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## Overview of type 2 diabetes in Hispanic Americans

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### Abstract

Diabetes mellitus continues to be a heavy burden on health and health resources throughout the world. In the USA the burden is borne disproportionately by ethnic minorities such as Hispanics. Therefore health education for Hispanics is important and it can help reduce the incidence of diabetes among Hispanics in the USA.

### Keywords

diabetes mellitus; prevention of diabetes; diabetes education; Hispanics in the USA

### Background

Irrespective of age, culture and gender, diabetes mellitus (DM) is one of the most chronic debilitating medical diseases plaguing our world today. As of 2005, it was estimated that approximately 220 million people worldwide had DM [1]. In the United States, DM is one of the major causes of morbidity and mortality and there has been a continuous rise over the years with 104% increase between 1980 and 2004 [2] and approximately 23.6 million people have DM [3]. However, this figure is disproportionately distributed among different ethnic groups within the United States.

### Hispanics in the United States

Hispanic ethnicity is one of the fastest growing ethnicities in the USA. As of 2006, it was estimated that there were 44.3 million Hispanics living in the USA. [4]. Of these, 66% are Mexican American and 9% are Puerto Rican [5]. An estimated 2.5 million Hispanic Americans aged 20 years and above have been diagnosed with DM [6]. Between 2004 to 2006, data from different ethnic populations within the USA from ages 20 years and older indicate that 6.6 percent of non-Hispanic whites, 7.5 percent of Asian Americans, 10.4 percent of Hispanics, and 11.8 percent of non-Hispanic blacks had been diagnosed with DM [3]. In 2007, an estimated 1.6 million new cases of diabetes were diagnosed in people 20 years and older in the USA.

Type 2 Diabetes (non-insulin-dependent diabetes mellitus, NIDDM) is highly prevalent among Hispanics [7] and it is the fifth cause of death among Hispanics [8]. Several risk factors have been implicated in type 2 DM including: age [7] obesity [9], ethnicity [7],

family history [7] and dyslipidemia [9]. In the state of California, there are approximately 2 million diabetics and this is expected to increase to 4 million by 2020. The state of California is one of the regions with the highest number of Hispanics/Latinos with a statewide diabetes prevalence of 6.22% [10].

## Financial burden

Because DM is a serious medical condition, it poses serious health concerns for individuals, families, health professionals and the government. In 2007, an estimated 17.5 million people in the USA were diagnosed with DM [11]. DM is the seventh leading cause of death in the USA [7], the leading cause of blindness between the ages 20 and 74 and of end-stage renal disease (ESRD) [3].

The financial burden of DM is alarming and increasing. Most of the reasons for this high burden have been attributed to the fact that diabetics are at a higher risk for health complications including cardiovascular disease [3] than their non-diabetic counterpart. While a non-diabetic patient may never visit the hospital in a given year, diabetics must visit the hospital for regular check-ups [12].

The cost of health care for diabetics has been categorized into: (a) direct costs which include physicians, laboratory tests, prescription drugs, and nursing care, while (b) indirect costs include loss of productivity due to mortality and morbidity [12].

In 1980, it was estimated that the cost of diabetes burden was between \$14 billion and \$20 billion. Of which, \$7.6–11.6 billion was due to direct costs and \$6.3 –\$10.8 billion was due to indirect costs [12]. In 2002, the financial burden of DM was \$132 billion (92 billion for direct costs and \$40 billion for indirect costs) [11]. As of 2007, it was estimated that the cost of diabetes in the USA was \$174 billion (\$116 billion accounted for direct costs and indirect costs accounted for \$58 [3]. A breakdown of this figure showed that over 50% of the total cost accounted for inpatient care, 12% for diabetes medication, 11% for retail prescriptions needed to treat diabetes complications and 9% was attributed to visits to physicians [11]. In addition, medical expenses for people with diabetes are approximately 2.3 times higher than those without diabetes [11]. Furthermore, absenteeism from work is higher among diabetics than non diabetics [13,14]. The absenteeism from work accounted for approximately \$15 million for diabetics in 2007 [11].

Diabetes Mellitus counted for over 280 000 deaths in 2007. This figure translates to \$26 million in terms of lost productivity due to premature death [11]. Data indicate that for every \$5 for health care, \$1 is spent to care for a diabetic patient [11]. According to American Diabetes Association [11], factors responsible for the increasing financial burden of diabetes as reflected in 2007 include: the rising prevalence of diabetes, the rising cost of medical care and improved method of data collection to estimate the financial burden.

