

Metabolic syndrome: A forerunner of cardiovascular diseases

Johnna F. Varghese, Rohit Patel, Umesh C. S. Yadav

Global scenario of disease pattern has undergone a drastic transition where the relative effect of infectious diseases has been replaced with chronic diseases such as cardiovascular diseases (CVDs), cancer and diabetes. In recent years, metabolic syndrome (MS) which encompasses metabolic abnormalities such as glucose intolerance, insulin resistance, dyslipidemia and hypertension has become a common health problem among people of both developed and developing countries, and implicated in global loss of productive life and work hours [1].

Approximately 22.7% of urban population above 18 years of age have metabolic syndrome which increases with age, sedentary life style, waist circumference and body mass index (BMI) [2, 3]. The parameters based on which an individual is stated to have metabolic syndrome are elevated triglycerides (≥ 1.7 mmol/L), fasting blood glucose (>5.5 mmol/L) and decreased levels of high density lipoprotein (HDL) (< 1.0 mmol/L in men and <1.3 mmol/L in women), increased blood pressure (≥ 130 systolic or ≥ 85 diastolic) and increase in waist circumference which varies based on ethnicity (Asians: male ≥ 90 cm, female ≥ 80 cm; Europeans/Americans: male ≥ 102 cm, female ≥ 88 cm) [4]. These predominant factors contributing to metabolic syndrome which attributes towards CVDs [2]. MS is associated with a two-fold increase in the cardiovascular morbidity and approximately 1.5 fold in the mortality [5]. The risk of cardiovascular complications in urban population with metabolic syndrome increases after attaining 40 years

of age [2]. Metabolic syndrome and CVDs are observed to be increasing simultaneously with obesity worldwide. Obesity propels the manifestation of characteristic features of metabolic syndrome. Modern lifestyle such as inappropriate dietary patterns, consumption of processed and fat-rich food and dearth of physical activity are major contributors in developing obesity-related CVDs, and are considered to be leading causes of morbidity and mortality worldwide [6, 7].

Atherosclerosis accounts for approximately 42.5% of total deaths associated with CVDs [8]. Atherosclerosis is a chronic progressive disease where plaque builds up and narrows down the arteries and therefore restricts the blood flow. Atherosclerosis is characterized by the presence of accumulated lipid and cholesterol along with different type of cells and cellular debris present in the arterial lumen. Studies show that atherosclerotic plaque formation is an end product of several biochemical and molecular events that precipitate endothelial dysfunction, macrophage foam cell formation, vascular smooth muscle cell proliferation and migration [9]. These events are instigated by an inflammatory response induced by long-term presence of various endogenous stress molecules and oxidants such as adipokines, glucose, modified low-density lipoproteins (LDL), cholesterol etc. commonly elevated during metabolic syndrome [10]. Therefore, to control the metabolic syndrome-related atherosclerosis incidence early diagnosis of metabolic syndrome, strategies for the prevention and reversal of the condition needs to be undertaken.

The factors that beget metabolic syndrome and CVDs are interconnected, hence it would be of great help to devise preventive and therapeutic strategies that target multiple targets in the pathophysiological pathways and address various risk factors. Additionally, regulation and control of lipid profile in metabolic syndrome patients, especially that of LDL levels is of utmost importance. Therefore, modifying the diet along with regular physical activity and controlling the body weight are important measures to prevent MS or to reverse the condition [11]. Aged individuals with CVD risks when subjected to moderate or vigorous physical activity and decreased sedentary behaviors showed reduction in the adverse effects of major risk factors of metabolic syndrome such as

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central obesity and hyperglycemic condition [3]. Further, epidemiological evidences and clinical trials also indicate the effectiveness of natural phytochemicals as opposed to synthetic drugs on decreasing the severity and progression of CVDs [12]. Furthermore, combining the therapeutic approaches with the lifestyle- and dietary-modification in MS induced atherosclerosis has promising potential on clinical outcomes. Research has emphasized the use of natural sources-derived compounds, e.g. from plants, which even though have a slow mode of action, they have shown little or no side effects as compare to synthetic drugs. The different groups of molecules derived from plant sources such as fruits, vegetables, legumes and cereals include flavonoids, polyphenolics, glucosinolates, fats, oils, etc. These compounds are potential anti-inflammatory, anti-oxidative, cholesterol reducing and anti-diabetic agents and have shown positive influence in studies. However, more clinical trials need to be conducted by stratifying different parameters and variable such as gender, age group, ethnicity to establish and demonstrate the potential of the identified plant based compounds in metabolic syndrome and CVDs.

In conclusion, increasing incidence of metabolic syndrome and associated morbidities including CVDs worldwide are a major challenge to the modern societies. Several risk factors and associated biomarkers have been recognized which may help the early diagnosis of these conditions in patients. Specific target-oriented therapeutic interventions, especially involving natural compounds based therapy along with dietary and lifestyle changes are required for metabolic syndrome patients suffering from or are at a greater risk to develop CVDs.

Keywords: Atherosclerosis, Cardiovascular diseases (CVDs), Metabolic syndrome, Obesity, Therapeutic intervention

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Conflict of Interest

Authors declare no conflict of interest.

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