Present Status and Trends in Prevalence of Diabetes in India

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Abstract

Diabetes is a chronic disorder and not a disease of opulent in India. It is estimated that prevalence of diabetes in India will be two-fold globally from 2000 to 2030. The associated risk factors are obesity, hypertension, age, change of lifestyle and so many. The obesity is main risk factor for the diabetes due to the intake of junk food or eating food with high glycemic index and no physical activity which contribute to the fat deposition in the body leading to accumulation of fat in the blood-stream thus, increasing the blood glucose level in the body. Maintaining the diabetic registries in India will give an idea about the distribution of disease and number of patients affected every year in every part of India. National undertaking programs are urgently needed for the early knowledge, detection and diagnosis, diseases management and primary prevention of diabetes. This review aims to highlight the emerging trends in the prevalence of diabetes and their associated risk factors in India.

Keywords: Diabetes; Prevalence; Blood glucose level; Emerging trends; Management Program.

Introduction

Diabetes mellitus is a chronic disease caused by inherited or acquired deficiency in production of insulin by pancreas or by the ineffectiveness of the insulin produced. Such deficiency results in increased concentration of glucose in the blood, which in turn damage many of body systems in particular the blood vessels and nerves.[1] According to WHO facts and figure sheet the level of HbA1C below 5.7% is considered to be normal whereas HbA1C level 6.5 or more than 6.5% is considered as diabetes. The fasting blood glucose test less than 100 mg/dL is normal within the patients but the patients with more than 126 mg/dL fasting blood glucose will be diabetic. The oral glucose tolerance test less than 140 mg/dL will be normal and OGTT with 200 mg/dL or more is considered to be diabetic.[1] Diabetes is no longer considered a disease of the opulent in India. It is predicted that the prevalence of diabetes will be two-fold globally from 171 million in 2000 to 366 million in 2030 with an extreme increase in developing countries like India. It is also predicted that in 2030 around 79.4 million individuals can be affected by diabetes mellitus in India,[2,3] as such no correct information on number of diabetic patients because unlike cancer registries there are no diabetic registries found in the country. However, T2D constitute a huge social and economic impact to all nations, developing countries suffer the most, since more than 80% of cases occur in these countries. In the last 50 years, there is a rapid progress in economy of country and thus experienced a vast epidemiological transformation from an increase prevalence of infectious diseases to an increase prevalence of trendy lifestyle-associated chronic non communicable diseases such as diabetes, hypertension (HTN) and cardiovascular risk factors. The concept of a wide variety of genetic, social, cultural and environmental factors, any number of which may be associated with rise in growth of diabetes. It will be difficult if not

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possible to control the impact of these factors on human population which is better understood that morbidity and mortality rate will be increased.

Contributing Risk Factors for Prevalence of Diabetes in India:

Urbanization and Socio-economic impact

In the past few decades, there is an escalating prevalence of diabetes seen among the Indian population which may be because of drastic change in healthy lifestyle as a result of rapid socio-economic burden. In India conversion rate of impaired glucose tolerance (IGT) to diabetes is increasing, probably due to the influence of lifestyle transitions.[4] The rapid increase in urban population is the key factor for the global rise in prevalence of diabetes. Urbanization, i.e. migration from rural to urban areas result in several adverse impacts; decrease in physical activity, diet habits change towards high-energy and more calorie intake foods and exposure to electromagnetic radiation in the microwave range (450–3800 MHz and 24-80GHz) with use of electronic gadgets and other digital wireless systems, such as data communication networks and etc produce the similar radiations. As shown in the recent studies in India,[5] considerable changes have occurred in the living pattern of the rural population, leading to an increase in total prevalence of overweight and diabetes in India.

