Journal of Diabetes and Its Complications 30 (2016) 1488–1493

Contents lists available at ScienceDirect

Journal of Diabetes and Its Complications

journal homepage: WWW.JDCJOURNAL.COM

Food insecurity and low self-efficacy are associated with increased healthcare utilization among adults with type II diabetes mellitus

Monideepa B. Becerra [a,*], Nickolas L. Allen [b], Benjamin J. Becerra [c]

[a] Department of Health Science and Human Ecology, California State University, San Bernardino, CA, United States
[b] California State University, San Bernardino, CA, United States
[c] School of Allied Health Professions, Loma Linda University, Loma Linda, CA, United States

ARTICLE INFO

Article history:
Received 9 May 2016
Received in revised form 3 July 2016
Accepted 15 July 2016
Available online 18 July 2016

Keywords:
California Health Interview Survey
Food security
Hospitalization
Self-efficacy
Diabetes
Emergency department

ABSTRACT

Objective: Food insecurity has been shown to negatively impact health outcomes, disease management and hospitalizations. Despite the increasing burden of type II diabetes mellitus (T2DM) in the United States, little research exists on the role of food insecurity and its association to T2DM-related healthcare utilization. The purpose of our study was to address such a gap in the literature by evaluating the role of food insecurity and T2DM-related past 12-month hospitalization or emergency department (ED) admission among adults with healthcare professional diagnosed T2DM.

Methods: We utilized the California Health Interview Survey (CHIS), 2009, 2011/2012 data to select CHIS participants who were aged 18 or older and reported doctor diagnosis of T2DM; resulting in a total of 8252 participants. Food insecurity was defined as: living at or above 200% federal poverty level (FPL), living below 200% FPL but food secure, living below 200% FPL and food insecure. A secondary exposure variable of interest was self-efficacy, based on the CHIS-provided variable of confidence to manage T2DM. All analyses were survey weighted with alpha less than .05 noting significance.

Results: Those with low food security (12.96%) and low-self efficacy (15.14%), reported significantly higher prevalence of T2DM-related healthcare utilization, as compared to their counterparts. Both living with low food security and having low self-efficacy were also associated with over two-fold increase in healthcare utilization.

Conclusion: Our results demonstrate the cumulative need for community-based resources to improve the continuum of care and ensure that such at-risk populations have adequate resources for disease management.

1. Introduction

The Centers for Disease Control and Prevention (CDC) reports that approximately 29 million Americans have diabetes, with the majority attributed to type 2 diabetes mellitus (T2DM) (Centers for Disease Control and Prevention, 2010). In addition, recent data have demonstrated the socioeconomic burden of diabetes including: 37.3 million outpatient and emergency department (ED) visits (Centers for Disease Control and Prevention, 2010), an estimated $245 billion in national cost, with 72% of such costs resulting from direct health care expenditures (Association AD, 2013), and over 75,000 annual deaths (Centers for Disease Control and Prevention, 2010). In addition, epidemiologic models predict the prevalence of T2DM quadrupling among youth between 2010 and 2050 (Imperatore et al., 2012). Furthermore, prior evaluations of the healthcare utilization burden of T2DM patients have shown that such patients are at a 30% higher risk of ED visits compared to the general population (Bo et al., 2004) and that hospital costs per patient were significantly higher among those with T2DM complications, as compared to those without (Pagano et al., 2009). Given the burden of T2DM, addressing the underlying factors associated with poor management is critical to ensure early prevention of complications.

In recent years, studies have highlighted the putative role of food insecurity in disease management. The United States Department of Agriculture (USDA) defines food security as "access by all people at all times to enough food for an active, healthy life" (USDA Economic Research Service, 2015) with over 14% of American households reporting food insecurity at least some time in 2013 (Coleman-Jensen, Gregory, & Singh, 2014). The existing body of literature notes a relationship between low food security and several negative health outcomes. For example, among both children and adults, food insecurity has been shown to be associated with lower adherence to physical activity guidelines (To, Frongillo, Gallegos, & Moore, 2014). Similarly, using a national survey in the U.S., Seligman, Bindman, Vittinghoff, Kanaya, & Kushel (2007) demonstrated increasing prevalence of diabetes with increasing food insecurity level, with the highest prevalence (16.1%) noted among those who were severely food insecure, compared to those who were food

Conflict of interest: The authors declare no conflict of interest.

* Corresponding author at: Department of Health Science and Human Ecology, California State University, 5500 University Parkway, San Bernardino, CA 92407, United States. Tel.: +1 909 537 5969.
E-mail address: mbecerra@csusb.edu (M.B. Becerra).

http://dx.doi.org/10.1016/j.jdiacomp.2016.07.009
1056-8727/

secure (11.7%). Even after accounting for population characteristics, physical activity, and even body mass index, odds of diabetes prevalence was 120% higher among food insecure adults, as compared to those who were food secure. Similar trends with food insecurity and increased weight status (Adams, Grummer-Strawn, & Chavez, 2003; Townsend, Peerson, Love, Achterberg, & Murphy, 2001), mental illness (Becerra, Sis-Medina, Reyes, & Becerra, 2015; Heylen, Panicker, Chandy, Steward, & Ekstrand, 2014), as well as poorer general health status (Stuff et al., 2004; Vozoris & Tarasuk, 2003) have been noted in the literature.

