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Revisión

Type 2 Diabetes in the Latino Population in the U.S.: a growing challenge

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Abstract

The Latino or Hispanic group in the United States of America has become the largest minority in the country, representing 13.7% of the total population. It is estimated that by the year 2050, 1 in 4 individuals will belong to this group. This population suffers from very high rates of type 2 diabetes, obesity, the metabolic syndrome, and their multiple vascular complications. Generally speaking, there is a genetic tendency to develop insulin resistance, abdominal obesity and beta cell dysfunction that in combination with multiple nutritional, life-style, socio-economic and cultural factors influence the development and course of type 2 diabetes in this high-risk group. Unfortunately, Latinos have lagged behind in their health care in the U.S. when compared to the mainstream white population. There are multiple and complex patient, health care provider and health care system factors that contribute to this health care disparity. Therefore, it is imperative to understand all the factors that contribute to the high rates of type 2 diabetes and suboptimal diabetes care in this group to develop and implement effective strategies to help this population. The gained experience through the work with this population may be helpful for the development of diabetes care programs in other parts of the world that aim at improving the care of underserved and disadvantaged populations.

Keywords: Latino, Hispanic, diabetes, culture, disparities.

Introduction

The Latino or Hispanic population in the United States of America represents the largest minority group, accounting for 13.7% of the total U.S. population.[1] Their growth rate is approximately 5.7% per year, the highest among all ethnic groups. It is estimated that by the year 2050, 1 in 4 people will be of Hispanic/Latino origin in this country.[1,2] This group develops type 2 diabetes twice as frequently as non-Hispanic Whites (NHW). Furthermore, they also have high rates of obesity, metabolic syndrome and diabetes related chronic complications, many of which lead to increased mortality rates.[3-6] Recent date show that approximately 45% of new cases of diabetes among Latinos between the age of 10 and 19 correspond to type 2 diabetes. The corresponding figure is about 18% for the NHW population.[7] In addition to the high rates of type 2 diabetes and diabetes related complications in this group, suboptimal diabetes care in this group is the norm, even more so than that in the general population that can also be considered far from ideal. The Institute of Medicine, a private, nonprofit organization that provides health policy advise under a congressional charter granted to the National Academy of Sciences, reported that clear health care disparities exist when comparing a large number of outcomes, including some related to diabetes care between the White population and Minority groups, including Hispanics or Latinos.[8] These disparities exist even after controlling for health care access and suggest that other factors determine these differences. Some of these factors are related to the population itself, and others are linked to the health care providers and our constantly evolving health care system (table 1).

As we collectively work throughout the world towards improving diabetes care in all populations, regardless of skin color and race, understanding particular diabetes related characteristics in disadvantaged groups, such as the Latino population, may allow us to better serve this

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List of abbreviations:

BRFSS: Behavioral Risk Factor Surveillance System; IFG: impaired fasting glucose; IGT: impaired glucose tolerance; MA: Mexican Americans; NHANES: National Health and Nutrition Examination Survey; NHW: non-Hispanic Whites; WHO: World Health Organization.

Table 1. Proposed model to explain health care disparities in diabetes care in the Latino population

- The Patient:
  - Medical, Personal
  - Socio-economic
  - Cultural factors
- The Health Care Provider:
  - Professional Education in Diabetes Care
  - Socio-cultural self-awareness
  - Understanding of Personal and Patient Factors
- The Health Care System. Insufficient:
  - Time to interact with patients
  - Human Resources
  - Financial Support
  - Access to Health Care
  - Cost-effective clinical care and education strategies

Three main factors contribute to a suboptimal quality of diabetes care in this population: many aspects related to the patient, those related to the health care provider and others related to the structure of our current health care system. Challenges and Opportunities can be identified in each of these components. Collective efforts at all these fronts may allow us to better serve this community and many others.

group and recognize effective treatment and prevention strategies that may be applicable to others. This manuscript describes the Latino or Hispanic population in the U.S., our current understanding of how type 2 diabetes develops and affects this group and identifies the multiple challenges and opportunities to improve diabetes care in this rapidly growing group, particularly through our work in the Latino Diabetes Initiative at the Joslin Diabetes Center, Harvard Medical School in Boston, Massachusetts, USA.

