International Journal of Applied Home Science **REVIEW PAPER**
Volume 5 (1), January (2018) : 239-245 ISSN : 2394-1413
Received : 11.12.2017; Revised : 20.12.2017; Accepted : 24.12.2017

Diabetes in Indians

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ABSTRACT

Diabetes has become one of the largest public health problems to date. Decreased physical activity, overnutrition, and nutrition transitions caused by changes in lifestyle contribute to the increasing incidence of chronic metabolic diseases as well as deaths related to them. The shift from undernutrition to overnutrition indicates that chronic diseases of affluence have become a public health problem; hence, sustainable health-related goals have been developed for the prevention of these diseases. Several studies have proven that lifestyle interventions can effectively deter the progression of diabetes in individuals with impaired glucose tolerance.

Key Words : Diabetes mellitus, neuropathy, sedentary lifestyle, insulin resistance

INTRODUCTION

Diabetes mellitus is a metabolic disorder defined by chronic hyperglycemia with deranged fat, carbohydrate and protein metabolism that results from improper secretion or action of insulin (American Diabetes Association, 2004). It is a modern day epidemic. The WHO Global Report on Diabetes has revealed that the number of adult diabetics in the world was 422 million in 2014 in comparison to 108 million in 1980 (World Health Organization, 2017). The age standardized prevalence of diabetes has become 8.5% in the adult population, almost double that of the 4.7% in 1980. More than 80% of deaths due to diabetes occur in middle and low income countries (Danaei *et al.*, 2011 and World Health Organization, 2009). WHO estimates that diabetes will become the seventh most common cause of mortality, worldwide, in the year 2030 (Lindstrom *et al.*, 2003 and Mathers and Loncar, 2006).

India is the diabetes capital of the world because there are around 41 million Indians suffering from diabetes till date and every fifth person in world, having diabetes, is an Indian (Joshi and Parikh, 2007). Recent studies have revealed that the occurrence of diabetes mellitus is increasing among children and adolescents in India (Molnar, 2004 and Amutha *et al.*, 2011).

There are two main types of diabetes mellitus (DM): Type 1 DM results from the inability of the pancreas to produce enough insulin. Its cause is unknown (RSSDI, 2012). Type 2 DM occurs due to insulin resistance, in which the peripheral cells fail to respond to insulin properly. As the disease progresses, failure to produce insulin may also occur. The most common risk factor of type 2 DM is excessive body weight and sedentary lifestyle. Type 2 DM accounts for more than 90% of the diabetes cases worldwide. It is difficult to diagnose early, as it is mostly asymptomatic and

Cite this Article: Majeed, Anesa (2018). Diabetes in Indians. *Internat. J. Appl. Home Sci.*, **5** (1) : 239-245.

usually presents with complications like nephropathy, cardiovascular disease, retinopathy, neuropathy, cerebrovascular disease and peripheral vascular disease (RSSDI, 2012). It can go undetected for 9–12 years and, consequently, present with complications (Roche and Wang, 2014). Recent studies have revealed that around half of the diabetics in the world are undiagnosed (RSSDI, 2012). American Diabetic Association has introduced a new category of blood glucose levels, preceding the onset of diabetes, known as prediabetes. Individuals with prediabetes, have a higher risk of development of diabetes in the future (Praveen *et al.*, 2013). American Diabetic Association has defined prediabetes as _ Impaired Fasting Glucose, when fasting plasma glucose level ranges from 100 to 125 mg/dl and Impaired Glucose Tolerance, when plasma glucose level 2-hr. after an oral glucose tolerance test ranges from 140 to 199 mg/dl (Expert committee on the diagnosis and classification of diabetes mellitus of the american diabetes association, 2005). Screening for prediabetes can lead to early diagnosis and treatment and prevention of complications (Expert committee on the diagnosis and classification of diabetes mellitus of the american diabetes association, 2005).

