



Full Length Research Article

RISK FACTORS FOR AND BARRIERS TO CONTROL TYPE-2 DIABETES AMONG HISPANICS

***Yahya Mari Alneami**

School of Nursing and Health Sciences, La Salle University, Philadelphia, USA

ARTICLE INFO

Article History:

Received 01st November, 2015
Received in revised form
10th December, 2015
Accepted 16th January, 2016
Published online 17th February, 2016

Key Words:

Type-2 diabetes,
Belief,
Social determinant,
Risk factor.

ABSTRACT

Background: In the United States, Type-2 Diabetes has now become the most common public health problem among Hispanics. Understanding risk factors for and barriers to control Type-2 Diabetes may lead to strategies that prevent and manage the disease. Purpose: To describe risk factors for and barriers to control Type-2 Diabetes among Hispanics.

Methods: Databases, including PubMed, MEDLINE, and Google Scholar were used for conducting this review. The literature search yielded 80 articles, of which 65 articles were included in this review after excluding non-relevant articles.

Results: The review revealed that obesity, physical inactivity, low socioeconomic status, smoking, and acculturation are the major risk factors for Type-2 Diabetes among Hispanics. Further, barriers including, fatalism, susto, herbal remedies, lack of access to healthcare services, and language hamper Hispanics from controlling Type-2 Diabetes.

Conclusion: Studies are needed to understand the complexity of successfully managing Type-2 Diabetes among diverse subgroups of Hispanic populations.

Copyright © 2016 Yahya Mari Alneami. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Type -2 Diabetes (T2D) is a disease that results when the body either doesn't make enough insulin or can't use its own insulin properly (The American Diabetes Association [ADA], 2015). It is estimated that 347 million people worldwide are diabetic, and T2D accounts for about 90% of all diabetes cases (Danaei *et al.*, 2011). In the United States (US), more than 29 million Americans were diagnosed with diabetes in 2012 (Centers for Disease Control and Prevention [CDC], 2014c). Further, the high costs associated with diabetes is a big concern in the US. In 2007, it was estimated that \$174 billion was spent on diabetes care (ADA, 2008). However, the total cost of diabetes care had risen to \$245 billion by 2012 (ADA, 2013). This trend highlights the substantial economic burden that diabetes imposes on society and underscores the importance of targeting efforts to attenuate diabetes complications. Therefore, reducing the yearly number of new cases of diagnosed diabetes in the US population is a crucial objective of the Healthy People 2020. There were 8.0 new cases of diabetes per 1000 population among individuals aged 18-84 that occurred between 2006-2008. Healthy People's 2020 objective is to reduce this number to 7.2 cases (U.S Department of Health and Human Services, 2015).

Additionally, in the US, Hispanics are the fastest-growing minority (CDC, 2014b). The term Hispanics refer to individuals of Cuban Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race (CDC, 2014b). In 2013, there were approximately 54 million Hispanics living in the US, accounting for 17 % of the US total population (CDC, 2014b). Further, the CDC expects that the number of Hispanics will reach roughly 129 million by 2060, representing 31% of the US total population (CDC, 2014b). In addition, T2D is a serious and growing epidemic among Hispanics in the US (Colon, Giachello, McIver, Pacheco, and Vela, 2013). In 2012, the CDC reported that 13 % of Hispanics were diagnosed with diabetes, and their risk for diabetes was 66% higher compared to non-Hispanic Whites (CDC, 2014c). Further, data indicated that Hispanics are 41% more likely to die from diabetes compared to non-Hispanic Whites (Ickes and Sharma, 2012). In 2010, CDC ranked diabetes as the seventh leading cause of death in the US (CDC, 2013). However, it ranked diabetes as the fifth leading cause of death among Hispanics (CDC, 2013). In addition to higher prevalence, Hispanics are more likely to develop complications and worse outcomes from diabetes such as: kidney, eye, circulation problems, and non-traumatic limb amputations than non-Hispanic Whites. Data from the San Antonio Heart Study and Third National Health and Nutrition Examination Survey underscored that diabetic Hispanics have twice the risk of retinopathy compared with diabetic non-

***Corresponding author: Yahya Mari Alneami**

School of Nursing and Health Sciences, La Salle University, Philadelphia, USA

Hispanic Whites (Kuo *et al.*, 2013). These statistics highlight the importance of controlling T2D among Hispanics. However, in order to prevent T2D, it is necessary to detect the associated risk factors for T2D. Additionally, this paper delineates barriers that hinder Hispanics from managing their T2D. Identifying these barriers may lead to effective management and avoid the occurrence of life-threatening complications (Kaplan *et al.*, 2014). The purpose of this paper is to describe risk factors for and barriers to control Type- 2 Diabetes among Hispanics in the US.

Search Strategy Method

The literature search was conducted on risk factors for and barriers to Type-2 Diabetes using the databases PubMed, MEDLINE, and Google Scholar. The literature search yielded 80 articles, of which 65 articles were included in this review after excluding non-relevant articles.

Findings of the Literature Review

Diabetes Risk Factors

Historical data indicates that the incidence and prevalence of diabetes continue to increase among Hispanics (Geiss *et al.*, 2014; Kandula *et al.*, 2008). A 20-year prospective study disclosed that Hispanics had a significantly higher risk of T2D than non-Hispanic Whites even after controlling for Body Mass Index (BMI) (Shai *et al.*, 2006). Therefore, in order to prevent T2D, it is necessary to determine its associated risk factors (Kaplan *et al.*, 2014). Data indicated that obesity, physical inactivity, socioeconomic status (SES), smoking, and acculturation were the major risk factors for T2D among Hispanics (AR, Pérez, Brown and Reininger, 2010; Caballero, 2011) (Figure a).

