

Metabolic Syndrome in Iran

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Abstract

Metabolic Syndrome (MS) also known as syndrome X, the Dysmetabolic Syndrome and Insulin resistance syndrome, refers to a cluster of cardiovascular risk factors including hypertension, glucose intolerance, triglyceridemia and low HDL cholesterol concentrations in blood. This syndrome consists of multiple metabolic risk factors. The significance of MS is that MS and its components seem to be underlying factors for the development of atherosclerotic cardiovascular disease and diabetes type 2. The current article reviews the literature on the prevalence of MS in Iran. According to global statistics, a quarter of the adult population suffers from metabolic syndrome. The prevalence of MS in United States is 24% and 44% of adults over 50 years old suffer from MS. In contrast to this high prevalence of MS in United States of America, its prevalence in some countries such as South Korea is less than 14.2% in men. However, its prevalence in two neighbor country of Iran including Saudi (39.3%) and Turkish (33%) populations is relatively high compared to other countries. We know that 30% of adults in Tehran (Capital city of Iran) suffer from MS and more than 45% of adults older than 20 years old in the Khorasan province (in north east Iran) have MS. This statistics reveal that the prevalence of MS in Iran is even higher than the developed countries and the relation between MS and Coronary Artery disease

suggests that we need to continue research on MS, its components, and the association between MS and Coronary Artery Disease.

Keywords: Metabolic syndrome, Coronary artery disease, Risk factor

1. Introduction

1.1 Definition of Metabolic Syndrome

Metabolic Syndrome (MS) also known as syndrome X, comprises of hypertension, glucose intolerance, high triglycerides, and decreased level of high density lipoproteins (HDL), which are considered risk factors of cardiovascular diseases (Reaven,1988). Additional terms, which define the same clinical entity, include the Deadly Quartet, the Dysmetabolic Syndrome, and Insulin Resistance Syndrome. The above mentioned MS components are known risk factors for development and progression of atherosclerosis, which in turn results in a higher risk for coronary artery diseases. It has also been shown that the MS components are associated with a higher risk for diabetes type 2. Our current knowledge suggests that there is no single cause for MS; however, abdominal obesity and insulin resistance are the most important risk factors for MS. Furthermore, it has been documented that other underlying risk factors such as physical inactivity, aging, hormonal imbalance, and race can increase the risk of MS (Grundy, 2005). These risk factors suggest that there exists an interrelation between combinations of risk factors which may predict the development of MS.

1.2 Diagnostic Criteria for Metabolic Syndrome

The National Cholesterol Education Program (NCEP)-Adult Treatment Panel (ATP), has introduced one of the most widely accepted diagnostic criteria for the diagnosis of MS. This criteria works on some measurements including waist circumference, serum triglyceride (TG), HDL-C, Blood pressure (BP), and fasting blood sugar (FBS). Additionally, and as it is illustrated in Table 1, the American Heart Association/National Heart Lung & Blood Institute (AHA/NHLBI) made some minor modification on the NCEP criteria which is currently considered more in research focusing on MS and its association with Coronary Artery Diseases (CAD) (Grundy SM, 2005). According to the new International Diabetes Federation (IDF), the metabolic syndrome is diagnosed if a person have central obesity plus one pair of any of the “increased level of TG (≥ 150 mg/dL), “decreased level of HDL cholesterol (< 40 mg/dL)”, “increased blood pressure (systolic BP ≥ 130 mm Hg or diastolic BP ≥ 85 mm Hg, or a diagnosed hypertension patient under treatment) “, increased FBS (≥ 100 mg/dL).

1.3 Risk Factors of Metabolic Syndrome

Similar to most of clinical syndromes, there exist groups of underlying risk factors for the development of MS. These risk factors have a metabolic origin known as MS components (Table 1) and are shown to be the risk factors for CAD. The metabolic risk factors of MS are as following:

- Atherogenic dyslipidemia.
- Elevated serum LDL level.
- Low HDL cholesterol (HDL-C) concentration.
- Elevated blood pressure.
- Elevated plasma glucose.
- Prothrombotic state.
- Proinflammatory state.

According to some research, physical inactivity, aging, hormonal imbalance, and genetic predisposition other underlying conditions associated with MS.(Grundy SM, 2005). Additionally, according to Maki (2004), Lee (2005), Niaura (2000), and Raikonen (2002), biological, behavioral, and social factors may influence MS.

1.4 Prevalence of metabolic syndrome

According to IDF, the global prevalence of MS is about 25% in adult populations (IDF 2008). A 2005 study on the prevalence of MS among the general population in the United States revealed that 24% of participants had MS (McNeill AM. 2004) where Grundy (2005) found 44% of adults over 50 years old suffered from MS. In contrast to this high prevalence of MS in the United States, an age adjusted prevalence statistics on MS in South Korea indicated only 14.2% of men and 17% of women had MS (Hye SP. *et al.* 2004). Similarly, a low prevalence of MS was reported by Boonyavakul (2005) in rural Thai populations where only 18% of the population was diagnosed as having MS. Numerous studies on the prevalence of MS in different countries reported a high prevalence of MS, specifically, 20.7% in the 50-69 year old population, 19.8% in adults over 18

years old, 31.6% in populations over 20 years old, and 24.3% of adults over 18 years old in Ireland (Villagas *et al.* 2003), Greece (Panagiotakos *et al.* 2004), India (Gupta *et al.* 2004), and Canada (Liu *et al.* 1999), respectively. The results of two studies in Saudi (39.3%, Al-Nozha M. 2005) and Turkish (33.4%, Ozsahin AK. 2004) populations illustrated a high prevalence of MS where both countries are neighbors to Iran. All of the above mentioned researchers employed NCEP criteria for the diagnosis of MS, and findings indicate variance in the prevalence of MS for different communities and ethnic groups.

