INFLAMMATION AND TYPE 2 DIABETES MELLITUS -A REVIEW

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Abstract

Hyperglycemic condition can be caused due to impaired insulin secretion or due to resistance to peripheral actions of insulin or due to the presence of both conditions. International Diabetes Federation reported that 415 million adults of age group 20 to 79 were affected with diabetes mellitus in 2015 and the incidence can increase to another 200 million by 2040 and also it was mentioned that the occurrence of one death every six seconds due to diabetes mellitus. The process of inflammation was considered only to benefit the individual to recover from tissue damage and to repair the damaged physiological process. It may lead to the endothelial dysfunction and so it has to be measured and evaluated as an indicator of normal biological, pathogenic or pharmacological responses to a medical intervention. Proper therapeutic approach, risk analysis, and stages of the disease is possible on the early detection of the condition.

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1. Introduction

Diabetes Mellitus (DM) is a chronic metabolic disorder that is characterized by persistent hyperglycemia. The hyperglycemic condition can be caused due to impaired insulin secretion or due to resistance to peripheral actions of insulin or due to the presence of both conditions (Goyal and Jialal, 2018) .The glucose status of the body gets greatly affected in individuals who are diabetic and the chronic stage of the condition where it results in vital organs dysfunction (Tsalamandris et al., 2019) .Long-term hyperglycemia can lead to the dysfunction of the eyes, kidneys, heart, and blood vessels (Powers, Niswender and Evans-Molina, 2015).Severe microvascular and macrovascular complications lead to the serious effects of T2DM resulting in morbidity and mortality. The Framingham study revealed the fact that the incidence of cardiovascular disease (CVD) in diabetic men was twice that of the non-diabetic men and it was three times in diabetic women (Kannel and McGee, 1979).

Diabetes and other diabetes-associated complications are the serious threat globally. In the past 3 decades, the incidence of diabetes has increased to a great extent, nearly quadrupling. The occurrence of T2DM shows a rapid increase in developed and developing countries but mostly the cases are contributed by low and middle-income countries (Adela *et al.*, 2015).. International Diabetes Federation (IDF) reported that 415 million adults of age group 20 to 79 were affected with diabetes mellitus in 2015 and the incidence can increase to another 200 million by 2040 and also it was mentioned that the occurrence of one death every six seconds due to diabetes mellitus (Zheng, Ley and Hu, 2018)(Federation, 2015). In 2016, a WHO report published the status that the adult population has increased four times since 1980 and the number has risen to 422 million and is expected to reach 552 million by 2030 (Whiting *et al.*, 2011). A 20% increase in the number of adults with diabetes mellitus in developed countries and a 69% increase in developing countries is likely to happen in the period of 2010 to 2030 (Shaw, Sicree and Zimmet, 2010). Population under the age of 19 surviving with insulin resistance is alarming every year. In Diabetes mellitus, hyperglycemic condition leads to the process of attachment of monosaccharides with the hemoglobin called glycation which leads to HbA1c formation. HbA1c is a significant diagnostic criterion for the detection of the development of diabetic complications and it is used as a marker for long-term glycemic control (Woo *et al.*, 2015).

Inflammation

Earlier, the process of inflammation was considered only to benefit the individual to recover from tissue damage and to repair the damaged physiological function (Nathan, 2002). It was Metchnikoff in19th century, who viewed the inflammation as a harmful process The tremendous changes that take place during inflammatory process and the changes occurring during inflammation are an indication of a development of other related inflammatory disease too (Punchard, Whelan and Adcock, 2004). Inflammation which may leads to the endothelial dysfunction and so it has to be objectively measured and evaluated as an indicator of normal biological, pathogenic or pharmacological responses to a medical intervention.

C - reactive protein

C - reactive protein (CRP) belongs to the pentraxin protein family, and it is an acute phase reactant. Serum CRP levels respond to the acute infections, inflammation, and trauma. Globally, HsCRP is the widely evaluated efficient biomarker for CVD (Kamath *et al.*, 2015). The association of CRP with cardiovascular diseases is primarily due to the systemic inflammation. Shimobayashi *et al.*, also explains that during inflammation activated platelets mediate the conversion of plasma CRP to monomeric CRP and are strongly associated with cardiovascular risks. CRP is produced as a response to the inflammatory process and the levels of HsCRP is a powerful predictor of CVD (Cardiovascular diseases) and these levels vary based on the population, gender, age and obesity. C-reactive protein was associated with CVD and it is very sensitive to systemic infection, inflammation and tissue damage (Pepys and Hirschfield, 2003). Inflammation is the major cause for genesis, progression and cardiovascular diseases. Due to a series of biochemical and histologic events in T2DM, atherosclerotic cardiovascular disease (ASCVD) has evolved from a condition of being passive elevated levels of cholesterol to a condition of chronic inflammation. In the atherosclerotic conditions, inflammation is the significant factor for all the events of atherothrombosis and it involves the upregulation of various adhesion molecules and selectins (Libby 2012).

Cardiovascular Diseases

Chronic inflammation is the prime cause for the development of insulin resistance, T2DM and cardiovascular diseases.T2DM is the major cause of Cardio vascular diseases (CVD), and the incidence of CVD is alarmingly increasing in our country and globally too. The occurrence of CVD in diabetes-affected individuals is higher than the non-diabetic individuals and about 75% of the deaths occur because of CVD. Acute myocardial infarction (AMI) is a condition that results due to the rupture of coronary atherosclerotic plaque

leading to the thrombus formation and loss of blood flow distal to the occlusion site. A study shows that in inflammatory conditions, the increased levels of plasma of nonspecific indicators like HsCRP and IL-6 and their upregulation in a persistent manner lead to conditions that are worse.TNF, IL-1 and IL-6 levels usually be elevated in AMI patients (Beckman, J.A. et al 2013).

Atherosclerosis is a cardiovascular disease condition that involves chronic inflammation in Type 2 Diabetes mellitus subjects. Cytokines secreted during inflammation are implicated in the pathology of cardio vascular disease. Innate immune cells, macrophages and adaptive immune cells, like IL-1, IL-6 and TNF and cytokines like IL-4, IL-10 and IL-13, promote the inflammation. Mitogen Activated Protein Kinase (MAPK) and Nuclear Factor (NF)-**κ**B are the pathways that primarily mediates IL-1 and TNF signaling. It was shown that the other circulating proteins include VCAM1 (Vascular cell adhesion protein 1), ICAM1 (Intercellular cell adhesion protein 1), and P-selectin were increased in the plasma of atherosclerosis patients. There is strong evidence of the association between HsCRP and the above mentioned inflammatory cytokines (Sproston and Ashworth, 2018).

2. Conclusion

Proper therapeutic approach, risk analysis, identification of the stage of the disease is possible on the early detection of the condition. HsCRP helps in the accurate diagnosis and detection of inflammation which helps to increase the survival rates of the patients (Adela *et al.*, 2015).

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