary prevention plans [23].

In the present study, did not show statistically significant differences in the prevalence of high level FBS between smokers and nonsmokers, but several prospective cohort studies suggest that smoking is associated with the development of diabetes. In the Nurses' Health Study, 114,247 women were followed for 8 years and 2,333 cases of type 2 diabetes were confirmed. After controlling for multiple risk factors, the relative risk of type 2 diabetes among women smoking 25 cigarettes per day compared with individuals who never smoked was 1.42, suggesting a moderate association between smoking and the subsequent development of diabetes [24, 25].

In conclusion, either sustained smoking or smoking cessation in a 3-year period is a risk factor for incident metabolic syndrome in men, independent of weight change, compared with nonsmoking men. In addition, smoking cessation within 3 years may be a higher risk factor for incident metabolic syndrome than sustained smoking. The present study indicates that weight control, especially in men who stop smoking, is critical to attenuate the additional risk for incident metabolic syndrome [19].

In this present study, we compared atherogenic criteria in subjects with and without metabolic syndrome, also with and without cigarette smoking. Therefore, metabolic syndrome and cigarette smoking were considered to be important risk factors for atherosclerosis. In addition, the numbers of cigarettes smoked per day were also closely linked to metabolic syndrome. Based on these findings, smoking is closely associated with the prevalence of metabolic syndrome in men. He et al. studies supports these findings [26].

Potential limitation still remains in our study. The cross sectional study design in this study makes it difficult to infer causality between metabolic syndrome and cigarette smoking. The overall, many of the important risk factors for cardiovascular disease are modifiable by specific preventive measures. In the worldwide Interheart study of

patients from 52 countries, nine potentially modifiable factors accounted for over 90% of the population attributable risk of a first MI. These included smoking, dyslipidemia, hypertension, diabetes, abdominal obesity, psychosocial factors, lack of daily consumption of fruits and vegetables, regular alcohol consumption, and lack of regular physical activity [27]. WHO has the unique authority and the clear mandate to lead the development and implementation of the global strategy for the prevention and control of noncommunicable diseases and thereby to create a better environment for world health in 2020 and beyond [1, 2].

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of interest

The authors declare no conflict of interest.

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References

1. World health organization; 2008-2013 action Plans for the Global Strategy for the Prevention and Control of Noncommunicable Diseases. Geneva (Switzerland) 2008. http://www.who.int/nmh/ publications/9789241597418/en/
2. Special communication: 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(19): 2486-2497.
3. Weitzman M, Cook S, Auinger P, et al. Tobacco smoke exposure is associated with the metabolic syndrome in adolescents. Circulation 2005; 112(6): 862-869.
4. Grundy SM. Metabolic syndrome pandemic. Arterioscler Thromb Vasc Biol 2008; 28(4): 629-636.
5. Alikhani S, Delavari A, Alaedini F, et al. A province-based surveillance system for the risk factors of non-communicable diseases: A prototype for integration of risk factor surveillance into primary healthcare systems of developing countries. Public Health 2009; 123(5): 358-364.
6. Yoo S, Nicklas T, Baranowski T, et al. Comparison of dietary intakes associated with metabolic syndrome risk factors in young adults: the Bogalusa Heart Study. Am J Clin Nutr 2004; 80(4): 841-848.
7. Meysamie AP, Ghaletaki R, Haghazali M, et al. Pattern of tobacco use among the Iranian adult population: Results of the national Survey of Risk Factors of Non-Communicable Diseases (SuRFNCD-2007). Tob Control 2010; 19(2): 125-128.
8. Miyatake N, Wada J, Kawasaki Y, et al. Relationship between Metabolic Syndrome and Cigarette Smoking in the Japanese Population. Intern Med 2006; 45(18): 1039-1043.
9. Ministry of Health and Medical Education. National burden of disease and injury in the I.R. Iran. Tehran: Under-Secretary for Health; 2007.
10. Panagiotakos DB, Pitsavos C, Chrysohoou C, et al. Effect of exposure to secondhand smoke on markers of inflammation: The ATTICA study. Am J Med 2004; 116(3): 145-150.
11. Ferrence R, Slade J, Room R and Pope M. Nicotine and public health. Washington DC: American Public Health Association; 2000. International Conference on Public Health, Bergen, Norway 2003, 15-24.
12. Bee YT Jr, Haresh KK, Rajibans S. Prevalence of metabolic syndrome among Malaysians using the international diabetes federation, national cholesterol education program and modified World Health Organization definitions. Malays J Nutr 2003; 14(1): 65-77.
13. Khazale N, Haddad F. Effect of smoking, alcohol and exercise on the prevalence of metabolic syndrome in a cohort of royal jordanian air pilots. J Royal Med Serv 2011; 18(1): 34-38.
14. Alberti KG, Eckel RH, Grundy SM, et al. Harmonizing the metabolic syndrome. Circulation 2009; 120: 1640-1645.
15. Lakka HM, Laaksonen DE, Lakka TA, et al. The metabolic syndrome and total and cardiovascular disease mortality in middleaged men. JAMA 2002; 288(21): 2709-2716.
16. Isomaa B, Almgren P, Tuomi T, et al. Cardiovascular morbidity and mortality associated with the metabolic syndrome. Diabetes care 2001; 24(4): 683-689.
17. Ford ES, Giles WH, Dietz WH. Prevalence of the Metabolic syndrome among US adults findings from the Third National Health and Nutrition Examination Survey. JAMA 2002; 287(3): 356-359.
18. Shemirani H, Separham KH. The relative impact of smoking or hypertension on severity of premature coronary artery disease. IRCMJ 2007; 9(4): 177-181.
19. Kim BJ, Kim BS, Sung KC, et al. Association of smoking status, weight change, and incident metabolic syndrome in men: A 3-year follow-up study. Diabetes Care 2009; 32(7): 1314-1316.
20. Filozof C, Fernandez Pinilla MC, Fernandez-Cruz A. smoking cessation and weight gain. Obes Rev 2004; 5(2): 95-103.
21. Nakanishi N, Takatorige T, Suzuki K. Cigarette smoking and the risk of the metabolic syndrome in middle-aged Japanese male office workers. Ind Health 2005; 43(2): 295-301.
22. Ishizaka N, Ishizaka Y, Toda E, et al. Association between cigarette smoking, metabolic syndrome, and carotid arteriosclerosis in Japanese individuals. Atherosclerosis 2005; 181(2): 381-388.
23. Hosseini SK, Mehrpooya M. Lipid control before CABG and its association with in-hospital mortality. Iran Red Crescent Med J 2011; 13(2): 106-111.
24. Haire-Joshu D, Glasgow RE, Tibbs TL. Smoking and Diabetes. Diabetes Care 2003; 26 (Suppl 1): S89-90.
25. Sairenchi T, Iso H, Nishimura A, et al. Cigarette smoking and risk of type 2 diabetes mellitus among middle-aged and elderly Japanese men and women. Am J Epidemiol 2004; 160(2): 158-162.
26. He Y, Lam TH, Jiang B, et al. Combined effects of tobacco smoke exposure and metabolic syndrome on cardiovascular risk in older residents of China. J Am Coll Cardiol 2009; 53(4): 363-371.
27. Kojuri J, Karimi A, Pourafshar N and Vosoughi AR. Association between serum levels of Hs-CRP and LDL-C with degree of coronary artery stenosis in patients with stable angina pectoris. IRCMJ 2010; 12(4): 396-405.

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