Epidemiology :

According to the International Diabetes Federation (IDF), there were an estimated 387 million individuals with diabetes worldwide in 2014, and this number is set to increase to 592 million by the 2035 (International Diabetes Federation, 2017). Despite the large number of people with diabetes in southeast Asia, health care spending on the disease was estimated to be only US$6 billion, accounting for <1% of the global total, with India estimated to have spent the largest proportion.

Adults in India alone account for 86% of this region's adult population of 883 million. India is experiencing an economic growth rate second only to China (International Diabetes Federation, 2017). The projected increase in regional diabetes prevalence to 10.1% in 2035 is a consequence of ongoing large-scale urbanization and increasing life expectancy (in India, the proportion of the population age > 50 years is expected to increase from 27% to 35% between 2013 and 2035) (International Diabetes Federation, 2017). In 2013, an estimated 12,600 children age < 15 in the region developed type 1 diabetes (T1D) (International Diabetes Federation, 2017). India accounts for the majority of children with T1D, which has important consequences not only for the total region but also for worldwide estimates (International Diabetes Federation, 2017). With 1.2 million deaths (14.2% of all adult deaths) in 2013, this region has the second highest number of deaths attributable to diabetes of any of the 7 IDF global regions (Africa, Europe, Middle East and North Africa, North America and Caribbean, South and Central America, Southeast Asia, and Western Pacific) (International Diabetes Federation, 2017). More than half (55%) of these deaths occurred in individuals age < 60 years and 27% in people < 50 years of age (International Diabetes Federation, 2017). Increased mortality related to diabetes in India is related to poor overall health care, with 59.11% dying within 1 week of hospitalization with infection and chronic renal failure being the major causes of death, compared with cardio- and cerebrovascular disease in the West (Zargar *et al.*, 1999). The pooled prevalence of rural diabetes among low- and middle-income countries has been estimated at 5.6% over a 25-year period (International Diabetes Federation, 2017).

The prevalence of metabolic Syndrome as per WHO criteria in one of the study on ethnic Kashmiri patients was 84.5% (74.2% in males and 90.89% in females). Maximum numbers of study participants were having diabetes since 5–10 years. Hypertension was present in about more than two third of the study subjects with about 81.8% of female diabetics having hypertension but only 65% of male diabetics having hypertension. Central obesity was present in 70% of the study subjects according to the criteria by NCEP ATP III with about 90% of female subjects having waist

circumference more than 88 cm and only 41.3% males were having central obesity. Such a high prevalence of metabolic syndrome in our study population of type 2 diabetics is of great concern as the cardiovascular, cerebrovascular and other mortalities increase with the presence of metabolic syndrome in type two diabetics. Furthermore highest prevalence of metabolic syndrome in our population was found by using WHO criteria (Lone *et al.,* 2017). Another population based study—the National Urban Diabetes Survey (NUDS)-was conducted in 6 large cities from different regions of India in 2001 (Ramachandran *et al.,* 2001). The study showed that the age standardized prevalence of T2D was 12.1% (Ramachandran *et al.,* 2001). The prevalence was the highest in Hyderabad (16.6%), followed by Chennai (13.5%), Bengaluru (12.4%), Kolkata (11.7%), New Delhi (11.6%), and Mumbai (9.3%) (Ramachandran *et al.,* 2001). This study did not sample rural areas. PODIS (Prevalence of Diabetes in India Study) was carried out in 49 urban and 59 rural centers in different parts of India to determine urban/rural differences in T2D (Sadikot *et al.,* 2004). When American Diabetes Association criteria were used, the prevalence of diabetes was 4.7% in urban and 1.9% in rural areas (Sadikot *et al.,* 2004), whereas the prevalence according to World Health Organization criteria was 5.9% in urban and 2.7% in rural areas (Sadikot *et al.,* 2004).

