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Social Support and Glycohemoglobin Level Among Older Adults

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2019

Abstract

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MPH, Walden University, 2014

MS, University of Ibadan, 1992

BS, University of Ibadan, 1985

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Diabetes is a public health concern among older adults in the United States due to the increasing prevalence of diabetes among this age group and the associated long-term and financial impacts. Self-management is a key strategy in the control of diabetes. The purpose of this quantitative study was to examine the association between social support and glycohemoglobin level. The social cognitive theory was the conceptual framework for this study. The research questions were designed to determine whether social support played a role in diabetes management. Data were collected using a cross-sectional survey of secondary data from the 2007–2008 National Health and Nutrition Examination Survey. The participants represented a national sample of adults aged 65 years and older. The dependent variable was the glycohemoglobin level, and the independent variables were emotional and financial support, sources of social support, and sociodemographic factors. Statistical analyses, consisting of univariate analyses, were conducted to characterize the sample, and simple and multiple linear regression analysis were conducted for hypotheses testing. After controlling for the confounders, the multiple regression analyses revealed a statistically significant association between emotional and financial support, sources of social support, the frequency of religious activities, and the size of the social network and glycohemoglobin level. Spousal support, frequency of religious activities, and the size of the social network were positively associated with glycohemoglobin level. The study findings might contribute to positive social change through the integration of social support into clinical practices by using family-centered and church-based approaches to improve diabetes management among older adults.

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Dedication

I dedicate this study to very special people who have contributed to my development in various stages of my life. I dedicate the work to my late mother, Esther Oredola Tinubu, who inspired me to aim higher in my academic journey and to the loving memory of my late father, Emmanuel Tinubu, whose belief in education has encouraged me to accomplish my educational goals. I also dedicate this work to my daughter, Morayo Irene, who has been my constant support and encouragement throughout this process. To God be the Glory.

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Section 1: Foundation of the Study and Literature Review

Introduction

In 2015, the prevalence of diabetes among older adults age 65 and older was 25.2% with 12.0 million diagnosed and undiagnosed, and the number of new cases estimated at 11.5% (American Diabetes Association [ADA], 2018a). According to the U.S. Department of Health and Human Services (USDHHS, 2010), the health care costs and the burden of chronic disease management are likely to increase as the population of older adults in the United States is increasing due to increased life expectancy resulting from better health care technology. In this first section, I will discuss the background factors and provide a review of the literature on the association between social support and diabetes management among older adults in the United States.

Problem Statement

Diabetes mellitus (DM) is a group of metabolic disorders occurring as a result of defects in insulin secretion, utilization, or both (ADA, 2010; Gumbs, 2012). These defects affect glucose metabolism thereby causing high glucose in the blood, a condition known as hyperglycemia (Ozouguwu, Obimba, Belonwu, & Unakalemba, 2013). The two main types of diabetes are Type 1 and Type 2 diabetes. Type 1 diabetes occurs as a result of beta cell destruction in the islets of Langerhans of the pancreas, leading to absolute insulin deficiency (ADA, 2013a). Type 2 diabetes, on the other hand, results from a progressive insulin secretory defect leading to insulin resistance, which prevents the uptake of glucose by skeletal muscles (ADA, 2013a).

DM is a public health problem due to the increase in its prevalence and adverse effect on health (ADA, 2016; Ozougwu et al., 2013). The risk factors for the development of diabetes include genetics, age, overweight and obesity, and physical inactivity (ADA, 2016). According to the ADA (2018), in 2015 the prevalence of diabetes in the United States was estimated at 30.3 million (9.4%), out of which 23.1 million were diagnosed and 7.2 million were undiagnosed. The percentage of U.S. seniors age 65 and older with diabetes is higher than among those of younger age at 25.2% (or 12.0 million people), including diagnosed and undiagnosed (ADA, 2018). When not well managed, the complications arising from diabetes disease include hypertension, heart disease, cerebrovascular disease, heart attack, stroke, kidney disease, and amputation of lower extremities (ADA, 2016). The economic burden of DM is substantial with costs rising to $245 billion in 2012, of which $176 billion was for direct medical costs and $69 billion in reduced productivity (ADA, 2013b). In addition, the average medical expenditures among people with diagnosed diabetes were 2.3 times higher than for those without diabetes (ADA, 2016).

Self-management is a key component in the management of Type 2 DM (T2DM). Diabetes self-management (DSM) includes achieving adequate glycemic control and weight management through diet and exercise (ADA, 2013a). Glycemic control is measured using blood and testing for glycated hemoglobin or sugar in the red cells (ADA, 2018a). The test is known as the hemoglobin A1c and is used in the clinical management of diabetes to assess the long-term efficacy of diabetic control (ADA, 2018a). The glycated hemoglobin result reflects the mean daily blood glucose

concentration and the degree of carbohydrate imbalance over the preceding 2 to 3 months (ADA, 2018a).

Social support influences the effectiveness of self-management and refers to the help provided by family, friends, neighbors, and others (Barrera, Toobert, & Strucker, 2014). The importance of social support in the control of DM is documented in the literature. For example, Koetsenruijter et al. (2015) found that the participation of diabetic patients in community organizations was related to better health outcomes. Social support was also associated with health-promoting behaviors and well-being among patients with Type 2 diabetes (Schiotz, Bogulend, Almdal, Jensen, & Willang, 2012).

However, there is disagreement on whether social support affects diabetic outcomes negatively or positively. For example, Boas, Foss, Freitas, and Pace (2012) did not find significant associations between social support and clinical and metabolic control variables. The lack of evidence suggests that the influence of social support might conflict with health recommendations and hinder adherence (Boas et al., 2012). Chew, Khoo, and Chia (2011) did not find a significant association between social support and glycemic control in T2DM patients. The authors suggested that the inconsistent association between social support and glycemic control could be due to differing methodologies employed (Chew et al., 2011). Some of the reasons that researchers have assumed there is a negative impact of social support on diabetes outcomes include patients feeling criticized or nagged and sometimes even guilty when receiving support from family (Miller & Dimatteo, 2013). In addition, the competing demands between

patient and family members were interpreted as barriers to self-management (Miller & DiMatteo, 2013). Given the findings from this study, I extended existing research by assessing the degree to which social support predicts diabetes outcomes among older adults.

Purpose of the Study

The purpose of this quantitative study was to examine the association between social support and glycohemoglobin (GHB) level. DM is a serious and debilitating health problem in the United States (Bowen et al., 2015; Coffman, 2008; Pereira et al., 2015). Complications arising from the disease process are attributed to patients' nonadherence to treatment recommended by their healthcare providers (Miller & DiMatteo, 2013). Social support from friends and families promotes patient adherence to treatment by encouraging optimism and self-esteem (Miller & DiMatteo, 2013). Several studies have indicated the significant role that social support has played in glycemic control among diabetes patient (Pereira, Berg-Cross, Almeida, & Machado, 2008; Rosland et al., 2008). However, the negative effects of social support on diabetes outcomes are documented as well (Gallant, 2007; Rosland et al., 2008). Gallant (2007) suggested that negative support could occur because of the nagging attitude of the support person and competing demands between patient and family members. These contradictory findings have created a gap in the literature on the role of social support in diabetes management. Therefore, further research was needed to determine the effect of social support on GHB control and identify which support is most relevant to glycemic control.

Research Questions and Hypotheses

Research Question 1: Is there an association between emotional support and GHB level among older adults?

$H_0$1: There is no association between emotional support and GHB level among older adults.

H_A1: There is an association between emotional support and GHB level among older adults.

Research Question 2: Is there an association between the sources of emotional support and GHB level among older adults?

$H_0$2: There is no association between the sources of emotional support and GHB level among older adults.

H_A2: There is an association between the sources of emotional support and GHB level among older adults.

Research Question 3: Is there an association between financial support and GHB level among older adults?

$H_0$3: There is no association between financial support and GHB level among older adults.

H_A3: There is an association between financial support and GHB level among older adults.

Research Question 4: Is there an association between the frequency of religious activities and GHB level among older adults?

$H_0$4: There is no association between the frequency of religious activities and GHB level among older adults.

H_A4: There is an association between the frequency of religious activities and GHB level among older adults.

Research Question 5: Is there an association between the size of the personal network (i.e., number of close friends, relatives, and nonrelatives) and GHB level among older adults?

$H_0$5: There is no association between the size of the personal network and GHB level among older adults

H_A5: There is an association between the size of the personal network and GHB level among older adults

Theoretical Foundation for the Study

The theoretical framework for this study was Bandura's social cognitive theory (SCT). The emphasis of the SCT is on the learning that takes place in a social context and that much of what is learned is gained through observation (Glanz, Rimmer, & Viswanath, 2015). Through the SCT, Bandura defined human behavior as an interaction between personal factors, behavior, and the environment (Glanz & Bishop, 2010; Glanz, Rimmer, & Viswanath, 2008). The constructs of the SCT include observational learning, reinforcement, self-control, and self-efficacy (Glanz et al., 2015). Goal-setting and self-monitoring are useful components of effective interventions (Glanz & Bishop, 2010). The SCT is frequently used in various public health intervention programs. For example, SCT, in addition to other behavioral theories, was tested to explain physical activity in

adults with T2DM (Plotnikoff, Lubans, Penfold & Courneya, 2014). The SCT was also used for predicting physical activity behaviors of employed women, with and without children (Tavares, Plotnikoff, & Loucaides, 2009).

Nature of the Study

In this study, I employed a quantitative, cross-sectional research design using secondary data abstracted from the National Health and Nutrition Examination Survey (NHANES) collected during 2007–2008. The survey was a multistage probability sample of the civilian population of the United States (Curtin et al., 2013). Health interviews were conducted in respondent's homes, while examinations were performed in specially designed and equipped mobile examination centers (Zipf et al., 2013). I selected the 2007–2008 NHANES data because a module on social support was included in the personal interviews as part of data collection. As part of the examination in the mobile examination centers, blood samples were routinely collected by NHANES researchers and tested for the GHB (Zipf et al., 2013). This blood measure was used to assess the control of diabetes management and represents the percent of glycosylated red blood cells in the body (ADA, 2010). To maintain quality control in the NHANES research data, the glycohemoglobin level was tested by the same laboratory (Steffes et al., 2005). I abstracted the GHB variable from the laboratory file and merged with the observations on the personal interview file by participant research identification number.

In this study, I answered five research questions through hypotheses testing of the linear effect of distinct types of social support as predictors of control of diabetes management. Quantitative variables were analyzed using statistical procedures (see

Creswell, 2009). The key independent variables were whether the participant needed emotional support, the most helpful source of emotional support, financial support, and social interactions (i.e., the size of the personal network) and the frequency of religious activities). The dependent variable was the GHB level expressed as a percentage. I adjusted the regression analyses for confounding variables including gender, age, racial/ethnic groups, marital status, education, and income. Through simple and multiple linear regression, I examined whether emotional and financial support and social interaction were associated with GHB level among older adults. The statistical software Standard Package for Social Sciences (SPSS) Version 21 was used for the statistical analyses. Additional details on the methods will be provided in Section 2.

Literature Search Strategy

The literature used in this study was articles published in peer-reviewed, professional journals. I located these articles in the ProQuest and medical collection, ProQuest Nursing & Allied Health source, Science Direct, and Medline with full text databases, using the EBSCOhost search engine of the Walden University Library. Other articles were retrieved from Google Scholar, scholarly books, published Walden University dissertations, and federal/state government websites with links to several U.S. federal government agencies, such as the ADA and Centers for disease control and prevention (CDC) websites, which provide access to statistical information. The literature reviewed was published between the periods of 2006 to 2018; however, I also drew on some earlier works for the theoretical framework and history. I performed the literature search using a combination of terms with diabetes mellitus as the keyword in most cases.

Search terms used included *diabetes mellitus and prevalence, diabetes mellitus and risk factors, diabetes mellitus and complications, diabetes and self-care, diabetes and social support, SCT,* and *SCT and diabetes*. In all literature searches, I eliminated unrelated topics and duplicate articles. The abstract of the remaining articles was reviewed, and the body of literature was further narrowed. For those articles that were reviewed, I searched important reference lists for additional eligible publications. Some of this literature contained relevant information that was published before 2006 but were still included in the literature. The most recent search was completed in March 2018.

Literature Review Related to Key Concepts

In the succeeding sections, I will define DM, prevalence, risk factors, and complications brought about by the disease. I will also discuss the components of diabetes management and its effectiveness in the control of diabetes mellitus. Furthermore, I will present the relevance of the distinct types and sources of social support and their effectiveness in the management of diabetes. The knowledge gap from the literature will also be provided.

Diabetes Mellitus (DM)

DM is the most common chronic disorder in the United States because of its increase in the prevalence over the past few decades (Menke, Rust, Fradkin, Cheng, & Cowie, 2014). The prevalence of diagnosed and undiagnosed diabetes combined increased by 33% between 1988 to 1994 and 2005 to 2010 (Menke et al, 2014). The current information on the prevalence of diabetes in the United States indicated that 30.2 million people (12.2%) of the population have diabetes, of which 23 million people were

diagnosed and 7.2 million people were undiagnosed (CDC, 2017). The prevalence rate differs with age, gender, race/ethnic group, and socioeconomic strata (Caspersen, Thomas, Boseman, Beckles, & Albright, 2012). The prevalence is higher in adults between 45–64 years of age (14.3 million) compare to younger adults, ages 18–44 (4.6 million; CDC, 2017). By 2050, it is projected that the number of Americans aged 65 years or older who are diagnosed with diabetes will be 26.7 million (Caspersen et al., 2012; Stewart et al., 2011).