Age

Asian populations develop diabetes at a younger age than Western populations.[6] However, ethnic differences within Indians are evident in the age specific prevalence of diabetes. Higher prevalence of IGT at a younger age is also a common problem in India. The racial variations in the prevalence of diabetes and impaired glucose tolerance at younger age fails to explain completely only by the living environment and geographical factors but somehow considering genetic factors a major role for increasing prevalence of diabetes as well. It may be also due to stress, higher rates of obesity, hypertension, insulin resistance; genetic predisposition at a small age is responsible for higher prevalence of diabetes among Indian population. Increase in prevalence of diabetes is directly proportional to increase in diabetes within young people. Asian people with young onset of diabetes have substantial phenotypic heterogeneity, many with a positive family history, impaired beta cell function, no islet cell auto antibodies and with

clustering of cardio metabolic disorders.[7,8] The major cause for the increasing prevalence of T2D among Indian children is the increasing rate of obesity and decreasing rate of physical activity, leading to insulin resistance.

Gestational diabetes mellitus (GDM)

Gestational diabetes mellitus is defined as high blood glucose level during pregnancy. one in seven births are affected by GDM as per the International diabetes federation (IDF), Diabetes Atlas 2015.[9] India, being the second largest country with diabetic subjects of (69.2 million), has forced India to be the diabetes capital of the world because of GDM in four million women in India.[10] Nearly 21.4 million of live births were affected with hyperglycemia in pregnancy according to IDF 2013 repots.[11] A woman with GDM in pregnancy, in the future will be at high risk of developing Type II diabetes. Studies have proven that women with past history of GDM are also at high risk of cardiovascular diseases and various metabolic syndromes when compared to those women whose blood glucose level was normal during their antenatal period.[12] Studies have also revealed that in youth almost half of the proportion of diabetes (47.2%) in any population can cause maternal GDM.[13] In the last two decades, women are expected to enter pregnancy with preexisting diabetes in a larger fraction, thus increasing the risk of diabetes among the women population.[14,15] The rising trend of gestational diabetes among Indian women population can also play an important factor in prevalence of diabetes in young people.

Obesity

Over-weight is one of the common risk factor for several disorders including diabetes; hence there is no much of research work focused on the risk factors within India.[16] Eating habits like "junk food" will also add up to the obesity. Compared to western countries, India has a higher prevalence of diabetes despite of having lower bodyweight and obesity rate, recommending that diabetes not only occur with higher body mass index (BMI) as in Europeans but can also occur with lower body mass index (BMI) like Indians.[16,17] Consequently, Indian adults with a lower BMI (lean) may be at equivalent risk of getting diabetes (obese) having higher BMI.[17] Furthermore, Indian population are genetically prone to the development of coronary artery disease due to dyslipidaemia and decrease in levels of high density lipoproteins which make Indians more susceptible for diabetic complications at an early age (20–40 years) knowing the impact,

diabetes must be screened and maintain properly regardless of patient's age within India.

Hypertension and stress

The common term use for hypertension is high blood pressure, which can increase the risk of stroke and heart attack but moreover hypertension is the common risk factor for diabetes.

Hypertension and diabetes share similar risk factor including obesity, in-active lifestyle and improper diet. The end results of the metabolic syndrome are hypertension and diabetes. They may develop one after another in a single individual.[18] More often hypertension and diabetes are suppose to be present in a single individual suffering from any disorder than rather occurring it by chance; the dys-glycemia and high blood pressure are connected with each other and play a important role in diabetes and hypertension.[19] Nearly about 25–47% of persons with insulin resistance or impaired glucose tolerance is due to hypertension.[20]

Stress is nothing but strain or tension created in the body leading to exerts pressure on nerve cells. The concept of fight-or-flight response for stress is well know, where in if an individual is experiencing some stress or feeling complete threatened then the body of an individual will immediately react, this reaction will cause nerve cells to fire due to the release of stress hormones like adrenaline and cortisol in the bloodstream leading to severe respiratory disorders. If this is the case in diabetic patients, the nerve cells fail to process the glucose stored in the blood and thus builds up in the bloodstream causing extreme rise of glucose level in the blood. Constant stress from long term complications associated with diabetes can burden an individual with physical and mental health leading to the difficulties in managing diabetes.

Smoking and alcohol use

Nearly 40% of smokers are at high risk of diabetes than that of non-smokers in India. Central obesity and insulin resistance are the major responsible factors for the individual who smokes and chew tobacco which leads to other detrimental effects. The increase use of alcohol in India, especially among the middle class and rural population, also increases the risk for diabetes and other metabolic disorders.

