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The purpose of this cross-sectional correlational study was to examine diabetes self-management, related factors, and outcomes among Arab adults living in the United States. The target population was Arab Adults living with type 2 diabetes in the United States. Individual and Family Self-Management Theory (IFSMT) helped guide this study.

A convenience sample of 83 Arabs living with type 2 diabetes were recruited from non-profit community clinics, mosques, and Middle Eastern, Islamic, or Arabian stores. The following instruments were used: The Diabetes Fatalism Scale (DFS), the revised Diabetes Knowledge Test (DKT2), Diabetes Self-Management Questionnaire (DSMQ), the Diabetes Distress Scale (DDS), and a socio-demographic form.

The study found that diabetes self-management correlated with diabetes fatalism and diabetes distress. Diabetes knowledge correlated with A1C level. The regression models revealed that diabetes fatalism predicted diabetes self-management and when adjusted for diabetes knowledge and diabetes distress, diabetes fatalism did not predict the level of diabetes self-management. Diabetes self-management predicted the level of A1C directly and when adjusted for diabetes fatalism, diabetes distress, and diabetes knowledge. Age and years of diabetes predicted the level of A1C.

New knowledge was developed on diabetes self-management, related factors, and outcomes for a new minority group. The study results provide a foundation on which to further examine and intervene. The study informs implications in the area of practice and

may help researchers and diabetes care providers develop culturally appropriate diabetes

self-management education for this population.

DIABETES SELF-MANAGEMENT AMONG

ARABS IN THE UNITED STATES

by

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Approved by

Debra C. Wallace
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In the Name of Allah (God), the Most Beneficent, the Most Merciful. This work is

dedicated to my beloved parents, family, and those who serve humanity.

This dissertation, written by HAMZA A. MOAFA, has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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Completing this program and my dissertation has been a confirmation of how many intellectual giants and faculty I have had the privilege of knowing and working with and has undeniably improved my intellectual capacity and satisfactorily equipped me to begin new chapters of research, teaching, and service as a nurse scholar and become a nurse scientist.

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CHAPTER I

INTRODUCTION

Diabetes is one of the fastest-growing chronic conditions in people living in Arab countries. There are 38.7 million adults aged between 20 and 79 years living with diabetes in the Middle East and North Africa, representing 9.6% of the adult Arab population (International Diabetes Federation [IDF], 2017). In this region of the world, some Arab countries reported higher rates of diabetes. For instance, the highest diabetes rate reported among Arab countries is 17.7% in Saudi Arabia, followed by 17% in Egypt and the United Arab Emirates (IDF, 2017).

In the U.S., both Arab and Arab American terms are used interchangeably. The estimated prevalence of self-reported diabetes ranges from 4.8% to 20% among Arabs and Arab Americans in the U.S. (Aswad, 2001; Dallo & Borrell, 2006; L. A. Jaber, Brown, Hammad, Nowak, et al., 2003; L. A. Jaber et al., 2004; Neumayer, Weir, Fussman, & McKane, 2017). Arab Americans have a higher prevalence of diabetes than non-Hispanic Whites (PR 1.40, 95% CI=[1.29, 1.52]) (Dallo et al., 2016).

Diabetes is the fifth leading cause of death among Arab with diabetes living in the U.S. (Dallo et al., 2012). Diabetes death rates among Arabs living in the U.S. are only preceded by heart disease, cancer, stroke, and chronic lower respiratory disease mortality rates in both genders (Dallo et al., 2012). The age-adjusted diabetes mortality rate for Arab American women was 32.6 per 100,000 compared to 35.3 for White men and 60.7

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for Black men (Dallo et al., 2012). The age-adjusted death rates for Arab American men with diabetes 57.4 per 100,000 compared to 44 for White men (Dallo et al., 2012). Another study reported that death due to diabetes was 52 per 100,000 for Arab American men compared to 27 for White men and 32 per 100,000 for Arab American women compared to 21 for White women (El-Sayed et al., 2011). These numbers validate the importance of research needed to understand diabetes self-management, or the lack thereof, among the U.S. Arab population with diabetes.

Racial and ethnic groups are disproportionately affected by diabetes (Mayberry et al., 2016). A systematic literature review from 2011 to 2016 found disparities in medication adherence, diet behavior, self-monitoring of blood glucose, smoking behavior, and mixed evidence of differences in regular self-foot exams among African American /Black, White/Caucasian, and Hispanic/Latino (Mayberry et al., 2016). Arab Americans suffer sub-optimal care quality according to the American Association of Diabetes Guidelines (Berlie et al., 2008). About 26% of Arab Americans had HbA1c > 9.5% compared to 18% of the national U.S. population (Berlie et al., 2008). A recent study documented that Arab Americans are 38% more likely than non-Hispanic Whites to report HbA1c > 7% compared to non-Hispanic Whites (Dallo et al., 2018). HbA1c levels (glycemic control) may reflect the needs of the U.S. Arab population.

Many factors have contributed to diabetes care issues among the U.S. Arab population. The lack of understanding of diabetes etiology has been reported among Arab Americans with diabetes. Many Arab Americans with diabetes believe that diabetes is caused by blood pressure medications, cholesterol-lowering medications, eating at

bedtime, or consuming sugar substitutes (Bertran et al., 2017). Others believe that the high prevalence of diabetes is linked to weight, blood pressure, heredity, lack of healthy diets, and lack of exercise (Bertran et al., 2017). Knowledge deficit has been documented as a major barrier for diabetes care among Arab Americans (L. Jaber et al., 2014). Meanwhile, the lack of culturally sensitive diabetes education for Arab Americans hinders their access to knowledge and self-care behaviors (Bertran et al., 2015; Fritz et al., 2016). Analysis of administrative data from primary care data of patients with diabetes in the U.S. showed that only 34.1% of Arab Americans with diabetes had an eye exam in 2015, compared to 48.7% of Asians, 46.7% of non-Hispanic Whites, and 40% of non-Hispanic Blacks (Dallo et al., 2018).

Language has been documented as a significant barrier to access healthcare education (Bertran et al., 2017). Arab Americans are concerned about diabetes and their relationship with health care providers (Bertran et al., 2015). In addition to language issues, lack of health insurance was reported by many Arab Americans with diabetes as a major barrier to accessibility and utilization of healthcare services among Arab Americans with diabetes (Bertran et al., 2017; L. Jaber et al., 2014).

Arabs in the United States

The term Arab does not refer to race; it refers to an ethnic group that commonly shares linguistics, cultural, and political traditions (Samhan, 2001). The first wave of Arab immigrants to the U.S. occurred in 1875, primarily by Christian immigrants from Lebanon and Syria who were uneducated and worked unskilled jobs (El-Sayed & Galea, 2009). The second wave of Arab immigrants fled the post-war political upheavals in

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Egypt, Syria, Iraq, and Palestine who were better generally better educated, fluent in English, and involved in white-collar jobs (El-Sayed & Galea, 2009). The third wave began in 1965 after the end of the Immigration Act that favored the European immigrants (El-Sayed & Galea, 2009). The third wave was the best educated compared to the other two generations. Nativity and citizenship of Arabs in the U.S. are divided into the following groups: (a) foreign-born, not a citizen; (b) foreign-born, naturalized citizen; and (c) native (born in the United States or born abroad to U.S. citizen—third or greater generation parent (Brittingham & De la Cruz, 2005). Lack of consistent and comparable data from government sources by the federal government presents challenges for researchers and healthcare practitioners who serve the Arab community in the U.S. (Management & Budget, 1997; Samhan, 2014). Arab Americans in the United States are not defined ethnically and are counted as White (Management & Budget, 1997; Samhan, 2014). Arabs exist in the public mind, but they are uncounted as a separate group; thus, they have not been a part of a nationwide consideration with their needs (Jamal & Naber, 2008).

According to Asi and Beaulieu (2013), there are an estimated 1,517,664 Arab Households—representing 5% of the U.S. population—who report their ancestors or ethnic origins as Algerian, Bahraini, Egyptian, Emirati, Iraqi, Jordanian, Kuwaiti, Lebanese, Libyan, Moroccan, Omani, Palestinian, Qatari, Saudi Arabian, Syrian, Tunisian, or Yemeni. This 5% of the U.S. population increased 76% since 1990. Arab ethnic identification is derived from their responses to the ancestry questions on the American Community Survey (Asi & Beaulieu, 2013). On the other hand, the Arab

American Institute Foundation (AAI; AAI, n.d., 2015) claims that the U.S. is home to approximately 3,665,789 Arab Americans living in all 50 states, of which nearly 91,788 live in North Carolina. The AAI defines Arab Americans as those whose ethnicity comprises people who immigrated from the Arab-speaking countries of southwestern Asia and North Africa since the 1880s (AAI, 2009).

The first immigrant generation of Arab Americans tends to be less acculturated in the U.S. and tends to have difficulty accessing the healthcare system (L. Jaber et al., 2014). The first generation tends to seek care when they become ill, whereas the second generation tends to be younger and better aware of the U.S. healthcare system accessibility and acknowledge their health needs (L. Jaber et al., 2014). Bertran et al. (2015) noted that many Arab American women with diabetes accept the authoritative physician role and less willing to express their dissatisfaction with Arab physicians plainly. Other Arab Americans with diabetes believe that Arab physicians do not provide patient-centered care compared to other physicians and instead focus on lab results and medications rather than the patient (Bertran et al., 2015). Meanwhile, a study found that Arab Americans view healthcare providers as respected authorities who can provide better guidance to manage diabetes (Fritz et al., 2016). Diabetes among Arabs living in the United States is a major health problem, and a better understanding of this population is needed to help improve their diabetes-related health outcomes.

The Purpose of the Study

The purpose of this study is to examine diabetes self-management, related factors, and outcomes among Arabs living with type 2 diabetes in the United States.

Diabetes Burden

Prevalence and Incidence

Diabetes is a complicated chronic disease that necessitates continuous care with multifaceted risk reduction approaches beyond glycemic control (American Diabetes Association [ADA], 2018b). Diabetes is a term used to describe the elevated levels of glucose in the blood, also called hyperglycemia (World Health Organization [WHO], 2006). The WHO (2016) estimated that 422 million adults were living with diabetes in 2014, and the age-standardized diabetes rates have almost doubled since 1980, increasing from 4.7% to 8.8% in the adult population.

In the U.S., the Centers for Disease Control and Prevention (CDC) estimates that 30.3 million individuals "suffer from" or live with diabetes, accounting for 9.4% of the U.S. population (CDC, 2017). About 7.2 million individuals live with undiagnosed diabetes. According to the CDC (2017), around 30.2 million individuals suffering from diabetes in the U.S. were adults aged 18 years or older, consisting of 12% of all U.S. adults. Additionally, in 2015, approximately 84.1 million adults aged 18 years or older (33.9% of the U.S. adult population) had prediabetes (CDC, 2017). Furthermore, according to the CDC (2017), a total of 132,000 children and adolescents younger than age 18 years have been diagnosed with diabetes.

Diabetes Cost in the United States

In 2017, the total expenditures related to diagnosed diabetes and diabetes-related problems was $327 billion, with $237 billion attributed to direct medical costs and $90 billion attributed to indirect costs (ADA, 2018a). An individual with diabetes incurs an

average medical expenditure of $16,750, approximately $9,600 attributed to diabetes (ADA, 2018b). The indirect costs associated with diabetes include health conditions causing missed work (absenteeism), reduced productivity at work (presenteeism), inability to work, reduced the productivity of those who are not in the workforce, and premature death (ADA, 2018b; Pawaskar et al., 2018).

The Burden of Diabetes in North Carolina

The CDC estimates that 10.1% of the North Carolina population live with diabetes (CDC, 2016). North Carolina is one of the states that encounters substantial increases in diabetes-related costs (Morgan et al., 2014). In 2010, Hospital diabetes-related hospitalization cost North Carolina nearly $5 billion, with an average cost of $25,273 per hospital stay (North Carolina Division of Public Health Diabetes Prevention and Control, 2013). If diabetes remains uncontrolled by using scientific approaches in North Carolina, it would cost the public and private sectors approximately $17 billion annually by 2025 (as cited in Konen & Page, 2011).

Diabetes Complications

Diabetes complications develop when glucose levels are not appropriately controlled (ADA, 2018b). Uncontrolled diabetes leads to macrovascular complications such as myocardial infarction, stroke, and heart failure and microvascular complications such as blindness, lower extremities amputation, and kidney failures (ADA, 2018b; Stratton et al., 2000). Adults with diabetes are 2 to 4 times more likely to die from diabetes-related cardiovascular events such as myocardial infarction and strokes as compared to those without diabetes (American Heart Association, 2015). Zakarni (2013)

conducted a cross-sectional study to assess the quality of life among 185 Arab Americans with type 2 diabetes. The study findings revealed that at least 25.4% of the participants reported macrovascular complications related to diabetes such as cardiovascular diabetes, stroke, and peripheral vascular disease, and at least 48.1% reported having microvascular complications such as retinopathy, nephropathy, and neuropathy. About 26.9% of Arab Americans reported having retinopathy, 33.3% neuropathy, and 45.3% dyslipidemia (Berlie et al., 2008). Furthermore, diabetes is associated with increased risks of skin infections, elevated blood pressures, heart diseases (such as heart attack), and nerve damage (ADA, n.d.). In 2014 in the U.S., a total of 108,000 adults with diabetes were hospitalized for lower-extremity amputation (CDC, 2017).

Diabetes Deaths in the U.S.

Diabetes is the seventh leading cause of death in the U.S. (Heron, 2018). Diabetes can lead to disability and premature death (CDC, 2011). In the United States, diabetes was responsible for 80,085 deaths (2.9% of the total death cases) in 2018 compared to 72,535 (2.9% of the total death cases) in 2015 (Heron, 2018). Diabetes decreases life expectancy by as much as 4 to 15 years (Gu et al., 1998; Konen & Page, 2011; Morgan et al., 2014). Diabetes was responsible for 14,053 deaths in the non-Hispanic Black population (4.3% of total deaths in non-Hispanic Black population), 8,546 deaths in the Hispanic population (4.5% of total deaths in the Hispanic population), and 53,399 deaths in the Hispanic White population (2.5% of total deaths in Hispanic population; Heron, 2018). However, diabetes-related death rates among Arab/Arab Americans are unknown as this subgroup is not reported separately.

Risk Factors for Type 2 Diabetes

The most common form of diabetes is type 2 diabetes which accounts for 90% to 95% of all diabetes cases. Type 2 diabetes was formerly known as non-insulin-dependent diabetes or adult-onset diabetes (ADA, 2019a). Individuals with type 2 diabetes usually produce inefficient inulin or have peripheral insulin resistance (ADA, 2019a). Thus, individuals with type 2 diabetes often do not need insulin at the beginning of their disease course; however, these individuals may need insulin to survive due to a progressive loss of b-cell insulin secretion in the pancreas (ADA, 2019a). This disease has been attributed to modifiable and non-modifiable risk factors (WHO, 2016; Zheng et al., 2018).

The non-modifiable risk factors include, but are not limited to, genetics, ethnicity, and age (WHO, 2016; Zheng et al., 2018). The risk of developing type 2 diabetes is associated with older age because insulin sensitivity to the apoptosis and the proliferation capacity of beta-cell tends to decline as individuals advance in age (Halim & Halim, 2019). Insulin secretion decreases about 0.7% annually in healthy individuals and doubles in individuals with impaired glucose intolerance due to the body composition changes (Szoke et al., 2008). Individuals with a family history of diabetes have higher risks of developing diabetes, especially in those with a bi-parental history of type 2 diabetes and those with parental diabetes diagnosed at a younger age and with maternal history (L. A. Jaber, Brown, Hammad, Nowak, et al., 2003; Scott et al., 2013). Higher rates are also attributed to multiple genes in some ethnic groups, such as the Arab population (Al Muftah et al., 2016; Al Safar et al., 2013; Burghardt et al., 2017).

The modifiable risk factors include overweight, obesity, unhealthy diet, unsatisfactory physical activity, and smoking (WHO, 2016; Zheng et al., 2018). Weight gain or obesity increases the risks of developing type 2 diabetes. Adipose tissue secretes and synthesis many hormones, referred to as adipokines (Smitka & Marešová, 2015). These adipokines regulate many biological processes in many organs, including pancreatic b-cell, which in turn influences insulin sensitivity and glucose regulation (Romacho et al., 2014). Active smoking also increases the risk of type 2 diabetes. Smokers have a 30%-40% risk of developing diabetes compared to nonsmokers (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2014). A meta-analysis and systematic review of the studies before 2015 revealed that 10.3% of cases of type 2 diabetes in men and 2.2% in women were attributed to active and passive smoking (Pan et al., 2015). The risk of developing diabetes increases with increasing levels of smoking intensity (National Center for Chronic Disease Prevention and Health Promotion (US) Office on Smoking and Health, 2014). Furthermore, food intake patterns such as high intake of red meat, low-fiber bread, cereal, dried beans, fried potatoes, and cheese are associated with incident type 2 diabetes (Liese et al., 2009). In addition to dietary issues, lack of physical activities plays a role in developing diabetes. A meta-analysis of research studies before March 2, 2015, revealed strong evidence of an inverse relationship between physical activity and the risk of developing type 2 diabetes (Aune et al., 2015). The study also found that all subtypes of physical activities are beneficial. Aune et al. (2015) also suggested that this relationship is mediated by reducing adiposity. The burden of non-communicable disease increases with

the increase of risk factors in an individual (Wesonga et al., 2016). Thus, efforts are

needed for improved diabetes self-management to mitigate the effects of modifiable risk

factors.

National Goal for Diabetes Self-Management

The burden of diabetes will continue to grow until the appropriate implementation

of successful behavior change interventions and diabetes education interventions that

promote and reinforce individual behavior change and improve health outcomes begins.