Risk factors:

Asian Indians have thinner limbs, which is suggestive of smaller muscle mass. However, despite their thinness, they are centrally obese, with a higher waist-to-hip ratio (WHR) and higher subscapular-to-triceps skinfold ratio than their British counterparts. Many studies show that Asian Indians have more body fat for any given body mass index (BMI) compared with whites and black Africans (Banerji *et al.,* 1999). Asian Indians also have higher levels of central obesity (measured as waist circumference (WC), WHR, visceral fat, and posterior subcutaneous abdominal fat) (Deurenberg *et al.,* 2002). This is reflected in higher plasma nonesterified fatty acid (NEFA) and triacylglycerol (TG) concentrations, hyperinsulinemia with fasting as well as postglucose challenge states, and higher insulin resistance (IR) (Deurenberg *et al.,* 2002). The influence of environmental factors on human metabolism can be observed throughout lifespan. A poor lifestyle of the mother during pregnancy may lead to early life chronic metabolic diseases in the child. Poor nutrition during the embryonic period may induce the formation of "thrifty" genes in the fetus; obesity and metabolic disorders will appear when the postnatal baby receives adequate nutrition. The adverse influence of modern lifestyle on child and adolescent health is more significant, with the young generation. The rapid increase in the incidence of diabetes corresponds with the recent environmental and lifestyle changes. Long term excessive calorie intake, increased intake of dietary protein and lipids, and reduced physical activities are the core factors in diabetes development.

Prognosis:

Patients with diabetes also had increased subclinical atherosclerosis as measured by intimal medial thickness at every age point, compared with those without diabetes (Mohan *et al.,* 2008). The prevalence rate for hypertension among Indians with diabetes was 38% in one study (Joshi and Parikh, 2007). >50% of people with diabetes in India remain undiagnosed (Joshi *et al.,* 2014). These individuals are at increased risk for developing diabetic complications. The ICMR-INDIAB (ICMR-India Diabetes)(Mohan *et al.,* 2008) study reported that the ratio of undiagnosed to diagnosed diabetes is higher in rural compared with urban areas. Thus, if diabetes is not detected early and treated adequately, there is a high risk for developing both macrovascular (CAD, cerebrovascular, and/or PVD) and microvascular disease (retinopathy, nephropathy, and neuropathy). Diabetes has

both macro-vascular complications (ischaemic heart disease, stroke, and peripheral vascular disease) and micro-vascular complications (diabetic neuropathy, diabetic retinopathy, and diabetic nephropathy). Diabetic peripheral neuropathy (DPN) is a frequent complication of diabetes and a leading cause of morbidity and increased mortality; it is associated with the duration that a person is affected by diabetes, hyperlipidaemia, and poor glycaemic control. Diabetic neuropathy affects up to 50% of patients with diabetes, and new cases occur at an annual incidence of approximately 2%.

Treatment:

Lifestyle modifications are the cornerstone of diabetes management and include a prescription for healthy eating, regular exercise, stress management, and avoidance of tobacco. The aim of dietary management is to achieve and maintain ideal body weight, euglycemia, and desirable lipid profile; prevent and postpone complications related to diabetes; and provide optimal nutrition during pregnancy, lactation, growth, old age, and associated conditions (e.g , hypertension and catabolic illnesses). The recently published STARCH (Study To Assess the dietary Carbohydrate content of Indian type-2 diabetes population) study shows that Indians consume larger amounts of carbohydrates than Americans. The comparison of macronutrients by region in India revealed similar patterns of dietary consumption, that is, relatively high carbohydrates and low fat and protein. This study dispels the myth that only south Indian people consume high carbohydrates in their diet (rice, idli [a savory cake; part of a traditional south Indian breakfast], etc.) (Joshi *et al.*, 2014). Dietary transition and a sedentary lifestyle have led to an increase in obesity and diet-related non communicable diseases (T2D, cardiovascular disease, etc.) predominantly in urban, but also in rural areas. These recommendations Dietary transition and a sedentary lifestyle have led to an increase in obesity and diet-related noncommunicable diseases (T2D, cardiovascular disease, etc.) predominantly in urban, but also in rural areas. Dietary recommendations should be individualized according to person's ethnicity, cultural and family background, personal preferences, and associated comorbid conditions. The National Dietary Guidelines Consensus Group in India (Misra *et al.*, 2011) developed some broad guidelines that recommend lower intake of carbohydrate, especially sugar, saturated fat, and salt, higher intake of fiber, and an optimal ratio of essential fatty acids. Medical nutrition therapy remains the first choice of treatment for the management of newly detected diabetes. The current controversies of carbohydrates, proteins, and fats still remain an area of ongoing research. However, there is enough evidence that medical nutrition therapy is an integral component of diabetes prevention, management, and self management education Glycemic control is crucial for individuals with diabetes to prevent the progression of neuropathy.

