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Opinion

Metabolic Syndrome and Cancer: Is there a Connection?

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Metabolic syndrome (MetS) has now been universally recognized as the leading cause of various life threatening chronic diseases. While diabetes and cardiovascular, with their increasing incidences globally, get the most of the research and health awareness campaign funding, there has also been a rapid increase in various types of cancer cases, especially in developing countries. What is worrying is the significantly poor outcome in terms of 'life expectancy: treatment cost' ratio in cancer patients when compared to diabetes and cardiovascular conditions. This entails an equally sincere focus on strategies that could either reduce cancer incidences or complement cancer pharmacotherapy to improve treatment outcome measured in terms of survival rate and quality of life.

Chronic inflammation and cancer

Based on the definition by World Health organization (WHO) and Adult Treatment Panel III (ATP-III) guideline, metabolic syndrome is a combination of clinical conditions that include insulin resistance, dyslipidemia, hypertension, abdominal obesity, albuminuria, and high inflammatory biomarkers. Presence of insulin resistance in combination with any two of the remaining five conditions is indicative of metabolic syndrome. While further details of the criteria is provided in literature [1], what is notable is that these clinical conditions go undiagnosed for significant number of years, increasing the severity of the diseases by the time they are diagnosed. Of the above parameters, chronic inflammation, which is generally a consequence of insulin resistance and dyslipidemia, is one condition which is neither specifically diagnosed nor is treated in same manner as other risk factors of MetS, i.e. diabetes, hypertension, dyslipidemia, or obesity. Nonetheless, role of various inflammatory components (higher inflammatory biomarkers, angiogenesis, increased anti-apoptotic protein expression, compromised immunity system etc.) in induction and progression of tumorigenesis is being increasingly recognized. In a recently published report, Watson., *et al.* reported that one-year cancer incidence was more than double (3.53%) in primary care patients with raised inflammatory biomarkers, as compared to patients with normal level [2]. In another observational study conducted on healthy volunteers over 4 years, those who developed colorectal cancer had CRP level 53% higher than those who remained cancer free [3]. This, and similar outcome in several other studies, make baseline CRP level (and there by inflammation) a reliable prognostic tool for colorectal cancer [4,5]. While chronic inflammation is a widely accepted precursor to colorectal cancer, role of chronic inflammation as a trigger in other types of cancer is also well established [6,7]. Thus, addressing chronic inflammation holds promise to prevent a significant proportion of incidences of various types of cancer.

Metabolic syndrome and chronic inflammation

Metabolic Syndrome is prominent among various clinical conditions that are associated with chronic inflammation. Several studies have consistently reported significantly higher level of various inflammatory biomarkers (e.g. various cytokines and chemokines, C-reactive protein, tumor necrosis factor etc.) [8,9]. Consistent observation of higher level of inflammatory biomarkers, thus, directly leads to culpability of the metabolic syndrome in induction and progression of cancer. However, formulating effective prevention strategies needs further research to understand key component of metabolic syndrome that lead to development of cancer. A large case control study was recently initiated in Spain to link MetS (in primary care patients with age > 40 years) with any of the 14 identified cancer types [10]. Similarly, many clinical studies [11] either have been completed or are under progress to study MetS as a modifiable risk factor for vari-

ous types of cancer. Results of these studies would provide stronger clinical evidence of role of MetS in cancer and help to devise effective guidelines to reduce cancer incidences as well as recurrence.

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