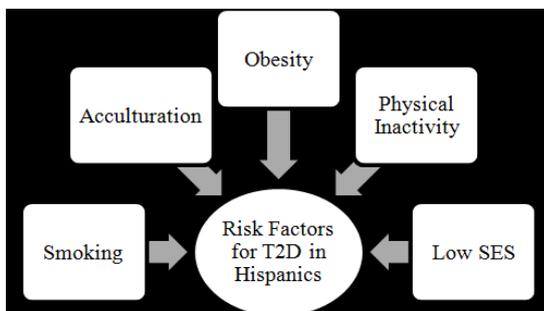


Fig. a. Diabetes risk factors among Hispanics

Obesity

The World Health Organization (WHO) identified obesity as the most visible, but the most neglected public health issue worldwide (Rahman and Berenson, 2010). Several studies revealed that obesity and weight gain are associated with an increased risk for T2D (Hossain, Kavar, and El Nahas, 2007; Mokdad *et al.*, 2003; Shai *et al.*, 2006). Additionally, data underscored that obesity is the most important factor in causing insulin resistance (Cossrow and Falkner, 2004; Kaplan *et al.*, 2014). In the US, Hispanics have disproportionately high rate of obesity. The prevalence of obesity among Hispanics is generally greater than among non-Hispanic Whites (Cossrow and Falkner, 2004). In 2012, the age-

adjusted level of obesity was 43% among Hispanics compared to 33% among non-Hispanic Whites (Ogden *et al.*, 2014). Further, it is well known that the prevalence of diabetes increases with increasing levels of obesity or body mass index (BMI of 30.0 and higher). It is estimated that the prevalence of obesity (BMI) of 30.0 and higher) is 36% of Hispanic men and 45% of women compared to 34% of non-Hispanic Whites men and 32% of women (American Heart Association, 2013). Additionally, physical inactivity is a risk factor for developing T2D among Hispanics.

Physical Inactivity

Several data indicated that physical inactivity is a significant risk factor for developing T2D (Al-Quwaidhi, Critchley, Flaherty, and Pearce, 2013; Hu, 2011; Salois, 2012; Temelkova and Stefanov, 2012). The prevalence of physical inactivity is higher among Hispanics (37%) compared to Blacks (33%), and Whites (22%) (Ickes and Sharma, 2012). Further, in terms of gender, data disclosed that Hispanic women are 74% less active compared to 65% of men respectively (Ickes and Sharma, 2012). Further, low socioeconomic status is found to be associated with T2D among Hispanics.

SES

Low socioeconomic status (SES) is associated with unhealthy lifestyles among Hispanics. Amongst Hispanics, health-related behaviors such as smoking cigarettes, being overweight, and being physically inactive are more common among Hispanics with a lower SES than among those with a higher SES (Morales, Lara, Kington, Valdez, and Escarce, 2002). Further, SES among Hispanics is significantly lower than that of non-Hispanic Whites in most measures including poverty rates and educational attainment. Hispanics are among the poorest people in the US. The Kaiser Family Foundation (2013) underscored that Hispanics are the second poorest people in the US, with 24% of the population living below the poverty line compared to 27% of Blacks and 10% of the non-Hispanic Whites. Further, the US Census Bureau (2012) reported that the median family income for Whites is \$62,545, however for Hispanics is \$39,730. Additionally, lower educational level is also high among Hispanics. The US Census (2012) reported that the percentage of Hispanics with a High school or less education is (63%) compared to their White (89%) and Black (84%) counterparts respectfully.

With regard to diabetes, Link and McKinlay (2009) reported that SES (education and income) are more important in determining who has diabetes than the non-modifiable risk factor of race/ethnicity. Additionally, data indicated that low income and less educational level are associated with a higher prevalence of T2D among Hispanics (Hunt, Arar, and Akana, 2000; Ogden, Carroll, Kit, and Flegal, 2014; West *et al.*, 2002). Further, SES is associated with undiagnosed of T2D among Hispanics. For example, a cohort study conducted from 2004 to 2007 on 810 Mexican Americans aged 35-64 years; indicated that participants with higher SES were significantly less likely to have undiagnosed diabetes compared with those in a lower SES classification (AR *et al.*, 2010). In addition to

low SES, smoking is another prominent risk factor related to the development of T2D among Hispanics.

Smoking

Several studies revealed that smoking is an independent modifiable risk factor for T2D (Cabellero and Tenzer, 2007; Eze *et al.*, 2014; Kaplan *et al.*, 2014; Luo *et al.*, 2013; Morales *et al.*, 2002; Saeed, 2012; Shai *et al.*, 2006). A 14-year prospective cohort study conducted on 1,236,443 Korean men and women, aged 30–95; underscored that smoking was significantly associated with increased risk for T2D (Jee *et al.*, 2010). Further, the CDC (2014a) reported that smokers are 30–40% more likely to develop T2D than nonsmokers. Additionally, smoking is found to be associated with glucose intolerance, impaired fasting glucose, and worsened diabetes control (Saeed, 2012). Smoking among Hispanics is a big concern (Cokkinides *et al.*, 2009). According to the US Census (2014), the prevalence of smoking rates among 18- to 24-year-old Hispanics is 11%. Additionally, Hispanic adolescents are two times more likely to smoke than Black adolescents (Rodriguez, Carlos, Adachi-Mejia, Berke, and Sargent, 2012). Further, Rodriguez *et al.* (2012) reported that there are a greater proportion of tobacco outlets being allocated in Hispanic community that might lead to increase smoking among Hispanics. In addition, acculturation is also another risk factor for T2D among Hispanics.