Dietary management :

Mediterranean style diets can cause significant decline in CVDs, type 2 diabetes, and cancer (Salas-Salvad *et al.*, 2011 and Toledo *et al.*, 2015). The beneficial effects of Mediterranean style diets may be due to the prominence of fruits, vegetables, nuts, fish, poultry, and olive oil, and foods with a low glycemic index, but very little red meat (GBD, 2015 SDG Collaborators, 2016). The majority of these foods possess increased content of polyphenolic flavonoids, carotenoids, omega-3 fatty acids, antioxidants, vitamins, and minerals, as well as essential and non-essential amino acids which may influence the brain-body interactions contributing to CVDs and diabetes.

Ingestion of processed and fast food; foods high in fat, sugar, and calories; animal products; and beverages high in sugar and calories have replaced traditional food and changed eating habits.

Food transition varies by country and region; however, the overall trend is an increasing proportion of fat and animal products and decreasing proportion of carbohydrates. Some diets have transitioned from the intake of carbohydrates from coarse grains to the intake of carbohydrates from processed and sugary foods. The calories in this type of diet are much higher, resulting in higher caloric output than that required by the body and an increased risk of obesity and diabetes. Additionally, this type of diet can cause chronic metabolic-related inflammation and induce metabolic diseases such as diabetes and CVDs. Diabetes Prevention Study (DPS) in Finland and the American Diabetes Prevention Program (DPP)(Lindstrom *et al.,* 2003). These studies have proved that lifestyle intervention can effectively deter the progression of diabetes for patients with IGT. Lifestyle intervention not only contributes to effectively reducing blood glucose level during the strengthened intervention period, but also perhaps to improving healthy habits developed during the intervention. The Da qing study explained the influence of lifestyle intervention on macrovascular and microvascular diseases as well: lifestyle intervention reduced the mortality rates of cardiovascular and cerebrovascular diseases by 17%,and the incidence of severe microvascular disease by 47%, in 20 years (Danaei *et al.,* 2011). Exercise is a powerful method to improve longterm glycemic control. It is clear that controlling blood glucose through modification of diet and lifestyle should be a mainstay of diabetes therapy. Regular exercise has been shown to improve blood glucose control, reduce cardiovascular risk factors, contribute to weight loss, and improve well-being. With increased physical activity, the selection of pre- and post-exercise meal and/or snacks becomes critical. A careful assessment of an individual should be made by a physician while incorporating an exercise program in the management. Exercise programs should be individualized according to individual capacity and disabilities (Misra *et al.,* 2008). People with diabetes must wear appropriate footwear for exercise (Misra *et al.,* 2008). Additional physical activity >60 minutes per day would be helpful in maintaining a good glycemic profile for patients with T2D (Misra *et al.,* 2008). It has been reported that children and adolescents with T1D should complete a minimum of 30 to 60 minutes of moderate-intensity physical activity daily (Copeland *et al.,* 2005).

Conclusion :

In conclusion, it can be said that Metabolic syndrome is associated with increased morbidity and mortality especially in diabetic's. BMI and waist circumference are easy-to-use tools that can be applied for screening of prediabetes since early adolescents. Since the beginning of non-communicable diseases like diabetes can be traced to childhood and adolescence, early diagnosis and timely lifestyle modification management can go a long way to prevent the prognosis, morbidity and mortality arising as a consequence of the diabetes.

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