The Latino or Hispanic Population

The terms Hispanic and Latino are often used interchangeably in the medical literature but are not identical. The term "Hispanic" derives from the Latin word for "Spain"[9] It refers to people born in a country that was "conquered" by Spaniards, mostly during the 16th century and for whom Spanish is their primary language. This term applies to most countries in Latin America, except Brazil, for instance, that was under the influence of Portugal and for whom Portuguese is the primary language. Strictly speaking, there are still some Native Indian groups in various countries in Latin America who were not «conquered» by Spaniards. They have kept their own roots, traditions, language and beliefs for hundreds of years and therefore, are not Hispanic. On the other hand, "Latino" is a broader term that refers to people born in a country whose language has evolved from Latin (Romance languages).[9] This term applies to all countries in Latin America and even some in Europe such as Italy, Spain and France. In most cases, both terms refer to people having their roots in a Latin American country. In this manuscript, both terms will be used interchangeably.

From a racial perspective, there are three possible backgrounds among Latinos or Hispanics: White, Black and/or Native Indian. Any one of these races or their combinations can be found in this group and speak to the wide genetic heterogeneity among Latino subgroups.

The largest Hispanic subgroups in the country are Mexicans (66.9%), Central/South Americans (14.3%), Puerto Ricans (8.6%), Cubans (3.6%) and others (6.5%). It is estimated that two in five Latinos are foreign born.[1,2,10] Hispanics are more likely than NHW to live inside central cities of metropolitan areas, particularly in the South Central and Southwestern United States, but their number is rapidly growing in many of the States in the North and Northeast. The median age in Hispanics is 26.7 years, contrasting with 39.6 years in NHW. Approximately one third of Hispanics are under the age of 18, and slightly above 10% under age 5, representing the youngest population in the U.S.[10] There are some clear indicators of socio-economic disadvantages among Latinos. It is estimated that only about 22.5% of Hispanics earn more than 35,000 USD per year, only 57% are high school graduates and only 67.6% have health care insurance coverage.[10]

Type 2 Diabetes in Latinos/Hispanics

Epidemiology

Type 2 but not type 1 diabetes has been consistently found to be higher among Latinos/Hispanics when compared to NHW. The prevalence of diabetes in Hispanics is twice as high as in NHW, as reported by the National Health and Nutrition Examination Survey (NHANES), conducted by the National Center for Health Statistics of the Centers for Disease Control and Prevention, for the period of 1988-1994 and recently confirmed for the period of 1999-2002.[3,4] The age and sex standardized prevalence of diagnosed diabetes in Mexican Americans (MA) was 10.4%, whereas in was 5.2% in NHW.[4] The

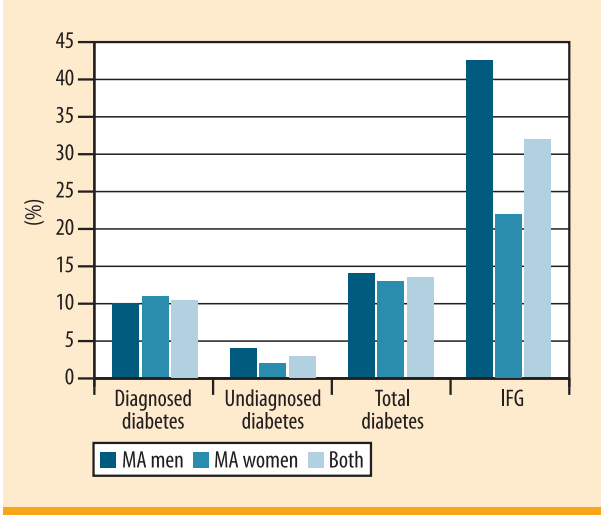

Figure 1. Prevalence of diagnosed, undiagnosed, total diabetes and impaired fasting glucose in adults aged ≥20 years in Mexican American men, women and both groups. Prevalence rates have been standardized to the 2,000 U.S. census population by age, sex and race/ethnicity. Created from reference # 4