DM is a group of metabolic disorders caused by a defect in insulin production at the beta cells of the islets of Langerhans of the pancreas (Ozougwu et al., 2013). Diabetes can also occur as a defect in insulin action or both (ADA, 2010). As a result of this disorder, the absorption of glucose by the body cells is affected, causing high glucose to build up in the blood, resulting in a condition referred to as hyperglycemia (National Institute of Diabetes and Digestive Kidney Diseases [NIDDK], 2016). There are four different types of diabetes: Type 1 diabetes; Type 2 diabetes; gestational diabetes occurring in pregnancy; and diabetes occurring from other sources such as infections, diseases of the pancreas, certain drugs or chemicals, and other conditions (ADA, 2013a, 2016). Type 1 diabetes accounts for 5%–10% of all diagnosed cases of diabetes and can occur in any age group but is more common among young children and young adults (ADA, 2010). The causes of Type 1 diabetes are unknown, but there are speculations that it can be the result of genetic, chemical, and environmental factors (ADA, 2013a; NIDDK, 2016). Other causes of Type 1 diabetes have been linked to environmental factors such as viruses, especially epidemic parotitis (i.e., mumps), rubella, and

enteroviruses (Ozougwu et al., 2013). The autoimmune reaction to the protein of the islets of the pancreas destroys the insulin production of the beta cells and causes a lack of insulin in the pancreas (ADA, 2015; NIDDK, 2016; Ozougwu et al., 2013).

T2DM is the most common form of diabetes, accounting for 90% to 95% of diagnosed cases of diabetes (ADA, 2010). T2DM is caused by a condition known as "*insulin resistance*", in which the body's muscle, fat and liver cells do not use insulin effectively (Ozougwu et al. 2013). In addition, the body cannot produce enough insulin to compensate for the impaired ability to use insulin (Ozougwu et al., 2013). The risk factors associated with the development of T2DM include age, overweight/obesity, ethnic/racial background, history of gestational diabetes, and disease conditions such as high blood pressure and history of cardiovascular diseases (CVDs) (NIDDK, 2016; Stewart et al., 2011).

Genetics and Diabetes

Genetics play an important role in the causation of T2DM. Evidence of the genetic component is revealed from studies on the family history of T2DM. While the risk of developing diabetes is 7% in the general population, the risk is four to six-fold higher (30%–40%) in individuals who had one parent with T2DM, and 10-fold (70%) if both parents had diabetes (Vimaleswaran & Loos, 2010). Genetics also contributes to the development of obesity (ADA, 2010). Studies have indicated that body mass index (BMI) alone is not a predictor of risk of many CVDs such as obesity, since the adverse health consequences associated with obesity are related to increased adiposity rather than in weight alone (Hirani, Zaninotto, & Primatesta, 2007). Abdominal obesity, which is one

of the key constituents of the metabolic syndrome classified as visceral adiposity (i.e., abdominal fat depots around organs) and subcutaneous adiposity (i.e., abdominal fat depots underneath skin), is a strong predictor of T2DM and CVDs (Hu et al., 2016). Furthermore, available evidence suggests that visceral adiposity has a more significant impact on diabetes-related risk factors than found in subcutaneous depots (Lee, Beretvas, & Freeland-Graves, 2014). In addition, abdominal obesity is more closely associated with chronic diabetes complications such as CVDs, diabetic retinopathy, and diabetic kidney disease (Hu et al., 2016; Man et al., 2016). Nonmodifiable risk factors, such as physical inactivity and poor dietary patterns, also give rise to abdominal obesity (Hirani et al., 2007; Wu, Ding, Tanaka, & Zhang, 2014). The prevalence of physical inactivity increases with age and is higher among ethnic minority groups compared with European Whites. Available data indicate that about 31 million Americans (28%) age 50 years and older are inactive (CDC, 2016). Furthermore, sedentary behavior, such as excessive television watching and prolonged computer use, rather than general lack of physical activity, increases the risk for diabetes (Dunstan et al., 2007; Hu, Li, Colditz, Willet, & Manson, 2003).

Obesity

Obesity can also occur through the consumption of a diet high in calories; for example, consumption of sugar-sweetened beverages (SSBs), such as soft drinks, fruit drinks, and iced tea, is associated with weight gain and risk of overweight and obesity (Nettleton et al., 2009; Vasanti, Barry, George, Jean-Pierre, & Walter, 2010). Consumption of SSBs has increased steadily in the United States; for example, between

1970 and 2006, consumption of SSBs increased from 64.1% to 141.7% kcal./per day (Vasanti et al., 2010). SSBs may increase T2DM and cardiovascular risk, independent of obesity, as a contributor to a high dietary glycemic load (GL) leading to inflammation, insulin resistance, and impaired beta cell function (Schulze et al., 2004).

The nutrient composition of the diet is also a risk factor for developing T2DM. Changes in dietary energy sources, particularly the increase in fat intake and simple sugars and the decrease in fiber intake, contribute to obesity and cause deterioration of glucose tolerance (Ozuogwu et al., 2012). Deficiency in some micronutrients, such as chromium and copper, were also studied to induce T2DM in a minority of cases (Kaura &Henry, 2014; Ozuogwu, et al., 2012). An important vitamin, vitamin D has also been associated with the improvement in diabetes control (Nakashima, Yokoyama, Yokoo, & Urashima, 2016). This is due to the significant roles of vitamin D in the synthesis and release of insulin (Pittas & Dawson-Huges, 2010). Vitamin D supplementation has been recognized as one of the ways of decreasing the risk of T2DM and improves glycemic parameters in T2DM patients (Wolden-Kirk et al., 2011). For example, an African American veteran was followed up for a period of 10 years in the endocrine clinic for insulin-requiring diabetes (Youssef, Abbassi, Jones, Woodby, & Peiris, 2010). Despite intensive medical, nutritional, and educational efforts, there was no discerning progress made in achieving an improvement in glycemic control (Youssef et al., 2010). The patient was screened and was found to be deficient in vitamin D (Youssef et al., 2010). Addition of vitamin D therapy to diabetes management was associated with significant improvement in glycosylated hemoglobin. (Tuomiletho, 2001; Youssef et al., 2010).

Interventions that combine physical activity and nutrition appear to result in a better outcome than those focused on either aspect alone (Burke et al., 2013). Psychosocial factors such as depression, increased stress, lower social support, and poor mental health are associated with an increased risk of development of diabetes (Desphande, Doson, German, & Browson, 2008).

Racial Disparity in the Prevalence of Diabetes Mellitus

There are racial and ethnic disparities in the prevalence of diabetes, access to diabetes care, diabetes-related complications, and mortality rates (CDC, 2016; Chow, Foster, Gonzalez, & Mclver, 2012; Gumbs, 2012). Members of the racial and ethnic minority groups in the United States have a higher prevalence of diabetes than nonminority individuals (Golden et al., 2012). These include Hispanics as well as non-Hispanic Black Americans, American Indians/Alaska Natives, and some Asian/Pacific Islander groups (Maty, James, & Kaplan, 2010). These groups are twice as likely to develop or have T2DM as are non-Hispanic Whites (Maty et al., 2010). Available statistics indicated that there is a higher prevalence of diabetes in American Indians/Alaska natives, affecting 15.9%, followed closely by Hispanic Blacks at 13.2% compared to 7.6% among non-Hispanic Whites (CDC, 2014). A stronger determinant of diabetes status and outcomes than race/ethnicity is socioeconomic factors (CDC, 2016; Link & McKinlay, 2009; Saday & Lochner, 2010). Socioeconomic determinants can be explained by modern lifestyle factors that promote obesity and inactivity common among Black Americans (Beckles & Chou, 2016). In addition, African Americans in comparison with European Whites are poorer, have less education, and are more likely to live in

distressed households and communities (Signorello et al., 2007). African Americans are also less able to access quality healthcare and have a less favorable risk factor for many disorders; therefore, socioeconomic factors have been linked to the differences in the prevalence of diabetes between racial/ethnic groups (Signorello et al., 2007).

Complications of Diabetes Mellitus

Diabetes-related complications are major causes of morbidity and mortality and have a serious impact on the quality of life of patients (Panari & Vegunarani, 2016). Alteration in glucose metabolism in T2DM can affect organ function either directly or indirectly through oxidative stress and inflammatory mechanisms linked to hyperglycemia (Brennan, McEvoy, Sadlier, Godson, & Martin, 2013). Elevated blood sugar levels may result in acute and chronic complications such as coronary artery disease, cerebrovascular disease, kidney and eye diseases, and disorders of the nerves among others (Panari & Vegunarani, 2016). Over time, damage to the retina can lead to blindness, while damage to the kidney from diabetes is a leading cause of kidney failure (ADA, 2013a; CDC, 2011), and damage to the nerves is the leading cause of foot and leg amputation (ADA, 2016) and paralysis (Panari & Vegunarani, 2016).

CVDs are the most common cause of death and disability among people with diabetes (Casperson, Thomas, Boseman, Beckles, & Albright, 2012). The CVDs that accompany diabetes include angina, myocardial infarction (i.e., heart attack), stroke, peripheral artery disease, and congestive heart failure (International Diabetes Federation, 2015). CVDs are highly prevalent among older adults with long-standing diabetes; estimates based on self-reported survey data indicated that in 2010, 40.1% of U.S.

diabetic patients aged 65 to 74 years had CVD, 26.8% had coronary heart disease, and 9.1% had suffered a stroke (Caspersen et al., 2012).

Other complications arising with T2DM include periodontal disease, also called gingivitis, which is a common cause of tooth loss among older adults in the United States (International Diabetes Federation, 2015). Susceptibility to periodontitis is increased three-fold in people with diabetes (Preshaw et al., 2012). Depression is another complication of DM. According to a report, there is a bidirectional relationship between depression and diabetes, where each disease is a risk factor for the other (Chen, Chan, Chen, Ko, & Li, 2013). The prevalence of depression is higher among people with diabetes and is partly attributed to vascular damage which may induce cerebral pathology that constitutes vulnerability for depression (Devarajooh & Chinna, 2017). People with diabetes and major depressive disorder are more likely to have poorer health outcomes (Kreider, 2017). Due to the comorbid health conditions associated with DM, it was classified as the seventh leading cause of death in the United States in 2010 (ADA, 2016).

The health care costs, disability, mortality, and morbidity due to diabetes and its complications pose a burden on the U.S. economy. In 2017, the United States spent $327 billion associated with diabetes (ADA, 2018b). This amount includes $237 billion in direct medical costs and $90 billion in reduced productivity (ADA, 2018b). This is a 47% increase from the previous estimate of $174 billion in 2007 (Dall et al., 2010). On average, people with diabetes have medical expenditures that are 2.3 times higher than those without diabetes (ADA, 2018b). Huang and Capretta (2009) predicted the number

of people with diagnosed and undiagnosed diabetes in the United States will increase to 44.1 million by 2034. During the same period, direct, annual, diabetes-related spending is expected to triple to $336 billion (Huang & Capretta, 2009).

Social Cognitive Theory

Social cognitive theory (SCT) was first known as social learning theory which intended to explain why people and animals behave the way they do (Thomas, 1990). The social learning theory was officially launched in 1941 with Miller and Dullards' publication of social learning and limitation. Their book was written to explain how animal and human models observed behaviors which then became learned through environmental reinforcements. In 1986, Albert Bandura renamed social learning theory as SCT (Bandura, 1986), by laying emphasis on the cognitive aspect. SCT focuses on how children and adults operate cognitively on their social experiences and how these cognitions then influence behavior and development (Bandura, 1986). The SCT defines human behavior as a triadic, dynamic, and reciprocal interaction of personal factors, behavior, and the environment (Bandura, 1986). According to SCT, an individual's behavior is uniquely determined by each of these factors. The basic premise of SCT is that people learn not only through their own experiences but also by observing the action of others and modeling their behaviors (Glanz et al., 2015).

Conceptual Framework

The key constructs of SCT that are relevant to health behavior change include reciprocal determinism, outcome expectations, self-efficacy, collective efficacy, observational learning, incentive motivation, facilitation, self-regulation, and moral

disengagement (Glanz et al., 2008). Reciprocal determinism refers to the dynamic and reciprocal interaction of individuals and groups with the environment and regulates their behaviors (Glanz et al., 2008). Outcome expectation is the consequences of a person's behavior and self-efficacy is defined as a person's confidence in his or her ability to act and to persist in that action despite obstacles or challenges which is important in influencing health behavior (Glanz & Bishop, 2010). Patient's self-efficacy can be increased by setting small, incremental and achievable goals, using formalized behavioral contracting to establish goals, and specify rewards, and monitoring and reinforcement by keeping records or feedback from self-monitor (Glanz et al., 2008). Collective efficacy is the belief about the ability of a group to perform actions that bring desired outcomes. Observational learning describes how individual perform a new behavior because of observing a behavior conducted by others and then reproduce those actions (Glanz et al., 2015). Self-regulation is the ability to control oneself through self-monitoring, goal setting, feedback, self-reward, self-instruction, and enlistment of social support (Glanz & Bishop, 2010).

Self-efficacy is important in disease management because it provides a suitable framework for understanding and predicting commitment towards self-care behaviors and effectiveness of self-management in diabetes treatment. This is important in changes in lifestyle like nutritious habits, smoking, and exercise which requires an elevated level of self-confidence. A person's self-efficacy develops because of their history of achievement in a particular area, from observations of others' successes and failures, from the persuasion of others, and from their own physiological state (Bandura, 1977).

Social support is important in creating an enabling environment for learning and provision of resources to build self-confidence. The result from studies supports the notion that self-efficacy or the confidence in one's ability to execute a behavior such as eating a healthy diet is associated with healthy nutrition patterns (Anderson, Winett, & Wojcik, 2007). Anderson et al. (2007) and Crawford et al. (2007) suggested that incorporating techniques that build confidence and reinforce the relationship of lifestyle choices to health outcomes could boost the effectiveness of health promotion efforts. Self-efficacy is a significant predictor of adherence to diabetes treatment regimens (Krichbaum, Aarestad, & Buethe, 2003). Because self-efficacy predicts behavior, the likelihood that a diabetes self-management task will be completed improves as self-efficacy increases (Coffman, 2008). For individuals to develop confidence in their ability to self-manage diabetes, they must be given the opportunity to practice expected behaviors. Diabetes task performance is in turn influenced by physical readiness, the opportunity to role model, participation in vicarious experiences, and praise for achievement (Glanz et al., 2008).

