Review Article

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Chronic Complications of Diabetes: Are We Missing Something?

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Abstract

The incidence of diabetes is increasing tremendously worldwide. According to IDF India has the second largest number of patients with diabetes. Discoveries of new drugs in treatment of diabetes have improved the longevity of patients with diabetes. But along with this the incidences of chronic complications of diabetes have also increased. Though the association of diabetes with that of neuropathy, nephropathy, and retinopathy has been well documented, majority of other complications have remained unfocussed. The present review focuses on some of the recently discovered complications of diabetes, such as diabetic myopathy and diabetes and lung function.

Key words: Diabetes;Myopathy;Lung function;Chronic complications.

The term diabetes was first used by Roman Physician Aretaeus in the 2nd century A.D. however description of diseased state similar to diabetes have been found in much older texts from different parts of world. The Egyptian Ebers Papyrus, dating back to 1552 B.C. is the oldest reference to a condition resembling diabetes. The ancient Indian medical texts of Charaka and Sushruta (400-500 B.C.) give detail description of diabetes, its classification and management.

American Diabetes Association has described diabetes as a group of metabolic disorders characterized by hyperglycemia resulting from insulin secretion, insulin action or both. Some workers describe the term diabetes as a metabolic cum vascular syndrome of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrates, fats and protein metabolism results from defect in insulin secretion, insulin action or both leading to changes in small blood vessels (Microangiopathy) and large blood vessels (Macroangiopathy).

Diabetes Mellitus (DM) is the most common metabolic disorder in the world. According to IDF 371 million people in the world live with diabetes as of 2012. In most countries the number of people with diabetes is steadily increasing. China has the largest number of people with diabetes (92 million), followed by

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India with 63 millions. In India the prevalence rates of diabetes have increased dramatically since the time the first national survey was undertaken. At that time the prevalence was 2.3%. The most recent studies suggest prevalence rates of between 15 to 20%. The reason for explosive increase in prevalence of diabetes in India have been attributed to increasing prosperity and urbanization which have lead to wholesale changes in lifestyle.[1]

Most of the morbidity and mortality due to diabetes is due to the chronic complications of the disease. Diabetes is leading cause of end stage renal failure and non traumatic lower limb amputation. It is also one of the leading causes of myocardial infarction, visual loss and stroke worldwide.

The chronic complications of diabetes are due to the pathological changes affecting the blood vessels of the involved organs. The disease can involve either small blood vessels (microangiopathy) or the larger blood vessels(macroangiopathy). Diabetec nephropathy and retinopathy are predominately the results of microvascular disease whereas cardiovascular disease occurs due to macroangiopathy. Diabetic neuropathy is due to combination of microvascular and macrovascular pathology.[2]

Though at present the association of diabetes with retinopathy, neuropathy and nephropathy has been proved beyond doubt, some of the chronic complications are still under experimental levels. There is a postulation that diabetes must be affecting not only eye,kidney, nerves but beyond that it must be having its effect on many other systems of body. Some workers have demonstrated involvement of muscles and lungs in diabetes. The current review will focus on some less addressed chronic complications of diabetes.

Studies conducted by various authors showed that all the pulmonary parameters, that is, FVC, FEV_1, FEF_{25}, FEF_{50}, FEF_{75}, FEF_{25-75}, $FEF_{0.2-1.2}$, and PEFR were significantly reduced except FEV_1/FVC in patients of type 2 DM as compared with the healthy controls.[3-7] Meta-analytical studies also showed that DM is associated with statistically significant, impaired pulmonary function of restrictive pattern irrespective of body mass index (BMI) and smoking.[8] some authors have also shown impaired gas diffusion across respiratory membrane in patients of type II DM.[9] The reduction in PFT values are proportionate to duration of diabetes and HbA1c levels. The risk of pulmonary complication increases in patients of DM if coexisting pulmonary pathologies such as asthma, COPD, fibrosis are present.[10] Though some authors did not find any significant differences in PFT parameters in DM patients as compared to normal healthy volunteers, these can be because of inadequate sample size in their study.[11-13]

The proposed pathophysiological mechanism for restrictive type of ventilation in patients of DM is non enzymatic glycosylation in connective tissues of lung parenchyma and diabetic polyneuropathy, which affects respiratory neuromuscular function. Decrease diffusion capacity across the respiratory membrane can be attributed to thicking of basement membrane of alveoli, micro and macroangiopathy of pulmonary capillaries.[14]

To conclude pulmonary dysfunction should be regarded as a specific derangement induced by DM. Further studies may clarify whether this should be included as a long-term complication of diabetes. The role of strict glycemic control on pulmonary function in diabetic patients is another interesting aspect and needs further studies.

Some studies have demonstrated that the mean handgrip muscle strength and endurance in patients of type II DM was significantly lower than that in the normal controls.[15,16,17,18] The decrease in muscle strength is proportional to duration of diabetes. HbA1c also have a positive correlation with muscle strength although no such correlation was found with muscle endurance.

- The probable reasons which have been put forward are increase systemic inflammatory cytokines such as TNF-α and interleukin - 6, non enzymatic glycosylation of muscle proteins, excessive catabolism of muscle proteins for energy generation and motor neuron neuropathy.[16,18]

To conclude type II DM patients suffer from skeletal muscle dysfunction in the form of reduced handgrip strength and endurance.

Thus review of literature shows while evaluating the patient of diabetes for chronic complication in addition to neuropathy, nephropathy, retinopathy emphasis should also be given on involvement of any other system of body especially respiratory and muscular system. The treating physician should not be ignorant about these disabilities. In addition to the strict measures to control the blood glucose levels and other chronic complications of diabetes, interventions to improve the respiratory function and muscle strength in these patients should be undertaken. Physiotherapic exercises to strengthen muscle mass and to improve respiratory function can be of great importance in these patients.

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