Acculturation

Acculturation is when people from one culture adopt the attitudes, behaviors, and beliefs of the people of the existing culture (Pérez and Putnik, 2007). During the acculturation process, individuals are thought to abandon the behavioral norms of their culture of origin while adopting those of another (Morales *et al.*, 2002). Acculturation is a complex phenomenon that is difficult to measure. Researchers frequently base their measures on simple static proxy indicators such as homeland, language use, and the length of residence in the US (Pérez and Putnik, 2007). With respect to T2D, acculturation is positively associated with T2D amongst Hispanics (West *et al.*, 2002). Data disclosed that the prevalence of diabetes is significantly higher among Hispanics living in the US compared to those in their countries of origin (Cusi and Ocampo, 2011; Kaplan, Huguet, and Newsom, 2004; Schneiderman *et al.*, 2014). An analysis of the San Antonio Heart Study and the Mexico City Diabetes Study underscored that Hispanics who live in the US particularly in San Antonio, Texas have higher incidence rates of T2D compared with Hispanics who live in Mexico City, Mexico (Caballero, 2011).

Additionally, Garcia *et al.* (2012) used data from the National Health and Nutrition Examination Survey (NHANES) (1999–2008) to examine the prevalence and the relation of acculturation to diabetes and obesity among a nationally representative sample of 5,069 Mexican-American aged 20–89 years. The report revealed that most acculturated Mexican Americans have a higher prevalence of diabetes and obesity compared with Mexican Americans least acculturated. However, Hazuda, Haffner, Stern, and Eifler (1988) carried out a cross sectional study on 1,288 Mexican Americans and 929 non-Hispanic whites, aged 25-64 years and highlighted

that increased acculturation was associated by a significant decline in diabetes among Mexican Americans. Further, acculturation to western lifestyles is related to greater BMI, which is linked to the risk of developing T2D. The adoption of an American diet, high in fats and sugars, and low in dietary fibers combined with a sedentary lifestyle promotes high rates of obesity and increases the risk for T2D among Hispanics (Cabellero and Tenzer, 2007; Calzada and Mora, 2011). Kaplan *et al.* (2004) conducted a cross sectional study on 2420 foreign-born Hispanic adults aged > or =18 years to determine whether length of residence in the US is associated with obesity defined by a body mass index [BMI]>30 kg/m². Kaplan *et al.* indicated that the prevalence of obesity among Hispanics with 0 to 4, 5 to 9, 10 to 14, and 15 years or higher of the US residency is 9%, 14%, 21%, and 24% respectively. Data highlighted that the link between obesity with length of residence could be due to the acculturation process including adopting unhealthy food habits including a diet high in fat and low in fibers (Cabellero and Tenzer, 2007; Calzada and Mora, 2011; Kaplan *et al.*, 2004).

T2D is a serious disease, prevalent in a large part of the US population, and Hispanics are at greater risk for developing T2D because of the aforementioned risk factors previously described. However, a number of hurdles still exist. In order to control T2D, it is necessary to identify barriers and address them effectively.

Barriers to Control T2D

Understanding the impact of how cultural beliefs and social determinants of health can be barriers to diabetes treatment is essential for effectively managing the disease. In this regard, determination of barriers to diabetes control amongst Hispanics is a vital step in attaining best possible health outcomes. Cultural beliefs including fatalism, susto, and herbal remedies may influence diabetes treatment among Hispanics (Caballero, 2011; Calzada and Mora, 2011; Coronado, Thompson, Tejada, and Godina, 2004). Additionally, social determinants of health including language and lack of access to healthcare services are hurdles that may hamper Hispanics from managing T2D as well (Cabellero and Tenzer, 2007; Campos, 2007) (Fig b).

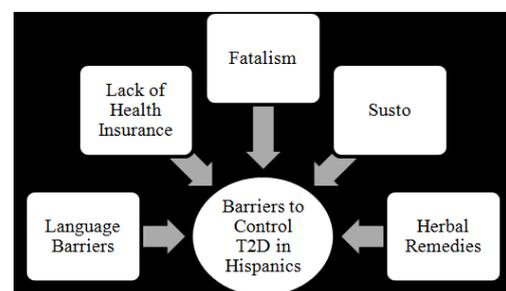


Fig. b. Barriers to control Type-2 Diabetes among Hispanics

Cultural Beliefs

Fatalism

Cultural concepts like fatalism or “fatalismo” in Spanish may influence healthy behavior among Hispanics (Caballero, 2011;

Coronado *et al.*, 2004). Fatalism is defined as individuals believing their diseases process cannot be changed because it is part of their destiny (Cusi and Ocampo, 2011). A survey distributed to 104 Hispanic patients diagnosed with T2D, indicated that 78% believed they had diabetes because it was God's will, and 81% believed their diabetes could only be controlled by God (Caballero, 2011). According to the results of this study, Hispanics who believe that their health is only in the hands of God, may delay seeking care for diabetes and not adhere to their recommended plans. Additionally, their beliefs may also hinder them from using preventative methods for diabetes prevention including engaging in healthy lifestyles (Caballero, 2011; Calzada and Mora, 2011; Cusi and Ocampo, 2011). Such a fatalistic view means that Hispanics may be less likely to actively manage their T2D.

Susto

In addition to fatalism, many Hispanics believe *susto*, "fright of surprise," is a cause of diabetes (Calzada and Mora, 2011). *Susto* is a belief that diabetes occurs as result of a specific startling event; a strong emotional response to events makes the body susceptible to diabetes (Poss and Jezewski, 2002). The emotion can be sadness, fear, or depression (Coronado *et al.*, 2004; Hatcher and Whittemore, 2007). Coronado *et al.* (2004) conducted a qualitative study on 42 Mexican Americans (14 men and 28 women); who reported that experiencing strong emotions such as fright, intense anger, or sadness and depression was thought to precipitate diabetes. The cultural belief "*susto*" can be a barrier that prevents Hispanics from seeking diabetes management. In addition to *susto*, another factor to consider is the use of herbal remedies among Hispanics.

