REVIEW

Diabetes in South Asians: Etiology and the Complexities of Care

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ABSTRACT

Fifteen to twenty percent of South Asians will develop type 2 diabetes mellitus. This extremely high prevalence of diabetes is seen in both South Asians living in developed countries and in South Asians who are living in either urban or rural South Asia. South Asians have a tendency to develop metabolically active abdominal fat, resulting in a high risk of diabetes even at a low body mass index. They are also particularly vulnerable to microvascular and macrovascular diabetic complications, including renal and cardiac disease. The high prevalence of diabetes in South Asians is likely due to a combination of biological and cultural factors. Targeting these factors is an effective way to provide education, prevention, screening, and treatment to South Asians. Culturally-focused community programs and interprofessional care teams are two health care paradigms that have been successful in helping these individuals manage this chronic illness. Continuing culturally-targeted care and education programs is necessary to reduce the prevalence and complications of diabetes in South Asian communities.

KEYWORDS: *diabetes mellitus, type 2, patient care team, culture, asia*

INTRODUCTION

Diabetes mellitus is a global epidemic affecting approximately 285 million people worldwide, a number that will likely increase to 439 million by 2030.[1] It is a chronic illness that can result in serious complications including coronary artery disease, nephropathy, neuropathy, and retinopathy over time. Diabetes mellitus also has a tremendous impact on economies. For example, in 2007, it was estimated that diabetes alone cost the United States $116 billion in medical costs and $58 billion in lost national productivity.[2]

There are two forms of diabetes mellitus. Type 1 diabetes, which is primarily due to β-cell destruction, has either an autoimmune or idiopathic etiology.[3] Type 2 diabetes is the more common variant, and can result from either an insulin secretion defect or insulin insensitivity.[3] This article will discuss only type 2 diabetes, which accounts for approximately 97% of cases of diabetes mellitus.[4]

South Asians, including Bangladeshis, Indians, Pakistanis, and Sri Lankans, are particularly vulnerable to diabetes. Although diabetes occurrence rates differ across South Asian ethnicities, all exhibit higher prevalence than is seen in Caucasians.[5] Approximately 15-20% of South Asians will develop diabetes compared to 2-5% of Caucasians.[6-8] This increased prevalence is seen in both South Asians who have migrated to the Western world and South Asians living in either rural or urban South Asia.[6,9-11] Studies also suggest that the prevalence of diabetes in the South Asian population is on the rise and that it is also being diagnosed at a younger age.[11, 12]

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Risk Factors

The high prevalence of diabetes in South Asians is associated with certain metabolic risk factors in this population. Compared to Caucasian children, South Asian children have been shown to have increased plasma insulin in the setting of normal plasma glucose levels, an early sign of insulin insensitivity.[13,14]

As adults, South Asians continue to be at higher risk for insulin insensitivity, as well as other diabetes-associated risk factors including increased visceral adiposity, or intra-abdominal fat, which is metabolically active and strongly linked to insulin resistance.[15,16] Increased metabolically active intra-abdominal fat causes the Body Mass Index (BMI) risk criteria for Caucasians to be too lenient for South Asians because they have a higher ratio of metabolically active intra-abdominal fat to total body fat.[16] South Asians also have an increased waist-to-hip ratio and increased skinfold (suprascapular and subiliac) thickness, both of which are risk factors for diabetes.[5,15]

Complications

South Asians are also at increased risk of developing both macrovascular and microvascular complications related to diabetes.[7,17] Development of secondary complications may be attributed to the early age of diabetes onset, resulting in prolonged

exposure of body organs and tissues to high blood glucose levels.[12] In addition to being more susceptible to diabetes, South Asians also suffer from a higher prevalence of ischemic cardiovascular disease.[9,18] It has been theorized that increased insulin resistance increases the risk of thrombosis, which in turn increases the likelihood of developing coronary artery disease leading to ischemic cardiovascular disease.[18,19]

ETIOLOGY

Genetic and Environment

The reason South Asians are more susceptible to diabetes remains unclear. Two leading theories explaining this increased susceptibility are the thrifty phenotype and thrifty genotype hypotheses. Low birth weight plays a role in both theories, and studies have shown South Asians tend to have lower birth weight than Caucasians, predisposing South Asian infants to metabolic abnormalities.[20,21] Lower birth weight is also associated with an increased risk of cardiovascular events, which are also more common in South Asians.[22]

Hales and Barker postulate that lower birth weight relates to type 2 diabetes with their thrifty phenotype hypothesis, which attributes the vulnerability to diabetes to environmental factors in the womb rather than genetic characteristics in the fetus.[20] They suggest that nutritional deficiencies in utero, which result in lower birth weight, may also lead to reduced β-cell mass or impaired β-cell function. These atypical β-cells may be unable to produce sufficient insulin throughout the individual's life, resulting in overt diabetes when β-cell insulin secretion is unable to compensate for increased metabolic demand.[20]

The thrifty genotype hypothesis is an alternative theory, involving genetic abnormalities, which relates low birth weight to adult diabetes. This hypothesis suggests that low nutrient conditions in-utero result in selective survival of infants who have insulin insensitivity allowing for efficient intake and utilization of nutrients.[21,23] This genotype is beneficial in a low calorie environment, but may increase vulnerability to diabetes in an environment with an abundance of calories, as is found in most of the developed world.[21,23] Both of these hypotheses suggest further studies need to be conducted to examine whether South Asians are receiving insufficient nutrients in-utero and how this correlates with susceptibility to diabetes.