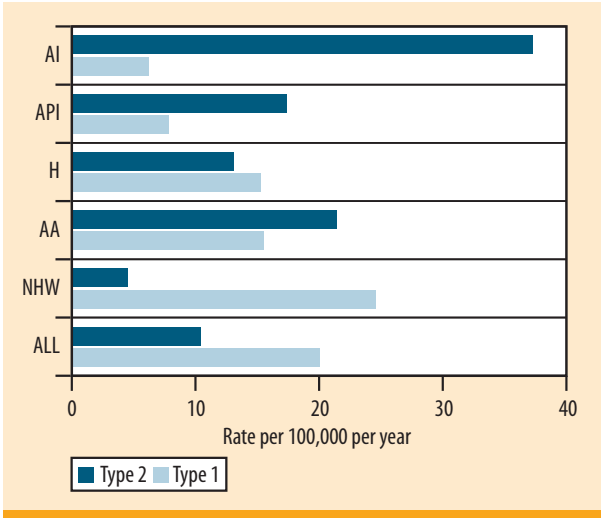

Figure 2. Rate of new cases of type 1 and type 2 diabetes among youth aged <20 years, by race/ethnicity, 2002-2003. NHW= Non-Hispanic whites; AA= African Americans; H= Hispanics; API= Asian/ Pacific Islanders; AI= American Indians. Created from reference # 7

standardized prevalence of undiagnosed diabetes among MA was 3% in the same study.[4] Therefore, a good estimate of the prevalence of total diabetes in adult MA is approximately 13.4% (figure 1). In practically every age group, the prevalence of diagnosed diabetes is higher in Hispanics than in NHW. The proportion of the MA population with diagnosed diabetes rises from 1.3 % for those younger than 39 years to as high as almost 25% for people ages 60 to 74, with a very similar overall rate for men and women (9.9 and 11 %, respectively).[4]

Similar diabetes prevalence data were found in the Behavioral Risk Factor Surveillance System (BRFSS) surveys in six geographical areas in the United States (California, Florida, Illinois, Arizona, New York/ New Jersey, and Texas).[5] The age-adjusted self-reported diabetes prevalence among Hispanics was 9.8%, whereas it was 5% in NHW. The prevalence of diabetes in Hispanic men and women was again, very similar. The six geographical areas included in this survey comprise 84% of all the U.S. Hispanic population. Whereas the NHANES study included primarily Mexican Americans, the BRFSS assessed a more heterogeneous group of Hispanics in the country.

Unfortunately, the rates of type 2 diabetes are also increasing among Latino children and adolescents (figure 2).[7,11] The Centers for Disease Control has recently estimated that the lifetime risk of developing diabetes for a Hispanic child born in 2000 is 45.4% for a man and 52.5% for a woman.[12]

Main Categories at risk for type 2 diabetes

IGT/IFG

The standardized prevalence of impaired fasting glucose (IFG) was recently estimated at 31.6% for the MA group and 26.1% for the NHW population.[4] MA men had twice as high rates of IFG in comparison to MA women (42.2 vs. 21.2%) (figure 1).[4] The prevalence of impaired glucose tolerance (IGT), according to the 1980 to 1985 World Health Organization (WHO) criteria, was 20.2% for Hispanics and 15.3% for NHW in the NHANES III study[3] IGT rates were not assessed in the most recent report.[4]

Gestational Diabetes

The prevalence of gestational diabetes in Hispanics is two to three times higher than in the general population.[13] Approximately 12% of MA women with gestational diabetes progress to type 2 diabetes each year according to a study conducted in Southern California. This figure is approximately four times higher than that in the White population.[14] In a more recent prospective, population-based cohort study, 42% of Latina women were overweight or obese when entering pregnancy.

Twenty seven percent had some degree of glucose abnormality and 6.8% had gestational diabetes.[15]

Overweight/Obesity/Metabolic Syndrome

The age-adjusted prevalence of combined overweight and obesity (body mass index >25) in MAs above the age of 20 was 65.9% in women and 63.9% in men in the NHANES III.[16] This figure is higher than in NHWs. An alarming increase in the prevalence of overweight in Hispanic youth has also been appreciated.[17] The age-adjusted prevalence of the metabolic syndrome, according to the National Cholesterol Education Panel criteria, in the Hispanic population in the United States is 31.9%, the highest among all studied groups.[18]

Thus, not only is the prevalence of type 2 diabetes alarmingly high in Hispanics, but also that of various categories at risk for type 2 diabetes, imposing a high risk for the development of cardiovascular disease.