Herbal Remedies

Hispanics preferred herbal treatments because they considered them as being natural and less expensive than western medicine (Hatcher and Whittemore, 2007). Hunt *et al.* (2000) carried out a qualitative design on 43 Mexican Americans with T2D and reported that 84% of these patients mentioned herbs as possible alternative treatments over conventional treatment of diabetes. Additionally, some Hispanics believed insulin, the recommended treatment for diabetes, causes blindness (Calzada and Mora, 2011; Campos, 2007). This means that some Hispanics will be more likely to seek out herbal and other non-pharmaceutical medications for treatment of diabetes. For example, a study enrolling 3,623 Hispanics in the southwestern US between the ages of 18 and 74 years; revealed that 4% of participants consulted herbalist, or other folk medicine practitioners to use natural remedies to treat their illnesses (Coronado *et al.*, 2004). Further, data underscored that many Hispanics tended not to reveal the use of herbal products for their health care providers because of the fear that their providers would disapprove of these herbal products (Calzada and Mora, 2011; Hatcher and Whittemore, 2007). In addition to understanding the impact of cultural beliefs, it is essential to examine how social determinants can impact management of diabetes.

Social Determinants Factors

The CDC (2014d) defines social determinants of health as economical, social, and political conditions in which people

are born, live, work, and age, as well as the systems put in place to deal with illness. Data indicated that social determinants of health could influence healthy behavior (Caballero, 2011; Campos, 2007; Coronado *et al.*, 2004). The Healthy People 2020 report indicated that resources including language and access to health care facilities enrich quality of life and have a substantial influence on population health outcomes (U.S Department of Health and Human Services, 2015). With regard to diabetes, data also revealed that language and lack of access to health care services are related to poor diabetes control among the Hispanics (Caballero and Tenzer, 2007; Wilper *et al.*, 2009).

Language

Patients who are not able to discuss their diabetes problems with their doctors in their own language may face inferior health outcomes, which can decrease the likelihood of successful treatment of diabetic care (Abdulrahim and Baker, 2009). Fernandez *et al.* (2011) conducted a cross-sectional study on 3,877 Latinos and 4,520 White patients with T2D using data from the 2005-2006 Diabetes Study of Northern California (DISTANCE) and uncovered that poor glycemic control was higher among Latino patients with limited English proficiency than in Whites. Additionally, data highlighted that Hispanic groups in the US who do not speak or understand English at all are less likely than English speaking Hispanics to adhere to a medication schedule and are also less possible to be satisfied with the care and services they received (Caballero and Tenzer, 2007). Fernandez *et al.* (2004) carried out a cross sectional study on 116 Spanish-speaking patients with diabetes and 48 primary care physicians with interpreter services, and revealed that Spanish-speaking diabetic patients were more likely to report better Interpersonal Processes of Care, a perception that providers are more receptive to patients, problems and concerns, when the primary care physician had higher language ability and cultural competence.

In addition to language deficits, low health literacy is more prevalent among Hispanics (Campos, 2007). Health literacy, the ability of patients to read, comprehend, and use basic healthcare information to make effective healthcare decisions and follow instructions for treatment, is important in diabetes management (Campos, 2007). Schillinger *et al.* (2002) conducted a cross sectional study on 408 English- and Spanish- speaking patients older than 30 years with T2D and reported that 52% of Hispanic patients had inadequate health literacy compared to 15% of non-Hispanic White patients. Further, patients with low health literacy are more likely to have poor glycemic control and greater likelihood of developing retinopathy (Campos, 2007). Similar to language deficits, the lack of access to healthcare services plays a prominent role in the management of diabetes among Hispanics.

Lack of Access to Healthcare Services

Hispanics confront an array of barriers to getting health care services of superior quality. Some of these barricades result from low SES (Tienda, Mitchell, Escarce, and Kapur, 2006). For example, low income has significantly contributed to the difficulty in accessing consistent transportation to physicians'

offices, buying medications, and receiving time off for doctor visits (Weinick, Zuvekas and Cohen, 2000). Further, lack of health insurance is a significant access problem for Hispanics (Morales *et al.*, 2002). In the US, Hispanics are less likely to have health insurance, in comparison to non-Hispanic Whites. The US Census (2012) reported that the percentage of Hispanics who lacked health insurance is 29% compared to only 11% of non-Hispanic Whites. Further, Campos (2007) reported that uninsured individuals with diabetes are less likely to receive the appropriate standards of care, including regular glucose monitoring and preventive examinations for their eyes and feet compare to insured people. Additionally, lack of health insurance can lead to a greater risk of hospitalization and increase the risk of chronic diseases including diabetes (Wilper *et al.*, 2009). In addition to health insurance, lack of cultural competence care could be a barrier that may prevent Hispanics to access the US healthcare services. Wallace, Mendez-Luck, and Castañeda, (2009) conducted a cross sectional study on 488,000 of Mexican immigrants to examine why Mexicans in California seek health services in Mexico and reported that services in Mexico provided a more culturally acceptable alternative source of care for many Mexicans compared to the US services.