Reducing the disease burden of diabetes and improving the quality of life for individuals

who have diabetes mellitus represent leading health indicators for *Healthy People 2020*,

which set the target that 62.5% of adults aged 18 years and over diagnosed with diabetes

should receive formal diabetes education (National Center for Health Statistics, 2016).

Prevention of diabetes and diabetes-related complications through implementing diabetes

self-management programs is a significant challenge to facing this deadly and costly

disease (Konen & Page, 2011).

The American Association of Diabetes Educators (AADE, 2019) identifies seven

self-care behaviors for better diabetes control: (a) healthy eating, (b) being active, (c)

monitoring, (d) taking medications, (e) problem solving, (f) healthy coping, and (g)

reducing risk. Diabetes self-management education and support (DSMES) provides the

knowledge, skills, and abilities necessary for optimal diabetes self-care and incorporates

the needs, goals, and life experience of individuals with diabetes (Funnell et al., 2009).

The primary purpose of DSMES is to promote informed decision-making, self-care

behaviors, problem-solving, and active collaboration with the health care providers in

order to enhance the quality of life and improve clinical outcomes and health status through cost-effect approaches (Powers et al., 2015). DSMES promotes patient-centered care in which care is respectful and responsive to individual needs, values, and preferences when making clinical decisions (Powers et al., 2015). A multidisciplinary team including but not limited to registered nurses, registered dietitians, and pharmacists with expertise in the clinical care of diabetes, educational methodologies, teaching strategies, the psychological and behavioral aspects of diabetes self-care play crucial roles in designing the curriculum and assisting in the delivery of diabetes self-care education (Funnell et al., 2009).

Conceptual Framework

The conceptual framework was based on Ryan and Sawin's (2009) Individual and Family Self-Management Theory (IFSMT). The IFSMT is a new mid-range descriptive theory developed by Dr. Polly Ryan and Dr. Kathleen Swain at the University of Milwaukee Wisconsin Self-Management Center (Ryan & Sawin, 2009). The IFSM elaborates on the concept of self-management in health care practice.

The self-management process is the principal concept of the theory and is conceptualized as:

> Self-management is a process by which individuals and families use knowledge and beliefs, self-regulation skills and abilities, and social facilitation to achieve health-related outcomes. Self-management takes place in the context of risk and protective factors specific to the condition, physical and social environment, and individual and family. Proximal outcomes are self-management behaviors and cost of health care services; distal outcomes are health status, quality of life and cost of health. Self-management is applicable to chronic conditions and health promotion (Ryan & Sawin, 2009; Ryan, 2009; UWM Self‑Management Science

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Center Working Group, 2011; Ryan & Sawin, 2014). (UWM Self ‑ Management
Science Center Working Group, 2011, para. 1)

The IFSMT purports that individuals, dyads, or families—not limited to
biological families—assume the responsibility for the individual and family self-
management (Ryan & Sawin, 2009). This self-management can occur in collaboration
with healthcare professionals to prevent or lessen illness or aid in the management of
complex health regimens in ways that reflect individual and family values and beliefs in
meaningful ways (Ryan & Sawin, 2009). Ryan and Sawin (2009) postulated that self-
management is a multidimensional and complex phenomenon consisting of and affected
by three dimensions (context, process, and outcome).

According to the theory, the factors in the contextual dimension directly influence
the process of self-management and outcomes. The theory also proposes that improve the
process of self-management will result in favorable outcomes. The outcome dimension of
the theory relates to the proximal and distal outcomes.

Context Dimension, **Risk, and Protective Factors**

Context dimensions, risk, and protective factors consist of (a) condition-specific
factors, (b) physical and social environments such as access to health care, culture,
setting, provider transition, transportation, culture, and social capital, and (c) individual
and family characteristics which have influences on self-management such literacy level,
developmental stages, perspectives, information process, capability. Condition-specific
factors relate to physiological, structural, or functional characteristics of the condition, its
treatment, or prevention of the conditions that impact the amount, type, and nature of

behavior needed for self-management (Ryan & Sawin, 2009). In this theory, the context, risk, and protective factors influence each other. Ryan and Sawin (2009) hypothesized that factors in the context dimension affect the individual's and family's ability to engage in the process dimensions such as self-monitoring and have direct impacts on outcomes self-management behaviors. Individuals with inadequate health literacy experience poorer health-related quality of life, including self-care (Sayah et al., 2016). For example, as a part of the culture, fatalism has been associated with poor self-care and poor medication adherence (Walker et al., 2012).

Process Dimension

The process of self-management consists of knowledge and beliefs, self-regulation skills and abilities, and social facilitation (Ryan & Sawin, 2009). Knowledge and beliefs refer to self-efficacy, outcomes expectancy, and goal congruence, whereas self-regulation skills and abilities refer to goal-setting, self-monitoring, reflective thinking, decision making, planning and action, self-evaluation, and emotional control. Social facilitation includes influence, support, and collaboration (Ryan & Sawin, 2009). Ryan and Sawin (2009) theorized that the constructs in the process dimension are linked to the constructs in the context dimension, internally related, and affect the outcomes dimension. For example, enhancement of knowledge-specific health beliefs is linked to engagement in self-regulation behaviors. This process or action, in turn, leads the individuals and families to engage in self-management behaviors or proximal outcomes. Also, Ryan and Sawin (2009) theorized that goal incongruence and anxiety resulting from competing demands associated with health goals affect self-management. Diabetes

distress was found to be an essential determinant for glycemic control (Masri et al., 2018). Moreover, a lack of knowledge negatively influences glycemic control (Islam et al., 2015).

Outcome Dimensions

Outcome dimensions consist of both proximal and distal outcomes. According to the theory, the proximal outcome is the actual engagement in self-management behaviors that are specific to a health condition, risk, or transition, as well as symptoms management and pharmacological adherence. Proximal outcomes can be behaviors that control, lessen the impact, decrease consequences, and make daily life calmer with condition management. Proximal outcomes also include costs of healthcare service use. On the other hand, distal outcomes relate to health status disease trajectories such as improving or worsening of HbA1c level or mortality, quality of life, perceived well-being, and cost of health. Distal outcomes are usually affected by proximal outcomes.

Figure 1.

The Conceptual Framework for the Relationship Between Diabetes Fatalism, Diabetes Knowledge, Diabetes Distress, Diabetes Self-Management, and A1C Level
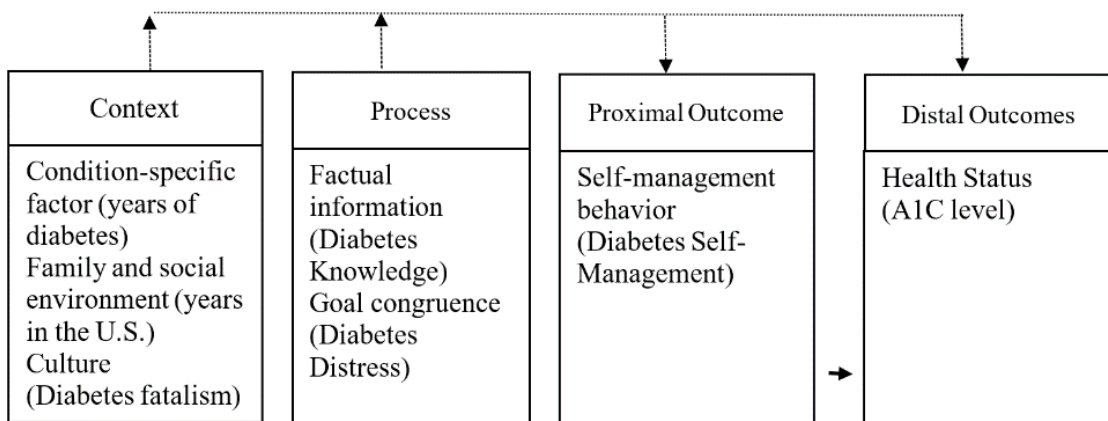
Research Questions

The research questions for this study follow:

RQ1:   What are the sociodemographic characteristics and diabetes-related characteristics of Arabs living with type 2 diabetes in the United States?

RQ2:   What is the relationship between the context (diabetes fatalism) and the proximal outcome (diabetes self-management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the United States?

RQ3:   What is the relationship between the context (diabetes fatalism) and the process (diabetes knowledge and diabetes distress) on the proximal outcome (diabetes self-management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the United States?

RQ4:   What is the relationship between the proximal outcome (diabetes self-management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the United States?

RQ5:   What are the combined relationships between the context (diabetes fatalism), the process (diabetes distress, diabetes knowledge), and the proximal outcome (diabetes self-management on the distal outcome (A1C level) among Arabs living with type 2 diabetes in the United States?

RQ6:   What is the impact of socio-demographic characteristics and diabetes-related characteristic (age, gender, years of diabetes, marital status, education, diabetes education, income, presence of health insurance, and years in the United States) on the proximal outcome (diabetes self-

management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the United States?

Definitions

Theoretical indicators of the framework concepts are discussed. These definitions were derived from the scientific literature, the framework, and national guidelines for diabetes best practices.

A1C Level

Theoretical definition: The individual's average of blood sugar levels during the previous 2-3 months (ADA, n.d.). It is indicative of glycemic control (ADA, 2019c).

Arab

The term Arab is used to describe someone whose ethnic origin, descent, roots, heritage, or the place of birth or place of birth of their ancestors is from Algerian, Bahraini, Egyptian, Emirati, Iraqi, Jordanian, Kuwaiti, Lebanese, Libyan, Moroccan, Omani, Palestinian, Qatari, Saudi Arabian, Syrian, Tunisian, and Yemeni, or self-identified Arab (Asi & Beaulieu, 2013).

Diabetes Distress

Theoretical definition: Diabetes distress refers to patient concerns about access to diabetes care, patient emotional burdens resulting from diabetes, and distress coming from diabetes-related regimens (Fisher et al., 2012).

Diabetes Knowledge

Theoretical definition: The individual's knowledge about diabetes, self-perception, and self-care behaviors, which are needed for decision-making and performing specific health behaviors to achieve optimal diabetes self-care (Sausa, 2003).

Diabetes Fatalism

Theoretical definition: Believing in the lack of personal control over destiny or fate, which hinders participation in desirable health behavior (Drew & Schoenberg, 2011).

Self-Management

Theoretical definition: Ability of the patient to be an active participant in treatment plans and engaged in problem-solving, decision-making, resource utilization, interaction with healthcare providers, taking action, and self-tailoring (Beck et al., 2017; Lorig & Holman, 2003). Self-care and self-management are used interchangeably in the literature.

Chapter Summary

Diabetes is a growing public health problem in the U.S. associated with an increased risk of cardiovascular mortality and morbidity. Nursing research is concerned with the development of a scientific body of knowledge about the health and care of individuals, families, and communities to improve nursing practice, form health policies, and enhance the health of individuals in all countries (American Association of Colleges of Nursing, 2006). Addressing the continued needs and demands of minorities with diabetes is one of the biggest challenges in the area of health care in the U.S. (Canedo et

al., 2018; Taylor et al., 2018). The importance of regular follow-up of patients with diabetes plays a pivotal role in averting diabetes sequelae (ADA, 2019d). Maintaining blood glucose levels within specific ranges, adhering to appropriate diabetes diet plans, and avoiding sedentary lifestyles can prevent or slow the progression of diabetes complications (ADA, 2019b).

Relevant research studies in the literature demonstrate a high rate of diabetes among Arabs living in the U.S. Moreover, a small number of research studies regarding this ethnic group compared to other ethnic groups in the U.S. However, none of the previously mentioned studies measured determinants of diabetes self-management among Arabs with diabetes in the U.S. According to *Healthy People 2020*, achieving healthy disparities is a type of health difference associated with social or economic disadvantage (Secretary's Advisory Committee on Health Promotion and Disease Prevention Objectives for 2020, 2008). As can be seen, the U.S. Arab population is underserved. Health disparities unfavorably affect individuals because of social or economic obstacles to health based on factors such as racial or ethnic group orientation (Secretary's Advisory Committee on Health Promotion and Disease Prevention Objectives for 2020, 2008). Thus, *Health People 2020* encourages attention to such disadvantaged groups and pays attention to the root causes of health disparities (Secretary's Advisory Committee on Health Promotion and Disease Prevention Objectives for 2020, 2008).

Many researchers agreed upon the need to develop culturally appropriate diabetes self-management education for this population (Bertran et al., 2015; Bertran et al., 2017; DiZazzo-Miller et al., 2017; Fritz et al., 2016; Masri et al., 2018). This is because the

individuals by themselves or with their support system manage most of the day-to-day

diabetes care. The study filled gaps in knowledge.

CHAPTER II

LITERATURE REVIEW

This dissertation sought to examine diabetes self-management, related factors, and outcomes among Arabs living in the United States. The review of the literature is composed of the following: (a) the relationship between context (diabetes fatalism), process (diabetes knowledge and diabetes distress), and proximal outcome (A1C), (b) gaps in knowledge, and (c) summary.

Theoretical Framework

The Individual and Family Self-management Theory (IFSMT) has not been tested among the U.S. Arab population with diabetes. As shown in the conceptual framework (Figure 1), the context (Risk and Protective Factors) related to the study is diabetes fatalism. The process of self-management related to this study is diabetes knowledge and diabetes distress. The proximal outcome related to this study is diabetes self-management. The distal outcome related to this study is A1C. As theorized in the theoretical framework (Figure 1), context and process influence outcomes, and proximal outcome influences distal outcome. In this chapter, this theoretical framework facilitated the review of the literature examining the relationship between the context, process, proximal outcome, and distal outcome.

The Context Dimensions

As mentioned earlier, condition-specific factors, physical and social environments such as access to health care, culture, setting, and social capital, and individual and family characteristics are components of the context dimension. Cultural beliefs play an important role among Arabs with chronic disease. For example, one study showed that Arab Americans tend to have an external locus of control (chance), which has shown a strong association with blood glucose levels (Shara et al., 2017). In a study of cancer beliefs and attitudes among Arab immigrants in the U.S., both Christian and Muslim focus group participants believed that cancer was a punishment by God and under control of God, as well as viewing God as the omnipotent healer and projector (Shah et al., 2008). On the other hand, in the Arab Region, a phenomenological study conducted among the Sudanese Arab with diabetes, Hag Hamed (2014) found that both Sunni Muslims and Coptic Christians participants believe that they are responsible for their health and well-being and did not feel that their health is not under their control.

Not all Arabs are Muslim, and not all Muslims are Arabs. The exact breakdowns of the U.S. population are difficult to determine since the immigration authorities do not document and record religion (Kayyali, 2018). However, people from the Middle East and Arab countries are racially varied and share similar values and behavior (Aboul-Enein & Aboul-Enein, 2010). Almost every Arab (a) believes in God, acknowledges God's power, and has a religious affiliation, and (b) accepts that humans cannot control all events; many things depend on God (i.e., "Fate"; Nydell, 1987).

Diabetes Fatalism. Fatalism is usually present in religious communities (Berardi et al., 2016; Egede & Bonadonna, 2003; Franklin et al., 2007). Fatalism is expected to be culturally passed from among generations, but different cultures and religions may conceive it differently (Ruiu, 2012). Regardless of whether Arabs are Christian or Muslim, they share religious values and beliefs such as fatalism (Nabolsi & Carson, 2011). Patients may view that the disease is coming from GOD, and they have no control over them (Nabolsi & Carson, 2011; Omu et al., 2014). This issue or idea has been attributed to the misinterpretation of predestination, especially among the followers of the Islamic beliefs (Odeh Yosef, 2008). For example, many Muslims may believe that God predetermines things and events in life. Therefore, they may not engage in health promotion behaviors, although the Islamic beliefs encourage individuals to maintain their wellbeing and health (Odeh Yosef, 2008).

Fatalism plays a role in determining self-management engagement. Diabetes fatalism is among these beliefs, which is exhibited in adult patients with chronic diseases such as type 2 diabetes (Sukkarieh-Haraty et al., 2018). Diabetes fatalism is defined as "a complex psychological cycle characterized by perceptions of despair, hopelessness, and powerlessness" (Egede & Ellis, 2009, p. 62). Fatalism hinders patients from seeking medical attention and healthcare (Powe & Finnie, 2003). Studies have shown that diabetes fatalistic beliefs are related to lower glycemic control and diabetes self-care (Berardi et al., 2016; Sukkarieh-Haraty et al., 2018; Walker et al., 2012). However, Walker et al. (2012) found no significant correlation between diabetes fatalism and diabetes knowledge (r=-0.054, p=.349). Individuals with fatalistic beliefs are less likely

to report good diabetes self-care understanding, adherence to healthy diet patterns, positive attitude toward diabetes, adherence to diabetes self-care recommendations, and see their health as essential (Egede & Ellis, 2009).

Egede and Ellis (2009) conducted a cross-sectional study to describe the psychometric properties of a 12-item diabetes fatalism scale in a sample of 216 participants, White (38.9%) and Black (61.1%). They found a medium significant negative correlation between diabetes self-management understanding and diabetes fatalism ($r=-0.35$, $p<0.001$), a small negative significant correlation between reporting self-care control problems and diabetes fatalism ($r=0.22$, $p=0.002$), and a small significant positive correlation between diabetes fatalism and HbA1c ($r=0.20$ $p=0.004$). The authors also found a medium significant negative correlation between diabetes fatalism and self-care ability ($r=-0.30$, $p<0.001$) and a small significant negative correlation in self-care adherence ($r=-0.23$, $p<0.001$).