The high prevalence of diabetes in South Asian populations suggests they may carry genetic polymorphisms that increase their susceptibility to diabetes. The PC-1 K121Q polymorphism of the ENPP1 gene and non-coding variants of the TCF7L2 gene have been found to increase the vulnerability of both South Asians and Caucasians to diabetes.[24,25] However, due to the small sample sizes in these studies, additional studies must be conducted to test the validity of linking these polymorphisms to increased diabetic susceptibility and to determine if polymorphisms are responsible for the increased vulnerability seen in South Asians.

Cultural

Culture is an amalgamation of behaviors, ideas, attitudes, values, habits, beliefs, customs, language, rituals, and ceremonies.[26] A community's culture provides the structure and design for how individuals live their lives and interpret reality, including their own health. South Asians are a linguistically and religiously diverse population whose behavior is strongly influenced by cultural values.[27,28] Unfortunately, some aspects of this culture have resulted in an increase in the risk of diabetes in an already biologically vulnerable population.

For example, the South Asian diet is rich in fats, sugars, and deep fried foods, which are major contributors to the increased risk of diabetes in this population.[27,29,30] Food plays an important social role for South Asians, and South Asians who are diabetic agree that changing their traditional diet is the most difficult aspect of their care regimen.[28-30] As a result, compliance with reduced sugar and caloric diets tends to be poor.[29,30] Additionally, misconceptions about certain foods, such as "ghor", or brown sugar, being a 'natural' source of sugar and therefore a healthy dietary supplement further exacerbate problems in managing blood glucose levels.[31]

Many societal and religious practices also act as obstacles to effectively manage diabetes in South Asians. For example, strong religious beliefs cause many individuals to develop apathy towards the management of their disease because they feel their illness is 'God's will'. These individuals believe they do not have to treat their diabetes because a higher power will look after them.[27,29,32] Some communities have been known to encourage obesity as it is a sign of wealth, prosperity, and good health.[27,32] During specific holidays and festivals, certain South Asian groups practice fasting and pilgrimages followed by massive feasts. These activities often lead to extreme changes in blood glucose levels and complicate diabetes management.[33]

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APPROACH TO MANAGEMENT

Prevention and effective management of the disease are of paramount importance in helping patients lead productive lives without the adverse consequences of diabetes. Preventing obesity and increasing physical activity are of particular importance in South Asians due to their increased insulin insensitivity and additional type 2 diabetes risk factors. The earlier onset of diabetes, increased risk of diabetic complications, and the higher likelihood of developing metabolic syndrome suggest that early diabetic screening of South Asians is essential.[13,34] In addition, further research is required to develop the appropriate pharmacological approach to managing South Asians as it has been shown that their blood glucose levels are difficult to control with conventional treatment.[35]

Several national bodies, including Health Canada and the Canadian Diabetes Association, have drafted recommendations to improve the health outcomes for South Asian diabetics.[36,37]

It is strongly encouraged that Asian-specific BMI and waist circumference (WC) cutoffs should be used to evaluate diabetes risk.[38,39] South Asian individuals with a BMI ≥22, or a WC ≥80cm for women and ≥90cm for men should be considered "at risk" for diabetes.[38,40]

Culturally Targeted Community Programs

To address the unique needs and complex interplay of culture and genetic predisposition in South Asians, community-based diabetes prevention and management programs should be developed in partnership with the South Asian communities.

For the many distinct South Asian communities, a major barrier to appropriate diabetes screening, care, and education, is a lack of knowledge and understanding of the disease.[29,30,43] Many members of these communities do not regard diabetes as a "serious" disease, and because of health literacy issues and poor English skills, this has proven a difficult attitude to change.[29,30,44] As a consequence, some communities have developed a poor understanding of the link between diabetes and lifestyle factors such as diet and exercise.

Education is an invaluable tool in helping manage diabetes in a population because it can empower patients to improve control of their blood glucose, which in turn reduces their risk of diabetic complications.[45,46] It has been shown that high risk ethnic groups are more likely to participate in diabetes education if the information is presented in a culturally sensitive manner.[41,47] Education sessions are better received if they take place in an informal, relaxed, community environment that allows participants to freely explore topics and questions.[44] A strong understanding of South Asian culture must be the foundation upon which new diabetes programs, policies, and strategies are built. The incorporation of familiar music, clothing, and language has been shown to be effective in educating minorities with respect to health issues.[26] Effective programs have been developed with a strong visual focus as well as with the incorporation of recipes and samples of healthy versions of traditional foods.[48] The use of diabetes awareness days, cooking events, guided shopping, and educational plays have proved to be effective means for providing information to people who would otherwise have difficulty accessing it.[48] It is essential that lifestyle changes not just be conveyed to individuals but rather these practices and healthy habits be embraced by the community as a whole.[31]

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Interprofessional Care Teams

When attempting to control their blood glucose levels, many patients benefit from the support of interprofessional Diabetes Health Care (DHC) teams.[49-51] At the core of DHC teams are primary care physicians, nurses, and dieticians, and as needed, teams are supported by endocrinologists, social workers, pharmacists, exercise physiologists, ophthalmologists, nephrologists, and podiatrists.[52,53] Education and support through DHC teams has been shown to decrease hemoglobin A1c and cholesterol levels.[54-56] Long-term studies of interpofessional management have shown a reduction in the number of lower limb amputations and a decrease in mortality due to chronic kidney disease.[57,58] Not only is patient self-reported happiness higher with DHC team care, but such integrated programs also have the potential to decrease health care costs.[52,59]

CONCLUSION

Type 2 diabetes is a serious chronic health concern for South Asians. The increased risk of diabetes may be associated with several factors, including genetic predisposition, in-utero metabolic factors, and cultural practices. In light of this increased risk, it is important to provide an interprofessional approach to management. This may include sufficient education that takes into consideration cultural practices and development of a therapeutic plan.

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