Review

The status of diabetes and its complications in Latin-American population: A review article

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Abstract
The Latino population consists of distinct cultural groups, with differences in dietary habits and lifestyle that can affect the risk for type 2 diabetes. The best terminology today is Latino/Hispanic, and it should only be used as ethnicity. Latin-America has different races such as Caucasians, Native Americans, Blacks and Asians, and many mixtures of all. The leading cause of death in Latin-America is Cardiovascular diseases and the most important risk factor is diabetes mellitus (DM). According to the latest estimates from the Global Burden of Disease, the burden of DM was greater than expected in Latin America and the Caribbean region. Extensive data illustrates that lower cardiovascular disease risk in Latino group is a paradox. Instead, it is evident that the cardiovascular disease is the leading cause of mortality in Latinos.

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1. Introduction
The Latino population consists of distinct cultural groups, with differences in dietary habits and lifestyle that can affect the risk for type 2 diabetes. The term Hispanic first appeared in the 1970’s in the US Census. In the United States it became the used medical terminology. However, in Latin America the term is mostly recognized as having Spanish roots. In many cases referred as a race and only years later as an ethnicity.
The best terminology today is Latino/Hispanic, and it should only be used as ethnicity. Latin America has different races such as Caucasians, Native Americans, Blacks and Asians, and many mixtures of all [1].

Socioeconomic issues and demographic characteristics also differ among various Latino groups, affecting the risk for diabetes within specific populations [1].

The leading cause of death in Latin-America is Cardiovascular diseases (CVD). It represents 33.7% of total mortality rates with the highest one reported in Venezuela and the lowest one in Chile. The predominant form of CVD is ischemic heart disease with an adjusted mortality of 66.4 per 100,000 persons [2].

The most important risk factors for this elevated morbidity-mortality are Diabetes mellitus (DM), obesity associated with sedentary lifestyle, lipid disorders with low levels of high-density lipoprotein cholesterol (HDL) followed by high levels of low-density lipoprotein cholesterol (LDL) and high triglycerides, hypertension and tobacco smoking remains a problem in both females and males [3].

Patients with heart disease in Latin America appear to receive less aggressive treatment and face mortality rates nearly twice as high as the US and Canada. In the PURSUIT study in Latin America 46% of patients underwent diagnostic angiography, 18% received angioplasty, and 11% had cardiac bypass surgery. In Contrast to North America were 79% diagnostic angiography, 34% received angioplasty, and 20% cardiac bypass surgery. Within 30 days of being hospitalized 6.8% of patients in Latin America died compared with 3.6% in North America [4] (Davidson, 2018 #25).

2. Epidemiology of diabetes mellitus type 2 in Latin-America

Latin-America has a territory size of 7.412 million mi² with a population of more than 653 million people. Comparing the territory size is almost double than European Union (3.931 million mi²). According to the latest assessments, the burden of DM type 2 was greater than expected in Latin America [5,6]. Brazil and Mexico rank among the top ten countries in the world in terms of DM type 2 population size [7]. This disease affect 10–15% of the population in the Caribbean [6,8] whereas in Mexico, results from a national survey in 2012, reported a prevalence of 9.2% in the adult population [9].

In the Latin-American and Caribbean region, over the course of a single generation, epidemiologic transition has significantly altered lifestyles in physical activity levels and nutritional patterns, leading to global rises in overweight and obesity [10]. Based on the International Diabetes Federation data for 2015, the South and Central-American region had an estimated 9.4% prevalence of diabetic adult population, out of which 39% were undiagnosed [11].

Various observational studies have characterized higher prevalence of DM in women compared to men, although the underlying mechanisms are not fully understood [12,13]. Moreover, females with DM have a greater risk of mortality than males with diabetes [14,15], yet a register-based study in Brazil has reported convergence in mortality trends [16]. Geographical disparities within countries have also been documented, the highest age-adjusted DM mortality rates were found mostly in provinces with predominantly urban development in Panama [14]. Recently, a population-based cross sectional study in indigenous populations in Guatemala reported high prevalence of risk factors for DM, including obesity in women [17]. The lack of incident registries of DM in Latin America and the Caribbean hampers further assessments of epidemiological incidence and survival measures.

Currently, this region has a very elevated out-of-pocket medical payment [6,18,19]. This is associated with an increase of poverty and unhealthy alimention [20]. Furthermore, patients with diabetes delay medical attention to the late stages of the disease, leading to an increase in medical expenditure [19]. Diabetes economic burden is not only related to health care costs, but also to indirect costs caused by loss of productivity from disability and premature mortality [21].

Results from an analysis of 35 low-income countries, including some Latin-America countries, showed that diabetic patients spend US$ 157 more compared to those without diabetes. The total direct cost for diabetes in Latin America was shown to be of US$ 10.7 billion, or US$ 701 per person. The cost of medications depends on the country. In 2014, the cost for 1 month of insulin administration was of US$ 35, whereas the cost for 100 tablets of metformin was approximately US$ 17. This amount is elevated when we relate it to the GDP of countries in Latin America.