DISCUSSION

The literature revealed that obesity, physical inactivity, low SES, and smoking are the major risk factors for T2D among Hispanics. Further, cultural beliefs (i.e., fatalism, *susto*, and herbal remedies) and social determinants (i.e., language and lack of access to healthcare services) are barriers that hamper Hispanics from controlling T2D. In this review SES was treated as an independent factor because research showed that SES is a key predictor for T2D among Hispanics (Link, and McKinlay, 2009; AR *et al.*, 2010). With respect to acculturation, the associations between acculturation, obesity, and diabetes in Hispanics have not been consistent (Kandula *et al.*, 2008). Longitudinal studies are needed to better understand if and how acculturation is a risk factor for obesity and diabetes among Hispanic populations. Further, the findings of this review highlighted that greater efforts are needed to curb T2D among Hispanics in the US. There are multiple diabetes risk factors among Hispanics, which make T2D a big challenge to overcome. Luckily these risk factors are modifiable which means they are possible to control when adapting healthy lifestyles. As such, diabetes health prevention programs should focus on modifiable factors including obesity, physical activity, and smoking to achieve a significant reduction in T2D among Hispanics. Health care providers including primary care physicians and nurses can play an important role in educating their Hispanic patients by emphasizing the importance of exercise, weight control, and smoking cessation in diabetes prevention and management. Additionally, providing educational lectures on these diabetes risk factors in Hispanic communities including health centers, churches, work sites, and schools may be useful in reducing the incidence and prevalence of T2D.

Beside health education, the use of culturally oriented campaigns for diabetes prevention, as described by the National Diabetes Education Program is an important aspect of public health practice. These campaigns could include

elements such as radio and television campaigns on Spanish-language stations, magazines advertising healthier alternative ingredients to use in traditional Hispanic cooking, community prepared educational materials with an appropriate level of literacy, and local community leaders being trained in the delivery of diabetes prevention messages (Calzada and Mora, 2011). Further, it is crucial to mention that majority of studies in this review were focusing on Mexican Americans. Given the nature and design of the research studies hamper our ability to generalized to other Hispanic populations. More studies are needed that include diverse Hispanic subgroups. Further, even though these diabetes risk factors are well understood, the balance may differ among various Hispanic populations. Measuring the contribution of each risk factor among Hispanic populations will be very useful to tailor effective diabetes prevention to each community. Additionally, the result of this review highlights the importance of health care providers understanding Hispanic cultural beliefs. This may potentially encourage Hispanics to be more willing to share their beliefs with their providers, which may lead to correcting the misconceptions that improve diabetes outcomes. However, it must be kept in mind that cultural beliefs may not be applied to all Hispanic populations. The majority of studies on health beliefs in this review were conducted on Mexican Americans. Hence, it is not clear whether Hispanic populations (excluding Mexican Americans) believe in these long standing traditions as well. Further studies on health beliefs and diabetes incorporating diverse Hispanic subgroups in their samples are needed to extrapolate how subgroups of Hispanic populations differ on health beliefs.

In addition to understanding cultural beliefs, health care providers should make sure that Hispanics with T2D have fully understood the instructions of diabetes treatment. Hiring full-time translators with clinical background or using Spanish-speaking staff, as interpreters could be helpful to overcome language barriers. Additionally, having comfortable environments and effective communication between Hispanic patients with their health providers may encourage Hispanic patients to ask for more clarifications about their diabetes when they do not understand diabetes care instructions. Beside effective communication, health care providers should also be aware about the barriers that may prevent Hispanics with T2D from coming back to health centers include transportation and lack of health insurance. Low-income Hispanics with limited or no insurance may be eligible to receive free or discounted medications from various sources (Campos, 2007). Therefore, health care providers can direct those patients who are in need to these community health resources. This will allow Hispanics to stay on diabetes controlling plans.

Limitations

It is important to mention that this review has limitations that should be considered while interpreting the findings. First, some of the studies included in this review had small sample sizes. Second, the vast majority of research was specific to Mexican Americans. So, this limited the generalizability of the findings to all Hispanic populations. Third, many cultural beliefs studies presented in this review relied primarily on qualitative data collection methods (i.e., focus groups and

open-ended/semi structured interview), which limited the ability to generalize the findings. Finally, there were many cross-sectional analyses in this review, which limited causal inferences.

Conclusion

T2D remains a serious public health problem among Hispanics. In an attempt to decrease the high burden of T2D among Hispanics, T2D prevention and control should be put one the US list of top priorities. From the public health viewpoint, these findings can be helpful for preventing diabetes, reducing its economic burden, and improving the quality of life for Hispanics who have or are at risk for T2D. Since Hispanics are the fastest-growing minority in the US, developing culturally appropriate prevention and management of T2D in this population should be supported.

Acknowledgments

I sincerely thank Dr. Daniel Rodriguez, associate professor, La Salle University, for his guidance and encouragement in carrying out this literature review. I also thank the Director of Master of Public Health program at La Salle University Dr. Holly Harner who rendered her help during the period of my project work.