## Complications

### Diabetic retinopathy

This is one of the leading causes of blindness between ages 20 and 74 and it correlates with duration of illness. Usually a progressive process, it begins from a simple non-proliferative disorder due to increased vascular permeability to a more complicated proliferative disorder characterized by presence of new vessels in the retina [15]. In a study conducted by Lee et al. [16] on racial and ethnic differences in diabetes and health care costs, Hispanics were more likely to suffer eye problems than whites (odds ratio, 1.56; 95% confidence interval [CI], 1.03–2.56).

Similarly, a multi-cohort study on diabetic retinopathy reported that the prevalence of diabetic retinopathy and macular edema were significantly higher in blacks (36.7% and 11.1%) and Hispanics (37.4% and 10.7%) than in whites (24.8% and 2.7%) and Chinese (25.7% and 8.9%) respectively [17]. Furthermore, a study conducted on 6357 Hispanics with DM concluded that diabetic retinopathy is higher among Latinos of primarily Mexican ancestry [14].

Emmanuele et al. [19] in the Veteran Affairs Diabetes Trial (VADT), conducted a cross sectional analyses at baseline of seven-field stereo fundus photos of 1,283 patients with DM. They concluded that the prevalence of diabetic retinopathy scores (greater than 40) was higher among Hispanics (36%) and African Americans (29%) than non-Hispanic whites (22%).

### **Diabetic nephropathy/end stage renal disease (ESRD)**

Diabetes is the leading cause of ESRD and this figure is higher in Hispanics with type 2 diabetes (NIDDM) than other ethnicities [20]. In a population-based multiethnic incidence cohort assembled from all dialysis centers in Bexar (San Antonio) and Dallas counties in Texas for three-four years reported that NIDDM causes ESRD; 59.5% for non-Hispanic whites, 92.8% for Mexican-Americans, and 84.3% for African-Americans. Mexican-Americans and African-Americans, respectively, have 6.1 and 6.5 times higher incidence of treatment for diabetic ESRD than non-Hispanic whites [20]. They also reported that type 2 diabetes (NIDDM) was likely to lead to ESRD than insulin-dependent diabetes mellitus type 1 [20].

Similarly, Peralta et al. [21] examined the associations between Hispanic ethnicity and chronic kidney disease (CKD), risks for ESRD, cardiovascular events, and death. A total of 39 550 patients with stages 3 to 4 CKD from Kaiser Permanente of Northern California were recruited for the study. They concluded that Hispanics were at a higher risk for ESRD (hazard ratio [HR] 1.93; [CI] 1.72 to 2.17) when compared with non-Hispanic white patients. Ironically, they also reported that Hispanics with CKD are associated with lower rates of death and cardiovascular events but a higher rate of progression to ESRD.

### **Diabetic foot syndrome**

DM is the single most common chronic disease responsible for lower-extremity amputation in the USA and Europe [22–24]. Diabetic foot syndrome includes: peripheral sensory neuropathy, peripheral vascular disease, ulceration, Charcot arthropathy, and infection which contribute to lower-extremity amputation [25–26].

Due to inability to feel pain and sensation, diabetics are prone to injuries which lead to ulcers and ultimately (if not treated promptly) to gangrene and amputation. A study conducted by Lavery et al. [27] examined the clinical outcomes of 1666 patients enrolled in a disease management program for a period of 24 months (50.3% men, aged  $69.1 \pm 11.1$  years). The results showed that the incidence of gangrene and amputation was higher in Mexican Americans than in non-Hispanic whites (7.4/1000 vs. 4.1/1000;  $P = 0.003$ ) respectively. The amputation-to-ulcer ratio was 8.7%. The incidence of Charcot arthropathy was 8.5/1000 per year.

In addition, it has been reported that the incidence of lower-extremity amputation increases with age [28]. Data indicate that in Mexican and African American communities, 75–83% of all amputations occur in those diagnosed with DM [29,30].

Several reasons have been given for the higher of amputation in Hispanic diabetics. These include: access to specialty medical care, patient education, self-care practices, patient compliance, disease severity, or cultural issues [27].

### **Gestational diabetes (GDM)**

GDM 'is carbohydrate intolerance with onset or first recognition during pregnancy' [31,32]. This definition excludes pregnant women who have been previously diagnosed with DM. Approximately 135 000 women every year are diagnosed with GDM in the USA [33]. Risk factors for GDM include: obesity, age greater than 25 years, previous history of abnormal glucose metabolism or poor obstetric outcome, first-degree relatives with diabetes, or members of ethnic groups with high prevalence of diabetes [34]. Many obstetric complications arise from GDM, such as fetal macrosomia [35], birth weight greater than 4500g, which can lead to birth injuries [36–37] and increased risk of prematurity which in turn increases the risk of hyperbilirubinemia, hypocalcaemia, and respiratory distress [38].