Tuberculosis

Unconventional risk factors like tobacco smoking and Diabetes mellitus causes tuberculosis a harmful diseases. Relapse, treatment failure and death are the several treatment outcomes of these diseases.[21,22] Hence TB patients should be routinely screened for tobacco smoking and diabetes and if positive, patients should improve TB with different treatment outcomes.[23] Various international guidelines like (WHO guidelines) exist for the tuberculosis patients for the management of co-morbid conditions, such as human immunodeficiency virus infection, tobacco smoking and DM etc. Although India has a good Revised National TB Control Programme, still TB control efforts are hindered by the potential of tobacco chewing and diabetes among the individuals. Research studies in South India have reported that prevalence of Diabetes mellitus is high among patients having TB, nearly 25% in Tamil Nadu State and Kerala with 44%.[24,25] The risk of developing new as well as reactivation of old TB disease is higher among the diabetic patients. Diabetes if not controlled properly in terms of diagnosis and treatment may results into high prevalence of TB and its poor source of treatment.[26] Some hospitals undergo routine screening for diabetes, if the same practice of screening is implemented in all the clinics and hospitals, will lead to an effective, earlier detection and better treatment of DM, which will improve the clinical results and enhances the TB treatment.[27]

Glycemic index of food and HbA1c test

GI, the glycemic index, is an estimation of glycemic response in an amount of carbohydrate eaten in a particular diet, constituting only the type of carbohydrate present in the diet but fails to detect the amount of carbohydrate taken in a diet, whereas the combination of quality as well as quantity of carbohydrate consumed will represent the total glycemic load, which may interrupt the normal blood glucose level in the body.[28]

There is no proper diet or meal plan that works easily for everyone with diabetes. Management of a diet plan with personal preferences and interest with cutting off the calories (food with low GI) may help to reduce blood glucose level, high cholesterol and triglycerides, blood pressure and obesity. The food which contain carbohydrate with low GI includes non-starchy vegetables, legumes (lentils and kidney beans), and some starchy vegetables like sweet potatoes, fruits and many whole grain bread and cereals. It has been reported in earlier studies that control over glycemic index of food lowers the risk of complications associated with diabetes.[28] Proper management of glycemic status in the body and diabetic complications are most important steps in order to cut down the economic burden and to enhance the quality of life in a

country.

HbA1c is one of the diagnostic tests for the glycemic index, which helps in detection of past 2–3 months glycemic exposure in the body, fasting glucose and postprandial plasma glucose (PPG) can easily determine the level of glycemic index. Cross-sectional studies recommend that HbA1c goals of <7.0 or 6.5 may be at the risk of acquiring postprandial hyperglycemia.[29,30] The HbA1c range of 4.0%–5.6% is for non-diabetes. The HbA1c level for prediabetics is 5.7%–6.4%, while HbA1c levels with 6.4% or higher have diabetes. Rahbar et al. in his studies reported the elevated levels of HbA1c in diabetic patients.[31] Higher the glycemic index more will be the complications related with diabetes.

Genetic susceptibility

Risk of T2D is generally high among Indian populations, with irrespective of gender, may be due to high genetic susceptibility and enhanced interaction with environmental triggers. The common factors which trigger the gene-environmental interaction are exposure to a high fat diet and lower levels of physical activity. Both the thrifty genotype and thrifty phenotype hypotheses appear to have etiological roles in development of diabetes in Asian populations. While the thrifty genotype hypothesis points to a mismatch between the ancestral genes and modern environment, the thrifty phenotype hypothesis postulates a mismatch between intrauterine and adult life environments.[32] Weight gain in children's due to a nutritionally rich food (calorie intake food) in the surrounding environment increases the high risk of adult diseases. Unexpected weight gain in adult population is also a broad risk factor for glucose intolerance among the Indian population. Gestational diabetes occurs because of in *utero* nutritional imbalance, hormonal imbalance, and childhood obesity and over nutrition in adulthood is a leading problem which will, thus, fuel the epidemic in India undergoing rapid nutritional changes.