1.5 Prevalence of MS in Iran

Several studies in Iran reported a considerably high prevalence of MS in some regions compared with other countries; however, the prevalence of MS was comparable with the global prevalence in some other areas in Iran. Sarrafzadegan (2008) found 23.3% of adults over 19 years old in three central cities of Iran had MS, while Ghayour Mobarhan (2007) found a much higher prevalence of over 45% of adults 20 years old and older in the Khorasan province suffered from MS. Azizi (2003 & 2004) is among the scholars who conducted several studies on MS in Iran. The statistics from his study in Tehran (2003) showed 30.1% of adults over 20 years old had MS.

We can categorize the literature on MS and its significance, in five categories as follows:

The first category consists of the articles which illustrated the high prevalence of MS globally, regionally, and in Iran (Ford ES, 2002; Azizi F, 2004; Ghayar mobarhan M, 2007). The second category includes the group of articles which emphasized the independent CAD prediction role for MS (Sattar N, 2003; Hunt K, 2004; Lakka HM, 2002; Sadeghi M, 2006; Chen Q, 2008). The next group of literature attempted to show the biomolecular basis of MS components and their atherogenicity (Villena JA, 2004; Ginsberg HN, 2006; Szapary Po, 2004). The effect of dietary factors, as well as physical factors on the risk of MS is beautifully depicted by the fourth category of the literature (Clark SD, 2000; Maki K, 2004; Haffner SM, 2007). Laaksonen (2002), and Lee (2005) are among the researchers whose work proved that life style factors (e.g., physical activity, smoking habit, etc.) have an impact on the risk of having MS. These studies are listed in our fifth category of literature. Finally, numerous studies have suggested the need to explore the matter in different populations and as a multivariable model (Ford Es, 2005; Ghayour M, 2007; Azizi F, 2004; Sadeghi M, 2006).

2. Discussion

Review of the literature on metabolic syndrome demonstrates that MS is a prevalent syndrome both throughout the world and in Iran (Sarti S, 2006, and Azizi F, 2004). As we discussed before, the noteworthiness of the epidemiologic studies on MS in Iran is that the prevalence of this syndrome is considerably higher in this region than throughout the world. Evidence of this comes from McNeil (2005) who found that 24% of general population in United States suffers from MS. Similarly, Azizi (2004) reported that 30% of adults in Tehran (Capital city of Iran) suffer from MS. These statistics reveal that the prevalence of MS in Iran is even higher than in developed countries.

As a rule, the prevalence of MS is increasing parallel to the trend in overweight and obesity. In general, the prevalence of MS increases with age and its prevalence are considerably different among races and ethnic groups, which supports the probable genetic predisposition. It seems genetic, social, environmental, psychological, and behavioral factors are linked to this clinical syndrome. The results from previous studies strongly emphasize the need for more studies to explain the interrelation between MS components and their association with MS.

A problem, which shows the significance of MS is that patients with MS have a higher risk of developing CVD mortality & morbidity (Isomma B 2001, Qingwe C, 2008). In addition, coronary artery disease is a common cause of death in Iran (Azizi F, 2004). Thus, it is expected that preventive measures such as, early diagnosis and appropriate management of MS can be considered the key to success in our efforts in reducing the risk of future development of coronary artery disease in our society (Chen Q, 2008).

3. Conclusion

In summary, a strong link between MS and coronary artery disease (CAD) has not been well documented (Petra M, 2004). Additionally, only a few studies conducted on the prevalence of MS and its risk factors in the general population in Iran (Zabetian A, 2007) and rare supplemental information is available regarding MS in CAD patients and the determination of risk factors of MS for this high risk group. Review of the literature and our knowledge on MS suggests the need for future study concerning the association between MS and its components with coronary artery disease in Iran.

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Table 1. Diagnosis of MS. National Cholesterol Education program (NCEP)-Adult Treatment Panel III (ATP III) last modified by AHA/NHLBI 2005/update 2008

| Measure any 3 of 5 Constitutes Diagnosis of MS | Categorical Cutoff Points |
|---|---|
| Elevated waist circumference | 102 cm (40 inches) in men 88 cm (35 inches) in women |
| Elevated TG | 150 mg/dL (1.7 mmol/L) or Drug treatment for elevated TG |
| Reduced HDL-C | 40 mg/dL (1.03 mmol/L) in men 50 mg/dL (1.3 mmol/L) in women or Drug treatment for reduced HDL-C |
| Elevated BP | 130 mm Hg systolic BP or 85 mm Hg diastolic BP or Drug treatment for hypertension |
| Elevated fasting glucose | 100 mg/dL or Drug treatment for elevated glucose |

Table 2. Literature on MS and its significance

| Categorized Literature | Main References |
|--|---|
| Articles illustrated the high prevalence of MS (Global, Regional/Country) | Ford ES (2002); Azizi F(2004); Ghayur Mobarhan M (2007) |
| Articles illustrated the MS as an independent predictor of CAD | Sattar N (2003); Hunt K (2004); Lakka HM (2002); Sadeghi M (2006); Chen Q (2007) |
| Articles illustrated the Biomolecular basis of the MS components and their atherogenicity | Villena JA (2004); Ginsberg HN (2006); Szapary PO (2004) |
| Articles illustrated that life style factors (dietary factors, physical activity, smoking habit) have an impact on the risk of having MS | Laaksonen D (2002), Lee WY (2005); Clark SD (2000); Maki K (2004); Haffner SM (2007) |
| Literatures suggesting the need to explore the matter in different populations and as an multivariable model | Ford ES (2005); Ghayur Mobarhan M (2007); Aizi F (2004); Sadeghi M (2006) |