REFERENCES

- Abdulrahim, S., and Baker, W. 2009. Differences in self-rated health by immigrant status and language preference among Arab Americans in the Detroit Metropolitan Area. *Social Science and Medicine*, 68(12), 2097-2103.
- Ahluwalia, I. B., Ford, E. S., Link, M., and Bolen, J. C. 2007. Acculturation, weight, and weight-related behaviors among Mexican Americans in the United States. *Ethnicity and Disease*, 17(4), 643.
- Al-Quwaidhi, A., Critchley, J., O' Flaherty, M., and Pearce, M. 2013. Obesity and type 2 diabetes mellitus: A complex association. *Saudi Journal of Obesity*, 1(2), 49. doi:10.4103/2347-2618.128627
- American Diabetes Association 2008. Economic costs of diabetes in the US in 2007. *Diabetes Care*, 31(3), 596-615.
- American Diabetes Association, 2013. Economic costs of diabetes in the US in 2012. *Diabetes Care*, 36(4), 1033-1046.
- AR, S. J., Pérez, A., Brown, H. S., and Reininger, B. M. 2010. Socioeconomic Status and Prevalence of Obesity and Diabetes in a Mexican American Community, Cameron County, Texas, 2004-2007. *Center for Disease Control and Prevention*, 7.
- Betancourt, J., Green, A. and Carrillo, E. 2002. Cultural competence in health care: Emerging frameworks and practical approaches. *The Commonwealth Fund*.
- Brown, S. A., Garcia, A. A., Kouzekanani, K., and Hanis, C. L. 2002. Culturally Competent Diabetes Self-Management Education for Mexican Americans The Starr County Border Health Initiative. *Diabetes Care*, 25(2), 259-268.
- Caballero, A. E. 2011. Understanding the Hispanic/Latino patient. *The American Journal of Medicine*, 124(10), S10-S15.
- Caban, A., and Walker, E. A. 2006. A systematic review of research on culturally relevant issues for Hispanics with diabetes. *The Diabetes Educator*, 32(4), 584-595.
- Cabellero, A. E., and Tenzer, P. 2007. Building cultural competency for improved diabetes care: Latino Americans and diabetes. *The Journal of Family Practice*, 56(9 Suppl Building), S7-13.
- Calzada, P. J., and Mora, J. C. 2011. First-generation Hispanic Americans and diabetes mellitus. *AOA Health Watch*.
- Campos, C. 2007. Addressing cultural barriers to the successful use of insulin in Hispanics with type 2 diabetes. *Southern Medical Journal-Birmingham Alabama*, 100(8), 812.
- Chow, E. A., Foster, H., Gonzalez, V., and McIver, L. (2012). The disparate impact of diabetes on racial/ethnic minority populations. *Clinical Diabetes*, 30(3), 130-133.
- Cokkinides, V., Bandi, P., McMahan, C., Jemal, A., Glynn, T., and Ward, E. 2009. Tobacco control in the United States recent progress and opportunities. *CA: A Cancer Journal for Clinicians*, 59(6), 352-365.
- Collinsworth, A. W., Vulimiri, M., Schmidt, K. L., and Snead, C. A. 2013. Effectiveness of a Community Health Worker-led Diabetes Self-Management Education Program and Implications for CHW Involvement in Care Coordination Strategies. *The Diabetes Educator*, 39(6), 792-799.
- Colon E, Giachello A, McIver L, Pacheco G and Vela L. 2013. Diabetes and Depression in the Hispanic/Latino Community in *Clinical Diabetes* 31(1) pp. 43 – 45.
- Coronado, G. D., Thompson, B., Tejada, S., and Godina, R. 2004. Attitudes and beliefs among Mexican Americans about type 2 diabetes. *Journal of Health Care for the Poor and Underserved*, 15(4), 576-588.
- Cossrow, N., and Falkner, B. 2004. Race/ethnic issues in obesity and obesity-related comorbidities. *The Journal of Clinical Endocrinology and Metabolism*, 89(6), 2590-2594.
- Cusi, K., and Ocampo, G. L. 2011. Unmet needs in Hispanic/Latino patients with type 2 diabetes mellitus. *The American Journal of Medicine*, 124(10), S2-S9.
- Dall, T. M., Zhang, Y., Chen, Y. J., Quick, W. W., Yang, W. G., and Fogli, J. 2010. The economic burden of diabetes. *Health Affairs*, 29(2), 297-303.
- Danaei, G., Finucane, M. M., Lu, Y., Singh, G. M., Cowan, M. J., Paciorek, C. J., and Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating Group (Blood Glucose, 2011. National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2·7 million participants. *The Lancet*, 378(9785), 31-40.
- Diabetes, 2014. *U.S. Department of Health and Human Services*. Retrieved March 15, 2015, from <http://www.healthypeople.gov/2020/topics-objectives/topic/diabetes>
- Educational attainment by race and Hispanic origin, 2012. *The US Census Bureau Web site*. Retrieved March 15, 2015, from <http://www.census.gov/compendia/statab/2012/tables/12s0229.pdf>
- Everson, S. A., Maty, S. C., Lynch, J. W., and Kaplan, G. A. 2002. Epidemiologic evidence for the relation between socioeconomic status and depression, obesity, and