Walker et al. (2012) found a significant negative correlation between diabetes fatalism and medication adherence ($r=-0.23$, $p<.001$), diet ($r=-0.26$, $p<0.001$), exercise ($r=-0.20$, $p<0.001$), and frequency of blood sugar testing ($r=-0.18$, $p<0.001$) in a convenience sample of 378 non-Arab adults with type 2 diabetes in the Southeastern U.S. However, in an earlier study, in a sample of 452 Black/African Americans, Hispanic/ Latinos, and Asian/Pacific Islanders, Lange and Piette (2006) found that patients with an annual household income of more than $20,000 were less fatalistic and reported better personal control over diabetes than those with lower income bracket $F(2, 398)=11.72$,

p<.001. They also found higher fatalistic beliefs to be associated with a greater number of co-morbidities [*r*(452)=.14, *p*<.01].

A cross-sectional study conducted by Walker et al. (2014a) measured diabetes fatalism with the Diabetes Fatalism Scale (DFS) and diabetes self-care with behavioral skills with the Summary of Diabetes Self-care Activities Scale in a convenience sample of 615 adults with diabetes consisting of non-Hispanic Black (64.9%), non-Hispanic White (33%), and Hispanic/Other (2.1%). The study findings revealed that diabetes fatalism was positively associated with medication adherence (β= 0.03, CI: 0.01 to 0.05) and general diet (β=0.03, CI: 0.01 to 0.05) and showed no significant association with frequency of following a specific diet, frequency of exercises, frequency of blood sugar testing, or frequency of foot care check and inspection.

In the Middle East, a systematic review of 34 studies of the Middle Eastern with diabetes found that management of diabetes is influenced by religious beliefs "fatalism" although the population is diverse, and Islamic beliefs predominate the region (Alsairafi et al., 2016). In the Arab Region, a phenomenological study conducted in the Sudanese Arab population with diabetes, Hag Hamed and Daniel (2019) found that both Sunni Muslims and Coptic Christians participants believe that they are responsible for their health and well-being and did not feel that their health was under their control. In a recent cross-sectional study in Lebanese (Arabs), Farran et al. (2019) found diabetes fatalism as a predictor of glycemic control. Moreover, Sukkarieh-Haraty et al. (2018) found that younger patients with diabetes exhibited more fatalistic attitudes among Lebanese (Arabs).

So far, there have been studies examining the relationship between diabetes fatalism, diabetes self-management, self-care behaviors, and glycemic control. However, research shows mixed findings. For example, the frequency of blood sugar testing as a part of self-care behaviors was found to have a significant negative correlation and no significant correlation in another study. Moreover, patients' levels of fatalism have been associated with self-care behaviors and glycemic control. Even though some studies that examined these relationships were conducted in the Arab countries, none of them were conducted in the U.S., where there may be differences in the cultural contexts in terms of the healthcare system, culture, health education, and beliefs. More studies are needed to explore the relationship between context (diabetes fatalism), proximal outcome (diabetes self-management), and distal outcome (glycemic control).

The Process Dimensions

As mentioned previously, the process of self-management consists of knowledge and beliefs, self-regulation skills and abilities, social facilitation. Knowledge and beliefs refer to self-efficacy, outcomes expectancy, and goal congruence, whereas self-regulation skills and abilities refer to goal-setting, self-monitoring, reflective thinking, decision making, planning and action, self-evaluation, and emotional control. Social facilitation includes influence, support, and collaboration. Ryan and Sawin (2009) referred to knowledge as factual information about a health condition or behavior and goal congruence as the individual's ability to resolve the confusion from the competing demands associated with health demands. Based on the IFSMT, the process dimension

(diabetes knowledge and diabetes distress) as well as the outcomes dimensions (diabetes self-management and glycemic control).

Knowledge. Diabetes knowledge has been acknowledged as one of the important determinants of adherence to diabetes self-care behaviors. The levels of diabetes knowledge have been widely investigated among different cultures and countries. In the mid-1980s, the Michigan Diabetes Research and Training Centre developed the Diabetes Knowledge Questionnaires to address the need for a validated and reliable instrument to assess the level of diabetes knowledge among patients with diabetes (Fitzgerald et al., 1998; Hess & Davis, 1983). In the mid-1990s, a series of three diabetes knowledge scales (DKNA, DKNB, and DKNC) were developed and validated for Australian patients with diabetes (Dunn et al., 1984). In 2001, the Audit of Diabetes Knowledge (ADKnowl) was developed and tested in the United Kingdom (Speight & Bradley, 2001). In 2011, a 15-item diabetes knowledge questionnaire (DKQ) was developed and tested to address the need for a validated and reliable instrument for Australian patients with type 2 and type 1 diabetes (Eigenmann, Skinner, & Colagiuri, 2011).

Evidence suggested that lack of diabetes knowledge is a contributing factor to the level of diabetes self-care behaviors (Kassahun et al., 2016; Kueh et al., 2017; Saleh et al., 2017). Individuals with higher levels of diabetes knowledge usually are less likely to have poor diabetes self-care and vice versa (Kassahun et al., 2016; Kueh et al., 2017; Saleh et al., 2017). For example, Bains and Egede (2011) found diabetes knowledge to have a positive, linear relationship with glycemic control in a sample of 125 low-income people, a sample that consisted of Black (71.4%) and White (28.6%) participants.

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Similarly, Heisler et al. (2005) found that those who knew their recent HbA1c values had better diabetes care in a sample that consisted of Black (n=122), Latino (n=70), and Other (n=46). Individuals who knew their fasting glucose levels were 2.7 times more likely to have good diabetes self-care practices than those who did not know their glucose level (AOR=2.709; 95% CI [1.481, 4.957]) (Mariye et al., 2018). In a cross-sectional study with 76 Blacks, 19 Hispanics, and five of an unknown race, Zulman et al. (2012) found that better diabetes understanding was associated with better glycemic control (r =-0.14, p<0.05).

In the Arab Region, Alhaik et al. (2019) assessed the level of diabetes self-care knowledge and its relationship with demographics and medical characteristics among 273 patients with diabetes in Amman-Jordan. A 38-item questionnaire included steps of the Summary of Diabetes Self-care (DSCKQ-30) and Diabetes Knowledge Test (DKT) was given to assess the level of knowledge. The levels of diabetes knowledge were categorized into low (mean < 33%), moderate (mean = 33-66%), and high (mean > 66%). The study findings revealed that the overall level of knowledge was moderate (58.28 [SD=18.24]). The levels of knowledge ranged from a low of 42.5% for the exercise domain followed by monitoring, causes of diabetes, foot care, symptom, and complication, diabetes medication, up to meal planning domain, which was the highest level of knowledge (70.2%). The study also revealed that younger patients were more knowledgeable in the causes of diabetes mellitus, monitoring, meal planning, and diabetes medication (F=9.86, p<0.05, F=13.10, p<0.05, F=26.33, p<0.05, F=14.08, p<0.05, and F=22.66, p<0.05, respectively).

At least three qualitative studies reported the lack of diabetes knowledge among Arab Americans with diabetes (Bertran et al., 2015; Bertran et al., 2017; Fritz et al., 2016). For instance, one of the providers said, "In the Arabic community, … most of the time they don't understand the seriousness of a disease" (Fritz et al., 2016, p. 3). An Arab American patient with diabetes stated, "We are not educated about the disease we have … There should be a special committee for Arab American people that have diabetes … to give us lessons and educate us about the disease" (Fritz et al., 2016, p. 3). Furthermore, in a qualitative study in Michigan with a sample of 23 Arab Americans, participants reported a lack of diabetes knowledge sources (Bertran et al., 2015). A male participant stated,

> We are not educated about the disease we have. We eat everything, we drink everything, and after all we look back [and say] "Oh, what did we eat?" There should be a special committee for Arab American people that have diabetes that holds meeting at least one a week or twice a week . . . to give us lessons, and educate us about the disease. (Bertran et al., 2015, p. 753)

These three studies used qualitative designs and analysis in order to gain insights into issues of diabetes self-care management among Arabs in the United States. Furthermore, patient's levels of knowledge have been associated with self-care behaviors and glycemic control among Arab living in the United States. However, there are no studies that examined the relationship between process (diabetes knowledge) and outcomes (diabetes self-management and glycemic control) among Arabs in the United States. The relationship between diabetes knowledge and diabetes self-management

behavior and glycemic may be different due to differences in the cultural contexts in terms of the healthcare system, culture, health education, and beliefs.

Diabetes Distress. Diabetes distress or diabetes-related distress are used interchangeably, and both terms refer to the negative emotions resulting from the burden of living with and managing diabetes mellitus (Fisher et al., 2014; Hermanns et al., 2018). Diabetes distress and depression are partially overlapping, but they are not identical; however, both concepts have been widely used in the health literature without accounting for the actual differences between them (Fisher et al., 2014; Hermanns et al., 2018; Perrin et al., 2017). For example, similarly, in a qualitative interview with 18 healthcare providers in Northern Virginia designed to obtain their perspectives on diabetes distress in the management of type 2 diabetes, the participants reported a lack of awareness of diabetes distress in their experience of type 2 diabetes-related psychological and emotional challenges faced by the immigrant and underserved population (John, 2018).

In addition to lack of awareness about diabetes distress, a large proportion of research includes both type 1 and type 2 diabetes populations when studying diabetes distress. However, this can be an issue because the way in which diabetes manifests in the two populations may be practically different such as fear of hypoglycemia among patients with type 1 diabetes (Perrin et al., 2017). However, some research has shown the distinction between the two conditions (Fisher et al., 2010). For instance, a study by Fisher et al. (2010) examining the relationship between major depressive disorder (MDD), depressive symptoms, and diabetes distress with glycemic control showed that

only diabetes distress held a cross-sectional and time-varying longitudinal relation to glycemic control.

The concept of diabetes distress refers to concerns about diabetes self-care due to emotional burdens, physician, regimen, and interpersonal burdens (Fisher et al., 2012; Fisher et al., 2009; Polonsky et al., 2005). Diabetes distress has been reported as affecting up to 36% of individuals with type 2 diabetes, with higher levels in the comorbid depressive symptoms and reported by female participants (Perrin et al., 2017).

Diabetes distress is different from depression. Diabetes distress concerns those negative emotional states that result from specific stressors associated with diabetes, whereas depression refers to cognitive-affective, not necessarily related to a specific cause (Hermanns et al., 2018). Diabetes distress is linked to specific stressors, whereas depression focuses on the diagnosis of the symptoms irrespective of their cause (Fisher et al., 2014). Stressors that cause diabetes distress are either related to objective stressors, such as treatment complexity and complications or fears and worries, or the individual's perception of these stressors and an appraisal of individual coping ability (Hermanns et al., 2018). For example, in a qualitative interview with 15 insulin-treated adults (75% Black, 25% White) with type 2 diabetes and with 17 orally-treated adults (64.71% Black, 35.29% White) with type 2 diabetes, participants reported that a lack of understanding from others, difficulties communicating with health care providers, and burdens of lifestyle changes as sources of diabetes distress (Tanenbaum et al., 2016).

The level of diabetes distress has been widely assessed by means of the Diabetes Distress Scale (DDS) and the Problem Areas in Diabetes (PAID) Scale (Schmitt et al.,

2015). The DDS is more reflective of physician-related distress and problems regarding diabetes self-management, whereas PAID focuses more on food-related problems and diabetes self-management (Schmitt et al., 2015). The DDS demonstrated a stronger association between goof diabetes self-care and good metabolic outcomes compared to the PAID (Schmitt et al., 2015).

Diabetes distress is substantially higher among minorities with type 2 diabetes (Özcan et al., 2018). An increased level of diabetes distress has been associated with poor glycemic control, poor adherence to diabetes diet plans, and lower physical activity (Fisher et al., 2012). Diabetes distress impacts diabetes self-management. For example, Zulman et al. (2012) examined the influence of the psychological attributes of diabetes and self-management in glycemic control using the health and retirement study (HRS) data of 1,834 adults, consisted of Caucasian, Black, and unidentified races. The study revealed that lower ratings of diabetes self-management and higher levels of diabetes distress were associated with worse HbA1c levels and glycemic control ($p<0.01$, $p<0.01$, respectively). Unlike Zulman et al., Aikens (2012) found that diabetes predicts future diet behavior ($p=0.049$), physical activity ($p=0.001$), glucose testing ($p=0.018$), future glycemic control ($p=0.001$), and medication adherence ($p=0.011$) in a sample of 253 patients with type 2 diabetes. In the same vein, Jannoo et al. (2017) found that patients with lower levels of diabetes-specific distress showed higher levels of adherence to diabetes medications; the sample consisted of 87 Chinese and 173 Indians with type 2 diabetes in Malaysia.

In Arab regions, Alamoudi et al. (2016) assessed the level of diabetes distress in Saudi patients with diabetes. A convenience sample of 197 participated in the study. Both DDS and PAID were used to assess diabetes distress. The findings revealed that fear of diabetes complications, adverse effects of low blood sugar levels on health, the effect of glycemic control on mood, and constant feelings of inability to manage or control diabetes are the main concerns. Recently, Aljuaid et al. (2018) found a positive correlation between diabetes distress scores and HabAc1. In the same manner, Darawad et al. (2017) conducted a descriptive cross-sectional study evaluating the psychometrics of the Arabic version of the DDS among a convenience sample of 289 Arabs with diabetes in Jordan. The study findings indicated that a higher level of diabetes distress is positively correlated with higher HbA1c levels ($r=0.153$, $p=0.018$) and negatively associated with diabetes self-management ($r=-0.174$, $p=0.003$). In the same vein, a cross-sectional study with 280 Arab adults with type 2 diabetes from Lebanon revealed a significant amount of emotional distress ($p=0.018$) was significantly associated with higher HbA1c values (Sukkarieh-Haraty et al., 2017).

In the case of the Arabs living in the U.S., a qualitative study with eight health care providers aimed at exploring providers' perspectives on cultural barriers and facilitators to diabetes self-management among Arab Americans reported the need for Arab-speaking health care providers to help Arab Americans with diabetes to maintain the best health possible (DiZazzo-Miller et al., 2017). Another qualitative study with 23 Adult Arab Americans with type 2 diabetes reported negative and positive attitudes toward health care providers. Some participants who dealt with Arab American health

care providers perceived that Arab American health care providers were not as caring (compared to non-Arab American doctors) (Fritz et al., 2016). Dissatisfaction with health care providers and lack of appropriate care and communication lead to distress among patients with diabetes (Polonsky et al., 2005; Tanenbaum et al., 2016).

Patients' levels of distress have been associated with diabetes self-management and glycemic control. No previous study has investigated the relationship between process (diabetes knowledge and diabetes distress), proximal outcome (diabetes self-management), and distal outcome (glycemic control) among Arabs living in the United States with diabetes. Even though some studies that examined these relationships were conducted in the Arab countries, none of them were done in the U.S., where there may be differences in the cultural contexts in terms of the healthcare system, culture, health education, and beliefs.

Outcomes Dimension

According to the IFSMT, outcome dimensions can be proximal and distal. In this study, the proximal outcome is theorized as diabetes self-management, and the distal outcome is theorized as glycemic control. The Proximal outcomes include self-management behaviors specific to a condition, risk, transition, and managing symptoms and pharmacological theories, whereas the distal outcome is related to health status, quality of life or perceived wellbeing, and cost of health.

Proximal Outcome. Self-management is a keystone of diabetes care. Individuals with diabetes are expected to perform diabetes self-care activities in order to achieve the optimal glycemic level and help avoid undesirable diabetes outcomes (ADA, 2019b;

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Diabetes Prevention Program Research Group et al., 2009). These activities may include (a) healthy eating, (b) being active, (c) monitoring, (d) taking medications, (e) problem solving, (f) healthy coping, and (g) reducing risk (AADE, 2019). However, the problem is that the lack of diabetes self-management is more present among ethnic groups (Bertran et al., 2015; Fritz et al., 2016; Mayberry et al., 2016). For example, a systematic review of 92 articles of Americans with diabetes between January 2011 and March 2015 revealed good evidence of disparities in terms of medication adherence and self-monitoring of blood glucose among non-Hispanic Whites, non-Hispanic Blacks, and Hispanic with type 2 diabetes (Mayberry et al., 2016). In addition to disparities among the visible U.S. population, the U.S. Arab population reported issues with diabetes care.

Lack of diabetes self-management has been identified as one of the most important issues among Arab Americans with diabetes (Bertran et al., 2015; Bertran et al., 2017; Fritz et al., 2016). For example, Bertran et al. (2015) conducted a qualitative study evaluating the barriers to and facilitators of diabetes self-management education among Arab Americans with diabetes. A convenience sample of 23 Arab Americans participated in the study. Focus group methodology was employed to produce rich data on patients' experiences of barriers to and facilitators of diabetes self-management. The findings revealed that religious beliefs, food sharing, and general roles could be either facultative or inhibitive. The findings also revealed conflicting views about their interactions with their healthcare providers. Some participants praised them as a "respected authority," while others acknowledged the gaps in communication between the healthcare providers and Arab patients with diabetes. The participants acknowledged

that the lack of appropriate educational and supportive resources are critical barriers to diabetes self-management education.

Fritz et al. (2016) conducted a qualitative study exploring Arab American providers' and patients' perspectives on the meaning of diabetes self-management and perceived cultural barriers to diabetes self-management among Arab Americans with diabetes by employing focus group methodology. A sample of 8 Arab American providers and 23 Arab Americans with diabetes participated in the study. Participants reported limited resources for diabetes self-management education and support, stigma as a barrier to ongoing support, family support as an opportunity or challenge, and issues with Arab American patient-provider relationships issue.

Bertran et al. (2017) conducted a qualitative study to assess Arab Americans' knowledge and perceptions of diabetes and their preference for lifestyle interventions. A convenience sample of 69 self-identified Arabs or Americans was recruited. A focus group methodology was employed to produce rich data on Arab American knowledge, perception, and practice relevant to diabetes. The participants believed that lack of health insurance and/or cost of care are significant barriers. The participants also reported the need for gender-specific exercise and including family in diabetes education, utilizing community facilities, and considering religious ideology in diabetes education intervention.