In low income countries, ischemic heart disease and stroke account for greater than 25% of total disability-adjusted life-years [22], in which DM is a major risk factor for these disabling conditions. It has been estimated that 22% of all ischemic heart disease deaths and 14% of stroke deaths are attributable to high glucose in low income countries, in addition to the deaths directly attributable to DM. These deaths generally occur at younger ages in low- and middle-income countries compared with high-income countries, increasing the loss of healthy life-years in these countries [23]. Diabetic nephropathy is currently the leading cause of end-stage renal disease globally, accounting for an extraordinarily elevated cost [24]. It is noteworthy that direct costs of treating diabetic foot complications exceed the treatment costs for many common cancers [25].

3. Impact of body weight on glycemic control

Mainous et al., estimated that more than 20% of the Latino population in the US is more likely to have diabetes mellitus type 2 by 2031 [26]. In addition, prevalence of type 2 diabetes is about 70–80% higher than that of non-Latino counterparts [27]. Latino population in the US were shown to have greater disease severity, higher disease complication rate, and poor disease outcomes [28,29]. Simultaneously, approximately 80% of Latinos living in US-Mexican border were known to be overweight or obese [30]. A 5% weight increase is associated with a 33% increase in diabetes prevalence [31]. Moreover, 1.5-fold increase in BMI is associated with 90-fold increase in diabetes incidence in women and a 40-fold increase in diabetes incidence in men [32,33]. This relationship between body weight and insulin resistance has been well established in various prospective studies [34,35]. Insulin
clamp technique studies have shown that obesity leads to insulin resistance at liver, muscle and adipose tissue [36,37]. However, it is important to note that distribution of fat content is an important predictor of insulin sensitivity. Individuals with android obesity i.e., are shown to have more insulin resistance, dyslipidemia, and hyperinsulinemia as compared to that of individuals with gynecoid obesity [38]. Also, accumulation of intra-hepatic, intra-pancreatic, and intra-arterial fat content also influences the development of type 2 diabetes in obese individuals [39]. Previous studies have analyzed the ethnic and racial differences in lipid profiles and metabolic syndromes among obese individuals [40]. For a given BMI, Latino/Hispanics were shown to have higher triglyceride levels as compared to that of matched African-American counterparts [41]. On the contrary, the high-density lipid cholesterol (HDL-C) content was found to be comparatively low in the Hispanic moderate and severely obese individuals when compared to African Americans [41]. In an analysis performed by Richter A et al., Latino/Hispanics were shown to have higher rates of end-stage renal disease (26%) as compared to that of Caucasians (2.5%) and African Americans (14%). Similar trends of higher rates of lower extremity amputations and legal blindness were seen in Latino/Hispanics as compared to that of African Americans and Caucasians. On the contrary, the risk of coronary artery disease is marginally less (28%) as compared to that of Caucasians (32%), and stroke risk was almost similar in all the race/ethnicities- 8% in Caucasians, 7% in Latino/Hispanics and African Americans [42].

4. Impact of metabolic syndrome on cardiovascular disease

A prospective population-based study evaluated the relationship between diabetes and post-myocardial infarction overall survival in Mexican-Americans and non-Hispanic Whites [43]. The study showed that the prevalence of diabetes was much higher in Mexican Americans (54%) as compared to that of non-Hispanic Whites (33%) (p < 0.001). In this population-based study, the non-Hispanic Whites who were hospitalized with myocardial infarction were older than the Mexican Americans and later were shown to have a lower proportion of surviving after a myocardial infarction as compared to that of non-Hispanic Whites. Similar findings of higher cardiovascular risk in United States (U.S) Latinos/Hispanics was seen in a recent U.S Census Bureau Analysis (2003–12) [44]. The study showed that the counties that harbored a higher Latino population were more likely to have high cardiovascular mortality as compared to that of the counterparts (215 vs 134 per 100,000 individuals). Additionally, counties with highest Latino/Hispanic density encountered 60% higher mortality. This higher cardiovascular mortality may be attributed to socioeconomic disparities such as language barriers, living in areas with limited access to health care, low quality care due to the financial status and ethnic background of the United States Latino population [45]. Alegre-Diaz et al conducted a study in Mexico on approximately 50,000 men and 100,000 women. The authors concluded that diabetes was accounted for at least one third of all deaths between 35 and 74 years of age [46]. This indicates the importance of addressing diabetes in Hispanic population. Delaying the onset of type 2 diabetes, as well as improving its treatment, is essential to reduce premature adult mortality in Latin population [47]. Given this high mortality rate, we agree with Aguayo-Mazzucato et al who suggested using Spanish materials and campaign targeting Hispanic population to promote nutritional education to help decreasing the cardiovascular mortality and addressing these barriers [48].

In the United States Latino/Hispanics are today the largest minority. Further research is required to understand how to better implement policies based on best predictors of atherosclerosis in Latinos with diabetes [43].

5. Summary

Extensive data illustrates that lower cardiovascular disease risk in Latino group is a paradox. Instead, it is evident that the cardiovascular disease is the leading cause of mortality in Latinos. Several risk factors such as poorly controlled diabetes; weight issues such as overweight and central obesity; lipid abnormalities encountering low HDL and elevated triglycerides; and/or blood pressure issues increase morbidity on these population. It is also important to note that Latinos are more prone to these early onset detrimental metabolic changes as compared to other ethnic groups [1].

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Competing Interest Statement

All authors declare that they have no significant competing financial, professional, or personal interests that might have influenced the performance or presentation of the work described in this manuscript.

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