- diabetes. *Journal of Psychosomatic Research*, 53(4), 891-895.
- Eze, I. C., Schaffner, E., Zemp, E., von Eckardstein, A., Turk, A., Bettschart, R., and Probst-Hensch, N. 2014. Environmental tobacco smoke exposure and diabetes in adult never-smokers. *Environmental Health*, 13(1), 74.
- Fernandez, A., Schillinger, D., Grumbach, K., Rosenthal, A., Stewart, A. L., Wang, F., and Pérez-Stable, E. J. 2004. Physician language ability and cultural competence. *Journal of General Internal Medicine*, 19(2), 167-174.
- Fernandez, A., Schillinger, D., Warton, E. M., Adler, N., Moffet, H. H., Schenker, Y., and Karter, A. J. 2011. Language barriers, physician-patient language concordance, and glycemic control among insured Latinos with diabetes: the Diabetes Study of Northern California (DISTANCE). *Journal of General Internal Medicine*, 26(2), 170-176.
- Garcia, L., Gold, E. B., Wang, L., Yang, X., Mao, M., and Schwartz, A. V. 2012. The relation of acculturation to overweight, obesity, pre-diabetes and diabetes among US Mexican-American women and men. *Ethnicity and Disease*, 22(1), 58.
- Geiss, L. S., Wang, J., Cheng, Y. J., Thompson, T. J., Barker, L., Li, Y., and Gregg, E. W. 2014. Prevalence and incidence trends for diagnosed diabetes among adults aged 20 to 79 years, United States, 1980-2012. *JAMA*, 312(12), 1218-1226.
- Gonzalez, Lisanna Stamos, M.S., F.N.P.-B.C., Berry, Diane C, PhD, A.N.P.-B.C., F.A.A.N.P., and Davison, Jean Ann, M.S.N., F.N.P.-B.C. 2013. Diabetes self-management education interventions and glycemic control among hispanics: A literature review. *Hispanic Health Care International*, 11(4), 157-166.
- Hatcher, E., and Whittemore, R. 2007. Hispanic adults' beliefs about type 2 diabetes: Clinical implications. *Journal of the American Academy of Nurse Practitioners*, 19(10), 536-545.
- Hazuda, H. P., Haffner, S. M., Stern, M. P., and Eifler, C. W. 1988. Effects of acculturation and socioeconomic status on obesity and diabetes in Mexican Americans The San Antonio heart study. *American Journal of Epidemiology*, 128(6), 1289-1301.
- Health insurance, 2012. *The US Census Bureau Web site*. Retrieved March 15, 2015, from <http://www.census.gov/hhes/www/hlthins/data/incpovhlth/2012/highlights.html>
- Hispanic or Latino populations, 2014b. *Centers for Disease Control and Prevention Web site*. Retrieved March 15, 2015, from <http://www.cdc.gov/minorityhealth/populations/REMP/hispanic.html#Demographics>
- Hossain, P., Kavar, B., and El Nahas, M. 2007. Obesity and diabetes in the developing world—a growing challenge. *New England Journal of Medicine*, 356(3), 213-215.
- Hu, F. B. 2011. Globalization of Diabetes The role of diet, lifestyle, and genes. *Diabetes Care*, 34(6), 1249-1257.
- Hunt, L. M., Arar, N. H., and Akana, L. L. 2000. Herbs, prayer, and insulin. Use of medical and alternative treatments by a group of Mexican American diabetes patients. *J Fam Pract*, 49(3), 216-223.
- Ickes, M. J., and Sharma, M. 2012. A systematic review of physical activity interventions in Hispanic adults. *Journal of Environmental and Public Health*, 2012.
- Income, expenditures, poverty, and wealth, 2012. *The US Census Bureau Web site*. Retrieved March 15, 2015, from <http://www.census.gov/compendia/statab/2012/tables/12s0697.pdf>
- Kandula, N. R., Diez-Roux, A. V., Chan, C., Daviglius, M. L., Jackson, S. A., Ni, H., and Schreiner, P. J. 2008. Association of acculturation levels and prevalence of diabetes in the multi-ethnic study of atherosclerosis (MESA). *Diabetes Care*, 31(8), 1621-1628.
- Kaplan, M. S., Huguet, N., Newsom, J. T., and McFarland, B. H. (2004). The association between length of residence and obesity among Hispanic immigrants. *American Journal of Preventive Medicine*, 27(4), 323-326.
- Kaplan, R. C., Bangdiwala, S. I., Barnhart, J. M., Castañeda, S. F., Gellman, M. D., Lee, D. J., and Giachello, A. L. 2014. Smoking among US Hispanic/Latino adults: the Hispanic community health study/study of Latinos. *American Journal of Preventive Medicine*, 46(5), 496-506.
- Kuo, Y. F., Raji, M. A., Markides, K. S., Ray, L. A., Espino, D. V., and Goodwin, J. S. 2003. Inconsistent use of diabetes medications, diabetes complications, and mortality in older Mexican Americans over a 7-year period data from the Hispanic established population for the epidemiologic study of the elderly. *Diabetes Care*, 26(11), 3054-3060.
- Link, C. L., and McKinlay, J. B. 2009. Disparities in the prevalence of diabetes: is it race/ethnicity or socioeconomic status? Results from the Boston Area Community Health (BACH) survey. *Ethnicity and Disease*, 19(3), 288.
- Leading causes of death, 2013. *Centers of Disease Control and Prevention Web site*. Retrieved April 9, 2015, from <http://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm>
- Leong, K. S., and Wilding, J. P. 1999. Obesity and diabetes. *Best Practice and Research Clinical Endocrinology and Metabolism*, 13(2), 221-237.
- Luo, J., Rossouw, J., Tong, E., Giovino, G. A., Lee, C. C., Chen, C., and Margolis, K. L. 2013. Smoking and diabetes: does the increased risk ever go away?. *American Journal of Epidemiology*, kwt071.
- Mainous, A. G., Diaz, V. A., Koopman, R. J., and Everett, C. J. 2007. Quality of care for Hispanic adults with diabetes. *Family Medicine-Kansas City*, 39(5), 351.
- Mainous, A. G., Majeed, A., Koopman, R. J., Baker, R., Everett, C. J., Tilley, B. C., and Diaz, V. A. 2006. Acculturation and diabetes among Hispanics: evidence from the 1999-2002 National Health and Nutrition Examination Survey. *Public Health Reports*, 121(1), 60.
- Mokdad, A. H., Ford, E. S., Bowman, B. A., Dietz, W. H., Vinicor, F., Bales, V. S., and Marks, J. S. 2003. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *JAMA*, 289(1), 76-79.
- Morales, L. S., Lara, M., Kington, R. S., Valdez, R. O., and Escarce, J. J. 2002. Socioeconomic, cultural, and behavioral factors affecting Hispanic health outcomes. *Journal of Health Care for the Poor and Underserved*, 13(4), 477.
- National Diabetes Fact Sheet, 2014c. *Centers for Disease Control and Prevention*. Retrieved April, 9, 2015 from http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf

- Ogden, C. L., Carroll, M. D., Kit, B. K. and Flegal, K. M. 2014. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA*, 311(8), 806-814.
- Overweight and obesity, 2013. *American Heart Association*. Retrieved March 15, 2015, from http://www.heart.org/idc/groups/heartpublic/@wcm/@sop/@smd/documents/downloadable/ucm_319588.pdf
- Pérez-Escamilla, R., and Putnik, P. 2007. The role of acculturation in nutrition, lifestyle, and incidence of type 2 diabetes among Latinos. *The Journal of Nutrition*, 137(4), 860-870.
- Poss, J., and Jezewski, M. A. 2002. The role and meaning of susto in Mexican Americans' explanatory model of type 2 diabetes. *Medical Anthropology Quarterly*, 16(3), 360-377.
- Poverty rate by race/ ethnicity. *The Henry J Kaiser Family Foundation*, 2013. Retrieved March 15, 2015, from <http://kff.org/other/state-indicator/poverty-rate-by-raceethnicity/>
- Prezio, E. A., Cheng, D., Balasubramanian, B. A., Shuval, K., Kendzor, D. E., and Culica, D. 2013. Community Diabetes Education (CoDE) for uninsured Mexican Americans: a randomized controlled trial of a culturally tailored diabetes education and management program led by a community health worker. *Diabetes Research and Clinical Practice*, 100(1), 19-28.
- Rahman, M., and Berenson, A. B. 2010. Accuracy of current body mass index obesity classification for white, black and Hispanic reproductive-age women. *Obstetrics and Gynecology*, 115(5), 982.
- Robbins, J. M., Vaccarino, V., Zhang, H., and Kasl, S. V. 2001. Socioeconomic status and type 2 diabetes in African American and non-Hispanic white women and men: evidence from the Third National Health and Nutrition Examination Survey. *American Journal of Public Health*, 91(1), 76.
- Rodriguez, D., Carlos, H. A., Adachi-Mejia, A. M., Berke, E. M., and Sargent, J. D. 2012. Predictors of tobacco outlet density nationwide: a geographic analysis. *Tobacco Control*, tobaccocontrol-2011.
- Saeed, A. A. 2012. Association of Tobacco Products Use and Diabetes Mellitus-Results of a National Survey Among Adults in Saudi Arabia. *Balkan Medical Journal*, 29 (3), 247.
- Salois, M. J. 2012. Obesity and diabetes, the built environment, and the 'local' food economy in the United States, 2007. *Economics and Human Biology*, 10(1), 35-42.
- Schneiderman, N., Llabre, M., Cowie, C. C., Barnhart, J., Carnethon, M., Gallo, L. C., and Avilés-Santa, M. L. 2014. Prevalence of diabetes among Hispanics/Latinos from diverse backgrounds: the Hispanic community health study/study of Latinos (HCHS/SOL). *Diabetes Care*, 37(8), 2233-2239.
- Shai, I., Jiang, R., Manson, J. E., Stampfer, M. J., Willett, W. C., Colditz, G. A., and Hu, F. B. 2006. Ethnicity, Obesity, and Risk of Type 2 Diabetes in Women A 20-year follow-up study. *Diabetes Care*, 29(7), 1585-1590.
- Schillinger, D., Grumbach, K., Piette, J., Wang, F., Osmond, D., Daher, C., and Bindman, A. B. 2002. Association of health literacy with diabetes outcomes. *JAMA*, 288(4), 475-482.
- Social determinants of health, 2014d. *Centers of Disease Control and Prevention*. Retrieved April 9, 2015, from <http://www.cdc.gov/socialdeterminants/FAQ.html>
- Social determinants of health, 2014. *Diabetes U.S. Department of Health and Human Services* Retrieved March 15, 2015 from <http://www.healthypeople.gov/2020/topics-objectives/topic/social-determinants-health>
- Smoking and diabetes, 2014a. *Centers for Disease Control and Prevention (CDC) Web site*. Retrieved April 15, 2015, from <http://www.cdc.gov/tobacco/campaign/tips/diseases/diabetes.html#three>
- Smoking rates among 18- to 24-year-olds are down for all racial/ethnic groups and for both males and females. 2014. *The US Census Bureau*. Retrieved March 15, 2015, from http://www.census.gov/content/dam/Census/news_room/c-span/2014/20140829_cspan_young_adults.pdf
- Temelkova-Kurktschiev, T., and Stefanov, T. 2012. Lifestyle and genetics in obesity and type 2 diabetes. *Experimental and Clinical Endocrinology and Diabetes: official journal, German Society of Endocrinology [and] German Diabetes Association*, 120(1), 1-6.
- Tienda, M., Mitchell, F., Escarce, J. J., and Kapur, K. 2006. *Access to and quality of health care*. Washington, DC: National Academic Press SBN-10: 0-309-10044-5.
- Type2, 2015. *American Diabetes Association*. Retrieved April 15, 2015, from Retrieved April 15, 2015, from <http://www.diabetes.org/diabetes-basics/type-2/>
- Weinick, R. M., Zuvekas, S. H., and Cohen, J. W. 2000. Racial and ethnic differences in access to and use of health care services, 1977 to 1996. *Medical Care Research and Review*, 57(suppl 1), 36-54.
- West, S. K., Munoz, B., Klein, R., Broman, A. T., Sanchez, R., Rodriguez, J., and Snyder, R. 2002. Risk factors for type II diabetes and diabetic retinopathy in a Mexican-American population: Proyecto VER. *American Journal of Ophthalmology*, 134(3), 390-398.
- Wilper, A. P., Woolhandler, S., Lasser, K. E., McCormick, D., Bor, D. H., and Himmelstein, D. U. 2009. Hypertension, diabetes, and elevated cholesterol among insured and uninsured US adults. *Health Affairs*, 28(6), w1151-w1159