Diabetes Management

T2DM is a chronic, complex illness that requires multifactorial risk reduction strategies beyond glycemic control. These strategies include continuing medical care, self-management education and support that are in line with the established standard of care to prevent complications (ADA, 2013a). Self-management of a chronic illness refers to the daily activities that individuals undertake to keep their illness under control and minimize its impact on their physical health and functioning as well as enabling them to

cope with the psychosocial sequelae of their illness **(**Kadirvelu, Sadasivan, & Ng, 2012). According to ADA guidelines, people with diabetes should receive diabetes self-management education (DSME) at the time their diabetes is diagnosed and as needed thereafter **(**Nuti et al., 2015). DSME and diabetes self-management support (DSMS) are the ongoing processes of facilitating the knowledge, skill, and ability necessary for diabetes self-care. Successful self-management and quality of life are the key outcomes of DSME and DSMS and should be measured as part of care (ADA, 2013a). The importance of DSME and DSMS in the management of diabetes cannot be underestimated. DSME and DSMS programs are appropriate venues for people with prediabetes to receive education and support to develop and maintain behaviors that can prevent or delay the onset of diabetes. DSME and DSMS are essential elements of diabetes care. Education helps people with diabetes initiate effective self-management and cope with diabetes when they are first diagnosed (ADA, 2013a). The overall objectives of DSME and DSMS are to support informed decision making, self-care behaviors, problem-solving and active collaboration with the health care team to improve clinical outcomes, health status and quality of care in a cost-effective manner (ADA, 2013a). Several studies indicated that DSME is associated with improved diabetes knowledge and improved self-care behavior, improved clinical outcomes such as lower AIC, lower self-reported weights, improved quality of life, healthy coping and lower costs. (McEwen, Pasvogel, Gallegos, & Barrera, 2010). Diabetes education according to the report of the ADA (2013a) is associated with increased use of primary and preventive services, and lower use of acute, inpatient hospital services. In addition, patients who

participate in diabetes education were known to follow best practice treatment recommendations (ADA, 2013a). In addition, diabetic patients that are actively involved in their self-management experience improved quality of care (QOC) and improved HbA1c levels (Nuti et al., 2015).

Glycemic control defined by the ADA (2010) as glycosylated hemoglobin (HbA1c) levels of less than 7% is an indicator of adequate self-care behaviors. Gumbs (2012), explore the extent to which African American women participate in DSME and the impact of participation on self-care behaviors. The result indicated that those who received DSME were significantly more likely to adhere to preventive precautions such as checking their own blood sugar and feet regularly. Self-management interventions alone do not enable individuals to maintain behavior changes (McEwen et al., 2010). Better outcomes were reported for DSME intervention programs that were of longer duration with culturally, age appropriate support that were tailored to individual needs and preferences and that also addressed psychosocial issues (Norris et al., 2001) Self-management is often conceptualized as an individual responsibility in which only the patient can be responsible for his or her day-to-day care over the length of illness (Glanz & Rimmer, 2008; Lorig & Holman, 2003). Research does not support the contention that self-management interventions make individual self-sufficient or autonomous in managing their disease. Rather, a meta-analysis of diabetes self-management programs found a sharp decline in benefits a few months after the interventions (Norris, 2002). Thus, the long-term success of self-management depends on the contexts that surround

the individuals such as the support of families, friends and peer groups as well as the social network ties within the community.

Social Support

Social support according to Bardach, Tarasenko, and Schoenberg (2011) is the participation in voluntary associations and formal and informal relationships among significant others, associates, and colleagues. Social support can also be described as the assistance that is given to a person in need in form of providing information, resources, and socio-emotional aid (Bardach et al., 2011; Van-Dam et al., 2005) Social support can be conveyed through five categories of specific behaviors. The first category is the emotional support which is the expression of positive affect, warmth, and nurturance and commitment, empathetic understanding, and the encouragement of expressions of feelings (Bardach et al., 2011; Van-Dam et al., 2005). The second category is the informational support. Informational support is offering of advice, giving information, guidance or feedback. The third category is the tangible support which is the provision of material aid and financial assistance (Bardach et al., 2011; Van-Dam et al., 2005). The fourth category is the appraisal support. Appraisal support is empowering a person to understand a stressful condition and access to available resources and coping strategies to deal with the stressful condition. Social support can also be classified in relation to social relations. These are structural support and functional support (Gallo et al., 2015). Structural support is the number and diversity of social roles or frequency of social contact that one experiences. Functional support, on the other hand, is often conceptualized as the perception that supports resources such as material aid, emotional

support, companionship, information that would be available from one's social network if needed (i.e., perceived functional support; Gallo et al., 2015).

Social Support in Disease Management

Social support according to Debnam, Holt, Clark, Roth, and Southward (2012) include the self-appraisal of real or perceived social networks of family, friends, and organization, which provide emotional, financial, or personal assistant when needed. Social support has been used in disease management for better health outcome. Prior work has found that those with high quality or quantity of social networks have a decreased risk of mortality in comparison to those who have low quantity or quality of social relationships (Robin & Uchino, 2008). In a longitudinal study on heart problems, social participation was shown to predict the incidence of first-time acute M.I.. In this longitudinal study, those who had lower social involvement were 1.5 times more likely to have a first myocardial infarction (Ali, Merlo, Rosvall, Lithman, & Lindstrom, 2006). This might be due to the buffering effect of social support which is protective during stressful events (Strom & Egede, 2012). In diabetes management, social support is considered a critical aspect of disease prevention and management. It is beneficial in diagnosis, acceptance, emotional adjustment and decreasing stress. Consequently, lack of social support has been associated with increased mortality and diabetes-related complications. Research studies have indicated the benefit of social support in diabetes management. For example, Schiotz et al. (2012) carried out a study to investigate the relationships between structural and functional support and patient activation, self-management behavior and HbA1c levels among patients with T2DM. A self-

administered questionnaire was collected from 2,512 patients with T2DM. Logistic regression models were used to examine associations between social networks and patient activation, psychosocial problems, self-management behaviors, and HbA1c levels. The result of this study indicated that seeing friends more frequently, having a well-functioning social network and good social support from the social network was associated with higher patient activation, less diabetes-related emotional distress, and more promoting self-management behaviors among patients with T2DM. Good social support is significantly associated with health-promoting behaviors and well-being among patients with T2DM. The amount and satisfaction of support are related to diabetes outcome. Tang, Brown, Funnell, and Anderson (2008) investigated four social support variables among 89 African American adults diagnosed with diabetes. These are the amount and satisfaction of diabetes-related support received as well as positive and negative support behaviors. The authors found out that diabetes support satisfaction was associated with improved quality of life which could be beneficial to adhering to a healthy diet and regular physical activity. These findings suggested that diabetes-related social support has a significant role in improving the quality of life and self-management behaviors among individuals with diabetes. The beneficial effect of social support varies among diverse sources of social support as well as distinct types of social support.

Bardach et al. (2011) conducted a study to compare the strength of distinct types of social support for disease management. The study took place in rural Appalachia, Kentucky and the participants were recruited from three federally qualified health centers. In-depth interviews were conducted with each participant. Four separate social

support scales were used, including emotional/informational, tangible, affectionate, and social interactions. The result of the study indicated that the strength of support was greater for affectionate support followed by positive social interaction support, and then tangible support (Bardach et al., 2011). Perceptions were weaker for emotional/informational support. The reason given for the difference in the type of support is that the members of the community preferred support from the health professionals for medical and social services and avoided placing stress on family members and friends. Participants preferred to turn to families for more emotional needs as they viewed family members as reservoir support they could run to as an alternative when absolutely necessary (Bardach et al., 2011).

Sources of Social Support in Disease Management

In the management of diabetes, the selection of the source of support is based on hierarchical order, in which the family members are always selected first (Luttik, Jaarsma, Moser, Sanderman, & Veldhuisen, 2005). Within the family, the spouse and the children are chosen more often than distant relatives; this is followed by the support received from friends, neighbors, before the support of individuals from formal organizations (Luttik et al., 2005). This family-first view is in contrast with the view of Bardach et al. (2011), where the diabetic patients seek the support of professional first before the families. Partners or spouses provide support most of the time. Family members are likely to be an important source of influence because most of the diabetes management occurs at home, within the family network. (Shaw, Gallant, Riley-Jacone, & Spokane, 2006). Family members may directly facilitate self-management by cooking or

shopping for food that is consistent with the dietary needs of a patient with diabetes, or family members may directly get involved in carrying out actions such as blood glucose monitoring or foot care (Shaw et al., 2006). They might also identify the signs of an oncoming hypoglycemic episode (Paddison, 2010).

Another type of support is the peer support group. Peer support according to Yin et al. (2015) refers to the dissemination of knowledge of a specific behavior or coping strategy for a stressor between people who share a particular characteristic. The principle behind peer support group is that people with a common illness can share knowledge and experience in a less hierarchical and more reciprocal relationship than between patients and healthcare (Yin et al., 2015). Yin et al. conducted a study in which expert patients were supported and used as peer supporters for patients with chronic diabetes. The participants were diabetic patients age 18-75 years recruited from three hospitals in Hong Kong. The selected participants were then trained on several aspects of diabetes management such as diet, physical activity, behavioral psychology, with emphasis on positive thinking, goal setting, decision making, and coping with negative emotions. The peer supporters were asked to provide structural support for at least one year. The peer supporters followed up with their assigned patients through telephone calls. Peer supporters received a checklist to review specific management skills that included medication adherence, a healthy diet, regular exercise, sick day management, foot care, and glucose monitoring. They were also encouraged to provide psychological support based on their own experiences. Yin et al. indicated that the participants who attended the peer support training were more successful in their own self-care behaviors and metabolic

control (Yin et al., 2015). Simmons et al. (2015) found that group peer support was more effective than one to one approach in improving diabetes outcomes. The authors suggested that group peer support offers greater participation and members have greater choices to establish preferred supportive relationships, and groups undertook physical activity together.

Negative Effect of Social Support on Diabetes Management

There is disagreement over the evidence of the association between social support and diabetes. While some scholars believe that social support has a positive effect on diabetes management, others have discussed the negative effect of social support on diabetes management. For example, according to Gallo et al. (2015), when spouses participated in weight loss education group programs, their participation had a negative effect on obese men with T2DM. A larger social network size negatively affected both men and women (Gallo et al., 2015). The reason for the negative effect can be linked to the way support is provided, such as in the form of nagging and harassment. This may act negatively on dietary adherence. Receiving too much instrumental support was also associated with more depressive symptoms. Too much support, therefore, may worsen diabetes outcome (Miller & DiMatteo, 2013).

Evidence on the association between the form of social support and healthy behaviors or regimen adherence have mixed results (Boas et al., 2012; Chew et al., 2011; Rosland et al., 2014). Boas et al. conducted a study to analyze the relationship among social support and adherence to diet and physical exercise, pharmacological treatments, and clinical and metabolic control of DM. There were no associations between social

support and clinical and metabolic control variables. Some scholars believed that the positive effect of social support on glycosylated hemoglobin is observed more in Type 1 DM patients and the negative effect between social support and glycemic control was observed more in T2DM (Chew et al., 2011). Rosland et al. (2014) examined the association between social support and seven chronic illness self-management behaviors. These behaviors included lifestyle (physical activity and diet), and diabetes-specific behaviors such as checking feet, oral medication adherence, insulin adherence, self-monitored glucose, and primary care attendance. The evidence from a systematic review indicated that emotional support received from families and friends was significantly associated with increased adherence to recommended healthful eating regimen, physical activity levels, and checking feet daily, but not adherence to oral diabetes medications and insulin administration (Chew et al., 2011; Rosland et al, 2014). The sparse and conflicting evidence about the associations between social support and medication adherence or home monitoring (glucose or blood pressure) suggests that self-management may be more disease specific and may require more technical skill (Chew et al., 2011; Rosland et al., 2014).

Summary of the Role of Social Support on Diabetes Management

Social support is an important instrument to sustain diabetes self-management education programs (Chew et al., 2011; Debman et al., 2012; Gallo et al., 2015; Simmons et al., 2015). Social support can be applied at every level of interaction through the application of the socio-ecological model, while the SCT emphasizes confidence in the ability to manage diabetes well (Kricbaum et al., 2003). Different reviews have supported

the positive effect of social support on diabetes outcome (Chew et al., 2011; Robin & Uchino, 2008; Schiotz et al. 2012; Tang et al., 2008; Yin et al., 2015). However, the negative effect of social support is documented in the literature as well (Gallo et al., 2015; Miller & DiMatteo, 2013). This mixture of positive and negative effects has brought inconsistencies in the role of social support in the management of diabetes (Boas et al., 2013; Rosland et al., 2014; Shaw et al., 2006; Simmons et al., 2015). This inconsistency in the association between social support and diabetes self-management has created a gap in the literature which this study addressed.

Definition of Terms

Operational definitions include the following:

Diabetes mellitus: Diabetes mellitus is a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both (ADA, 2010).

Diabetes self-care management: Diabetes self-care management (DSM) includes achieving adequate glycemic control, blood lipids and blood pressure as well as weight management through diet and exercise (ADA, 2013a).

Emotional support: It is the type of support that describes what people do such as the provision of warmth, and nurture to express the feeling of love and care (Taylor, 2011).

Glycohemoglobin: Glycohemoglobin refers to a blood test to monitor diabetes self-management. Clinically, it is referred to as hemoglobin A1c, a diabetes test that reflects plasma glucose for the previous 120 days. A diagnosis of diabetes is made if the

A1C is 6.5% or greater and prediabetes if the A1C is between 5.7%-6.4% which is clinical practice recommendation (ADA, 2010).

Peer support: Peer support is the dissemination of experiential knowledge of a specific behavior or coping strategy for a stressor between people who share a particular characteristic (Boothroyd & Fisher, 2010).

Quality of life: is an individual's perception of their position in life as it relates to culture, value systems in which they live and in relation to their goals, expectations, standards, and concerns (Azmoude, Tafazoli, & Parnan, 2016).

Self-efficacy: It is referred to as the person's confidence in his or her ability to take action and to persist in that action despite obstacles and challenges (Glanz & Bishop, 2010).

Social cognitive theory: explains human behavior in terms of a three-way, dynamic, reciprocal model in which personal factors, environmental influences, and behavior continually interact (Glanz & Bishop, 2010).

Social network: Social network refers to the social relationship that surrounds the individual through which emotional support, information, and services are received (Israel, 1982)

Social support: Social support is a perception that one is loved and cared for, esteemed and valued, and part of a network of communication and mutual obligations from parents, a spouse or lover, other relatives, friends, social and community contacts such as churches, or clubs (Antonucci, 1985; Strom & Egede, 2012.).