The development of Type 2 diabetes: Genes or Culture?

Biological Factors

Type 2 diabetes is a heterogeneous disease that results from the combination of a genetic predisposition and environmental factors. The «thrifty gene» hypothesis has emerged as a possible explanation for the increased genetic tendency to type 2 diabetes among some minority groups, including Latinos. This theory, first proposed in 1962, suggests that populations of indigenous people who experienced alternating periods of feast and famine gradually adapted by developing a way to store fat more efficiently during periods of plenty to better survive famine. However, this genetic adaptation has now become detrimental since food supplies are more constant and abundant, leading to an increased prevalence of obesity and type 2 diabetes in certain populations.[19] This genetic tendency to type 2 diabetes may be related to the frequent development of obesity and insulin resistance among some racial/ethnic groups.[20] In fact, Hispanics have been found to be more insulin resistant than their White counterparts.[21,22] This pattern was also found in apparently healthy young MA (as well as African-Americans and Asian-Americans), suggesting that genetic factors truly influence insulin sensitivity.[23] A higher level of insulin resistance has also been appreciated in Hispanic American (and African American) children than in NHW children, even after adjustment for differences in body fat.[24] The precise nature of the genetic factors leading to insulin resistance in Latinos is far from clear. In general, it is believed that a reduction in the expression of genes of oxidative metabolism is an important abnormality not only in those with diabetes, both also in people at risk for the disease.[25]

In addition, Latinos have a tendency to develop abdominal obesity, an important determinant of insulin resistance, insulin secretion, endothelial dysfunction and vascular inflammation.[26,27] It seems that some specific genetic factors may directly influence fat deposition and body size in some groups.[28]

Ultimately, beta cell dysfunction is required for the development of type 2 diabetes. At this point, it is uncertain whether a particular defect in beta cell function exists in Hispanics/Latinos. As in other groups, an initial robust increase in insulin production serves as a compensatory mechanism to insulin resistance, but in a subgroup of people, beta cell function is not able to permanently compensate and hyperglycemia ensues.[22,29]

Further research is required to fully understand the nature of the genetic defects that lead to insulin resistance, beta cell dysfunction and adiposity in Latinos. It will also be of crucial importance to study the distinct Hispanic subgroups as biological abnormalities may vary among them.

Lifestyle/Social/Cultural Factors

Lifestyle may ultimately determine the full expression of multiple genes.[30] A healthy diet is inversely associated with the development of type 2 diabetes.[31] This association seems to be even stronger in genetically predisposed individuals as in the Latino population.[32] Although there is a wide variation in food preferences among Hispanic subgroups, the consumption of carbohydrate and saturated fat-rich foods is very common.[33] Interestingly, some traditional Hispanic foods (*eg,* "nopal") may have some beneficial effects in diabetes.[34]

Physical activity is another determinant of type 2 diabetes. It was found to be inversely predictive of the incidence of type 2 diabetes in MA men.[35] The NHANES III survey reported that as many as 65% of MA men and 74% of MA had little or no leisure-time physical activity.[36] Unfortunately, most people in the Latino population, as it happens with other groups, do not routinely exercise.[37] In combination, an inadequate meal plan and the general lack of regular physical activity have contrib-