Moreover, studies have highlighted that low food security is associated with worse hospital outcomes. For instance, diabetes self-management, such as, medication and glucose monitoring have been found to be lower among T2DM patients who are food insecure compared to their food secure counterparts (Sattler, Lee, & Bhargava, 2014; Seligman, Davis, Schillinger, & Wolf, 2010). Among adults with T2DM, food insecurity has also been associated with healthcare utilization, with Nelson, Cunningham, Andersen, Harrison, & Gelberg (2001) noting higher physician encounters among those reporting food insufficiency; though no relationship between hospitalization was found. In this study, utilizing a large population-based survey, we aimed to address this gap in the literature and assess whether food insecurity is associated with higher healthcare utilization among T2DM adult patients. This is especially pertinent as a significant portion (43% of total medical cost) of health expenditures on T2DM is on hospitalizations (American Diabetes Association, 2013). Moreover, most common and potentially fatal T2DM-related cases are seen in the ED; and thus to have a comprehensive understanding of T2DM-related healthcare utilization, we evaluated both overnight or longer hospital stay and ED visit (McNaughton, Self, & Slovis, 2011).

2. Methods

2.1. Data source and population

In this analysis, we utilized the 2009, 2011/2012 public use California Health Interview Survey (CHIS) data. CHIS is considered to be the largest state health survey, delivered in several languages and utilizes a random-digit-dial system that includes cell phones. CHIS response rates are comparable to other population-based surveys and details on the methodology for CHIS can be found elsewhere (UCLA Center for Health Policy Research, 2012). In this study, we selected adults (aged 18 years or older), with self-reported healthcare professional diagnosis of T2DM.

2.2. Measures

Our primary outcome variable of interest was T2DM-related healthcare utilization, defined using CHIS-provided measures of having visited the ED for diabetes in the past 12 months or having been admitted to the hospital overnight or longer for diabetes in the past 12 months.

Our primary exposure variable was food security status, defined using the CHIS-provided variables of: living at or above 200% federal poverty level (FPL), living below 200% FPL but food secure, and living below 200% FPL with food insecurity. Food security status was assessed in CHIS using questions on availability and ability to have balanced meals and frequency of skipping or reducing meal sizes to accommodate limited budget. Participants who lived below 200% FPL (or those who were marked as "unknown" for poverty) were asked the following six questions: "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more," "(I/We) couldn't afford to eat balanced meals," "In the last 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?" "How often did this happen? Almost every month, some months but not every month, or only in 1 or 2 months?" "In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?" and "In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?" CHIS researchers utilized such questions to create the food security variable, which was used in this study. Further details of each question are available directly from CHIS questionnaire data documentation (UCLA Center for Health Policy Research, 2012).

In addition, given prior empirical evidence demonstrating a positive relationship between self-efficacy and diabetes self-management (Sarkar, Fisher, & Schillinger, 2006), our secondary exposure variable of interest was self-efficacy of T2DM management. Self-efficacy was assessed using CHIS variable of "How confident are you that you can control and manage your diabetes?" with response options of: very confident, somewhat confident, not too confident, and not at all confident. In our study, reporting not too confident and not at all confident were utilized to characterize low self-efficacy of T2DM self-management.

Control variables of age (18–44 years, 45–64 years, 65 or more years), sex (male, female), race/ethnicity (African American, Asian American and Pacific Islander, Latino, non-Hispanic White, and other), marital status (currently married, not currently married), education (high school or less, some college including vocational or Associate degree, and Bachelor's degree or higher), and insurance status (insured all past 12 months, not insured all past 12 months) were included. Given that the literature has shown the association between psychological wellbeing and diabetes (Anderson, Freedland, Clouse, & Lustman, 2001; Egede, Zheng, & Simpson, 2002; Rotella & Mannucci, 2013), we further included serious psychological distress (SPD), assessed through the Kessler-6-scale (Kessler et al., 2003), as a control variable. Similarly, due to the association between weight status (Astrup & Finer, 2000), cigarette smoking (Manson, Ajani, Liu, Nathan, & Hennekens, 2000; Nakanishi, Nakamura, Matsuo, Suzuki, & Tatara, 2000), and high levels of drinking (Seike, Noda, & Kadowaki, 2008; Wannamethee, Camargo, Manson, Willett, & Rimm, 2003), to that of diabetes or other chronic disease complications, we further included overweight or obese status and current behavior of being a current smoker and/or binge drinking in past 12 months as control variables.

2.3. Statistical analyses

All statistical analyses were conducted using SAS 9.4 (SAS Institute, Inc., Cary, NC) and were survey-weighted. We first conducted descriptive statistics to evaluate the weighted percent of each characteristic in the study population, followed by survey-weighted chi-square analyses, using design-based *F* values, to identify the prevalence of T2DM-related healthcare utilization by study population characteristics. Next, we utilized survey-weighted multivariable binary logistic regression analysis to assess the relationship between both primary (food security status) and secondary (self-efficacy) exposure variables and the outcome (T2DM-related healthcare utilization). Relevant interactions were also assessed. Alpha of .05 was utilized to establish significance.

3. Results

A total sample size (n) of 8252, extrapolated to an average annual population estimate (N) of 1,920,669 Californians with T2DM, were included in this study. Among the T2DM patient population in the study, 7.47% (n = 485, average annual N = 143,514) reported T2DM-related healthcare utilization (Table 1). Table 1 further shows the characteristics of the study population, with 21.07% of the population being food insecure and 8.50% with low confidence in T2DM self-efficacy. A higher proportion of our study population were aged 45–64 years (48.14%), were males (51.81%), were non-Hispanic White (39.38%), had a high school degree or less (52.60%), were currently married (39.14%), reported having insurance all past 12 months (86.53%), were overweight or obese (86.63%), and reported no risk behaviors of being a current smoker or binge drinking in the past 12 months (75.60%), while close to eight percent of the population reported having SPD in the past year.

In addition, among all healthcare utilization encounters, highest prevalence was for past 12-month T2DM-related ED visit (46.33%, n = 205, average annual N = 66,495), followed by, both ED and