Although the previous three studies were carried out on exploring issues of diabetes self-management among the U.S. Arab population, to the best of my knowledge, no single study exists which assesses the level of diabetes self-management among this

population. Studies have revealed issues with diabetes regimens among Arabs in the Arab world, although they have acceptable diabetes education programs for Arabs compared to those in the U.S. (Abaza & Marschollek, 2017; Al-Bannay et al., 2015). In the U.S., diabetes self-management education for the U.S. Arab population is not an integral component of diabetes care across the nation. In studies done in the U.S., it was revealed that Arabs with diabetes disproportionately suffer from diabetes and suggested that the needs for understanding this population (Bertran et al., 2015; Bertran et al., 2017; DiZazzo-Miller et al., 2017; Fritz et al., 2016; Masri et al., 2018). These findings raise questions about diabetes self-management behaviors such as medication adherence, diet, exercise, smoking, and foot care among this population.

Medication adherence. Medication adherence helps with glycemic control. For example, in a cross-sectional study with 615 (Non-Hispanic Blacks (64.9%), non-Hispanic Whites, (33%), and Hispanic/other (2.1%) with type 2 diabetes in the southwestern United States, Walker et al. (2014b) found a significant negative correlation between adherence to diabetes medications and HbA1c levels. Unfortunately, disparities in adherence to diabetes medication exist among ethnic groups (Mayberry et al., 2016). For instance, Xie, Clair, Goldman, and Joyce (2019) investigated racial and ethnic groups disparities in medication adherence among a sample of Hispanics, Blacks, and Whites from a sizable U.S.-based insurance provider between 2011 and 2013. The study included 56,720 patients on oral diabetics. The study found that the average adherence rate among Whites taking oral antidiabetics was 8.4% higher than Hispanics, approximately one month less of medication use per year for Hispanics (Xie et al., 2019).

In the case of Arabs living in the U.S., Berlie et al. (2007) examined the use of glucose-lowering agents and aspirin therapy among Arab Americans with diabetes by taking complete medication history using face-to-face interviews and compared those to data from the Third National Health and Nutrition Examination Survey (NHANES) and the Behavioral Risk Factor Surveillance System (BRFSS). A total of 53 participants completed the study. The study's findings indicated that Arab Americans are less likely to be treated with insulin (27% vs. 17%) and more likely to receive oral diabetes medications (65% vs. 81%) compared to the national average. Moreover, 23% of Arab Americans with diabetes used aspirin compared to 64% of the national average. Thus, questions might have been raised about reasons for diabetes self-management, which includes adherence to medication regimens.

There are different reasons that may explain the lack of medication adherence among Arabs in the U.S. For example, DiZazzo-Miller et al. (2017) conducted a qualitative study to examine providers' perspectives on cultural factors and facilitators of diabetes self-management among Arab Americans with diabetes. A total of five Arab American Physicians and three pharmacists were recruited. The participants identified fears of diabetes medication and treatment, and the use of alternative preparations such as cinnamon hinders medication adherence. Moreover, Arab Americans are fearful of needles and perceive insulin as if it is a "death sentence." The study found that limited health insurance, a lack of health insurance, and the complex process of authorizing medications play major roles in adherence to diabetes medications. Differently, in a qualitative study with eight Arab American providers, participants reported issues with

medication adherence among Arab Americans with diabetes (Fritz et al., 2016). One of the provider participants stated,

> They don't wanna take the medication, they wanna go and get … this herb or these concoctions from the Middle East. And they bring it trying to bring their sugar down, and they give it to each other and they tell each other about it. …, maybe I can take out one of the drugs, and it's like, no, you cannot. (Fritz et al., 2016, p. 3)

Using alternative cures is present in the Arabs without diabetes. For example, in a qualitative study with 69 Arab Americans without diabetes in Michigan, some participants believed that the use of "Khat" and "Azaqan" lower the sugar level in the blood (Bertran et al., 2017).

Diet. Lower diet quality has been associated with poor glycemic control (Antonio et al., 2019). A low-carbohydrate, low-fat, Mediterranean diet and vegetarian eating pattern have been found to improve glycemic control (Wheeler et al., 2012). However, not all individuals with diabetes adhere to these diets. For example, Casagrande et al. (2018) found that dietary fiber intake was significantly lower among Hispanic with diabetes, and Sodium intake was significantly higher among Hispanic with diabetes. A systematic review of 92 articles of Americans with diabetes between January 2011 and March 2015 found good evidence of a disparity in diet behaviors among these ethnic groups, such as Hispanics, who eat healthier diets than non-Hispanic Whites (Mayberry et al., 2016).

In the case of Arabs living in the U.S., red meat-based foods are common among Arabs from Iraq, while vegetable- and legume-based foods are common among Arabs

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from Jordan, Syria, and Lebanon (L. Jaber et al., 2014). Consuming a large amount of honey and dates is very common and are perceived as healthy foods among Arab Americans (L. Jaber et al., 2014). Food and sweets usually are present at social events such as family gatherings or parties and are a source of temptations for those who have diabetes (DiZazzo-Miller et al., 2017). Refusing to eat during those events is considered an insult (DiZazzo-Miller et al., 2017). For example, in a qualitative study with 23 Arab Americans with diabetes in Michigan, participants reported struggling with cultural food norms (Bertran et al., 2015). On female participant stated,

> We cook at home, but the problem [is] that we cook in big quantities . . . because we love our kids and the family . . . and we are like "come on, eat." I used to make my kids big plates until they became fat but now my son lost weight because he was on a strict diet. (Bertran et al., 2015, p. 751)

Adherence to dietary regimens among individuals with diabetes may be ignored in the month of Ramadan since eating patterns change and contain large meals at dusk (sunset) and before dawn (Pinelli & Jaber, 2011). A cross-sectional study of 27 Arabs with type 2 diabetes who observed the month of Ramadan in the U.S. found a 25% decreased in the frequency of glucose monitoring, 67% of whom had consulted healthcare providers prior to Ramadan (Pinelli & Jaber, 2011). Many Muslim Arabs observe the month of Ramadan. Ramadan is the lunar month when Muslims refrain from any oral intake, including food, fluids, and medications from dawn until dusk (sunset) (L. Jaber et al., 2014; Myers et al., 2019; Pinelli & Jaber, 2011). This month takes place in the ninth month on the Islamic calendar and lasts from 29 to 30 days (Myers et al., 2019).

Muslims believe that fasting during this month cleanses the soul (Myers et al., 2019).

Although religious exemptions, such as not requiring very sick people to fast, may apply

to those with chronic disease such as diabetes, a majority of Arab Muslims may observe

the month of Ramadan against the medical advice due to high religious drive (Hassanein

et al., 2017; Myers et al., 2019). Finally, vitamin D insufficiency and hypovitaminosis

have been documented among Arab Americans and have been linked to insulin

resistance, metabolic syndrome, and glucose intolerance among Arab American men

(Pinelli et al., 2010).

Exercise. Physical activity improves glycemic control (Colberg et al., 2016). Lack

of physical activities or lower physical activities has been associated with diabetes-

related complications such as hypertension, retinopathy, and nephropathy among patients

with type 2 diabetes (Bukht et al., 2019). A study with 615 adults from the U.S., with no

Arab participants, found a significant negative correlation between diabetes distress and

exercise (-0.10, $p<0.05$) and a significant correlation between diabetes fatalism and

exercise (-0.09, $p<0.05$; Asuzu et al., 2017). A systematic review of 102 articles between

January 2011 and March 2016 found no disparities in excises among non-Hispanic

Blacks, non-Hispanic Whites, and Hispanic with diabetes (Mayberry et al., 2016).

Arabs with diabetes are less likely to exercise. A study by Zakarni (2013) reported

that 46.5% of Arab Americans with diabetes did not exercise at all in the last 7 days, and

only 15.7% exercise every day. In the 2016 Michigan Behavior Risk Factor Survey, Arab

adults (8.3%) reported significantly lower prevalence of diabetes and adequate physical

activity compared to non-Hispanic Whites (19.3%), non-Hispanic Blacks (21.2%), and

Hispanics (18.8%) as well as the overall Michigan population (19.5%; Neumayer et al., 2017). Also, the report indicated that adequate physical activities significantly decreased among females than males and increased with increasing education and income (Neumayer et al., 2017). This lower percentage among Arab women with diabetes can be attributed to cultural views, gender roles, and female modesty, which poses a barrier to exercise among Arab American women. For example, in a qualitative study with 23 Arab Americans with diabetes in Michigan, participants reported cultural barriers to physical exercise (Bertran et al., 2015). One female participant stated, "Mixed [exercise is] no[t acceptable], due to respect for our head cover [hijab], and our religion. Our religion doesn't allow that" (Bertran et al., 2015, p. 751).

Many Arab American women with diabetes believe that access to mixed-gender exercise facilities is inappropriate, while a few women had flexible views, such as exercising on machines but not swimming (Bertran et al., 2015). Walking has been shown to be acceptable among Arab American women with diabetes (Bertran et al., 2015; Bertran et al., 2017). A qualitative study with 21 Arabs (nine men, 12 women) in the U.S. found that the more acculturated participants tend to be more physically active than less acculturated participants (Kahan, 2011).

Smoking. Smoking is very common among Arabs and has some connections to culture. Smoking continues among Arabs even after their immigration to the U.S. (El Hajj et al., 2017; Roula Ghadban et al., 2019). A systematic review and meta-analysis of research studies published between 1990 and 2016 revealed that the smoking prevalence among Arab Americans ranges from 39% to 69%, with higher rates among men

(Ghadban et al., 2016). Arab Adults (13.5%) reported a significantly higher prevalence of hookah usage, water pipes that are used to smoke tobacco than non-Hispanic Whites (Neumayer et al., 2017). The prevalence of smoking among Arab Americans with diabetes ranges between 9.9%and 38.8% (Berlie et al., 2008; Kridli et al., 2006).

Foot Care. The practice of diabetes includes inspecting the feet and checking the interior of shoes to ensure that there are no materials that could cause injuries is important to prevent and detect diabetic foot complications at earlier stages (Armstrong et al., 2017). High incidences of diabetic foot complications have been associated with poor knowledge and lack of practice of diabetes foot care (George et al., 2013). Approximately 19–34% of individuals with diabetes are likely to be affected by diabetic foot ulcers (Armstrong et al., 2017). In the U.S., a cross-sectional analysis of 1830 patients age 20 years and older by Peraj et al. (2019) found that Hispanics and Asian Americans with diabetes are less likely to have had a food exam by healthcare providers when compared to non-Hispanic Whites Americans.

Inappropriate foot care among individuals with diabetes may are attributed to different reasons, such as diabetes knowledge. For example, a cross-sectional study designed with 161 Muslims with type 2 diabetes from Indonesia found that diabetic foot care knowledge ($p<0.05$) was a positive predictor of diabetic foot care behaviors (Setiawati et al., 2018). Differently, Walker et al. (2012) found a slight correlation between diabetes fatalism and foot care (r=-0.107, p=.057). However, Asuzu et al. (2017) found a significant correlation between diabetes fatalism and foot care (-0.08, $p<0.05$). In the case of Arabs, a systematic analysis of studies conducted in the Arab countries found

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that the prevalence of diabetic foot ranges from 1.9 to 19% among patients with diabetes (Mairghani et al., 2017).

Distal Outcome

Glycemic Control and Blood Glucose Monitoring. The U.S. Arab population with diabetes suffers sub-optimal care quality according to the American Association of Diabetes Guidelines (Berlie et al., 2008). About 26% of Arab Americans had HbA1c > 9.5% compared to 18% of the national U.S. population (Berlie et al., 2008). A recent study documented that Arab Americans are 38% more likely than non-Hispanic Whites to report HbA1c > 7% compared to non-Hispanic Whites (Dallo et al., 2018). A previous study by Berlie et al. (2008) found that only 30% of Arab Americans met the goal of HbA1c levels as recommended by the American Diabetes Association. A higher percentage of Arab Americans with diabetes have an HbA1c > 9% compared to the national average (26.4% vs. 18%) (Berlie et al., 2008). A correctional study by Zakarni (2013) found that 70% of Arabs check their blood glucose levels at least one week, and 30% did not check their blood glucose in the previous 7 days. A study with 615 (Non-Hispanic Blacks (64.9%), non-Hispanic Whites (33%), and Hispanic/Other (2.1%) with type 2 diabetes found a significant negative correlation between diabetes distress and blood sugar testing (-0.09; p <0.05) (Asuzu et al., 2017).

<div align="center">

Knowledge Gaps

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As can be seen in the studies mentioned above, Arabs in the U.S. living with diabetes are at risk for poorer diabetes outcomes. The current literature fails to examine the relationship between diabetes context (fatalism), process (diabetes knowledge and

diabetes distress), the proximal outcome (diabetes self-management), the distal outcome

(glycemic control). Several studies explored various issues contributing to the lack of

diabetes self-management among Arabs Americans (Bertran et al., 2015; Bertran et al.,

2017; DiZazzo-Miller et al., 2017; Fritz et al., 2016; Masri et al., 2018). These studies

varied in sample size (8 to 69). One study focused on providers' perspectives on cultural

barriers and facilitators to diabetes self-management education and found denial to accept

diabetes and stigma are the main barriers to diabetes self-management (DiZazzo-Miller et

al., 2017). In addition to providers' perspectives, Fritz et al. (2016) included patients'

perspectives and found limited resources for diabetes self-management education and

stigma are the main barriers and patient-provider relationships and family supports as an

opportunity and challenge. Masri et al. (2018) assessed the Arab American's perceptions

of diabetes self-management behaviors and found that portion control, food selection, and

maintaining a healthy lifestyle were important to Arab Americans with diabetes.

Moreover, when Bertran et al. (2017) explored Arab Americans' knowledge and

perceptions of diabetes, they found that myths about the cause of diabetes, folk remedies,

social stigma, and lack of health insurance cost of care are barriers to healthcare

educations. A study by Bertran et al. (2015) found that food, sharing religious beliefs, and

gender can be both facilitators or barriers to diabetes self-management among Arab

Americans with diabetes. Authors in the previous studies agreed upon the need to develop

culturally appropriate and acceptable diabetes self-management education (Bertran et al.,

2015; Bertran et al., 2017; DiZazzo-Miller et al., 2017; Fritz et al., 2016; Masri et al.,

2018).

Other studies focused on the pathophysiological aspects of diabetes among Arab Americans (Burghardt et al., 2017; Pinelli et al., 2010; Salinitri et al., 2013). At least four study studies reported the prevalence of diabetes among Arab Americans (Aswad, 2001; Dallo & Borrell, 2006; L. A. Jaber, Brown, Hammad, Nowak, et al., 2003; L. A. Jaber et al., 2004). L. A. Jaber, Brown, Hammad, Zhu, and Herman (2003) found that a lack of acculturation is associated with dysglycemia among Arab Americans.

At least two studies assessed the quality of life among Arab Americans (Berlie et al., 2008; Zakarni, 2013). Berlie et al. (2008) found that this population is less aggressively treated with pharmacologic agents than recommended by the American Diabetes Association and show uncontrolled HbA1c levels. Zakarni (2013) investigated the determinant of the health-related quality of life in Arab Americans with diabetes, such as diabetes-related characteristics, religion-related factors, disease acceptance, social support, self-management behaviors, quality of life, and glycemic control. Zakarni (2013) found a significant association between intrinsic religiosity, stroke, and the presence of a micro-complication of diabetes, and social support and health-related quality of life among Arab American Muslims and Christians.

Summary

Many studies are relevant to understanding diabetes self-management and glycemic control and diabetes-related concepts such as diabetes fatalism, diabetes knowledge, and diabetes distress. Although evidence shows a growing body of research in this field in Arab countries and the United States, few studies have been conducted in the United States exploring issues of Arab Americans with diabetes. For the most part,

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studies have reported higher unhealthy behaviors such as inappropriate eating behaviors, smoking, lowers rates of physical activities, and issues with exercising.

Most of the research on diabetes self-management among Arab Americans with diabetes has implemented qualitative methods to explore diabetes self-management issues with this population. Most studies about this population have been conducted in California and Michigan. However, much uncertainty still exists about the relation between diabetes context (fatalism), process (diabetes knowledge and diabetes distress), the proximal outcome (diabetes self-management), the distal outcome (glycemic control) among the U.S. Arab population with type 2 diabetes. This study was the first to examine the relationships between the aforementioned three concepts among Arabs live with diabetes in the United States. This study is not only significant to the U.S. Arab population but also to the field of diabetes studies and the health of a segment of the U.S. population.

CHAPTER III

METHODOLOGY

This chapter explains the research methodology used to answer the research questions. The study's design, setting, sampling, measure and instrument, data analysis, and human subject protection are described in detail. The purpose of this study was to examine diabetes self-management, related factors, and outcomes among Arab adults living in the United States. It examined the relationship between context (diabetes fatalism), process (diabetes knowledge and diabetes distress), proximal outcome (diabetes self-management), and distal outcome (A1C level). The study explored the impact of age, gender, years of diabetes, marital status, education, diabetes education, income, presence of health insurance, and years in the United States on diabetes self-management and A1c level.

Design

A cross-sectional, descriptive correlational research design was used to explore diabetes self-management, related factors, and outcomes among Arab adults living in the United States. An obvious advantage of using a correlational research design is that it requires meeting a target population at a single collection point (Polit & Beck, 2012; Setia, 2016). A correlational design used an appropriate method to examine relationships (Polit & Beck, 2012). A correlational method helps find associations and relating variables and makes predictions from independent variables (predictors) to scores on the

dependent variable (Gliner et al., 2017). The correctional studies do not provide evidence of causation but provide inferences about possible causes (Gliner et al., 2017). A structured self-reporting questionnaire was used to collect data in order to examine the relationship between context (diabetes fatalism), process (diabetes knowledge and diabetes distress), proximal outcome (diabetes self-management), and distal outcome (A1C level or self-reporting A1C).