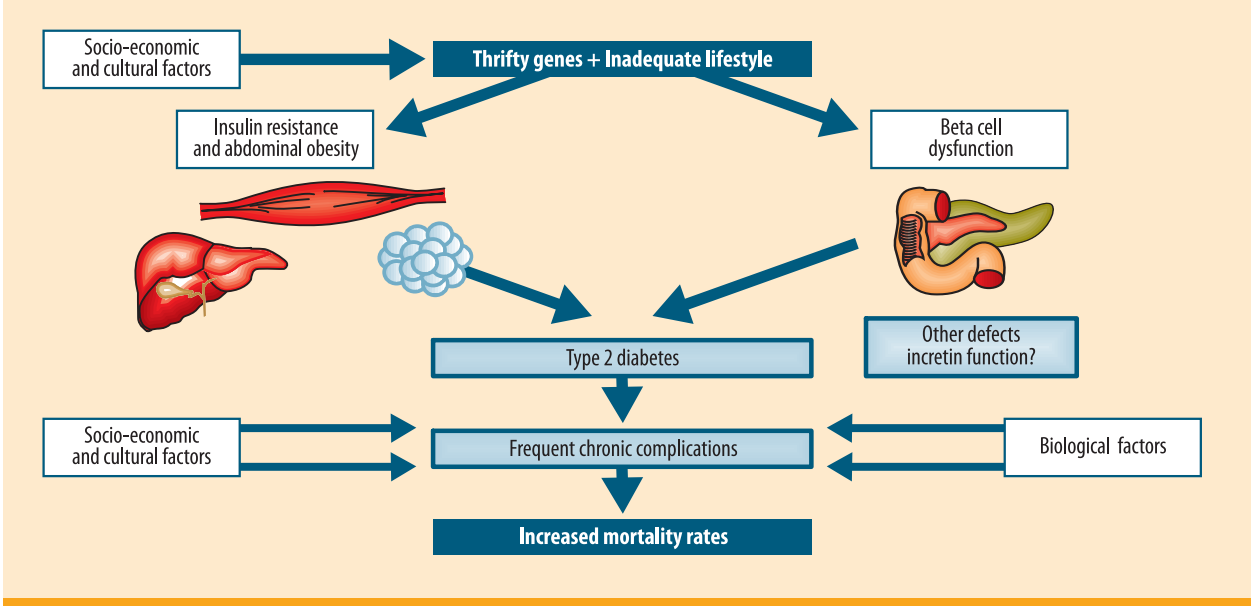

Figure 3. Pathophysiology and progression of type 2 diabetes in the Latino/Hispanic population. Genetic factors (thrifty genes) in combination with an inadequate lifestyle, particularly in the form of improper nutrition and physical activity lead to increased insulin resistance and/or abdominal obesity and possibly to beta cell dysfunction as well. Multiple socio-economic and cultural factors influence lifestyle. In people with type 2 diabetes, the frequent appearance of chronic complications that often lead to increased mortality rates are influenced again by multiple socio-economic and cultural factors and biological factors, many of which may have not been identified yet

uted to the very high rates of obesity and type 2 diabetes in this group in the U.S. As an example, the prevalence of type 2 diabetes is significantly higher in MA living in San Antonio, Texas, when compared to Mexicans living in Mexico City.[38]

Like any racial or ethnic group, the Hispanic culture is rich in fascinating values, traditions, beliefs, practices and attitudes. Many of them influence the perception and understanding of disease processes as well as their treatment and may be relevant in the field of diabetes. Some of the factors that have been associated in one way or another to the development and course of type 2 diabetes are acculturation, body image, depression, stress, education attainment, family and social support, health beliefs, faith and religion, socio-economic status, and health care access.[39-47] Figure 3 presents a general view of the participation of biological, socio-economic and cultural aspects in the development and course of type 2 diabetes in the Latino population.

Diabetes Related Chronic Complications

In general, the prevalence of most diabetes related chronic vascular complications is higher in Latinos with diabetes when compared to the NHW population, particularly chronic kidney disease and retinopathy.[39,48] Interestingly, various studies have reported equal or lower prevalence rates of cardiovascular disease morbidity and mortality in Hispanics when compared to NHW.[49-51] This would constitute an apparent paradox because as previously described, Hispanics tend to have more severe insulin resistance, abdominal obesity and type 2 diabetes. However, multiple factors may influence the reported lower rates of CVD, including the definition of CVD, the accuracy of the reported events, differences in the health status of the compared populations (migration effects), among others.[6,52] In fact, after taking into consideration some of these factors, cardiovascular mortality appears to be higher in Hispanics in the United States.[6,52,53] Therefore, there is no conclusive evidence on the existence of a protective mechanism for the development of CVD in the Hispanic population and, thus, aggressive management of cardiovascular risk factors is warranted as in any other group. In fact, worse glycemic control in Latinos than in Whites has been reported and may be a contributing factor to the high rates of diabetes related complications.[54] In this population based study, the mean A_{1c} for Hispanic patients with diabetes was 8.2%, 8.1% for Blacks and 7.6% for Whites. The percentage of Hispanics with diabetes with an A1c equal or