Assumptions

There were several assumptions made in the design of this study. Using secondary data, I assumed that there was no selection bias and that the participants were randomly selected, using the correct statistical method. I assumed that the participants of the study understand the questions and answered truthfully. In addition, I assumed that the measurement used for laboratory examinations was reliable.

Scope and Delimitations

I delimited my study to the association between diabetes and social support among older adults. All participants were assumed to be 65 years and older. These exclude children, young adults, adults below the age of 65 years, and pregnant women as they might have gestational diabetes. This exclusion of certain groups of the population might limit the generalization to a broader population of diabetes. Based on the availability in the NHANES data, the social support includes emotional support, the source of emotional support, financial support, and social interactions. Although there were several blood tests performed on the participants related to chronic disease, I only used a glycohemoglobin level as the measure of diabetes outcomes.

Significance, Summary, and Conclusions

This study may contribute to the current literature on the roles played by social support in diabetes outcome. The findings from the study may also help to identify which source of support group (family, friends, peers, and health professionals) is more useful, in providing adequate support for the diabetes patients. The knowledge from this finding may help to understand better ways of integrating social support in the management of

diabetes, thereby promoting self-management behaviors necessary for social change. In section 2, I described the research design and methodology of the study.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative study was to examine the association between the social support domains on the glycohemoglobin level. This section will include the methodology used to investigate and analyze research findings. In this section, I will describe the research design and approach to the study, the target population, and selection of study sample and provide a discussion of the setting and sampling techniques, research instrumentation and materials, data collection and analysis, threats to validity, and the measures taken to protect the participants' rights.

Research Design and Rationale

I used a quantitative, cross-sectional research design with secondary analyses as the approach. The datasets were extracted from NHANES in multiple files and merged to produce the analytical datasets used for the study. I chose a cross-sectional design for this study because it measures the set of variables at one point in time, it is simpler to analyze, and it is descriptive in interpretation (see Frankfort-Nachimas & Nachimas, 2008). A quantitative method was preferred over the qualitative method for this study. I used this approach to express the relationship between variables in numerical forms using statistical measures. I chose the quantitative method because the approach allowed me to structure the research to show how all the major parts of the research project, such as the samples, measures of treatments, etc., worked together to address the research questions.

Methodology

I analyzed secondary data from the NHANES 2007–2008. The latest data on social support were available in the years of 2007–2008 (CDC, 2013). I used secondary data for this study because it allows the use of large survey data for research purposes and it is economical and time-saving (see Smith et al., 2011). Secondly, as the researcher, I could easily and quickly have access to raw data and it made for a shorter period in obtaining Institutional Review Board (IRB) approval because the primary data were collected and had already received IRB approval elsewhere. The NHANES personal interview files that I used in this study included demographic, socioeconomic, and health-related questions. The examination component of NHANES data that was used in this study was the laboratory test for GHB, which was analyzed under strict quality control (see Steffes et al., 2005).

Population

The population of the NHANES represents the civilian resident population of the United States with the exclusion of all persons in supervised care or custody in institutional settings, all active-duty military personnel, and active-duty family members living overseas (Zipf et al., 2013). The NHANES survey selects individuals of all ages from birth and up, both male and female, and classifies participants by racial/ethnic groups and socioeconomic strata (Zipf. et al., 2013). Overall, the number of participants that were interviewed in the 2007–2008 survey was 10,149, with 9,762 (96%) participants completing the mobile examination (Curtin et al., 2013).

The sample for my study was limited to the older adults (i.e., those 65 years old and above). I selected the older adults as the target population for this study because the risk of developing T2DM increases with age (see ADA, 2018). According to the CDC (2017) diabetes statistics report, in 2017, 12 million (25.2%) of older adults in the United States had diabetes. Using SPSS (Version 21) I downloaded the subset of the NHANES data limited to those 65 years old and above for analysis. The total number of participants 65 years old and above was 1,378 (679 males and 699 females). My selection of a large representative sample for this study was appropriate for generalization to the entire population of older adults in the United States. The data for this study was obtained from the NHANES website: https://www.cdc.gov/nchs/nhanes/index.htm.

Sampling and Sampling Procedures

The group of researchers at the National Center for Health Statistics used a multistage probability sampling design to collect NHANES data. This method was appropriate for this study because of the complexity of the survey and an oversampling of certain populations to ensure generalization of the results to the entire U.S. population. A four-stage sample design was used in NHANES 2007-2008 (Curtin et al., 2013). In the first stage, the primary sampling units were selected from a frame of all U.S. counties using probabilities proportionate to a measure of size (Curtin et al., 2013). In the second stage of selection, samples were chosen from census blocks using the 2000 census data (Curtin et al., 2013). In the third stage, specific households within the segments were selected, and in the final stage, individuals within a household were selected (Curtin et al., 2013). To improve the statistical reliability and stability of estimates, data from a 2-

year cycle was combined and was found to be appropriate for rare events (Curtin et al., 2013). I analyzed the NHANES sample using sample weights to represent the entire country.

Statistical Power Calculation

I conducted a power calculation for the required sample using the level of significance and the effect size. Statistical power analysis for multiple linear regression was performed following the guidelines established in G*Power 3 software (see Faul, Erdfelder, Lang & Buchner, 2007). I chose the post hoc calculation since the sample size was already known. Based on Cohen's (1992) definition of effect sizes, the medium effect of 0.15 an alpha of 0.05 was selected. The power calculation was based on six key predictor variables that I used to estimate the effect on the dependent variable. Based on a multiple linear regression analysis, the sample size of 1,378 participants would achieve greater than 99% power to detect a medium effect size of 0.15. Using an adequate sample size is important to ensure that the statistical tests performed have enough statistical power to detect the effect of the predictors on the response variable (Sullivan, 2012).

Instrumentation and Operationalization of Constructs

The NHANES data were collected on health, nutritional status, and health behaviors of the participants. The face-to-face interview at the household was conducted using a computer-assisted personal interview system (Zipf et al., 2013). Interpreters were available for the household interview for the non-English/non-Spanish participants (Zipf et al., 2013). The family questionnaire included sections related to education level, race/ethnicity, marital status, and family income (Zipf et al., 2013). The blood sample

collected at the mobile examination centers was centrifuged at 4° C to 8° C before being shipped to the clinical laboratory for testing (Zipf et al., 2013). The operationalization of variables selected for this study are shown in Table 1 and include demographic information on age, gender, marital status, race/ethnicity, and income, as well as distinct types of social support, social interactions, and glycohemoglobin level.

The dependent variable was the GHB level found in the laboratory file of the NHANES data. The GHB blood test provided a 3-month average of blood sugar levels (ADA, 2018a). The GHB variable in NHANES was recorded as a continuous percent of glycosylated hemoglobin, where values of 6.5% and higher represented abnormal levels of diabetes (ADA, 2018a). The six key independent variables (both original and derived) were available in the personal interview file of NHANES in the social support module: emotional support, the source of emotional support, need for emotional support, financial support, the size of the social network, and frequency of religious activities.

Emotional and financial support were coded as binomial variables where "yes was coded as = 1," and "no or did not need the support as = 0" (CDC, 2009). Since only the participants who said "yes, they could count on emotional support" were asked "who was the most helpful in providing emotional support," a new combined variable was derived (see CDC, 2009). In the new variable, source of emotional support, those who said they did not need emotional support in the prior question were coded as "0 = no one," and the rest of the observations that represented the nuclear family, other relatives, neighbors, professionals, and community members were grouped into five categories as spouse; children (i.e., daughter and son); extended family members (i.e., siblings, parents, other

relatives); friends and others in social network (i.e., neighbors, coworkers, church members, club members, professionals, and others (CDC,2009). Whether participants needed additional emotional support was captured over the last 12 months (CDC, 2009). Social interactions were measured as the size of their social network (i.e., number of close friends) and the frequency of attending religious activities (CDC, 2009).

The sociodemographic variables represented confounders and included age, gender, marital status, income, education, and race/ethnicity. Marital status was regrouped into two categories: 1 = married (i.e., married or living with a partner) and 2 = living alone (i.e., widowed, divorced, separated, never married, and living alone). Several studies indicated the association between diabetes and these confounding variables (e.g., Caspersen et al., 2012; Kushner, 2013; May et al., 2010). Confounders can alter the effect of the independent variables on the GHB level and can potentially exaggerate or mask the association between the independent variables and the dependent variable.

Table 1

Operational Description of Variables

Study Variable	NHANES Variable	Response Categories	Variable Type
		Dependent Variable	
Glycohemoglobin control	GHB Laboratory	% glycosylated hemoglobin	Continuous
		Key Independent Variables	
Social Support	SSQ		
Emotional Support	Can you count on anyone to provide emotional support?	0 = No/does not need help 1 = Yes	Binomial
Sources of Emotional Support	In the last 12 months, who was most helpful in providing with Emotional Support?	0 = No one 1 = Spouse 2 = Children 3 = Extended family 4 = Friends 5 = Groups in social network	Nominal
Needed more Emotional Support	In the last 12 months could you have you used more emotional support than you received?	0 = No did not need 1 = Yes	Ordinal
Financial Support	If you need some extra help financially, could you count on anyone to help you?	0 = No or did not accept 1 = Yes	Binomial
Frequency of Religious activities	How often do you attend church or religious services? (Times in a year)	0 = Never 1 = 1-50 2 = 51-100 3 = 101 and more	Ordinal
Size of personal network	In general, how many Close friends (Relative/Non-relatives) do you Have?	1 = 0-9 2 = 10-19 3 = 20 and more	Ordinal

(table continues)

Study Variable	NHANES Variable	Response Categories	Variable Type
		Sociodemographic Factors	
Age Group	RIDAGEYR	1 = 65-69 years 2 = 70-74 3 = 75-79 4 ≥ 80	Ordinal
Gender	RIAGENDR	1 = Male 2 = Female	Nominal
Race/Ethnicity	RIDRETHI	1 = Mexican American 2 = Other Hispanic 3 = Non-Hispanic White 4 = Non-Hispanic Black 5 = Other Race	Nominal
Education Level	DMDEDUC2	1 =< 11th Grade 2 = High school/GED 3 = Some college or AA 4 = College Graduate	Ordinal
Marital Status	DMDMARTL	1 = Married 2 = Living alone	Nominal
Annual Family Income	INDFMIN2	1 ≤ $19,999 2 = $20,000- $34, 999 3 = $35,000- $ 54,999 4 = $55,000 and more	Ordinal

Data Analysis Plan

I used both descriptive and inferential statistics to analyze data, and data were weighted to adjust for the complex, multistage design so that the sample was representative of the U.S. general population. The SPSS Version 21 was used to analyze these secondary data. The sample characteristics were presented using unweighted and weighted descriptive statistics, including frequencies and percentages for categorical variables and a measure of central tendency (i.e., mean) and a measure of dispersion (i.e., standard deviation) for continuous variables. Any analysis comparing differences between two categorical variables was tested using the chi-square test with statistical significance criteria of $p < .05$ significance level.

Linear Regression Analysis

Simple and multiple linear regression is a type of statistical inference where hypothesis testing determines whether independent variables predict a dependent variable (Cohen, 1988). Simple linear regression involves one independent (i.e., categorical or continuous) variable and one dependent variable (i.e., continuous), while multiple linear regression can have more than one independent variable (i.e., categorical or continuous; (Sullivan, 2012). For both types of analyses, the dependent variable must be a continuous measure and meet the four assumptions of parametric analysis: linearity, normality, multicollinearity, and homoscedasticity (Osborne & Waters, 2002). If the assumptions were violated and could not be achieved with transformations, I used a nonlinear regression analysis.

Linearity. Testing for linearity requires that the relationship between the independent and dependent variables be linear. Scatter plots and boxplots are used to visually inspect whether relationships between the independent and dependent variables are linear or curvilinear. Cohen (1988) suggested detecting nonlinearity through examination of residual plots (plots of the standardized residuals as a function of standardized predicted values), and to use curvilinear components, such as cubic terms when running regression analyses.

Normality. Normality refers to the shape of the data distribution for an individual variable. Testing for normality requires that the errors between the predictors (independent variables) and actual main outcome are normally distributed, or that the residuals of the regression are approximately zero. This assumption of normality was

checked using a histogram, and *p*-plot. Outliers can be identified through visual inspection of histograms or frequency distributions. According to Osborne and Waters (2002), removal of univariate and bivariate outliers can reduce the probability of Type I and Type II errors and improve the accuracy of estimates. These authors recommended transformation of cases using square root, log, or inverse, to improve normality. Normality can also be checked with a goodness of fit test, such as the Kolmogorov-Smirnov test (Green & Salkind, 2014).

Multicollinearity. This assumption only applies to multiple linear regression. When two or more of the independent or explanatory variables are highly correlated they are said to be multicollinear and not independent. A correlation matrix was used to identify highly correlated independent variables where the magnitude of the correlation coefficient is higher than 0.80. SPSS includes a procedure that is more accurate at detecting independence, the variance inflation factor (VIF) and tolerance level (TOL) (Williams, Grajales, & Kurkiewicz, 2013). The VIF ideally should be below 10.00 but preferably under 5.00. Both VIF and TOL were used to test for multicollinearity.

Homoscedasticity. The assumption of homoscedasticity means that the variance of errors is the same across all levels of the independent variable, and the residuals randomly scatter around the horizontal line with an even distribution. Heteroscedasticity is when residuals are not randomly scattered around 0 and can take the shape of a bow-tie or a fan shape. When there is heteroscedasticity, it can lead to distort and weaken findings and increase the possibility of Type I error. This assumption was tested with visual examination of a scatterplot of residuals versus predicted values. There should not

be a clear pattern in the distribution of the scatterplot. A nonlinear transformation or addition of a quadratic term can fix the unequal variance error (Nathans, Oswald & Nimon, 2012; Williams et al., 2013).

Research Questions and Hypotheses

Research Question 1: Is there an association between emotional support and glycohemoglobin level among older adults?

$H_0$1: There is no association between emotional support and glycohemoglobin level among older adults.

H_A1: There is an association between emotional support and glycohemoglobin level among older adults.

Statistical Plan. The first research question had two key variables; emotional support (predictor variable, binomial) and GHB level (dependent variable, continuous). A simple linear regression was performed to determine whether emotional support predicts GHB level. Using multiple linear regression, the predictor was adjusted for socio-demographic confounders; the null hypothesis would be rejected if $p < .05$.

