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## Metabolic Syndrome: An Important Health Issue in Iran

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Metabolic syndrome (MetS) is a major metabolic disorder worldwide which is characterized by having three or more of the five metabolic abnormalities. These metabolic abnormalities include abdominal obesity (waist circumference  $\geq 90$  cm for men and  $\geq 80$  cm for women), high triglyceride levels (TG) ( $\geq 150$  mg/dL), decreased high density lipoprotein cholesterol (HDL-c) ( $< 40$  mg/dL in men and  $< 50$  mg/dL in women), increased blood pressure (BP) (systolic  $\geq 130$  mmHg and/or diastolic  $\geq 85$  mmHg), and elevated fasting blood glucose (FBG) ( $\geq 100$  mg/dL) (Mohammadi *et al.*, 2016). These conditions induce insulin resistance, inflammation, and chronic stress resulting in excessive flux of fatty acids which can lead to increased risk for type 2 diabetes and cardiovascular diseases (Brunner *et al.*, 2002, Eckel *et al.*, 2005, Yaffe *et al.*, 2004). Approximately 20% of the patients with MetS who do not have diabetes remain at high risk of incident cardiovascular events (Wong *et al.*, 2003a, Wong

*et al.*, 2003b). The population-attributable fraction for all-cause mortality from the MetS was 6–7% (Ford, 2005).

In 2012, the total costs of diagnosed diabetes in the USA were estimated to be around 245 billion dollars; US \$176 billion of which were direct medical costs (Association, 2013). Furthermore, the American Heart Association reported that the one-year cost of cardiovascular diseases (CVD) is US \$457.4 billion in the USA (Thom *et al.*, 2006). In a survey conducted among the Iranian population, the costs of essential diagnostic and therapeutic services of CVD patients in the Central Hospital of National Iranian Oil Corporation were nearly 10.94 billion Rials (Fakhzadeh *et al.*, 2002). Therefore, regarding the heavy economic burden of MetS and other associated diseases on the health care system, it is necessary to pay special attention to its prevention, control, and treatment.

The prevalence of MetS was reported to be around 24% in the United States, 12% in Europe, and 10–40% in most Asian countries (Ryan *et al.*,

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2008). In Iran, the rate of MetS was estimated to be approximately 36.9%, 34.6%, and 41.5% according to the Adult Treatment Panel III (ATP III) criteria, the International Diabetes Federation (IDF) criteria, and the Joint Interim Societies (JIS) criteria, respectively (Amirkalali *et al.*, 2015). It was also reported that more than 32% of population of Yazd city have MetS (Sadrbafoghi *et al.*, 2006). Another survey among female teachers in Yazd showed that the prevalence of MetS was high even in the educated people of this area (39.11% based on ATP III definition) (Shahvazi *et al.*, 2016).

The MetS complications and comorbid diseases can be prevented by appropriate control of body weight, lipid profile, and blood pressure (Malik *et al.*, 2004). Indeed, it was indicated that all components of MetS may be related to obesity. Therefore, weight loss and physical activity might be the most important strategies to improve the MetS risk factors (Olefsky *et al.*, 1974).

Consumption of healthy diets containing more vegetables, fruits, whole grains, low-fat dairy products, and replacing some dietary carbohydrates with monounsaturated fat (e.g. olive oil) may also be beneficial for most patients with MetS (Feldeisen and Tucker, 2007, Prasad *et al.*, 2012). Healthy dietary patterns such as Dietary Approaches to Stop Hypertension (DASH) and Mediterranean diet can decrease most metabolic risk factors in both men and women. Indeed, these diets were inversely associated with Body mass index which can be useful for improvement of hypertension, atherogenic dyslipidemia, or inflammatory reactions associated with MetS (Azadbakht *et al.*, 2005, Babio *et al.*, 2009).

Unfortunately, the health care system in Iran is more focused on treatment of diseases than implementation of preventive strategies. Planning national programs which benefit from intersectoral collaborations for determining and controlling the MetS risk factors seems to be urgent in Iran.

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