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# Association between dietary patterns and metabolic syndrome in a sample of Tehranian adults



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## KEYWORDS

Dietary patterns;  
Metabolic syndrome;  
Factor analysis;  
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## Summary

**Aim:** Metabolic syndrome is one of the most known risk factors of cardiovascular disease. The aim of the current study was to investigate relationships between major dietary patterns and cardio-metabolic risk factors in patients with metabolic syndrome.

**Methods:** This cross-sectional study was conducted among patients with metabolic syndrome. All of the participants underwent anthropometric and blood pressure measurements. Biochemical assessments including serum aspartate aminotransferase (AST), alanine amino transferase (ALT), fasting serum glucose (FSG), serum lipids, insulin and adiponectin concentrations were performed by enzymatic methods. Dietary patterns were obtained by factor analysis procedure using principal component method. Nutrient intakes were analyzed by a semi-quantitative food frequency questionnaire (FFQ).

**Results:** Four major dietary patterns including healthy, meats and fats, sweets, potatoes and refined grains were extracted in the current study. Higher healthy pattern score was in relation with higher concentrations of AST and lower systolic blood pressure. Lower diastolic blood pressure and higher serum triglyceride concentrations were also observed in upper quintiles of meat and fats pattern ( $P < 0.05$ ).

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Upper quintile of sweet pattern was accompanied with higher serum FSG and insulin concentrations ( $P < 0.05$ ).

**Conclusions:** The independent associations between dietary patterns and blood pressure and serum lipids further support the protective role of healthy diet with fruits, vegetables and fish as predominant food items and an un-favorable effect of unhealthy diets with meat, fats and sweets as major ingredients.

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## Introduction

Metabolic syndrome, a cluster of inter-related risk factors for cardiovascular disease and type 2 diabetes mellitus is a major public health concern; its pathophysiology includes insulin resistance, central obesity, dyslipidemia, glucose intolerance, hypertension and alterations in several pro-inflammatory and inflammatory factors and is known as “insulin resistance syndrome” [1]. Metabolic syndrome is associated with 3–4.3 fold increase in mortality from CVD and subjects with metabolic syndrome are 3.5–5 times more likely to develop type 2 diabetes mellitus [2–4]. The prevalence of metabolic syndrome in Iran is increasing in parallel of increasing in coronary artery disease (CAD); the age-adjusted prevalence of metabolic syndrome in Tehran Lipid and Glucose Study (TLGS) was 33.7%; while the prevalence in women was higher than men (42% versus 24%) [5].

Diet has been suggested as a potent risk factor in developing metabolic syndrome [6,7]; however there is inconsistency regarding which dietary approach is effective in managing metabolic syndrome; it seems that the reason of this controversy is relying on traditional single-nutrient approach in nutritional researches [8]. Given the complexity of human diets and high biochemical and nutritional interaction between various nutrients, single nutrient approach might be misleading.

Dietary pattern analysis examines the effects of overall diet instead of looking at individual nutrients or foods, and conceptually, dietary patterns represent a broader picture of food and nutrient consumption and are more predictive of disease risk than individual foods or nutrients [9]. In fact, dietary patterns are reflecting the real eating behaviors of the population [8]. Factor analysis has been recently used to better identify person's dietary patterns than other approaches [10]; in the current study we aimed to assess the relationship between major dietary patterns identified by factor analysis, metabolic biomarkers and anthropometric

variables in sample of Tehranian adult population with metabolic syndrome.

## Materials and methods

This study was a cross-sectional investigation of 160 Iranian adults patients with metabolic syndrome living in Tehran; the details of this study has been reported elsewhere [11,12]. Briefly this was an internet-based life style modification interactive program, and we enrolled community-dwelling individuals from Jun 22 to August 22, 2012. Participants were patients who have metabolic syndrome according to the National Cholesterol Education Program's Adult Treatment Panel III report (NCEP-ATP III) criteria [13] (except for waist circumference which was defined as  $\geq 90$  cm for both genders for Iranian population [14] Subjects were aged 20 years and above and have no history of cardiovascular diseases, diabetics, cancer, renal diseases and pregnancy. They also did not have any history of taking medication for hypertension or dyslipidemia. At the beginning of the study the subjects underwent demographic, anthropometrics, nutritional and clinical assessments.

Weight was measured using a calibrated scale (Seca model 8811021658) while subjects were in light clothing without shoes and height with a stadiometer. Waist circumference (WC) was measured in horizontal plane, midway between the lowest rib and the iliac crest with a measuring tape in centimeter. Waist to hip ratio (WHR) was calculated by waist circumference divided by hip circumference. BMI was calculated by weight (kg) divided by height squared ( $m^2$ ) [15]. Blood pressure was measured with mercury sphygmomanometer twice in the same arm after the individual seated at rest 10–15 min.

Usual dietary intake was assessed using a 147 item semi-quantitative standard food frequency questionnaire (FFQ) which was developed and validated in Tehran [16]. This FFQ consisted of a list

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