Research Questions

RQ1: What are the sociodemographic characteristics and diabetes-related characteristics of Arabs living with type 2 diabetes in the U.S.?

RQ2: What is the relationship between the context (diabetes fatalism) and the proximal outcome (diabetes self-management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the United States?

RQ3: What is the relationship between the context (diabetes fatalism) and the process (diabetes knowledge and diabetes distress) on the proximal outcome (diabetes self-management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the U.S.?

RQ4: What is the relationship between the proximal outcome (diabetes self-management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the U.S.?

RQ5: What are the combined relationships between the context (diabetes fatalism), the process (diabetes distress, diabetes knowledge), and the

proximal outcome (diabetes self-management on the distal outcome (A1C level) among Arabs living with type 2 diabetes in the U.S.?

RQ6: What is the impact of socio-demographic characteristics and diabetes-related characteristic (age, gender, years of diabetes, marital status, education, diabetes education, income, presence of health insurance, and years in the United States) on the proximal outcome (diabetes self-management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the U.S.?

Setting

The participants were recruited from two selected southeastern states—North Carolina and Florida. The participants were recruited from different locations across North Carolina, including but not limited to two non-profit community clinics, mosques, and Middle Eastern, Islamic, or Arabian stores in Mecklenburg, Alamance, and Guilford Counties. In Florida, data were collected from Miami-Dade. In 2016, approximately 10.1% of the North Carolina population had diabetes (CDC, 2016). As mentioned earlier, Arabs have higher rates of diabetes than non-Hispanic Whites (Dallo et al., 2016). North Carolina is home to an estimated 91,788 Arab-Americans (AAI, 2015). Currently, Arab Americans reside in 75 counties of the 100 counties in North Carolina (AAI, 2015). This population is clustered in Gaston, Cumberland, Mecklenburg, and Wake Counties (AAI, 2015). There are 255,000 Arabs who reside in Florida, with a significant number in the county of Miami-Dade (AAI, 2003).

Sample

The principal investigator used a convenience strategy and snowballing sampling technique from a variety of locations, including but limited to two non-profit community clinics, mosques, and Middle Eastern, Islamic, or Arabian stores. A convenience sample is composed of participants who are easily accessible to researchers, meet the inclusion criteria, and represent the theoretical population (Gliner et al., 2017). Snowballing is a technique to help when the population of interest is rare, and researchers asked research participants to encourage others who meet the entry criteria to communicate with the researcher to participate in the study (Gliner et al., 2017). The inclusion criteria were (a) self-identified Arab, (b) self-reported of type 2 diabetes, (c) able to speak, read, or understand either Arabic or English, (d) age of 18 years of age or older, and (e) was born or living in the United States. A total of 83 participants were recruited.

Sample Size

A priori power analysis (the G*power) was conducted to predict the sufficient number of participants needed for the research questions. The *a priori* analysis indicated that 42 participants would be sufficient to answer RQ4 when using a simple linear regression model with an estimated effect size of R^2 of 20%, a two-tailed power of 0.80, and an alpha level of 0.05. Fifty-two participants were required to answer RQ2 using multiple regression with an estimated effect size of R^2 of 20%, a two-tailed power of 0.80, and an alpha level of 0.05. *A priori* analysis indicated that 59 participants were needed to answer RQ3 and 65 participants were needed to answer RQ5 using multiple regression with an estimated effect size of R^2 of 20%, a two-tailed power of 0.80, and an

alpha level of 0.05. Concerning RQ6, *a priori* analysis using multiple regression analysis indicated that 65 participants were sufficient to achieve a power of 0.80 with a moderate effect size of 0.28 and an alpha level of 0.05.

Recruitment Strategies

Several recruitment strategies were employed in this research study. First, flyers and announcements in Arabic and English were in visibly prominent places in clinics, mosques, and Middle Eastern, Islamic, or Arabian stores, as well as restaurants in areas of the cities with a high density of Arabs in the selected southeastern states. Next, managers (presidents) of Arab-related organizations and student clubs were asked to post and share flyers, announcements, and the online link to the study with their Arab community via their communication channels such as social media and electronic email. Moreover, selected Arab Adult community insiders helped send flyers, announcements, and the link to the study with their community members via their communication channels.

Second, the principal investigator met with healthcare providers at targeted clinics to inform them about the study and request their assistance in referring potential participants to the study. The principal investigator oriented the selected providers in the clinics to the study and entry criteria to facilitate identifying potential participants. Their roles were limited to distributing flyers and referring potential participants to the principal investigator. Moreover, the principal investigator asked the personnel in the clinic to distribute flyers among potential participants.

Third, in the mosques and community fairs, where Arabs cluster, the principal investigator collaborated with community insiders and key persons to obtain approval and gained access to where Arabs cluster. In the mosques, the principal investigator attended weekly Friday prayers in different mosques. The principal investigator obtained approval to set up a table to conduct the study pre-, during, and post-working hours. The principal investigator asked Imams in the mosques personnel events to announce the study and/or allow the principal investigator to speak briefly to the congregation and attendee about the study.

The principal investigator informed selected personnel in settings about the study purpose and requested their help in referring potential participants to the research study. The principal investigator provided potential participants, personnel in the sites, and Imams with extra flyers and announcements and encouraged them to share them with friends, family, and community. The principal investigator set up a table where he was permitted to conduct the study.

Finally, for potential participants who reached the principal investigator by phone, email, or in-person and preferred not to participate in the first encounter for any reason, the principal investigator offered to arrange an agreeable and convenient location and time for the participant that guaranteed privacy. Moreover, the principal investigator distributed flyers whenever and wherever he met Arab adults and encouraged them to share them with their friends, family, and community.

It was expected that the principal investigator would encounter challenges when trying to recruit female participants because the principal investigator is male and

typically is not culturally acceptable for non-family members of the opposite gender to meet alone. The principal investigator is a native Arabic speaker and is familiar with the Arab culture. The male principal investigator approached the potential female participants in a culturally appropriate manner as recommended (Timraz et al., 2017). It is possible that female participants' male companions or males of her family could be present during the study. To navigate this potential challenge and protect female participants, the principal investigator (a) explained the purpose of the study and the importance of having an individual's own opinion, (b) engaged the companion in the decision making and assured them about the priority of the well-being of the participant, (c) offered appreciation to the woman and her companion for their time and effort to either participate and telling others about the study, and (d) presented the women and her companion questions in a non-judgmental manner as recommended (Timraz et al., 2017).

Data Collection Procedures

The principal investigator asked the participants to complete self-administered paper-and-pencil questionnaires offered in Arabic or English. The principal investigator provided the participants with the information sheet form to read, and the principal investigator read it if there was a literacy issue or vision issue. When any of these issues were present, the principal investigator offered assistance in the completion of the questionnaire in a confidential way to avoid any embarrassment. Directly after data collection, the principal investigator reviewed the answers and checked for missing data. When missing data was present, the principal respectfully asked the participant for clarification. After that, the principal investigator obtained the A1C level using the

A1CNow™ Point-of-Care device. The participants were given a printed result immediately, and the result were recorded on the questionnaire package. Each participant had a print copy of the A1C level. Those with high A1C levels were instructed to follow with their health care providers. The study process took about 35–45 minutes. Due to COVID-19 pandemic research restrictions for in-person research and difficulties with participant recruitment and the principal investigator's health safety, the data collection method was affected and changed during the study. A Qualtrics® survey method and self-reported A1C method were incorporated into data collection strategies. No participants were recruited in person during the COVID-19 pandemic.

Measurement and Instrumentation

Biophysical indicators and four instruments were used to collect data as can been seen in Table 1: (a) socio-demographic questionnaire, (b) Diabetes Fatalism Scale (DFS) (context), (c) The Revised Michigan Diabetes Knowledge Test (DKT2) (process), (d) Diabetes Distress Scale (DDS) (process), (e) The Diabetes Self-Management Questionnaires (DSMQ) (proximal outcome), and (f) A1C (Distal outcome).

Readability of the English Versions of the Questionnaires. The researcher used the Flesh-Kincaid Grade Level score obtained through Microsoft Word readability scores. This method computes five complexity parameters of texts (syntactic simplicity, abstractness/concreteness of words, narrativity, referential cohesion, and deep cohesion) (Solnyshkina et al., 2017). The questionnaire had a Flesh-Kincaid Grade Level score of 5.1, indicating that a fifth-grader can read and understand the questionnaire.

Readability of the Diabetes Distress Scale Translated by the Principal

Researcher. To the best of the knowledge of the principal investigator, who is a native

Arabic speaker, there was no known reliable tool known to measure the readability of

Arabic text. Thus, the translated version was provided to two different native Arab

laypersons, and they were asked to read the instructions and the items. They were asked if

the items were clear and understandable, and they were asked to point out any difficulty

or issue. The two layperson participants reported no issues with the translated Arabic

version of the Diabetes Distress Scale.

Readability of the Arabic Versions of Diabetes Fatalism Scale and the

Revised Michigan Diabetes Knowledge Test, and the Diabetes Self-Management

Questionnaires. Arabic questionnaires have been used among Arabs with diabetes in the

Middle East. Additionally, the researcher pilot-tested the Diabetes Fatalism Scale and the

Revised Michigan Diabetes Knowledge Test that were used in this study among five

Arabs with different educational levels, and participants reported that the questionnaires

were understandable and easy to read.

Table 1

Measurements

Dimensions	Variables	Measurement	Score Ranges
Socio-demographic	1. Age	Years	18 or more
	2. Gender	Male, Female	Male= 1 Female=0
	3. Years of diabetes	Years	

Dimensions	Variables	Measurement	Score Ranges
	4. Marital status	Married vs. unmarried	Married=1 unmarried=0
	5. Education	High school or less vs. More than high school	More than high school =1 High school or less = 0.
	6. Diabetes education	Yes, No	Yes = 1 No = 0
	7. Income	1. Less than $$20,780 2. $27,780 or more	Less than $20,780 =0 $27,780 or more =1
	8. Presence of health insurance	Insured vs. non-insured	Insured=1 Non-insured =0
	9. Years in the U.S.	Years	Number of years
	10. Years of type 2 diabetes	Years	Number of years
Context	Diabetes fatalism	Diabetes Fatalism Scale (DFS)	6-point Likert scale with scores (total score ranges from 12-72) ranging from 1 = strongly disagree to 6 = strongly agree. Higher values are indicative of higher fatalistic attitudes towards diabetes
Process	Diabetes knowledge	The Revised Michigan Diabetes Knowledge Test (DKT2)	0-14, a higher score indicates better knowledge.
	Diabetes distress	Diabetes Distress Scale (DDS)	1-6 The patients who score <2.0 may have little or no distress, 2.0- 2.9 may have moderate distress, and > 3.0

Dimensions	Variables	Measurement	Score Ranges
			may have high distress
Outcome			
Proximal outcome	Diabetes self-management	Diabetes Self-Management Questionnaires (DSMQ)	0-10 Higher values are indicative of more effective self-care. A score of ≥ 6 has been used as an indicator of optimal diabetes self-care.
Distal outcome	A1C level	Blood sugar test	Percent (Reasonable goal for adults = <7%, Less Stringent = <8% for patients with other issues such as patients with a history of diabetes complications)

Socio-Demographic Questionnaires. Socio-demographics, an investigator-designed form, comprised of 24 questions such as age, gender, identity, presence of type 2 diabetes, years of type 2 diabetes, years living in the U.S., birthplace, marital status, languages, level of education, employment status, presence of health insurance, understanding of diabetes and its treatment, gender health question, help with diabetes care, having and using of a glucose meter, diabetes education, income, height and weight, smoking status, and presence of diabetes complications.

Diabetes Fatalism. The total scores of the Diabetes Fatalism Scale were used to

assess the level of diabetes fatalism in terms of emotional distress, spiritual coping, and

perceived self-efficacy (Egede & Ellis, 2009). The English and Arabic versions of the

DFS were used to assess diabetes fatalism. The DFS, a 12-item self-administered 6-point

Likert scale, consists of three subscales: (a) emotional distress (five items), (b) religious

and spiritual coping (four items), and (c) perceived self-efficacy (three items) (Egede &

Ellis, 2009). For example, under the emotional distress subscale is, "I feel down when I

think about my diabetes" (Egede & Ellis, 2009, p. 63). Item scores range from 6 =

strongly agree, 5 = *moderately agree*, 4 = *agree*, 3 = *disagree*, 2 = *moderately agree*, to 1

= *strongly disagree*, except the religious and self-efficacy reverse (Egede & Ellis, 2009).

Then the average score of the sum of all items should be calculated (Egede & Ellis,

2009). A higher score indicates greater diabetes fatalism (Egede & Ellis, 2009). For

example, an individual who scores high in the DFS is more likely to report self-care

control problems, negative attitudes toward diabetes, social and personal factors that

negatively influence diabetes care and is less likely to report good self-care understanding

and ability, to adhere to recommended diet, and to adhere to self-care recommendations

(Egede & Ellis, 2009). Also, an individual who scores higher in the DFS are usually have

higher A1C level (Egede & Ellis, 2009). A Cronbach's alpha of 0.804, indicating good

internal consistency, was reported for the original English version of the scale (Egede &

Ellis, 2009). Construct, face, and content validity were assessed by the instrument

developer for the 12-item scale (Egede & Ellis, 2009). A Cronbach's alpha of 0.86,

indicating good internal consistency, was reported for the Arabic version of the 12-items

scale. Construct validity, content validity, and cultural suitability were assessed for the Arabic version (Sukkarieh-Haraty et al., 2018).

Diabetes Knowledge. The total score of the Revised Michigan Diabetes Knowledge Test (DKT2) was used to assess the individual's knowledge about diabetes (Fitzgerald et al., 2016). This study used DKT2, a 14-item self-administered test that assesses the diabetes knowledge of participants with diabetes mellitus (Fitzgerald et al., 2016, 1998). For example, "Which of the following is highest in carbohydrate?" and the participant could circle or choose the correct answer: (a) Baked chicken, (b) Swiss cheese, (c) Baked potato, or (d) Peanut butter (Fitzgerald et al., 2016, p. 186). The score is given based on the number of correct responses (Fitzgerald et al., 2016). A higher score indicates greater diabetes knowledge (Bukhsh et al., 2017). A Cronbach's alpha of 0.70 was reported by the instrument developers for the 14-item part by testing in community and health department samples (Fitzgerald et al., 1998). Content validity was established by a panel of national experts in diabetes (Fitzgerald et al., 1998). This tool has been adapted for use in Greece, Ireland, Saudi Arabia, Malaysia, and other countries (Alhaiti et al., 2016; Al-Qazaz et al., 2010; Fitzgerald et al., 2016). A review of the 1998 version of the instrument indicated that some items are outdated (Fitzgerald et al., 2016). As a result, a group of diabetes patients and care providers such as a certified diabetes educator and a Certified Diabetes Educator nurse reviewed it and revised it (Fitzgerald et al., 2016). A Cronbach's Alpha of 0.77 was reported for the English version of the (DKT2), indicating acceptable internal consistency (Fitzgerald et al., 2016). A Cronbach's Alpha of 0.75 indicating acceptable internal consistency was reported for the Arabic version (Alhaiti et

al., 2016). Content validity was established by a panel of Arab experts in diabetes (Alhaiti et al., 2016).

Diabetes Distress. The overall scores of the Diabetes Distress Scale (DDS) were used to measure and assess diabetes-related distress in terms of an emotional burden, physical-related distress, and a diabetes-related interpersonal subscale (Polonsky et al., 2005). The Arabic and English versions of the DDS were used to assess diabetes-related distress. The DDS is a 17-item self-administered 6-point Likert scale and consists of four subscales: (a) emotional burden subscale (five items), (b) physician-related distress subscale (four items), (c) regimen-related distress (five items), and (d) diabetes-related interpersonal subscale (three items; Polonsky et al., 2005). For example, under emotional distress, "Feeling that diabetes is taking up too much of my mental and physical energy every day" (Polonsky et al., 2005, p. 630), the patients who score <2.0 may have little or no distress, 2.0- 2.9 may have moderate distress, and ⩾ 3.0 may have high distress (Fisher et al., 2012). For example, higher distress correlates with poorer A1C levels (Fisher et al., 2012). The answer ranges from 1= *no problem* to 6 = *serious problem*. Scores are transformed to a percentage of 10, and a higher score indicates greater diabetes distress (Darawad et al., 2017; Polonsky et al., 2005). A Cronbach's alpha of 0.93, indicating an excellent internal consistency, was reported by the original developers (Polonsky et al., 2005). Construct validity was assessed expletory factor analysis was reported by the original developers (validity coefficients), showing significant linkages with the Center for Epidemiolocal Studies Depression Scale, meal planning, exercise, and total cholesterol (Polonsky et al., 2005). Similarly, Cronbach's Alpha of 0.882, indicating

an adequate internal consistency, was reported for the Arabic version (Darawad et al., 2017). Construct validity was assessed for the Arabic version (Darawad et al., 2017). Construct validity was reported for the Arabic version by using factor analysis, showing a 4-factor model that explained 65.59 of the variance with factor loading greater than 0.40 with no cross-loading (Darawad et al., 2017). However, this Arabic version is a 5-point Likert scale. As a result, the principal investigator translated the scale to be parallel with the English version.