Diabetic complications

An increase in number of prior out-break cases of diabetes is accountable for the numerous diabetic complications due to long duration of the disease; however data on diabetic related complications and prevalence of diabetes is limited in the country like India. The connection between vascular complications and poor glycemic control is been widely known. Poor glycemic control, a factor that has been observed in the Indian diabetic population,[33] plays a key role for micro- and macro-vascular changes which is associated with diabetes, and thus, increases other complications such as diabetic retinopathy, diabetic nephropathy, muscle infarction and diabetic myo-necrosis. The risk of CVD increases by 3–4 fold in a diabetic person. More than 75% of all mortality among diabetic persons occurs from cardiovascular diseases. Convergence of such diseases increases the risk of complications that not only affect the cost of available treatment and medicine but also increase the high risk of morbidity, mortality and more or less economy of a developing country like India.

Cost of Diabetes

The early onset of diseases at very young age not only increases the burden of treating patients with diabetes but also increases the rate of morbidity and premature mortality due to various diabetic complications. The cost of diabetes either with diagnosis or treatment is reported to be high and is increasing worldwide. This leads to high financial burden especially to the people living in under developing countries. Moreover, the gold standard test (HbA1c) basically use for diagnosis, i.e. insulin initiation and insulin intensification is also reported to be a costly test and not easily available to the large section of Indian population. The cost of diabetes care increases rapidly when complications rises or when patient has to be hospitalized or when undergoing surgery or during insulin treatment. Even the most common drug which is prescribed by the doctors (Metformin) is also available very costly.

Primary Prevention of Diabetes

The medical challenge posed by the burden of diabetes is huge and still growing in India. There are various factors which plaque the diabetes care in India. Primary prevention plays a key role to reduce the load of diabetes faced by patients, families and society on a large scale. Several clinical trials have shown that primary prevention of T2D is possible by change in lifestyle or by the intake of drug such as metformin. Proper management of obesity and diabetes not only prevent the development of diabetes but can also reduce the risk of complications associated with diabetes. Physical activity, yoga and intake of healthy food are also the primary factors for the prevention of

diabetes. National program for promoting healthy life-style should be implemented among the young generation population for their better and prosperous life in the future. Public awareness program; like talk, presentation and door-to-door explanation about the causative factors responsible for diabetes and what are the treatment remedies for the diabetes, should be done in every part of India. Indian Government should also make diabetic registries like cancer registries to keep a check on a number of diabetic patients every year so as to get a clear idea regarding how many people in a year are found to be diabetic. Free yoga and meditation centre in every health department should be maintained for the proper management of diabetes and diabetes related complications. Intake of nutritious or low glycemic index food should be consumed every day to reduce the risk of getting diabetes. Dr. Biswaroop Roy Chowdhury (nutritionist) in his 3 days tour study reported that the diet in the form of plant source like fruits and raw vegetables have shown to reduce both fasting and postprandial blood glucose levels. This diet form was suitably considered effective for the patients with both, Type 1 and Type 2 diabetes.[34] In 2014, Government of India, keeping in view the differences in national and international guidelines for diagnosis of GDM recommended the universal screening program for all Indian pregnant women following one step procedure of using 2 hours 75 gm OGTT irrespective of their last meal twice during their entire antenatal period of pregnancy.[35] This program should be strictly implemented in all the Government Hospitals to rule out the suffering of Type II diabetes/pre-GDM in pregnant women.

Conclusion

The social and health care facility burden for diabetes is growing in many parts of Indian country. The increase in the population with occurrence of the diseases and its complications in the young generation is considered as the point of significant concern for the country. The rise in urbanization, modernization, eating of junk food and poor sedentary practices has completely changed the life-style of Indian population, mostly the youths. The health related complications are gaining more importance in India due to the strong genetic predisposition factors, gestational diabetes, obesity, hypertension and stress, cardiovascular diseases and diabetes. The pattern of current life style in adults as well as the young people will implement the clinical utterance of the diseases in the country. Prevention or modifying the risk factors associated with diabetes such as obesity, hypertension, smoking and alcohol consumption and so many can at least reduce the risk of getting diabetes for the upcoming generation and can also help in controlling the blood glucose levels in the present generation.

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