higher than 11% was 10.4%, whereas it was only 1.7% for Whites. Hispanics with undiagnosed diabetes were also more likely to have an A_{1c} above 7% (60.5%) than Blacks (39.3%) and Whites (37.8%). A prior report from the same NHANES survey had reported higher A_{1c} levels among Hispanics, even after controlling for factors such as education, income, health insurance coverage, and number of physician visits per year.[55] Certainly, other cardiovascular risk factor and even suboptimal preventive risk reduction strategies may also contribute to elevate the high risk of complications among Latinos.[56, 57] It is still unclear whether specific genetically determined factors increase the risk of complications (figure 3). More research in this area is highly needed.

Many Opportunities with High-Risk populations

As previously discussed, multiple lifestyle, social and cultural aspects influence the development and course of diabetes among Latinos in the U.S.A. and may be similar to other high-risk populations around the world. Understanding these circumstances is an important task for those that wish to have a positive impact on these groups. Although patients are crucial for improving their diabetes care, we need to contribute by better understanding the factors that are constantly challenging these high-risk groups as well as those aspects within each health care system that limit the ability of the health care provider to improve the quality of diabetes care, whether we talk about available time with the patient, human resources, appropriate patient education strategies and materials, adequate support of education programs and availability and coverage of medications for diabetes control and other co-morbidities. Our society is constantly changing and in consequence, our health care system needs to adapt to the emerging needs. By living in multicultural societies, health care professionals ought to develop the knowledge and interpersonal skills to understand, appreciate, and work with individuals from cultures other than their own. This can apply to groups that may even speak the same language but may have distinct cultural backgrounds that may translate into different social, financial, nutritional and health care approach issues. Therefore, an awareness and acceptance of cultural differences, self-awareness, knowledge of patient's culture, and adaptation of skills are required. This is the area of cultural competence that has slowly started to receive attention in the U.S.A.[58,59] Furthermore, several programs have emerged to improve the lives of Latinos with diabetes and their families.

The Latino Diabetes Initiative at Joslin Diabetes Center

The Joslin Diabetes Center, an academic institution affiliated with Harvard Medical School in Boston, MA is fully dedicated to research, education and care for patients with diabetes. In order to contribute to improving diabetes care to the Latino population, a comprehensive initiative that includes clinical care, education, research, outreach and professional education activities has been developed: The Latino Diabetes Initiative.[60,61] The Initiative has integrated a multidisciplinary team of diabetes care professionals that provide care and education to Latinos in Spanish and in a culturally oriented manner. Patient education materials have been specifically developed for Latinos, taking into considerations their culture, language, preferences, education and health literacy levels.[61,62] Through our research activities, we have identified that Latino overweight youth already has significant metabolic and vascular abnormalities that may put them at high risk of developing type 2 diabetes and cardiovascular disease at a very young age.[63] Therefore, the development of effective strategies to prevent and treat diabetes in this high risk group is of high importance. Our program has tried to involve the patient's family in education activities and has created innovative community based programs that are being implemented at the present time, such as a dancing class, a peer support network and other activities.[62] Other community based programs with Latinos have also highlighted the importance of working with high risk groups in their primary living area and not only in Clinics and Hospitals.[64]

Whereas we collectively work toward increasing the standards of diabetes care through routine care in clinics and hospital around the world, the development and implementation of cost-effective socially and culturally appropriate strategies with community based components may allow us to improve the quality of diabetes care that must be provided to all patients with diabetes and their families.

Conclusions

The Latino or Hispanic population represents the largest minority group in the U.S.A. There are multiple biological, social and cultural aspects that have contributed to the tremendous increase in the prevalence of type 2 diabetes in this group, including children and adolescents. Latinos have lagged behind in their health care, exhibit-

ing unacceptable glycemic control and particularly high rates of diabetes related chronic complications. The development of comprehensive culturally oriented diabetes care, education and research programs with some community-based components for this and other high-risk populations may offer us an opportunity to improve the quality of diabetes care that we all strive for. ■

Declaration of potential conflict of interest

A.E. Caballero declares he has no conflict of interest related to the content of this article.

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