Research Question 2: Is there an association between sources of emotional support and glycohemoglobin level among older adults?

$H_0$2: There is no association between sources of emotional support and glycohemoglobin level among older adults.

H_A2: There is an association between sources of emotional support and glycohemoglobin level among older adults.

Statistical Plan. The second research question had two key variables, sources of emotional support (predictor variable, nominal) and GHB level (dependent variable, continuous). A simple linear regression was performed to determine whether sources of emotional support predict GHB level. The relationship was then adjusted for socio-demographic confounders using multiple linear regression; the null hypothesis would be rejected if $p < .05$.

Research Question 3: Is there an association between financial support and glycohemoglobin level among older adults?

$H_0$3: There is no association between financial support and glycohemoglobin level among older adults.

H_A3: There is an association between financial support and glycohemoglobin level among older adults.

Statistical Plan. The third research question had two key variables, financial support (predictor variable, binomial) and GBH level (dependent variable, continuous). A simple linear regression was performed to determine whether financial support predicts GBH level. The relationship was then adjusted for socio-demographic confounders using multiple linear regression; the null hypothesis would be rejected if $p < .05$.

Research Question 4: Is there an association between the frequency of religious activities and glycohemoglobin level among older adults?

$H_0$4: There is no association between the frequency of religious activities and glycohemoglobin level among older adults.

H_A4: There is an association between the frequency of religious activities and glycohemoglobin level among older adults.

Statistical Plan. The fourth research question had two key variables, the frequency of religious activities (predictor variable, ordinal) and GHB level (dependent variable, continuous). A simple linear regression was performed to determine whether the frequency of religious activities predicts GHB level. The relationship was adjusted for socio-demographic confounders using multiple linear regression; the null hypothesis would be rejected if $p < .05$.

Research Question 5: Is there an association between the size of the personal network and glycohemoglobin level among older adults?

H_05: There is no association between the size of the personal network and glycohemoglobin level among older adults

H_A5: There is an association between the size of the personal network and glycohemoglobin level among older adults

Statistical Plan. The fifth research question had two key variables, the size of the personal network (predictor variable,(Ordinal) and GHB level (dependent variable, continuous). A simple linear regression was performed to determine whether the size of the personal network predicts GHB level. The relationship was then adjusted for socio-demographic confounders using multiple linear regression; the null hypothesis would be rejected if $p < .05$.

The results of the inferential statistical analyses were presented in a table including the predictors and their beta coefficients, 95% confidence intervals, and the *p*-

value for significance using the *F*-test with degrees of freedom. Examples were given in the text of the regression equations indicating how much the GHB level would change for each predictor in the model. The results included both unadjusted and adjusted regression models, where the unadjusted coefficients reflected a simple linear regression, and the adjusted coefficients reflected multiple linear regression. All analysis used the weighted variables. The R^2 was used to show the amount of variance that the adjusted predictors explain the outcome variable. The null hypotheses were rejected based on the multiple linear regression models adjusted for confounders.

Threats to Validity

Validity is the degree to which a survey item and its response alternatives measure the phenomenon they are supposed to measure (Crosby, DiClemente, & Salazar, 2006). There are two main types of validity, internal and external validity. The other types of validity include construct validity and content validity, among others. The internal validity of a study is the extent to which clear, accurate conclusions can be derived from the study and the external validity is the extent to which the result of the study can be generalized to a specific population or other populations beyond those involved in the study (Crosby et al, 2006). The threats to external validity are related to people, place, or time. The sample collected must be a true representation of the population and can be achieved through random sampling.

The sampling method for NHANES underwent a complex, multistage probability design to ensure that the sample selected was a true representation of the civilian noninstitutionalized household population of the United States. In addition, the older

adult sample in my study was weighted to represent the entire older adult population of the United States. The place of study could affect the external validity of the study; however, the NHANES sample frame included all 50 states and the District of Columbia. Data were collected in a 2-year cycle to produce estimates with greater precision and not affected by a shorter period where seasonal bias may play a part (CDC, 2013).

The possible threats to internal validity in this study could be selection, mortality, and instrumentation (Creswell, 2009). Selection bias could occur in the selection of participants to the study. This was overcome in my study in two ways: the NHANES was a cross-section of all older adults in the United States and my selection criteria did not delimit this representation of older adults 65 years and above. The NHANES selects households to interview at random so that selection bias will be minimized; in addition, the weights to account for the complex design compensate further for selection bias and for attrition. Completion rates in a research study are affected at the initial attempt to contact and successfully recruit participants, withdrawal from the study, loss to follow-up due to illness or inability to meet the window of the study, and death of the participant. Due to the multistage sampling and the weights applied to the analyses of the data, the sample I selected from NHANES was protected from some of these issues. However, the GHB level was obtained from the laboratory file and there was about a 20% loss to follow-up from the initial home interview to the mobile examination component. When using secondary data for analysis, the issue of missing data and representation of the true population could occur. The large sample size in my study was an advantage in guarding against threats to internal validity.

Instrumentation is another threat to internal validity. This could be the quality of questionnaire administered, the interview method and the attitudes of the interviewer. There was adequate planning for NHANES 2007-2008. A pilot study was done to test the instruments to be used. The questionnaires were simple, clear, with closed-ended questions. The quality of the questionnaire data was enhanced by administration via a computer–assisted personal interview system which enhances the accuracy and completion of responses as skip patterns and possible responses were presented to the interviewer, reducing human error. The field officers and the interviewers received a series of training. Competent staff was selected for NHANES. Many positions required that the staff speak both English and Spanish. Interpreters were hired to assist interviewers and examiners when necessary for any language.

Construct validity ensures that the variables of interest are measured. The key variables of interest were social support and GHB level. There was evidence that social support was beneficial in diabetes management and the questions underwent psychometric testing, including construct validity (Miller & DiMatteo, 2013; Schiotz et al., 2012).

Ethical Procedures

During the primary collection of data, the NHANES staff underwent training on confidentiality practices and signed a non-disclosure affidavit (declaration of facts). Participants identity was kept confidential and participants' information were kept secured in the computer using password protection and encryption (Zipf et al., 2013). The

National Center for Health Statistics and Research Ethics Review Board reviewed the survey plan before implementation.

Participation in the NHANES was voluntary, and the participants were informed about the survey process before signing the consent for participation. Interpreters were available to help those participants who did not speak or read English or Spanish (Zipf et al, 2013). Participants' identities were protected as no names or any identifying information was left in the public use data files. For the analysis of these secondary data as part of my doctoral study, I obtained the Walden University institutional review board (IRB) approval (#: 07-12-18-0383303) prior to any analyses of the data.

Summary

The purpose of this study was to examine the association between different domains of support and GHB level among older adults. Section 2 of this doctoral study included the research design, rationale for approach, and study methodology. This study was a cross-sectional quantitative study using secondary data from the NHANES 2007-2008 interview and laboratory data files. Based on NHANES documentation publicly available, the study sample was estimated at 1,378 including older adults 65 years and older residing in communities and not institutionalized. Statistical analysis of the six research questions and corresponding hypotheses-testing included simple and multiple linear regression analysis, where each predictor examined individually first and then adjusted for the effect of confounders.

The dependent variable was the GHB level; the key independent variables were social support such as emotional support, most useful source of emotional support,

financial support, the frequency of religious activities, and size of the personal network. The confounding variables were age, gender, education, race/ethnicity, marital status, and income. I described the threats to internal and external validity and some strategies to reduce them. There were no human subject protection ethical issues.

In Section 3, I present the weighted and unweighted descriptive characteristics of the participants using counts and percentages. I identify the steps involved in data management which will include variable derivation, handling of missing data, and the testing of assumptions of multiple regressions. I present the results of the test of assumptions of multiple regressions and address whether any of the four assumptions are violated. I also present the research questions and results of hypotheses testing sequentially, including predictor variables, beta coefficients, 95% confidence intervals, and significance levels. The null hypotheses are rejected if the significance values are $p < .05$.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this study was to examine the association between social support and GHB level among older adults in the United States. I designed the research questions to determine the association between emotional support, the different sources of social support, financial support, the frequency of religious activities, and the size of the social network. Five sets of hypotheses were tested using two differential statistics techniques: linear regression and multiple regressions.

In this section, I will present the results of data analysis to address the research questions and the associated hypotheses. The section will be divided into three subsections. In the first subsection, I will describe the data collection of the secondary data set, the time frame, and response rates of the participants. In the second subsection, I will use descriptive statistics to describe the demographic characteristics of the sample. In the third section, I will explain the testing and confirmation of the statistical assumptions for parametric statistics and inferential statistical analyses to address each of the research questions.

Data Management and Descriptive Analyses

The data for this cross-sectional study were originally collected by the NHANES 2007–2008 survey among the civilian, noninstitutionalized population living in all 50 states including the District of Columbia (Curtin et al., 2013). The sampling design used by NHANES was a multistage probability design with a large sample size to ensure that the sample selected was reliable (Zipf et al., 2013). I merged the NHANES demographic

dataset with the examination (i.e., GHB) and questionnaire data sets. The merged dataset resulted in a sample population of 1,378 older adults 65 years and above. For the variable household annual income, there were 28 participants with income response of under $20,000. These 28 were added to the group of less than $19,999. There were another 58 participants with income response of $20,000 and over. To avoid bias within the household income group, I removed these 58 participants from the variables. There were a total of 109 missing participants for the household annual income data. There were also three missing cases for education; consequently, I removed a total of 112 missing cases from the entire dataset. After the aforementioned reclassifications of missing data were performed in the demographic variables, there was no other missing data in the study sample. I examined outliers on the continuous variable GHB using a box plot technique in the SPSS. Two outliers were observed, and the case numbers were removed from the sample using the command "Select Cases" in the SPSS. The data for the statistical analysis were weighted using the weighting techniques from SPSS 21.

Recoding of Variables

For the proper management of the data set, I collapsed some of the variables into fewer categories relative to the research questions, target group (i.e., older adults), and a number of responses in each category (i.e., response categories were collapsed into fewer categories) and the changes were reflected in the table of operational measures. The race and ethnicity variables were collapsed into one binary variable and labeled as "1" for non-Hispanic White, which was the largest group and "2 for others for inferential statistical analysis only. The marital status was classified into two categories since the

focus of one of the research questions was on spousal support. The first category was represented by "1" for married or living with a partner and "2" for living alone (i.e., widowed, divorced, separated, and never married) instead of the six categories under the original variable. The sources of social support were also collapsed from 14 categories into the following six categories: 0 = no one; 1 = spouse; 2 = children (i.e., daughter and son); 3 = extended family (i.e., siblings, parents, and other relatives); 4 = friends; and 5 = social network (i.e., neighbor, coworkers, church members, club members, professionals, and others). The number of categories of annual household income was reduced from seven to four as follows: 19,999 or less; 20,000–34,999; and 35,000–54,999; and 55,000 or more. Educational level was collapsed into four categories, and frequency of church activities was collapsed from six to four categories, while the size of the social network was also collapsed from six categories to three categories.

Characteristics of the Study Population

The final sample consisted of 1,264 older adults. The weighted and unweighted frequencies are presented in Table 2. The participants' ages ranged from 65–80 years with a mean age of 73.7 (*SD* = 5.2). Half of the participants (50.4%) were female, more than half (64%) were non-Hispanic White, and about a third (32.4%) of the family annual income was less than $20,000. Over half of the participants (54.9%) were married or living with a partner, and over a third (37.9%) had educational attainment of 11th grade or less.

Table 2

Unweighted and Weighted Demographic Characteristics of the Study Sample

Characteristic	Unweighted Frequencies	Unweighted Percentages	Weighted Frequencies	Weighted Percentages
Gender				
Male	627	49.6	46380	49.7
Female	637	50.4	46956	50.3
Race/ethnicity				
Mexican American	117	9.3	8542	9.2
Other Hispanic	105	8.3	7593	8.1
Non-Hispanic- White	809	64.0	60396	64.7
Non-Hispanic- Black	201	15.9	14451	15.5
Other race	32	2.5	2354	2.5
Marital status				
Married or living with a partner	694	54.9	51018	54.7
Living alone (widowed, divorced, separated, never married)	570	45.1	42318	45.3
Annual household income				
$19,999 or less	409	32.4	30412	32.6
$20,000–34,999	353	27.9	26121	28.0
$35,000–54,999	273	21.6	20168	21.6
$55,000 or more	229	18.1	16635	17.8
Education				
11th grade or less	479	37.9	35330	37.9
High school graduate/GED	337	26.7	25015	26.9
Some college	233	18.4	17147	18.4
College graduate or higher	215	17.0	15844	17.0

Note. N = 1,264. NHANES data set of older adults, 2007–2008

Demographic Characteristics by Diabetes Status

The mean GHB of the population studied was 6.0% (*SD* = 0.94), with a minimum value of 3.7% and a maximum value of 12.6%. For the descriptive analysis, I used the three categories of GHB, which were classified as a normal value with GHB of 5.6% or less, prediabetes, which included a GHB between 5.7% to less than 6.4%, and diabetes with a GHB of 6.4% and above (ADA, 2010). The prevalence of diabetes among the study population was 19.1%, while 42. 7% of the population was classified as prediabetic.

I examined the association between demographic variables and diabetes status using Pearson chi-square analysis. Chi-square is used to examine the statistical relationship between two categorical variables (Sullivan, 2012). In Table 3, a significant statistical association was observed between age (p = .017), race (p = .001), education (p = .000), and annual household income (p = .045), and diabetes status. This indicated that the observed differences in each of these categories were significant, while there were no differences between diabetes status and gender and marital status.