Data indicate that infants of women with GDM are at higher risk of developing obesity, impaired glucose tolerance (IGT), or diabetes at an early age [39–41]. Furthermore, after a pregnancy with GDM, the mother has an increased risk of developing type 2 diabetes [35].

Hispanic women are at a greater risk for GDM than other ethnicities. A study on pregnant women between 15–54 years with singleton pregnancy from 1991 to 2003 from Los Angeles County, reported that Hispanic women were at a greater risk for GDM compared to other ethnicities [41].

### **Diabetes and depression**

The relationship between diabetes and depression (both chronic diseases) has been documented. Depression has been linked to abnormal physiology due to the activation of the hypothalamic-pituitary-adrenal axis and the release of pro-inflammatory cytokines which leads to insulin resistance and increases the risk of diabetes [43]. Conversely, diabetes increases risk of depression because of its chronic nature and the huge lifestyle modification needed to prevent complications. Data suggest that 'late-life depression is associated with a history of vascular disease, including diabetes' [44].

In a meta analysis conducted by Mezuk et al. [45] using publications from 1950 through 2007 to establish the relationship between depression and type 2 Diabetes, seven of the 42 full-text publications reviewed met the criteria for diabetes predicting onset of depression, while 13 met eligibility for depression predicting onset of diabetes. They reported that the pooled relative risk (RR) for incident depression associated with baseline diabetes was 1.15 (95% C.I 1.02–1.30) and the RR for incident diabetes associated with baseline depression was 1.60 (1.37–1.88). They concluded that depression is associated with a 60% increased risk for type 2 diabetes while type 2 diabetes is associated with only a modest increased risk of depression. These findings are also consistent with the study conducted by Knol et al. [46] in establishing the relationship between diabetes and depression.

Hispanics with type 2 diabetes have a risk of depression compared to other ethnic groups [47]. In a bi-national study that examined the prevalence and correlates of clinical depressive symptoms in Hispanics of Mexican origin with type 2 diabetes living on both sides of the Texas-Mexico border, Meir et al. [47] reported that the rate of clinical depressive symptoms was similar in both South Texas and Northeastern Mexico patients (39% and 40.5%, respectively). However, they reported that gender, education, emergency department visits, and burden of diabetes symptoms were predictors of clinical depressive symptoms in the South Texas sample. However, for respondents in the Northeastern Mexico sample, the only statistically significant correlate to clinical depressive symptoms was the

burden of diabetes symptoms. Thus, Mier et al. [47] concluded that depression is an important aspect that must be addressed in diabetes initiatives at the US-Mexico border region.

## Recommendations

Overall, the cost of treating DM and diabetes-related complications far outweighs the cost of prevention. Studies have shown the importance of health education in reducing the incidence of diabetes while slowing the progression of diabetes-related complications [48]. In order to reduce the use of tax payer dollars for the treatment of diabetes, drastic preventive measures have to be taken to prevent diabetes. The following are recommended:

### Food choices

It is important to make healthy food choices. This translates to the importance of health education to the public, in schools, at work places, gymnasias and the media. People should be educated on how to read food labels and in selecting food portion sizes to ensure a complete and balanced diet.

### Physical activity

Patients with type 2 DM are usually obese. Obesity fosters insulin resistance. When people exercise, they increase glucose uptake by muscles and adipocytes, thus reducing plasma glucose. When diabetics exercise, they achieve better glycemic control and better health outcome [48]. Weight control thus becomes very important. In addition, diabetics should avoid snacks with high caloric content (eg 1 can of cola contains approximately 152 kcal, chocolate chip cookie contains approximately 69 kcal, potato chips barbecue flavor 1oz contains approximately 139 kcal, and chocolate ice cream [1 ½ cups] contains 11 teaspoons of sugar).

### Health education

Several studies have corroborated the importance of health education in reducing complications of diabetes especially certain ethnicities that are at increased risk of diabetes. Health education given to Hispanic participants with type 2 diabetes significantly improved blood glucose control and health outcomes [49–51].

### Preventive care practices

The statement ‘prevention is better than cure’ is so particularly true with respect to DM given the health complications associated with it. When people are educated on the health effects related to DM, they take positive steps to be healthy. Primary prevention remains one of the most effective ways of preventing DM because it promotes regular screening which in turn can prevent disease or slow the progression of a disease process. This not only reduces morbidity and mortality but also reduces the cost of health care. This also further suggests the need for primary care physicians and public health professionals in reducing the epidemic of DM. Furthermore, people with diabetics should regularly check their lipid profiles, eye exams, kidney function and foot care.

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