      Instrument Translation and Adaption Process. The Diabetes Distress Scale (DDS) items and instructions were translated into the Arabic language to fit this study context. Since the principal investigator planned to use Arabic and English versions of the survey, the principal investigator used an asymmetrical translation strategy (unicentered). "Asymmetrical translation (unicentered) refers to translation in which the target language remains loyal to the source language" (Waltz et al., 2017, p. 566). Back translation, or double translation, is the process that involves using two translators who work independently. One translates the items from the original language (the primary source) to the target (the second language), and the second translates the items from the target (the second language) to the original language (the primary source). Then the two translators compared the two original language versions to detect discrepancies and flaws. Item content valid index (ICVI) use a 4-point scale (1 = *not relevant*, 2 = *somewhat relevant*, 3 = *quite relevant*, and 4 = *highly relevant*) to assess the comprehensive, accuracy, and relevance of each statement in the instrument (Polit & Beck, 2012) Each item is computed as the number of experts giving the rate divided by

the number of experts (Polit & Beck, 2012). An I-CVI of 0.80 is considered acceptable (Polit & Beck, 2012; Waltz et al., 2017). Face validity refers to the appearance of the instrument to the layman (Waltz et al., 2017). The lowest level of agreement for the items was 0.81, except for Items 5 and 14, which received a level of agreement of 0.75. Then the principal investigator corrected the wording and the grammar based on discussion with the translation team.

The principal investigator took the following steps:

1. The principal investigator is a bilingual native speaker of Arabic and English as a second language nurse with a master's degree who independently translated the tool from English into Arabic.

2. A bilingual (native Arabic and English teacher) independently translated the Arabic version back to English

3. The principal investigator met with the bilingual language teacher and compared the translated versions to identify flaws with the original version by preparing a word document format in which the source language (English) and (Arabic) appear next to each other. This process allowed both translators to double-check understanding of items (statements) by reading each item a second time.

4. The principal investigator provided four bilingual nurses the original English version of the scale and the Arabic translation of the scale and asked them to rank items in word documents where the items appear next to each other. Those four nurses were asked to rank the items from 1 to 4, where 1 = *not*

relevant, 2 = *somewhat relevant*, 3 = *quite relevant*, and 4 = *highly relevant* to

check whether the meaning is relevant. Moreover, they were asked to discuss

the difference in language and whether items are appropriate for the Arab

culture. Changes to the translating questionnaire were made based on

consensus and discussion with them.

5. Finally, the principal investigator pretested the Arabic version of the scale

    with two Arab native speakers from the community and asked them whether

    the items and the instructions were easy to understand, easy to read, and

    comprehensible. No issues were reported, and no further changes were made

    to the Arabic translation.

Proximal Outcome. The sum score of the Diabetes Self-Management

Questionnaires (DSMQ) was used to assess the level of diabetes self-management

(Schmitt et al., 2013). The English and Arabic versions of the DSMQ were used to assess

the level of diabetes self-care over the last eight weeks (Schmitt et al., 2013). The DSMQ

is a 16-item self-administered 4-point Likert scale that consists of four subscales: (a)

glucose management (five items), (b) dietary control (four items), (c) physical activities

(three items), and (d) healthcare use (three items), as well as one item asking about an

overall rating of self-care (Schmitt et al., 2013). For example, under glucose management

part there is a question whether the participants monitor blood sugar levels with attention.

(Schmitt et al., 2013). Item sc*ores range* from 3 to 0 on four-point response about how

much the items apply to the participants (Schmitt et al., 2013). Scale scores are calculated

as sums of items scores and then transformed to a scale ranging from 0 to 10. The

questionnaire allows the summation to a "Sum Scale" score and four subscale scores. Higher sum scores indicate a higher degree of diabetes self-management (Schmitt et al., 2013). The DSMQ scales' Cronbach's alpha of the English version averaged 0.77 for glucose subscales and dietary control, 0.76 for physical activity, and 0.60 for healthcare use, with a Cronbach's alpha of 0.84 "Sum Scale" (Schmitt et al., 2013). Convergent validity and a good factorial validity were assessed and established by the tool developer, which confirms the four subscales and integration of all items scores to the "Sum Scale" (Schmitt et al., 2013). The Arabic version of the questionnaires revealed a Cronbach's alpha ranges from 0.79 to 0.89 among the four subscales (Hassan, 2017).

A1C Level. To assess the A1C level, the principal investigator used A1CNow™ Point-of-Care device and the self-reported A1c. A1CNow™ Point-of-Care portable device proved its accuracy in the primary care settings when compared to the laboratory test (Arrendale et al., 2008). The principal investigator obtained the results from the fingerstick A1C level. The A1c test is an indirect measure of the average blood sugar level for the past 2–3 months (American Diabetes Association, 2019c).

A self-reported A1C has been shown to be an acceptable measure, and most participants can report it accurately (Trivedi et al., 2017). A reasonable goal for the A1C level of nonpregnant adults is less than 7% and less than 8% for those with a history of advanced microvascular or macrovascular complications, limited life expectancy, and extensive corambid conditions (ADA, 2019b). A higher A1C level indicates poorer glycemic control.

Data Management and Analysis

First, the principal investigator collected data from the participants, and each questionnaire package was assigned a code. The participants' responses in the web-based survey were downloaded and exported directly from the survey website, Qualtrics®. All data were entered by the principal investigator into Statistical Package for the Social Sciences (SPSS) version 27 for analysis. Data were screened for missing values. There were 88 surveys, seven of which were removed because only the socio-demographic questions part was completed. Three tools were checked for missing data. A decision was made that each tool must have at least 80% filled out to be considered valid. Diabetes Distress Scale survey and Diabetes Fatalism Scale survey data were missing completely at random (MCAR) (Little's MCAR test: Chi-Square=68.368, df=66, p=0.397., Chi-Square=170.220, df=146, p=0.083, respectively). The diabetes distress scale had three ineligible cases, and 10 cases had between one and two missing data points. Diabetes Fatalism Scale survey had one ineligible case, and six cases had one missing point in each of them. Missing data were imputed separately from each survey using expectation-maximization imputation as recommended by Polit and Beck (2012). A decision was made to not impute for missing data in the socio-demographic and other data points. The predictors were first divided by 10 or 100 for modeling interpretations, except Question 4 (Kline, 2016). A1C was positively skewed and was transformed to enhance the models (inverse transformation). Frequencies, proportion (percentages), central tendency (mean, mode, median), the standard deviation were computed to describe the sample and to have an overall picture of how data looked.

Second, simple linear regression, weighted least squared regression, and multiple regression analysis were used to answer Research Questions 2-6. Data were examined for the assumptions of normality, linearity, multicollinearity, homoscedasticity, and outliers (as cited in Mertler & Reinhart, 2017). The normality of residuals was checked using the Q-Q plot, skewness and kurtosis, and Kolmogorov-Smirnov tests. The independent variables were first divided by 10 or 100 for modeling interpretations, except Question 4. A1C was positively skewed and was transformed to enhance the models (inverse transformation). **Homoscedasticity** depended on normality assumption; correcting the normality of the data will fix homoscedasticity if it is present. Linearity was checked using a thorough inspection of bivariate scatterplots (as cited in Mertler & Reinhart, 2017). Bivariate scatterplots were used to assess heteroscedasticity. Violation of heteroscedasticity was corrected by the transformation of variables (Mertler & Reinhart, 2017). Weighed least square regression was used for the model the violated the assumption of homoscedasticity (PennState Eberly College of Science, n.d.; Vynck, 2017). **Multicollinearity** was assessed using tolerance test, value inflection factor, and value inflation factor (VIF). Tolerance statistics more than 0.1 or VIF greater than 10 would indicate collinearity (as cited in Mertler & Reinhart, 2017). Studentized deleted residuals were checked for outliers. The reliability of the tools was computed and is presented below.

The study instruments were tested for reliability and are provided in Table 2. The Diabetes Self-Management Questionnaire (DSMQ) consisted of 16 items and had a Cronbach's alpha of 0.84. The mean DSMQ score was 6.21 ± 1.30, ranging between 3.40

and 8.94, where $\geq$ 6 has been used as an indicator of optimal diabetes self-care (diabetes self-management) (Calvo-Maroto et al., 2016; Summers-Gibson, 2019). This population has an average score in the suboptimal self-care range. Diabetes Distress Scale (DDS) consisted of 17 items and had a Cronbach's alpha of 0.96. Participants exhibited an insignificant level of diabetes distress with a mean score of 2.63 ± 1.31 (possible range =1 to 6). This indicates moderate stress (Fisher et al., 2012). The Diabetes Fatalism Scale (DFS) consisted of 12 items and had a Cronbach's alpha of 0.77. The mean score of DFS 31.62 ± 9.992, ranging from 12 to 53. The revised Michigan Diabetes Knowledge Test consisted of 14 items, ranging from 3 to 13, and had a Cronbach's alpha of 0.45 with a mean score of 8.44 ± 2.27. The poor reliability of this instrument has been reported and used to assess diabetes knowledge in some studies (Alanazi, 2021; Pouladi, 2018).

Table 2

Internal Consistency Reliability Coefficient (N = 83)

Instrument	n	Number of items	Cronbach's Alpha
Diabetes Self-Management Questionnaires	80	16	0.84
Diabetes Distress Scale	80	17	0.96
Diabetes Fatalism Scale	78	12	0.77
The Revised Michigan Diabetes Knowledge Test	72	14	0.45

Note. Before imputation.

Human Subjects Protection

Approval was obtained from the Institutional Review Board of the University of North Carolina prior to data collection. The principal investigator gave the participants the information sheet, and they were informed of the purpose, risks, conditionality and privacy, benefits of the study, and the study procedure. The information sheet also included the contact information for any questions or concerns. Participation in this study was completely voluntary.

For those who were recruited from the clinics, the principal investigator used a private room during the study for confidentiality. The study time did not interfere with the visiting time in the clinic. The participants were assured that participation that can withdraw from the study, for any reason, without penalty. The principal investigator also assured the participants that their withdrawal would not affect care rendered by the clinic and would not affect their relationships with clinic workers or lose any benefits that she or he would receive from the clinic in the future. Participants who contacted the principal investigator to participate in this study were screened for eligibility; then, the principal investigator arranged an agreeable and convenient location and time for the eligible participants. The male principal investigator approached the female participants in a culturally appropriate manner.

Participants' privacy was protected. The participants were given the socio-demographic questionnaire, and the four questionnaires are stapled together and labeled with a code so that data can be associated with one participant. Participants were directed not to write their names on any questionnaire in order to keep the study anonymous.

Participants who inadvertently wrote identifying information such as their name were completed marked out to make the questionnaires de-identifiable. The incentive forms were not coded and separated from the paper questionnaires. Thus, breach of confidentiality was not a concern. The de-identified questionnaires were stored and entered into a password-protected electronic database through UNCG MyCloud (http://box.uncg.edu) for analysis and storage. A Qualtrics account was established through the University of North Carolina at Greensboro using authentication access rules to secure participant information and storage of data for the electronic surveys. Finally, each participant was offered a $20 cash incentive for in-person participation; a $20 electronic gift card incentive was offered and sent for online participation as "a thank you" for their time.

Chapter Summary

The study aimed to fill a gap in the literature on diabetes self-management among Arabs living in the U.S. A quantitative method of research design using a questionnaire was used to assess the levels of diabetes self-management and A1C; socio-demographic and diabetes-related information was collected and computed to examine the relationship between context (diabetes fatalism), process (diabetes knowledge and diabetes distress), proximal outcome (diabetes self-management), and distal outcome (A1C level). The Individual and Family Self-Management Theory guided this study. The study would help nurses and other healthcare providers develop health promotion programs for Arab living with diabetes in the U.S.

CHAPTER IV

DATA ANALYSIS

This chapter is divided into main sections, each of which presents the results relating to one of the research questions. A description of the socio-demographic and diabetes-related characteristics, context (diabetes fatalism), process (diabetes knowledge and diabetes distress), proximal outcome (diabetes self-management), and distal outcome (A1C level) are provided. The findings from each research question are presented and explained. Table 4 presents the descriptive statistics for the categorical variables, and Table 5 presents the descriptive statistics for the continuous variables.

Research Question 1

What are the socio-demographic characteristics of Arab adults with type 2 diabetes?

Socio-Demographic Characteristics

A total of 83 Arab Adults with type 2 diabetes were recruited in this study. Forty-nine participants (59.04%) were recruited in-person, and 34 participants (40.96%) completed the survey online via Qualtrics (see Table 3). More than two-thirds of the participants were male (67.5%). Participants ranged in age from 20 to 78 years, with a mean age of 54.11 years. The majority of participants (90.36%) were recruited in North Carolina (see Table 3). Most of the participants were married (88%). Over two-thirds of the participants have more than a high school education (75.9%).

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Table 3

Mode of Administration and Location (N=83)

Mode	n	%
In-person	49	59.04
Online Survey	34	40.96
North Carolina	75	90.36
Florida	8	9.64

When it comes to the country of origin, more than one-third of the participants originated from Sudan (38.6%), followed by Palestine and Egypt (10.8%), Syria and Jordan (5%), Iraq and Algeria (4.8%), Yemen and Lebanon (2.4%), and United States (1.2). The average length of time living in the United States was around 20 years (SD= 12.82). The majority of the participants (92.8%) reported that Arabic is their natural language, roughly half of the participants (48.2%) preferred to communicate with the healthcare providers in Arabic, and more than two-thirds of participants (77.1%) reported that their healthcare providers speak English.

In terms of economic status, almost more than half of the participants (50.6%) reported more than $20,780 in the past year, and nearly half of the participants (49.4%) reported that they are working, and more than two-thirds of the participants (69.9%) reported carrying insurance plan. Moreover, more than two-thirds of participants (72.3%) reported having a glucometer.

Diabetes-Related Characteristics

The average age at diagnosis was 42.73 years (SD=10.56, range 12-74). The duration of diabetes ranged from 0 to 36 years (M=11.27, SD=8.32). The mean score self-rated of understanding diabetes and diabetes treatment was 7.33 (SD=2.21) on the scale of one to ten, where is number one indicated poor understanding and 10 demonstrated excellent understanding. The average A1C level was 7.70 (SD=1.96, range from 5.2 to 13). Nearly one-third of the participants (n=27; 32.5%) reported having diabetes education. More than one-half (n=48, 57.8%) have someone who helps them manage their diabetes.

Eighteen participants (21%) reported that their wives help them with diabetes management, followed by husbands (n=9; 10.8%), and daughters (n=2; 2.4%), and sons and family members (n=1; 1.2%). When asked to report how often they check their feet, 33.7% of the participants reported never check their feet, 31.3% of participants performed daily check, 10.8% of participants performed weekly checks, and 16.9% of participants check their feet monthly. Fourteen participants (16.9%) reported smoking cigarettes, 10.8% reported smoking Hookah, and 4.8% reported vaping (electronic cigarettes).

General Health Status

Three participants (4.8%) rated their general health as "excellent," nine participants (10.8%) rated their general health as "very good," 38 participants (45.8%) reported" good" general health, 20 participants (24.1%) reported "fair" general health, and nine participants (10.8%) indicated having poor general health. In terms of diabetes-

related comorbidities, the participants reported considerable diabetes-related

comorbidities (problems). Almost half of the participants (n=40, 48%) indicated having

high cholesterol level, 23 participants (27.7%) reported high blood pressure, 22

participants (26.5%) reported eye problem and weakness, numbness, and pain from nerve

damage, 12 participants (14.5%) reported having heart disease, and 10 participants (12%)

reported having kidney disease.

Table 4

Sample Characteristics for the Categorical Variables (N = 83)

Variable	n (%)
Gender	
Male	56 (67.5%)
Female	27 (32.5%)
Marital status	
Married	73 (88%)
Unmarried	10 (12%)
Country of Origin	
Sudan	32 (38.6%)
Palestine	9 (10.8%)
Egypt	9 (10.8%)
Syria	5 (5%)
Jordan	5 (5%)
Iraq	4 (4.8%)
Algeria	4 (4.8%)
Morocco	3 (3.6%)
Yemen	2 (2.4%)
Lebanon	2 (2.4%)
United States	1 (1.2%)
Country of diagnosis	
In the United States	41 (49.4%)
Outside of the United States	12 (14.5%)

Variable	*n* (%)
Natural Language	
Arabic	77 (92.8%)
English	1 (1.2%)
Other	1 (1.2%)
Preferred Language for Communicating with Healthcare providers	
Arabic	40 (48.2%)
English	35 (42.2%)
Healthcare provider language	
English	64 (77.1%)
Arabic	14 (16.9%)
Health status	
Poor	9 (10.8%)
Fair	20 (24.1%)
Good	38 (45.8%)
Very good	9 (10.8%)
Excellent	3 (4.8%)
Diabetes Education	
No	56 (67.5%)
Yes	27 (32.5%)
Education	
More than high school education	63 (75.9%)
High School or less	19 (22.9%)
Employment	
Working	41 (49.4%)
Not working	37 (44.6%)
Household income in the last year	
More than $20,780	42 (50.6%)
Less than $20,780	40 (48.2%)
Presence of health insurance	
Yes	58 (69.9%)
No	23 (27.7%)
Having glucometer	
Yes	60 (72.3%)
No	16 (19.3%)

Variable	*n* (%)
Somebody helps manage diabetes	
No	48 (57.8%)
Yes	31 (37.3%)
Who is helping with diabetes management?	
Wife	18 (21%)
Husband	9 (10.8%)
Daughter	2 (2.4%)
Son	1 (1.2%)
Family member	1 (1.2%)
Foot check	
Never check	28(33.7%)
Daily	26(31.3%)
Weekly	9 (10.8%)
Monthly	14(16.9)
Smoking status	
Cigarettes	14 (16.9%)
Hookah	9 (10.8%)
Vaping	4 (4.8%)
Other tobacco use	2 (2.4%)
Stroke	9 (10.8%)
High blood pressure from diabetes	23 (27.7%)
High cholesterol from diabetes	40 (48.2%)
Foot damage from Diabetes	19 (22.9%)
Eye disease from Diabetes	22 (26.5%)
Kidney disease from diabetes	10 (12.0%)
Weakness, numbness, and pain from nerve damage	22 (26.5%)
Heart Disease from Diabetes	12 (14.5%)

Table 5

Sample Characteristics for Continuous Variables (N = 83)

Variable	*n*	Possible range	*M ± SD*	Min-max
Age	80	>18	54.11 ± 10.204	20-78
Years in the U.S.	75		20.964 ± 12.824	0-53
Age when diagnosed with diabetes	79		42.734 ± 10.566	12-74
Duration of Diabetes	77		11.272 ± 8.324	0-36
Understanding of Diabetes and Diabetes Treatment	75	1-10	7.33 ± 2.210	1-10
A1C	77		7.70 ± 1.961	5.20-13
Diabetes self-management	83	0-10	6.21 ± 1.30	3.40-8.94
Diabetes distress	80	1-6	2.63 ± 1.314	1-5.94
Diabetes Knowledge	72	0-14	8.44 ± 2.275	3-13
Diabetes fatalism	82	12-72	31.62 ± 9.992	12-53

Correlation Among the Independent and Dependent Variables

The bivariate correlations were examined. The Kolmogorov–Smirnov test was run to assess the appropriateness of using parametric inferential or non-parametric statistics for diabetes fatalism and diabetes self-management. There was evidence for the violation of the assumption of normality for the dependent variables. As a result of this, Spearman correlations were run to assess the relationship between the independent and dependent variables.