Table 3

The Distribution of Demographics by Diabetic Status

Characters	Nondiabetic (%)	Prediabetic (%)	Diabetic (%)	*p* value
Age group (years)				
65–69	35.0	40.7	24.3	
70–74	39.5	40.1	20.4	.017
75–79	42.2	41.1	16.7	
80 and above	36.4	48.9	14.6	
Gender				
Male	39.9	39.9	20.3	.125
Female	36.4	45.5	18.1	
Race/ethnicity				
Mexican American	36.8	41.0	26.2	
Other Hispanic	35.2	42.9	21.9	
Non-Hispanic White	41.4	42.9	15.7	.001
Non- Hispanic Black	27.4	43.8	28.9	
Other race	37.5	37.5	25.0	
Educational level				
11th grade or less	35.7	39.7	24.6	
High school graduate/GED	36.5	46.0	17.5	.000
Some college	37.3	44.2	18.5	
College graduates or higher	47.0	42.84	10.2	
Marital status				
Married/living a with partner	39.5	41.6	18.9	.546
Living alone	36.5	44.0	19.5	
Annual household income				
$19,999 or less	40.8	39.4	19.8	
$20,000–34,999	31.4	47.6	21.0	.045
$35,000–54,999	37.7	43.2	19.0	
$55,000 or more	44.1	40.6	15.3	

Note. *N* = 1,264. The sample of older adults NHANES data. Set 2007-2008; *p*- value based on Chi-square statistical test.

Social Support by Diabetes Status

I determined the association between different types of social support and diabetes status by chi-square (See Table 4). A significant association was observed between older adults who reported needing more support in the past year (p = .039), needing financial support (p = .022) and diabetes status. Among different groups providing support to older adults, only support received from people in their social network (p = .029) was significantly associated with diabetes status.

Table 4

Association Between Different Support and Diabetes Status

Characters	Nondiabetic (38.2%)	Prediabetic (42.7%)	Diabetic (19.1%)	*p*- value
Emotional support				
Yes	39.0	42.8	18.2	
No	32.4	41.5	26.1	.064
Need more support in the past year				
Yes	29.4	50.3	20.3	.039
No	40.5	41.7	17.9	
Financial support				
Yes	39.3	43.5	17.2	
No	34.9	41.1	24.0	.022
The frequency of religious activities (days/year)				
Never	39.5	40.0	20.6	
1–50	37.2	43.2	19.6	.936
51–100	38.4	43.4	18.2	
101 and more	36.8	44.5	18.7	
Size of social network (Number of people)				
0–9	38.0	42.4	19.5	
10–19	37.7	42.6	19.6	.829
20 and more	39.7	45.2	15.1	
Sources of support				
Spouse	40.8	42.5	16.7	.116
Children	36.5	43.8	19.7	.542
Extended family	33.1	42.8	24.0	.130
Friends	37.3	44.1	18.6	.872
Social network	33.9	37.5	28.6	.029

Note. *N* = 1,264. The sample size of older adults, NHANES data 2007–2008
Statistic test: chi-square.

Multivariate Linear and Multiple Regression Analysis

To answer the research questions, I conducted a series of linear regression and multiple regressions with the GHB level as the dependent variable. The dependent variable was a continuous measure, and in order to use parametric statistics, such as linear and multiple regressions, the assumptions of parametric distributions were tested. I conducted multiple regression analysis to measure the significance of the relationship between the independent variable and the dependent variable while controlling for the sociodemographic confounders (i.e., age, gender, race/ethnicity, marital status, income, and education). Multiple regression analysis also determines the predictive power of each variable.

Testing for the Assumptions of Linear and Multiple Regressions

I carried out testing of the assumptions of linear and multiple regressions before starting the statistical analysis. The assumptions tested included normality, multicollinearity, homoscedasticity, and linearity. Normality was checked through a histogram of the standardized residuals (see Stevens, 2009). The histogram produced is shown in Figure 1, indicating the normal distribution of the dependent variable (i.e., GHB).

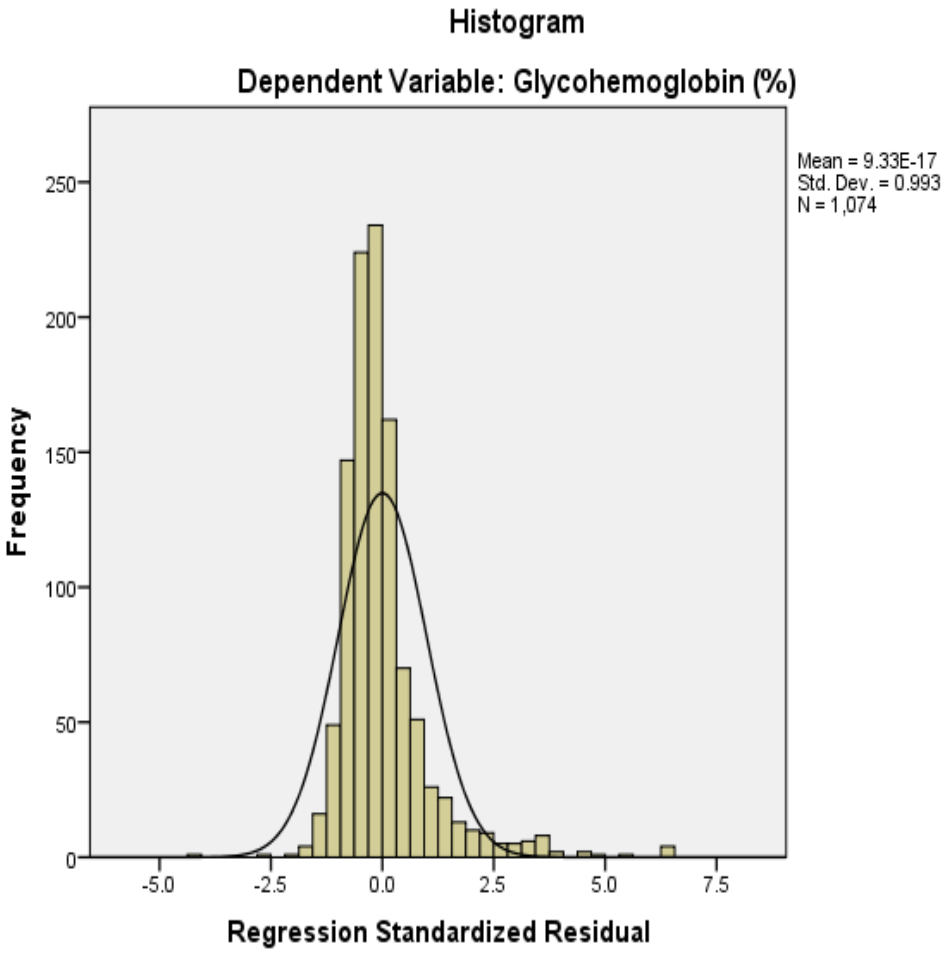

Figure 1. Histogram of glycohemoglobin (%) to check for normality.

Collinearity. Collinearity, also called multicollinearity, refers to the assumption that the independent variables are uncorrelated (Poole & O'Farrell, 1971). I assessed collinearity among all variables based on the tolerance statistics. Analysis of collinearity statistics indicated that the assumption of collinearity was met as the VIF scores were well below 10 and tolerance scores were above 0.2 (see Table 5).

Table 5

Collinearity Statistics

Model	Tolerance	VIF
Constant		
Age (Group)	.913	1.095
Gender	.841	1.189
Race/ethnicity	.924	1.083
Educational level	.769	1.300
Annual household income	.763	1.311
Marital status	.590	1.694
Spouses give more emotional support	.521	1.921
Children give more emotional support	.814	1.229
Extended family give more emotional support	.872	1.146
Friends give more emotional support	.870	1.150
Network (professionals, church members, club members, neighbors, and coworkers) give more emotional support	.862	1.160
No one gives more emotional support	.986	1.041
Needed more support in the past year	.942	1.062
Anyone to help with financial support	.934	1.071
The frequency of religious activities	.919	1.089
Size of social network	.960	1.041

Homoscedasticity. The assumption of homoscedasticity refers to the equal variance of errors across all levels of the independent variables (Osborne & Waters, 2002). Homoscedasticity was checked by visual examination of a plot of the standardized residuals by the regression standardized predicted value (Osborne & Waters, 2002). Residuals were randomly scattered around zero (the horizontal line, providing even

distribution (see Figure 3). No obvious sign of funneling suggesting the assumption of homoscedasticity was met.

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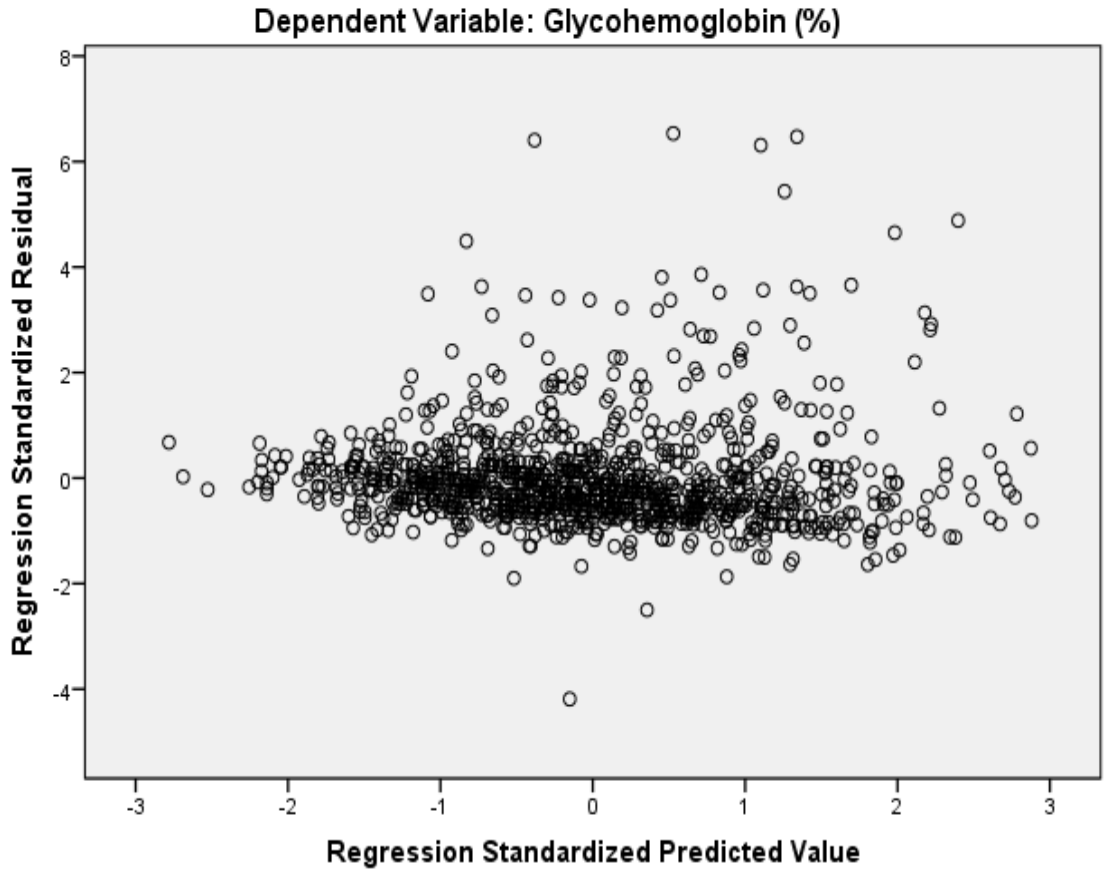

Figure 2. The scatter plot of the residuals to detect homoscedasticity.

Linearity. The relationship between the dependent variable and each of the independent variables must be linear. The assumption of linearity was achieved using partial regression plots between each independent variable and the dependent variable. The scatter plots indicated that there was a linear relationship between the dependent variable and the independent variables. The assumption of linearity was met.

Research Questions and Hypotheses

Research Question 1. Is there an association between emotional support and level among older adults?

$H_0$1: There is no association between emotional support and glycohemoglobin level among older adults.

H_A1: There is an association between emotional support and glycohemoglobin level among older adults.

To investigate the research question, a simple linear regression was conducted. The predictor was emotional support, and the dependent variable was the GHB percentage. The predictor variable was found to be statistically significant [*B*=.192, 95% C.I. (.173, .212), $p < 0.05$], indicating that for every unit increase in emotional support the GHB level changed by 19.2%. The model explained approximately 0.4% of the variability [R^2 =.004]. Therefore, the null hypothesis that stated that there was no association between emotional support and GHB level was rejected and the alternative hypothesis was retained. This served as the comparison model, and the covariates were entered in the next step.

The second step of the regression was the full or adjusted model [i.e. emotional support and potential sociodemographic confounding variables (age, gender, income, race/ethnicity, marital status, and education)]. The categorical predictor variables were dummy-coded. Male was the reference category for gender, age group (65-69 years) was the reference category for age, non-Hispanic White was the reference category for race/ethnicity, 11th grade or less was the reference category for education, married or

living with partner was the reference category for marital status and $19,999 or less was the reference category for income. The entry method of regression was used in which all variables were entered without any being removed. The results of the multiple linear regression analysis revealed a statistically significant association between emotional support and GHB level. Controlling for the sociodemographic confounders, the regression coefficient [B=.158, 95% C.I. (.138 .177*)* $p < 0.05$] associated with emotional support suggests that with each additional support, the hemoglobin level increases by 15.8%. (see Table 6). The R^2 value of .033 associated with this regression model suggests that emotional support accounts for 3.3 % of the variation in GHB level, which means that 96.7% of the variation in GHB level cannot be explained by emotional support alone. The C.I associated with the regression analysis does not contain 0, and $p < 0.05$ for the t test on the emotional support variable in the regression analysis (see Table 6). Which means the null hypothesis, there is no association between emotional support and GHB level can be rejected.

Table 6

Regression Analysis of Emotional Support and Glycohemoglobin Level

Linear Regression Analysis (Unadjusted)					Multiple Regression Analysis (Adjusted)			
Predictor Variables	*B*	S.E	*t*	*p*	*B*	S.E	*t*	*P*
Emotional Support	.192	.010	19.495	.000	.158	.010	15.778	.000
Gender					-.053	.006	-8.091	.000
Racial/ ethnicity					.065	.004	17.059	.000
Marital Status					.077	.007	11.375	.000
Income					.022	.003	6.894	.000
Education					-.123	.003	-39.733	.000
Age Group (years)								
Ref.65-69								
70-74					-.123	.009	-14.003	.000
75-79					-.224	.009	-24.424	.000
80 and above					-.213	.009	-24.402	.000

Note. N=1,264 95% C.I; Unadjusted (.173, .212); Adjusted (.138 .177). $p < 0.05$. The results are weighted to the U. S. population of older adults. NHANES data set, 2007-2008

Research Question 2. Is there an association between sources of emotional support and glycohemoglobin level among older adults?