Table 6

Spearman's Correlation Coefficients Between the Independent Variables and Diabetes Self-Management and A1C

Variables	1	2	3	4	5
1- DSMQ	-	-0.208	-0.311**	-0.020	-0.251*
2- A1C		-	0.159	-0.298*	0.099
3- DFS			-	0.115	0.545**
4- DNT2				-	0.294*
5- DDS					-

Note. DSMQ= The total score of diabetes self-management questionnaire; DFS= Sum score of diabetes fatalism scale; DNT2 = the Revised Brief Diabetes Knowledge Test (DKT2) score; DDS = The total score of diabetes distress scale; [a] divided by 10 or 100 for modeling interpretations.

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 7

Spearman's Correlation Coefficients Between Diabetes Self-Management and A1C and Socio-Demographics and Diabetes-Related Characteristics Independent Variables

Variables	1	2	3	4	5	6	7	8	9	10	11
1. DSMQ	-	-.208	.196	.076	.081	-.075	.080	.109	-.088	-.185	.110
2. A1C		-	-.123	-.183	.380**	-.185	.124	.062	.002	.180	-.049
3. Age			-	.179	.326**	-.318**	-.019	.024	.163	.097	-.049
4. Duration in the U.S.				-	.031	-.086	-.280*	.041	.043	-.100	.325**
5. Years of Diabetes					-	.131	-.056	.234*	.124	.234*	.157
6. Gender						-	-.217*	.002	-.077	.122	-.095
7. Marital status							-	.085	-.236*	.020	-.065
8. Education								-	.165	.077	.283*
9. Health insurance									-	.065	.215
10. Diabetes Education										-	.036
11. Income											-

Note. Variables: DSMQ= The total score of diabetes self-management; Age = years of age; Duration in the U.S.=Years; Gender = Male (1) or

Female (2); Marital status = Married (1) or Unmarried (0); Education = More than high school (1) or high school or less than high school (0);

Health insurance= Having health insurance (1) or Not having insurance; Diabetes education = Had diabetes education (1) or Not diabetes education;

Income = More than $20780 (1) or $20780 or less.

 **. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Research Question 2

What is the relationship between context (diabetes fatalism) and proximal

outcome (diabetes self-management) and distal outcome (A1C level) among Arabs living

with type 2 diabetes in the United States?

The preliminary step for examining the relationships and answering this question

was the bivariate correlation. Initially, the Spearman's correlation coefficient was

performed due to the violation of normality, and the Spearman's correlation coefficient

showed a significant negative correlation between diabetes fatalism and diabetes self-

management (r=-0.311, p<0.01; see Table 6). Lower fatalistic belief levels correlated

with higher levels of diabetes self-management (optimal level of self-care). On the other

hand, the Spearman's showed no significant correlation between diabetes fatalism and

A1C and diabetes self-management and A1C (see Table 6).

Secondly, simple linear regression models were conducted to predict diabetes

self-management and A1C levels based on diabetes fatalism. The diabetes self-

management model and A1C model were tested for the assumptions of simple linear

regression. The output data showed homoscedasticity, as assessed by visual inspection of

a plot of studentized residual vs. standardized predicted values. The Scatters plots of the

residuals were evaluated to examine the linearity, and there was no evidence of linearity

in both models. The assumption between the variables of linearity was met in both

models. The assumption of normality was supported, assessed by the Q-Q plot and the

Kolmogorov–Smirnov test. Both models were checked for the outliers, and all residual

values were between -3.0 and 3.0 stander deviation in both models, suggesting no

outliers. The study design suggested independence of observations, as evidenced by single-point data collection and unrelated participants.

The first regression was conducted to predict diabetes self-management based on diabetes fatalism. The regression indicated that the model explained 9.4% of the variance in diabetes self-management and that the model was statistically significant $F(1,80)=8.255$, $p=0.005$. For each additional point increase in diabetes fatalism, the predicted mean self-management score decreased by 3.993 points. The regression statistics are presented in Table 8.

Table 8

Simple Linear Regression for Diabetes Self-Management (N=82)

	B	Studentized regression coefficients	95 CI	*p*-value
Diabetes fatalism[a]	-3.993	-0.306	[-6.759, -1.227]	0.005

Note. CI= confidence interval; [a]= first divided by 100 for modeling interpretation; R^2= 0.094; R^2_{adj}=0.082, $F(1,80)$ =8.255, p=0.005

The second simple linear regression was utilized to predict A1c based on diabetes fatalism. A regression result revealed that that diabetes fatalism statistically did not explain the significant variance in the A1C level, $F(1,75)$ =1.107, p=0.296. The regression statistics are provided in Table 9.

Table 9

Simple Linear Regression for A1C (N=77)

	B	Standardized regression coefficients	95 CI	*p*-value
Diabetes fatalism[a]	-0.037	-0.121	[-0.106, 0.033]	0.296

Note. A1C = The inverse A1C; CI= confidence interval; [a]= first divided by 100 for modeling interpretation; R^2= 0.015; R^2_{adj}=0.01, $F_{(1,75)}$ =1.107, *p*=0.296

Thirdly, a multiple linear regression was utilized to predict A1C based on diabetes fatalism and diabetes self-management. The data outputs showed no violation of homoscedasticity, as assessed by the Breusch-Pagant test. There was no evidence of linearity of residual in the model, as assessed plot of studentized residual vs. standardized predicted values. The assumption of normality was met, assessed by the Q-Q plot, and examined by the Kolmogorov-Smirnov test. There was no evidence of multicollinearity, as assessed by tolerance value greater than 0.1 or variance inflation factor (VIF) greater than 10. All residual values were between -3.0 and 3.0 standard deviations in both models, indicating no outliers. The results of the regression did not explain the significant variance in A1C level, $F_{(2,74)}$ =2.506, *p*=0.089). The regression statistics are provided in Table 10.

Table 10

Multiple Linear Regression for the Inverse A1C (N= 77)

	B	Standardized Regression Beta	95% CI	*p*-value
Diabetes fatalism [a]	-0.014	-0.046	[-0.86, -0.058]	0.700
Diabetes self-management [a]	0.543	0.233	[-0.007, 1.092]	0.053

Note. A1c = The inverse A1C; CI= confidence interval; B= the slope; [a]= first divided by 100 for modeling interpretation; R^2= 0.063, R^2_{adj}=0.038, F= (2,74) =2.506, *p*=0.089

Research Question 3

What is the relationship between context (diabetes fatalism) and process (diabetes knowledge and diabetes distress) on the proximal outcome (diabetes self-management) and distal outcome (A1C level) among Arabs living with type 2 diabetes in the U.S.?

First, the preliminary analysis of the bivariate correlations was performed using Spearman's correlation coefficients to examine the relationships of diabetes fatalism, diabetes knowledge, and diabetes distress with diabetes self-management and A1C level. Spearman's correlation coefficients indicated that diabetes fatalism and diabetes distress statistically significantly negatively correlated with diabetes self-management (r=-0.311, $p<0.01$ and r =-251, $p <0.05$, respectively) (see Table 6). Lower fatalistic beliefs and lower diabetes distress levels correlated with higher levels of diabetes self-management (optimal levels of diabetes self-care). Diabetes knowledge did not statistically significantly correlate with diabetes self-management (r=-0.020). With the bivariate correlation with A1C level, Spearman's correlation coefficients revealed that a decrease

in the level of diabetes knowledge statistically significantly correlated with an increase in the level of A1C level (poor levels) (r=-0.298) and diabetes fatalism and diabetes distress did not (see Table 6).

Second, two multiple linear regression models were conducted to predict diabetes self-management and A1C based on diabetes fatalism, diabetes knowledge, and diabetes distress. The independent variables entered simultaneously into the model separately. Prior to analysis, the data outputs were appropriately examined the multiple linear regression assumptions in both models. These assumptions included linearity, constant variance (homoscedasticity), independence of observations, normality of residuals and outliers, and multicollinearity. The study design met the assumption of the independence of observations in both models. Both model data outputs showed no violation of homoscedasticity, as assessed by visual inspection of a plot of studentized residual vs. standardized predicted values, and were confirmed with the Breusch-Pagant test. There was no evidence of linearity of residual in both models, as assessed plot of studentized residual vs. standardized predicted values. The assumption of normality was met, assessed by the Q-Q plot, and examined by the Kolmogorov-Smirnov test. There was no evidence of multicollinearity, as assessed by tolerance value greater than 0.1 or variance inflation factor (VIF) greater than 10. All residual values were between -3.0 and 3.0 standard deviations in both models, indicating no outliers.

The first multiple linear regression was conducted to predict diabetes self-management based on diabetes fatalism, diabetes knowledge, and diabetes distress. The results of the regression indicated that the model did not explain significant variance in

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diabetes self-management F (3,67) =1.962, p=0.128. The regression statistics are shown in Table 11.

Table 11

Multiple Linear Regression for Diabetes Self-Management (N=71)

	B	Standardized regression Beta	95% CI	*p*-value
Diabetes fatalism [a]	-3.493	-0.265	[-7.016, -0.031]	0.052
Diabetes knowledge [a]	0.709	0.012	[-14.129, 15.548]	0.924
Diabetes distress [a]	-3.777	-0.039	[-31.048, 23.494]	0.783

Note. A1C = The inverse A1C; CI= confidence interval; B= the slope; R^2= 0.081; [a] first divided by 100

For modeling interpretation, R^2= 0.081; R^2_{adj}=0.040, F= (3,67) =1.962, p=0.128; * $p<0.05$

The second regression analysis was used to predict A1C level based on diabetes fatalism, diabetes knowledge, and diabetes distress. The multiple linear regression model did not explain significant variance in A1C level, F (3,64) =2.245, p=0.092. The regression details are presented in Table 12.

Table 12

Multiple Linear Regression for A1C (N= 68)

	B	Standardized regression Beta	95% CI	*p*-value
Diabetes fatalism [a]	-0.036	-0.121	[-0.119,0.046]	0.382
Diabetes knowledge [a]	0.433	0.297	[0.074,0.791]	0.019*
Diabetes distress [a]	-0.143	-0.064	[-0.711,0.486]	0.651

Note. A1C = The inverse A1C; CI= confidence interval; [a] first divided by 100 for modeling interpretation;

B = the slope; R^2 = 0.095; R^2_{adj} = 0.053, F (3,64)=2.245, p=0.092; * $p<0.05$

Research Question 4

What is the relationship between proximal outcome (diabetes self-management) and distal outcome (A1C level) among Arabs living with type 2 diabetes in the United States?

In order to fulfill the purpose of this question, the bivariate correlation was examined. The Spearman's rho was run due to a violation of normality. The non-parametric test of normality, Spearman's rho, was computed to determine the relationship between diabetes self-management level and A1C level. There was no statistically significant correlation between diabetes self-management and the A1C level ($r = -0.208$) (see Table 6).

A simple linear regression was proposed and was run to understand and examine the relationship between diabetes self-management and A1C level. However, the assumption of homoscedasticity was violated. This violation revealed that this test is inappropriate for these two variables. Instead, a weighted least square regression was utilized to answer this research question. The model showed that diabetes self-management statistically significantly predicted the A1C level. The weighted least square regression indicated that the model explained 10.6% of the variance in the A1C level and that the model was statistically significant, $F(1,75)=8.885$. With every one-point increase in diabetes self-management, the predicated mean A1C decreased by 0.412%. The regression results are shown in Table 13.

Table 13

The Weighted Least Square Regression (N=77)

Variable	B	Standardized coefficient Beta	95% CI	p
Diabetes self-management	-0.412	0.325	[-0.687,0.137]	-0.004

Note. R^2=0.106; R^2_{adj}=0.094, $F(1,75)$=8.885, p=0.004; A1C=not inverse.

Research Question 5

What are the combined relationships among context (diabetes fatalism), process (diabetes distress, diabetes knowledge), and proximal outcomes (diabetes self-management on distal outcomes (A1C level) among Arabs living with type 2 diabetes in the U.S.?

The first part of the answer for this question sought to determine the relationships of diabetes fatalism, diabetes knowledge, diabetes distress, and diabetes self-management with A1C level. Spearman's correlation showed that only diabetes knowledge was statistically significantly negatively correlated with A1C level (r = - 0.298, p <0.05) (see table 4). A decrease in the level of diabetes knowledge correlated with higher levels of A1C (poor levels). On the other hand, Spearman's correlation shows indicated that diabetes fatalism, diabetes distress, and diabetes self-management did not statistically significantly correlate with diabetes self-management.

Multiple linear regression was conducted to predict A1C levels based on diabetes fatalism, diabetes knowledge, diabetes distress, and diabetes self-management. The

independent variables entered simultaneously into the model. Before analyzing the data, the data were evaluated for the assumptions of the multiple linear regression. These assumptions included linearity, constant variance (homoscedasticity), independence of observations, normality of residuals and outliers, and multicollinearity.

The study design met the assumption of the independence of observations since the study data were collected at a single point and unrelated. The model output data presented no violation of homoscedasticity, as assessed by visual inspection of a plot of studentized residual vs. standardized predicted values, and was confirmed with the Breusch-Pagant test. There was no evidence of linearity. There were no outliers, as evaluated by studentized deleted residuals greater than ±3 standard deviations. The assumption of normality was met, assessed by the Q-Q plot, and was examined by the Kolmogorov-Smirnov test. There was no evidence of multicollinearity, as assessed by tolerance value greater than 0.1 or variance inflation factor (VIF) greater than 10.

The results of the regression indicated that the model explained 15.5% of the variances in the A1C level and that the model was statistically significant F (4,63) =2.898, p=0.029. While diabetes knowledge ($b = 0.466$, $p = 0.01$) and diabetes self-management ($b= 0.596$, $p = 0.038$) contributed to the model, diabetes fatalism, and diabetes distress, did not (see Table 14). With every point increase in diabetes knowledge, the predicted mean A1C level increased by 0.466 points, adjusting for diabetes fatalism, diabetes distress, and diabetes self-management. The diabetes self-management predicted mean A1C increased by 0.596 points, adjusting for diabetes fatalism, diabetes knowledge, and diabetes distress. The regression statistics are presented in Table 14.

Table 14

Multiple Linear Regression for A1C (N= 68)

	B	Standardized regression Beta	95% CI	*p*-value
Diabetes fatalism [a]	-0.016	-0.053	[-0.099,0.067]	0.699
Diabetes knowledge [a]	0.466	0.320	[0.115,0.817]	0.010[*]
Diabetes distress [a]	-0.102	-0.046	[-0.715,0.511]	0.740
Diabetes self-management [a]	0.596	0.260	[0.034,1.157]	0.038[*]

Note. A1C = The inverse A1C; CI= confidence interval; [a] = first divided by 100 for modeling interpretation; B= the slope; R^2= 0.155; R^2_{adj}=0.102, $F(4,63)$ =2.898, p =0.029; [*] $p<0.05$.

Research Question 6

What is the impact of socio-demographic characteristics and diabetes-related characteristic (age, gender, years of diabetes, marital status, education, diabetes education, income, presence of health insurance, and years in the United States) on the proximal outcome (diabetes self-management) and the distal outcome (A1C level) among Arabs living with type 2 diabetes in the U.S.?

The initial step for examining the relationships was bivariate correlations. First, Spearman's correlation coefficients were computed to establish the relationships between the independent variables and diabetes self-management (see Table 7). Spearman's correlation coefficients showed no significant relationships between age, years in the U.S., years with diabetes, marital status, education, presence of health insurance, diabetes education, and income and diabetes self-management. Second, Spearman's correlation coefficients were conducted to determine the relationships between the independent

variables and A1C level (see Table 7). Having more years with diabetes was statistically

significantly correlated with higher levels of A1C ($r= 0.380$, p <0.01). Age, years in the

U.S., years with diabetes, marital status, education, presence of health insurance, diabetes

education, and income did not statistically significantly correlate with the level of A1C

(see Table 5).

The following steps were conducted using multiple linear regression to determine

the effect of age, gender, years of diabetes, marital status, education, diabetes education,

income, presence of health insurance, and years in the U.S. on diabetes self-management

and on A1C level. The independent variables were entered simultaneously into both

models to explain the variances in diabetes self-management and A1C level. Both models

were tested for the assumption of linearity, constant variance (homoscedasticity),

independence of observations, normality of residuals and outliers, and multicollinearity.