$H_0$2: There is no association between sources of emotional support and glycohemoglobin level among older adults.

H_A2: There is an association between sources of emotional support and glycohemoglobin level among older adults.

The sources of social support were regrouped into five categories as follows: 0 = no one; 1 = spouse; 2 = children (daughter and son); 3 = extended family (siblings, parents, and other relatives), 4 = friends and 5 = others in the social network (neighbor,

coworkers, church members, club members, professionals, and others). Unadjusted and adjusted regression analysis was carried out for each of the categories.

Spouse Provided Emotional Support

To investigate the research question, a simple linear regression was conducted. The predictor was spousal support, and the dependent variable was a GHB percentage. The predictor variable was found to be statistically significant [*B*= -.149, 95% C.I. (-.161, -.136), $p < 0.05$], indicating that for every unit increase in spousal support the GHB level was reduced by 14.9%. The model explained approximately 0.6% of the variability [R^2=.006]. Therefore, the null hypothesis that stated that there was no association between spousal support and GHB level was rejected and the alternative hypothesis was retained. This served as the comparison model, and the covariates were entered in the next step. The entry method of regression was used in which all variables were entered without any being removed.

The results of the multiple linear regression analysis revealed a statistically significant association between spousal support and GHB level. Controlling for the sociodemographic confounders, the regression coefficient [*B*=-.187, 95% C.I. (-. 205, -.168*)* $p < 0.05$] associated with spousal support suggests that for every unit increase of spousal support, the GHB level decreased by 16.8%. The R^2 value of .035 associated with this regression model suggests that spousal support accounts for 3. 5 % of the variation in GHB level, which means that 96. 5% of the variation in GHB level cannot be explained by spousal support alone. The C.I (-.205, -.168) associated with the regression analysis does not contain 0, and $p < 0.05$ for the *t* test on the spousal support variable in the

regression analysis. Which means the null hypothesis, there is no association between spousal support and GHB level can be rejected.

Children Provided Emotional Support

To investigate the research question, a simple linear regression was conducted. The predictor was children provided emotional support, and the dependent variable was the GHB percentage. The predictor variable was found to be statistically significant [B=.061, 95% C.I. (.048, .073), $p < 0.05$], indicating that for every unit increase in emotional support provided by children, there was 6.1% change in GHB level. The model explained approximately 0.1% of the variability [R^2 = .001]. Therefore, the null hypothesis that stated that there was no association between children provided emotional support and GHB level was rejected and the alternative hypothesis was retained. This served as the comparison model, and the covariates were entered in the next step. The entry method of regression was used in which all variables were entered without any being removed.

The results of the multiple linear regression analysis revealed a statistically significant association between the support provided by children and GHB level. Controlling for the sociodemographic confounders, the regression coefficient [B=.040, 95% C.I. (.028, .053*)* $p < 0.05$] associated with children provided emotional support suggests that for every unit increase of emotional support provided by children, the GHB level changed by 4%. The R^2 value of .031 associated with this regression model suggests that emotional support provided by children accounts for 3.1 % of the variation in GHB level, which means that 96.9% of the variation in GHB level cannot be explained by

children provided emotional support alone. The C.I (.028, .053) associated with the regression analysis does not contain 0, and $p < 0.05$ for the *t* test on the children support variable in the regression analysis. This means the null hypothesis, there is no association between emotional support provided by children and GHB level can be rejected.

Extended Family Members Provided Emotional Support

Unadjusted linear regression analysis for extended family members provided emotional support yielded regression coefficient [*B*=.101, 95% C.I. (.085, .116), $p < 0.05$]. Indicating that for every unit increase in the emotional support provided by the extended family member, there was a 10.1 % change in GHB level. The model explained approximately 0.2% of the variability [R^2 =.002]. Therefore, the null hypothesis that stated that there was no association between extended family members providing emotional support was rejected and the alternative hypothesis was retained.

The results of the multiple linear regression analysis after controlling for the sociodemographic confounders revealed a statistically significant association between extended family members provided emotional support and GHB level. The regression coefficient [*B* =.043, 95% C.I. (.027, .059*)* $p < 0.05$] associated with the extended family member provided emotional support suggested that for every unit increase in the emotional support provided by the extended family member, the glycohemoglobin level increased by 4.3%. The R^2 value of .031 associated with this regression model suggests that emotional support provided by the extended family members' accounts for 3.1 % of the variation in GHB level, which means that 96.9% of the variation in GHB level cannot be explained by the extended family member provided emotional support alone. The C.I

(.027, .059) associated with the regression analysis does not contain 0 and p < 0.05 for the t-test on extended family variable in the regression analysis. This means the null hypothesis that says there was no association between the emotional support provided by the extended family member and GHB level can be rejected.

Friends Provided Emotional Support

Unadjusted linear regression analysis for friends provided emotional support yielded regression coefficient [*B*= - .017, 95% C.I. (-.032.-.002*) p*=.026], indicating that there was a statistically significant association between friends provided emotional support and GHB level. For every unit increase in the emotional support provided by friends, there was a 1.7% decrease in GHB level. The model explained approximately 0% of the variability [R^2 =.000]. This model indicated that though friends provided emotional support had a statistically significant association with GHB level, it was not a good predictor of the GHB level. The results of the multiple linear regression analysis after controlling for the sociodemographic confounders revealed a non statistically significant association between friends provided emotional support and the GHB level [*B*= -.010, 95% C.I. (-.025, .005*) p*=.196]. The C.I (-.025, .005) associated with the regression analysis contain 0, and $p > 0.05$ for the *t* test on friends' variable in the regression analysis. This indicated that the null hypothesis that says there was no association between the emotional support provided by friends and GHB level can be retained.

Others in the Social Network Provided Emotional Support

Unadjusted linear regression analysis for others in the social network provided the emotional support yielded regression coefficient [*B*=.163, 95% C.I. (.141, .185), $p < 0.05$]

indicating that there was a statistically significant association between others in the network provided emotional support and GHB level. This means that for every unit increase in the emotional support provided by others in the network, there was a 16.3% change in GHB level. The model explained approximately 0.2% of the variability [R^2 = .002]. This model indicated that there was an association between others in the network provided emotional support and GHB level.

The results of the multiple linear regression analysis after controlling for the sociodemographic confounders revealed a statistically significant ($p < 0.05$) association between others in the network provided emotional support and GHB level [B= .106, 95% C.I. (.086, .129*)* $p < 0.05$]. This indicated that for every unit increase in the emotional support provided by others in the social network, there was a 10.6% change in GHB level. The model explained approximately 3.2% of the variability [R^2 = .032]. The C.I (.086, .129) associated with the regression analysis does not contain 0, and $p < 0.05$ for the *t* test on others in the social network variable in the regression analysis. This means that the null hypothesis that says there was no association between the emotional support provided by others in the social network and GHB level can be rejected.

The Most Significant Source of Emotional Support

An analysis was carried out for the most significant source of support among the various groups that provided emotional support (spouse, children, extended family members, friends, and others in the social network). This was analyzed by using multiple regression analysis using the enter method where all the variables were entered at the same time. An observation was made on the beta value for each of the variables to detect

the variable with the highest value. The emotional support provided by spouse had the highest beta value [-.070] among the group (See Table 7). This was statistically significant $p < 0.05$ (See Table 7).

Table 7

The Most Frequent Source of Emotional Support

Predictor Variable	*B*	S.E	*β*	*t*	*p*
Spouses	-.137	.007	-.070	-21.067	.000
Friends	-.069	.008	-.030	-8.826	.000
Daughter and son	.036	.006	.019	5.620	.000
Extended family Members	.060	.008	.025	7.709	.000
People in the network	.149	.012	.044	12.712	.000

Note. N=1,264 *P* < 0.05, NHANES Social support data, 2007-2008.

Research Question 3. Is there an association between the financial support and glycohemoglobin level among older adults?

$H_0$3: There is no association between the financial support and glycohemoglobin level among older adults.

H_A3: There is an association between the financial support and glycohemoglobin level among older adults.

To investigate the research question, a simple linear regression was conducted. The predictor was the financial support and the dependent variable was the GHB level. The predictor variable was found to be statistically significant [*B*=.144, 95% C.I. (.130, .158), $p < 0$ .05], indicating that for every unit increase in financial support, the GHB level changed by 14.4% (see Table 8). The model explained approximately 0.5% of the variability (R^2 =.005). Therefore, the null hypothesis is rejected, and the alternative

hypothesis is retained. To adjust for the sociodemographic confounders, a multiple linear regression analysis was conducted. The predictors were the sociodemographic confounders and financial support. The dependent variable was the GHB level. The regression coefficient [B=.130, 95% C.I (.116, .144) $p < 0.05$] associated with financial support suggested that for every unit increase in the financial support provided, the GHB level increased by approximately 13.0%. The R^2 value of .034 associated with this regression model suggested that financial support accounted for 3.4% of the variation in GHB level. The confidence interval associated with the regression analyses does not contain 0, and $p < 0.05$ for the t test on the financial support variable in the regression analysis. This means the null hypothesis that states there is no association between financial support and the GHB level can be rejected.

Table 8.

Regression Analysis of Financial Support and Glycohemoglobin Level

Linear Regression Analysis (Unadjusted)					Multiple Regression Analysis (Adjusted)			
Predictor Variables	*B*	S.E	*t*	*P*	*B*	S.E	*t*	*p*
Financial Support	.144	.007	20.461	.000	.130	.007	18.404	.000
Gender					-.050	.077	-7.576	.000
Race/ethnicity					.060	.004	15.710	.000
Marital Status					.084	.077	12.259	.000
Income					.024	.003	7.457	.000
Education					-.127	.003	-32.341	.000
Age group (years)								
Ref. (65-69)						.		
70-74					-.123	.009	-13.917	.000
75-80					-.210	.009	-22.668	.000
80 and Above					-.198	.009	-22.410	.000

Note. N=1,264. C.I. Unadjusted (.130, .158); Adjusted (.116, .144). $p<0.05$. The results are weighted to the U.S. population of older adults. NHANES data set.2007-2008.

Research Question 4. Is there an association between the frequency of religious activities and glycohemoglobin level among older adults?

H_{04}: There is no association between the frequency of religious activities and glycohemoglobin level among older adults.

H_{A4}: There is an association between the frequency of religious activities and glycohemoglobin level among older adults.

To investigate the research question, a simple linear regression was conducted. The predictor was the frequency of religious activities (number of days per year) and the

dependent variable was the GHB level. The predictor variable was found to be statistically significant [*B*= -.028, 95% C.I. (-.034, -.022), $p < 0$ .05], indicating that for every unit increase in the frequency of religious activities, the GHB level decreased by 2.8%. (see Table 8). The model explained approximately 0.1% of the variability R^2 = .001. Therefore, the null hypothesis is rejected, and the alternative hypothesis is retained. To adjust for the sociodemographic confounders, a multiple linear regression analysis was conducted. The predictors were the sociodemographic confounders and the frequencies of religious activities. The dependent variable was the GHB level. The regression coefficient [*B*= -.023, 95% C.I (-.029, -.017)] associated with the frequency of religious activities suggested that for every unit increase in the frequency of religious activities, the GHB level decreased by approximately 2.3% (see Table 9) The R^2 value of .032 associated with this regression model suggested that the frequencies of religious activities accounted for 3.2% of the variation in GHB level. The confidence interval associated with the regression analyses does not contain 0, and $p < 0.05$ for the *t* test on the religious activities' variable in the regression analysis. This means the null hypothesis that stated there is no association between the frequencies of religious activities and GHB level was rejected.

Table 9.

Regression Analysis of Frequency of Religious Activities and Glycohemoglobin Level

Linear Regression Analysis (Unadjusted)					Multiple Regression Analysis (Adjusted)			
Predictor Variables	*B*	S.E	*T*	*p*	*B*	S.E	*t*	*p*
Frequency of Religious Activities	-.028	.003	-9.208	.000	-.023	.003	-7.590	.000
Gender					-.056	.007	-8.467	.000
Race/ethnicity					.054	.004	14.097	.000
Marital Status					.075	.007	10.758	.000
Income					.017	.003	5.326	.000
Education					-.129	.003	-41.338	.000
Age group (years)								
Ref. (65-69)								
70-74					-.134	.009	-15.012	.000
75-80					-.233	.009	-25.046	.000
80 and above					-.215	.009	-24.158	.000

Note. N=1,264. 95% C.I. Unadjusted (-.034, -.022); Adjusted (-.029, -.017). $p < 0.05$. The results are weighted to the U.S. population of older adults. NHANES data set, 2007-2008

Research Question 5. Is there an association between the size of the personal network and glycohemoglobin level among older adults?

$H_0$5; There is no association between the size of the personal network and glycohemoglobin level among older adults.

H_A5: There is an association between the size of the personal network and glycohemoglobin level among older adults.

To investigate the research question, a simple linear regression was conducted. The predictor was the size of the personal network, and the dependent variable was the GHB

level. The predictor variable was found to be statistically significant [*B*= -.084, 95% C.I. (-.093, -.075), p < 0 .05], indicating that for every unit increase in the size of the personal network, the GHB level decreased by 8.4 % (see Table 10). The model explained approximately 0.3% of the variability [R^2 = .003]. Therefore, the null hypothesis is rejected, and the alternative hypothesis is retained.

To adjust for the sociodemographic confounders, a multiple linear regression analysis was conducted. The predictors were the sociodemographic confounders and the size of the personal network. The dependent variable was the GHB level. The regression coefficient [*B*= -.075, 95% C.I (-.084, -.066)] associated with the size of the personal network suggested that for every unit increase in the size in the personal network, the GHB level decreased by approximately 7.5 % (see Table 10). The R^2 value of .033 associated with this regression model suggested that the size of the personal network accounted for 3. 3% of the variation in GHB level. The confidence interval associated with the regression analyses does not contain 0, and $p < 0.05$ for the *t* test on the personal network variable in the regression analysis. This means the null hypothesis that stated there is no association between the size of the personal network and GHB level was rejected.

Table 10.

Regression Analysis of The Size of Personal Network and Glycohemoglobin Level

Linear Regression Analysis (Unadjusted)					Multiple Regression Analysis (Adjusted)			
Predictor Variables	*B*	S.E	*T*	*p*	*B*	S.E	*t*	*p*
Size of Personal Network	-.084	.005	-17.771	.000	-.075	.005	-15.980	.000
Gender					-.071	.007	-10.973	.000
Race/ethnicity					.061	.004	16.051	.000
Marital Status					.073	.007	10.731	.000
Income					.021	.003	6.429	.000
Education					-.127	.003	-41.365	.000
Age group (years) Ref. (65-69)								
70-74					-.127	.009	-14.381	.000
75-80					-.210	.009	-22.792	.000
80 and above					-.201	.009	-22.808	.000

Note. N=1,264. 95% C.I. Unadjusted (-.093, -.075); Adjusted (-.084, -.066); $p < 0.05$. The results are weighted to the U.S. population of older adults NHANES data set, 2007-2008

Summary of Results

Univariate, bivariate and multivariate statistical methods were used to analyze the sample of 1, 264 older adults in the United States. The purpose of the analysis was to examine if there was a statistically significant association between social support and GHB level. Following the description of the study sample, the five research questions and hypotheses were tested using the linear regression and multiple regressions statistical analyses. Assumptions for multiple linear regressions were tested and met. The first research question investigated the association between emotional support and GHB level. There was an association between emotional support and GHB level. The null hypothesis

was rejected. The second research question investigated the association between different sources of emotional support and GHB level. The result indicated an association between spousal support, children providing support, extended family providing support, and other people in the social network providing support. The null hypothesis was rejected. After adjusting for the sociodemographic confounders, there was no association observed between friend providing emotional support and GHB level. The null hypothesis was retained. The support provided by the spouse was the most significant among the different sources of support. The third research question investigated the association between financial support and GHB level. There was an association between financial support and GHB level. The null hypothesis was rejected. The fourth research question investigated the association between the frequency of religious activities and GHB level. The result indicated an association between the frequency of religious activities and GHB level. The null hypothesis was rejected. The last research question investigated the association between the size of the personal network and GHB level. There was an association between the size of the personal network and GHB level. The null hypothesis was rejected. The interpretation of the results is presented in Section 4, where I corroborate my findings with literature. I also made recommendations that may be helpful for caregivers, professional practice among clinicians and diabetic educators, public health advocates, and policymakers to bring a positive social change in the management of diabetes among older adults.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this study was to examine the association between social support and GHB level among older adults. The objective of the study was to assess the role of social support in diabetes management. Evidence from this study may provide information to researchers and health workers about the role of social support in the management of diabetes. This information may aid in the development of interventions that incorporate different sources of social support in the management of diabetes among older adults.

In this section, I will interpret the research findings and discuss the limitations of the study, recommendations, implications for professional practice and social change, and end with a conclusion. Data were collected from the 2007–2008 NHANES database for this study. SPSS Version 21 was used to provide descriptive and inferential analyses. For analytical purposes, the data for complex sampling, including primary sampling units and sampling strata, were weighed and the findings represent the sample of older adults, 65 years old and older, in the United States for the years of data collection.

Interpretation of the Findings

According to the GHB test, the prevalence of prediabetes is more than double (42.7%) that of diagnosed diabetes (19.1%) among older adults. There were racial disparities in the prevalence of diabetes, where older adult nonHispanic Black had almost double the prevalence of diabetes (28.9%) compared to nonHispanic White (15.7%). Prior evidence indicated a higher prevalence of diabetes among older adults compared to

the total population in the United States (CDC, 2017; Menke, Casagrande, Geiss, & Cowie, 2015). According to the 2017 National Diabetic Statistic report, the prevalence of diabetes among older adults in the United States in 2015 was 25.2%, while 48.3% of older adults had prediabetes compared to 33.9% among adults aged 18 years or older (CDC, 2017). According to Casperson et al. (2012), the prevalence of prediabetes among older adults from 2005 to 2008 was estimated to be 50%, which is somewhat higher than the findings of this study. The prevalence reported by Casperson et al. indicates an extremely large reservoir (i.e., 50%) of older adults at high risk for T2DM; however, this estimate was based on projections and not actual morbidity statistics.

Research Question 1

Research Question 1 was: Is there an association between emotional support and glycohemoglobin level among older adults? The linear and multiple linear regression models indicated that emotional support was significantly associated with the GHB level. This association was observed to be a positive linear relationship, which means that as the emotional support increased, there was an increase in GHB level. This finding illustrates the negative effect of emotional support on the worsening glycemic control. My findings were consistent with Fortman et al. (2015), who found that higher functional support was related to poorer glycemic control. Robin and Uchino (2008) found a similar direction between emotional support and worsening health in their population survey that indicated that lower perceived emotional support predicted higher mortality among elderly women. In addition, adults that were socially isolated and who received less emotional and practical support were more likely to be newly and previously diagnosed

T2DM (Brinkhues et al., 2017). The findings of this latter study were inconsistent with the findings of the present study.

Research Question 2

Research Question 2 was: Is there an association between sources of emotional support and glycohemoglobin level among older adults? The linear and multiple regression analysis indicated that there was a significant association between the personal network (i.e., spouse, children, extended family members, and others) and provision of social support and its effect on glycemic control. Multiple regression analysis also indicated that spousal support was the most frequent source of emotional support. Support from friends was significantly associated with GHB with linear regression analysis but was not significant when adjusted for sociodemographic confounders. Family members were identified as the most significant source of support in diabetes management because the vast majority of diabetes self-management occurs at home (Azmoude et al., 2016; Barrera et al., 2014; Miller & DiMatteo, 2013; Rosland et al., 2008); family's role in disease management has been inconsistent. For example, in diabetes education and family social support training program about how to manage diabetes, patients who participated in the training program had reduced blood glucose levels (Miller & DiMatteo, 2013). Conversely, a negative relationship was revealed between the family support and quality of life among diabetic patient (Azmoude et al., 2016). Some studies suggested that patients often feel criticized or nagged, and sometimes feeling guilty when receiving support from family (Azmoude et al., 2016; Miller & DiMatteo, 2013). Patients' family and friends can also pose barriers to self-

management (Rosland et al., 2008). Different studies have demonstrated the hierarchal order of social support within the family in which the spouse and the children are chosen more often than distant relatives (Li et al., 2014; Luttik et al., 2005). This report is consistent with the findings of this study. Partner support has been identified as vital in the management of diabetes and improves quality of life for both partners (Beverly, Miller, & Wray, 2008).

Research Question 3

Research Question 3 was: Is there an association between financial support and glycohemoglobin level among older patients? Linear and multiple regression analyses indicated a significant association between financial support and GHB level. I observed a positive relationship which indicated that an increase in the financial support provided increased the GHB level. Non adherence (i.e., noncompliance) to medication and treatment among patients with chronic illness has been linked to poor health outcomes (Miller & DiMatteo, 2013). Financial stress has been identified as one of the reasons for nonadherence to treatment (McBrien et al., 2017; Miller & DiMatteo, 2013; Strom & Egede, 2012). McBrien et al. (2017) indicated that financial barriers could have an effect on medication costs and eating a healthy diet, which could have an effect on glycemic control. The findings from this study were not consistent with the previous findings.

Research Question 4

Research Question 4 was: Is there an association between the frequency of religious activities and glycohemoglobin level? Linear and multiple regression analyses indicated a significant relationship between frequencies of religious activities and GHB

level. Spiritual and religious beliefs activities play a key role that aid in coping with a chronic illness by providing support, confidence, and hope (Watkins, Quinn, Ruggeiro, Quinn, & Choi, 2013). Banerjee, Strachanan, Boyle, Anand, and Oremus (2014) conducted a qualitative study to assess the relationship between attendance of religious services and coronary heart disease and related risk factors in older adults in Canadian community health survey. Their results indicated that older persons who attended religious services more than once a week, compared to persons who did not attend at all, have a lower prevalence of coronary heart disease, diabetes, and high blood pressure. This was consistent with the findings of this study in which the frequency of religious activities decreased GHB level.

Research Question 5

Research Question 5 was: Is there an association between the size of the personal network and glycohemoglobin level. Linear and multiple regression analysis indicated a significant relationship between the size of the personal network and GHB level. With an increase in the size of the personal network, there was a decrease in GHB level. Available evidence indicated the contribution of social networks to long-term disease management through the actions, practices, and emotional activities and support work that members of peoples' personal networks undertake (Vassilev, Rogers, Kennedy, & Koetsenruijter, 2014). Belonging support, characterized by interaction with friends, family, and other groups, was a predictor of disease outcomes such as diabetes (Robin & Uchino, 2008). Brinkhues et al. (2017) assessed the relationship between social network and diabetes and

found that more socially isolated individuals (i.e., those with a smaller social network size) more frequently had newly diagnosed and previously diagnosed T2DM.

Limitations of the Study

One strength of this study was the selection of a large representative sample of older adults in the United States; however, several factors may limit the study. One limitation was that the survey excluded older adults in supervised care such as nursing homes or hospitals. The cross-sectional nature of this study meant that all the parameters were reported at one point in time. Causal inferences could not be made, especially with the emotional and financial support that had a positive linear association with GHB level. The response rate for an important variable (i.e., health professional support) was very small; hence, independent analysis of the association between health professional as a source of social support and GHB could not be assessed. In addition, I could not account for the relationship between other sources of social support, such as peer support and informational support, and GHB due to the limitation of using secondary data. Though the findings revealed the association between social support and GHB level, the quality of the support could not be measured. Another limitation was that the strength of association from the findings of this study was weak for each of the research questions.

Recommendations

The findings of this study only revealed the association between social support and hemoglobin. Being a cross-sectional study, the cause and effect could not be determined and the quality of the support received through various sources could not be assessed. I recommend that a longitudinal research be used for further study. The

literature on financial support and diabetes was scarce, so I recommend that more studies are needed on financial support in relation to access to health care and harnessing resources for diabetic care.

The NHANES data used for this survey was for the wave period of 2007–2008. This was the latest data on social support available at the time of the study. I recommend that future studies on the health and nutrition of older adults should include social support. Family-based interventions regarding diabetes care have resulted in improvements in diabetes management and adherence (Rosland et al., 2008). Therefore, it is important to incorporate strategies for harnessing and bolstering the use of family support, particularly spousal support, in diabetes management. Partners should be involved in the disease management from the beginning of diagnosis. Interventions that include the spouse may increase their understanding of the disease process and the support needed which may minimize spousal conflict and enhance collaborative management. The patient should be knowledgeable about different sources and types of support available. They should have the right to freely discuss the quantity and quality of the support they have received for the better management of their disease.

Awareness creation about the complementary effect of social support in glycemic control is important to enhance the support of family members, communities, and health professionals in the management of diabetes. This can be in form of advocacy to political leaders, sensitization workshops, and training. Agencies and professional organizations that include those who direct and implement programs and deliver health care to older adults with diabetes should receive training on the effectiveness of social support on

diabetes management to build their capacity and enable them to effect changes at different levels.

Clinicians and diabetes educators should include assessment of social support in their practice so that appropriate interventions can be planned that can enhance patients' adaptation to their disease, reduce the barriers to social support, and consequently improve treatment adherence. Furthermore, because of religious beliefs being associated with improvement in chronic diseases, such as diabetes, clinicians should include religion and spirituality in their practice.

To increase the social network of the patient, the government can support the establishment of diabetic support groups in the communities where patients can meet peers having the same problems and learn through shared experiences, observations, and instructions from health care providers. Behavioral changes occur through learning and observation (Glanz et al., 2008). Lifestyle changes can be promoted within the group by exercising, preparing food, and eating together. This, in turn, will enhance the quality of life among patients in the group and help in their diabetes control. A church-based diabetic group can also be supportive. Health workers, public health advocates, and diabetic educators can link patients to available resources such as the diabetic support group.

Implications for Professional Practice and Social Change

I examined the association between different types of social support and GHB level among older adults. The results confirm evidence that spousal support, the frequency of religious activities, and size of social network contribute to the decrease in

GHB level. Based on the findings of this study, the physicians and diabetic educators should consider the social support network of a diabetic patient and the level of influence that the network has on self-care behavior when designing the treatment and health care goal for the individual. Such personalized therapy should consider the individual's health history, demographic factors, and cultural values and beliefs on disease management.

The implications for social change will include educating clients with family members and professionals about the connections between spirituality, social networking, and social support in the self-management of diabetes. In addition, church-based approach and family-centered supportive intervention by health professionals may improve diabetes management among older adults. Furthermore, cultivating a collaborative approach between different sectors in providing resources to support diabetes among older adults may effect a possible social change.

Conclusion

To my knowledge, the current study was the first to examine the association between social support and GHB level among older adults in the United States. The findings from the study indicated a significant association between GHB level and emotional and financial support, sources of social support, the frequency of religious activities, and the size of the personal network. The literature review indicated that social support has a positive effect on the glycohemoglobin level (Shao, Liang, Shi, Wan, & Yu, 2017). On the other hand, the findings from the literature also indicated the negative effect of social support on the glycohemoglobin level (Miller & DiMatteo, 2013). This study contributes to knowledge by explaining the controversial issue surrounding the

importance of social support in glycemic control. The type of social support provided is the key factor in determining glycemic control. While spousal support, the frequency of religious activities, and the size of the social network have a positive effect by causing a decrease in the GHB level, the negative effect was observed with emotional and financial support, which caused an increase in the GHB level.

The mechanism of how social support has a positive effect in glycemic control is beyond the scope of this study. However, available evidence indicated a relationship between self-efficacy, medication adherence, and glycemic control (Chlebowy & Garvin, 2006; Shao et al., 2017). Self-efficacy is an important construct of social cognitive theory, which is the theoretical framework for this study. The reciprocal interactions between personal factors, behavior, and environment are essential for positive behavioral change necessary for health promotion. This study was built on the understanding that social support being an environmental factor could induce changes in the patient through motivation, empowerment, and provision of resources to effect positive change. The support from family member especially the spouse, communities, and people in the social network could cultivate positive and mental changes within the older adult and strengthen their belief and confidence in managing his or her conditions.

The current study has provided information on how social support can be integrated into clinical practices in the management of diabetes among older adults. Furthermore, the information about the outcome of this study about the usefulness of social support can be used in designing intervention programs to improve glycemic control among older adults. Further research is needed to understand the quality of social

support received and to find an association between other sources of social support such as support from professional, peers, and Internet sources and glycemic control.

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