There was independence of observations, as evidence by the study design in both models.

There was no evidence of heteroscedasticity in both models, as assessed by visual

inspection of a plot of studentized residual vs. standardized predicted values, and was

confirmed with the Breusch-Pagant test. There was no evidence of linearity in the

residuals. There were no outliers in both models, as assessed by studentized deleted

residuals greater than ± 3 standard deviations. The assumption of normality was

supported in both models, assessed by the Q-Q plot and examined by Kolmogorov-

Smirnov. There was no evidence of multicollinearity, as judged by tolerance value greater

than 0.1 or variance inflation factor (VIF) greater than 10 in both models.

The first regression model was a multiple regression carried out to investigate whether age, years in the U.S., years with diabetes, marital status, education, presence of health insurance, diabetes education, and income could significantly predict diabetes self-management. The results of the model indicated the model variables considered together were not a significant predictor of diabetes self-management $F(9,60) =1.055$, $p=0.409$. Table 15 displays the regression statistics.

Table 15

Multiple Linear Regression for Diabetes Self-Management (N= 70)

	B	Standardized regression Beta	95% CI	p-value
1. Age[a]	0.342	0.266	[-0.033,0.717]	0.074
2. Years in U.S.[a]	0.071	0.068	[-0.226,0.368]	0.635
3. Years of Diabetes[a]	0.009	0.006	[-0.426,0.444]	0.967

4. Gender
    Male
    Female[RC]
	0.507	0.018	[-7.145,8.167]	0.895

5. Marital status[a]
    Married
    Unmarried[RC]
	5.739	0.146	[-5.079,16.557]	0.293

6. Education[a]
    More than high school
    High school or less[RC]
	2.262	0.072	[-6.124,10.648]	0.592

7. Presence of Insurance[a]
    Yes
    No[RC]
	-1.869	-0.065	[-9.434,5.696]	0.623

8. Diabetes Education[a]
    Yes
    No[RC]
	-5.034	-0.176	[-12.843,2.774]	0.202

	B	Standardized regression Beta	95% CI	*p*-value
9. Income[a]				
More than $20780	1.887	0.072	[-5.826,9.600]	0.626
$20780 or less[RC]				

Note. A1C = CI= confidence interval; [a] = first divided by 10 for modeling interpretation; B= the slope; R^2= 0.137; R^2_{adj}=0.007, $F(9,60)$ =1.055, p=0.409; ; [*] $p<0.05$

The second model was a multiple linear regression calculated to predict A1C level based on age, years in the U.S., years with diabetes, marital status, education, presence of health insurance, diabetes education, and income. The results of regression revealed that the model explained 27.2% of the variance in A1C level and that the model was statistically significant $F(9,56)$ =2.329, p=0.026. While age (b=0.010, p =0.015) contributed to the model, years in the U.S., years with diabetes, marital status, education, presence of health insurance, diabetes education, and income did not contribute (see Table 15). For each year's increase in age, the predicted mean A1C increased by 0.010 points, adjusting for years in the U.S., years of diabetes, gender, marital status, education, insurance, diabetes education, and income. For each year increase in diabetes years, the predicted mean A1C level decreased 0.015, adjusting for age, gender, marital status, education, diabetes education, income, presence of health insurance, and years in the U.S. Table 16 provides the results of the regression.

Table 16

Multiple Linear Regression for A1C (N= 66)

	B	Standardized Regression Beta	95% CI	*p*-value
1. Age[a]	0.010	0.350	[0.002,0.019]	0.015[*]
2. Years in the U.S.[a]	0.003	0.133	[-0.003,0.010]	0.343
3. Years of Diabetes[a]	-0.015	-0.437	[-0.025, -0.006]	0.002[*]
4. Gender[a] Male Female[RC]	-0.108	-0.169	[-0.273,0.057]	0.195
5. Marital status[a] Married Unmarried[RC]	-0.101	-0.109	[-0.337,0.135]	0.396
6. Education[a] More than high school High school or less[RC]	0.046	0.063	[-0.136,0.227]	0.617
7. Presence of Insurance[a] Yes No[RC]	-0.019	-0.029	[-0.1835,0.145]	0.817
8. Diabetes Education[a] Yes No[RC]	-0.044	-0.068	[-0.212,0.124]	0.603
9. Income[a] More than $20780 $20780 or less[RC]	0.042	0.070	[-0.132,0.217]	0.628

Note. A1C = The inverse A1C; CI= confidence interval; [a] = first divided by 10 for modeling interpretation;

B= the slope; R^2= 0.272; R^2_{adj}=155, F (9,56) =2.329, p=0.026; [*] $p<0.05$

Summary

Eighty-three Arabs with type 2 diabetes were recruited to provide valuable insight

into the socio-demographic and diabetes-related characteristics and the relationship

between context (diabetes fatalism), process (diabetes knowledge and diabetes distress), proximal outcome (diabetes self-management), and distal outcome (A1C level). Moreover, this sample of the U.S. population helps explore the effect of age, gender, years of diabetes, marital status, education, diabetes education, income, presence of health insurance, and years in the U.S. on diabetes self-management and A1C level. Overall, the effects of independent variables on diabetes self-management and A1C level may have changed because of combining them and the moderation or mediation effects of the independent variables on each other.

CHAPTER V

DISCUSSION

In this study, diabetes self-management, related factors, and outcomes were examined among Arab adults living in the United States. The relationships between context (diabetes fatalism), process (diabetes knowledge and diabetes distress), proximal outcome (diabetes self-management), and distal outcome (A1C level) were assessed. The study explored the impact of age, gender, years of diabetes, marital status, education, diabetes education, income, presence of health insurance, and years in the United States on diabetes self-management and A1C level. The findings of this study are discussed and compared with previously published findings. The findings of this study, strengths, limitations, and implications are deliberated.

Socio-Demographic and Diabetes-Related Characteristics

This sample of Arab adults was similar to Arab participants described in previous research on diabetes (Zakarni, 2013). Participants ranged in age from 20 to 78 years old, with a mean age of 54.11 years. This is lower than the average age of the U.S. population with diagnosed diabetes (59.3 years) (Eberhardt et al., 2018) and is lower than other minority groups such as Chinese Americans (68 years) (Pan et al., 2019). Additionally, it is lower than it was reported in a previous study (59.4 years) among Arab Americans with type 2 diabetes (Berlie et al., 2008). Marriage was more common (88%) and higher compared to the general U.S. population with diabetes (59.2%) (Eberhardt et al., 2018)

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and comparable to the previously reported findings among Arabs with diabetes (Al-Dahir et al., 2013; El Masri et al., 2020). The average years in the U.S. (mean = 20 years) is comparable to a previous report (Aseeri, 2020) and is similar to the years in another minority group with diabetes (Pan et al., 2019). Unlike other studies, most of the study participants are originally from Sudan (Alanazi, 2021; Aseeri, 2020; Zakarni, 2013). Only 1.2% of participants reported being born in the United States, which indicated most reported results in the study come from the first generation of this minor immigrant group. This finding is comparable to the previously reported findings (Al-Dahir et al., 2013; Aseeri, 2020).

In terms of education, more than two-thirds of the participants have more than a high school education (75.9%). This is inconsistent with what has been reported in the U.S. Arab population (Aseeri, 2020; Berlie et al., 2008; Zakarni, 2013). Inconsistent with that of the Aseeri (2020) study, most participants (92.8%) reported that Arabic is their natural language, roughly half of the participants (48.2%) preferred to communicate with the healthcare providers in Arabic, and more than two-thirds of participants (77.1%) reported that their healthcare providers speak English.

In terms of economic status, almost more than half of the participants (50.6%) reported more than $20,780 income during the past year, and nearly half of the participants (49.4%) reported that they are working, which is higher than the U.S. population with diabetes (43.3%) (Eberhardt et al., 2018) and lower than a previously reported among Arab Americans with type 2 diabetes (Berlie et al., 2008). This rate is

higher than a previous report among Arabs with type 2 diabetes (39.5%) (Zakarni, 2013) and a comparable recent report (Aseeri, 2020).

The presence of health insurance (69.9%) is low compared to the U.S. population with diabetes (90.4%) (Casagrande & Cowie, 2018) and a previous report (83%) among Arab Americans with type 2 diabetes (Berlie et al., 2008). Moreover, it is lower than the Chinese population counterpart (Pan et al., 2019). Furthermore, it is lower than previously reported among Arabs adults with diabetes (Alanazi, 2021; Zakarni, 2013).

The average age when diagnosed with diabetes (42.73 years) was found to be lower than the average age at diagnosis for non-Hispanic White (52.3 years), non-Hispanic Asian/Pacific Islander (49.4 years), non-Hispanic Black (47.4 years), Hispanic (47.3 years), and non-Hispanic American Indian and Alaska Native adults (46.1 years) (Eberhardt et al., 2018). The age of onset is lower than a previous report among Arab decedents with diabetes (48.62 years) (Aseeri, 2020). The mean duration of diabetes (11.27 years) was higher than the U.S. adults with diabetes (9.9 years) (Eberhardt et al., 2018) and comparable to a previous study among Arab Americans with type 2 diabetes (11.3 years). However, it is slightly lower than it is in a different nation (11.7 years) (Schmitt et al., 2021). Understanding of diabetes and its treatment (7.33 of 10). This finding may not be comparable with a previous study which reported that many Arabs believed that diabetes is linked to using blood pressure medications or cholesterol-lowering medications, eating at bedtime, or consuming sugar substitutes (Bertran et al., 2017). In the current study, the average A1C level is 7.7, higher than their counterparts, those treated with insulin or oral diabetes medication (7.4% in treated diagnosed diabetes

in the U.S.) (Menke et al., 2018). Only one-third of the participants (*n*=27; 32.5%) reported having diabetes education. This finding is consistent with the literature. Lack of diabetes education has been reported among this minority group (Fritz et al., 2016). This finding is lower than the national average. The national average (53.1% was in) and far from the Healthy People 2020 target is 2020 (58.4%) (Healthy People, 2020). This sample of participants reported a lower prevalence of fair (24.1%) or poor health (10.8%) than the U.S. general population (Menke et al., 2018). These percentages are different from that of Phillips et al. (2018), who found self-reported general health status 41.5% fair and 14.5% poor (El Masri et al., 2020).

One-third of the participants reported they never check their feet, 10.8% of participants performed a weekly check, 16.9% of participants check their feet monthly, and only 31.3% of participants performed daily checks. Reported foot self-care was overall suboptimal and comparable with the previous studies (Al-Busaidi et al., 2020; Aseeri, 2020). These percentages are concerning and indicate that this sample of the population does not follow recommendations for foot care (Bus et al., 2020). The smoking status reported in this study is comparable to a previously reported status among Arab Americans with type 2 diabetes (16.3%) (Berlie et al., 2008).

This sample reported a lower rate of high blood pressure than the U.S. population (65% per CDC) (Al-Dahir et al., 2013). It is higher than it was reported among this minority group (Al-Dahir et al., 2013). This sample reported higher cholesterol levels compared to the U.S. Adult with diabetes, 43.5% (CDC, 2020). The study reports higher cholesterol levels than was reported previously among this minority group (Al-Dahir et

al., 2013). This sample reported higher rates of foot damage (22.9%) than other populations (in different nations) with diabetes (Mairghani et al., 2017; Margolis et al., 2011; Schmitt et al., 2021). Diabetes-related foot damage is lower than was previously reported in this group (42%) (Alanazi, 2021). The rate of eye disease (26.9%) was higher than the U.S. adults with diabetes (CDC, 2020) and comparable to the finding in a previous report among Arab Americans with type 2 diabetes (Berlie et al., 2008). The sample reported lower rates of kidney disease (12%) compared to the U.S. adults with diabetes (CDC, 2020) and higher a previously reported study (3.8%) (Berlie et al., 2008). The sample reported higher rates of Weakness, numbness, and pain from nerve damage compared to a previous report (Zakarni, 2013). The sample reported a similar rate of heart disease (14.2%) to their national counterpart (Barrett-Connor et al., 2018). But it is lower than a recent report among Arab women with diabetes (21.2%) (Alanazi, 2021) and higher than a previous report (Berlie et al., 2008).

Interrelationships and Correlations Among the Study Variables

Diabetes Fatalism

In the current study, the diabetes fatalism level (31.62, ±) is comparable/similar to that of a comparable study (33.9, ± 9.5) among not non-Arab U.S. population with type 2 diabetes, using the same tool and using the same scale of measurement (Walker et al., 2014c). The current study found that an increased level of diabetes fatalism correlates with poorer level diabetes self-management. This finding is comparable with that of Walker et al. (2012), who found a statistically significant negative correlation between diabetes fatalism and the diabetes management behaviors such as medication adherence

(r = - 0.23, p < .001), diet (r=−0.26, p < 0.001), exercise (r=−0.20, p < 0.001) and frequency of blood sugar testing (r=−0.18, p < 0.001) in a convenience sample of 378 non-Arab adults with type 2 diabetes in the Southeastern United States. Moreover, this result accords with our earlier observations, which showed that more diabetes fatalism attitudes are associated with poor diabetes self-care behaviors (Walker et al., 2012). This result is consistent with Egede and Ellis (2009), who found that diabetes fatalism has a statistically negative association with diabetes self-care adherence, self-management understanding, self-care ability, perceived control of diabetes.

The result of this study showed no correlation between diabetes fatalism and A1C level. This result is inconsistent with the literature. For example, Egede and Ellis (2009) found that an increase in the level of diabetes fatalism correlated with a poor level (higher level) of A1C. Moreover, using a regression model revealed no statistically significant association between diabetes fatalism and A1C level in the current study. This finding did not support the previous research. For example, Farran et al. (2019) found that diabetes fatalism significantly predicts the level of A1C. Also, the current study results different from that of Walker et al. (2014c), who found that higher fatalistic attitudes were associated with lower A1C, adjusting for age, gender, race, and health literacy. Furthermore, when (fatalism and diabetes self-management in the second question combined), (diabetes fatalism, diabetes knowledge, and diabetes distress in the third question), or (diabetes fatalism, diabetes knowledge, diabetes distress, diabetes self-management in the fifth question) were combined, the diabetes fatalism association with A1C level did not appear.

The theoretical framework states that the context dimensions such as culture influence the proximal such self-management behaviors and distal outcomes such as health status and combing the context and proximal outcome influence distal outcomes. However, this change in the relationship suggests that the association may be independent of diabetes knowledge, diabetes distress, and diabetes self-management. This change in the effect could be attributed to the moderation or mediation effect of diabetes self-management on the relationship between diabetes fatalism and A1C level. Analysis of mediator or moderators effect would provide more in-depth information about the research phenomenon that cannot be explained by examining the direct relationship and association among the variable (Bennett, 2000). The change in the relationship indicated that the influence of the context (diabetes fatalism) and proximal outcome (diabetes self-management) on the proximal outcome (A1C) is inconclusive.

Diabetes Distress

The current study found that the level of diabetes distress (2.63) is higher than that of Walker et al. (2014c), who found distress scores (1.6, ± 0.7) among the non-Arab U.S. population with type 2 diabetes, using the same scale of measurement in the study. The third research question in this study was to determine whether diabetes fatalism, diabetes knowledge, diabetes distress have an association with diabetes self-management and A1C level. The results of this study indicated that higher levels of diabetes distress correlated with poorer diabetes self-management. This finding is consistent with that of Darawad et al. (2017), who reported an increased level of diabetes distress correlated with poor diabetes self-management in a sample of Arab Adults with diabetes. This

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outcome is contrary to that of Kurnia et al. (2017), which indicated that diabetes distress did not significantly correlate with diabetes self-management among individuals with type 2 diabetes. This correlation supports the link between the two variables as suggested by Ryan and Sawin's Individual and Family Self-management Theory, which indicates that the proximal outcome (self-management behaviors) influences distal outcome (health status).

The current study indicated that diabetes distress is not associated with self-management in the third question regression model when considering diabetes knowledge and diabetes fatalism. The present study regression model found no statistically significant association between diabetes distress and A1C level in Research Question 3, adjusting for diabetes fatalism and diabetes knowledge, and in Research Question 5 when adjusting for diabetes fatalism, diabetes knowledge, and diabetes self-management. In accordance with the present result, a recent study has detected no significant association between diabetes distress and diabetes self-management among those with type 2 diabetes (Schmitt et al., 2021). However, the literature documented the effect of diabetes distress. For example, Fisher et al. (2012) found that increased diabetes distress is associated with poor management of diabetes behaviors such as poor adherence to diabetes diet and physical activity among individuals with diabetes. The findings differ from that of Walker et al. (2014c), who found that less diabetes distress was associated with lower A1C level, adjusted for age, gender, race, and health literacy. The result of the association model did not support the link between the two variables as suggested by Ryan and Sawin's Individual and Family Self-management Theory, which indicates the

proximal outcome (self-management behaviors) influences distal outcome (health status). The inconsistent results with the literature suggest further exploration of other variables that may affect the relationship between diabetes distress and A1C. For example, mediators' or moderators' effect would provide more in-depth information about the research phenomenon that cannot be explained by examining the indirect relationship between the variables (Bennett, 2000).

Diabetes Knowledge

The current study found that the mean knowledge score (8.44 ± 2.275) is comparable to that of Phillips et al. (2018), who found the mean knowledge score (8.4) among participants with type 2 diabetes participants, using the same scale of measurement used in this current study. The most interesting finding was that diabetes knowledge did not correlate with diabetes self-management. However, this finding does not support the previous research. For example, Bukhsh et al. (2019) found that better diabetes knowledge correlates with better diabetes self-management. Furthermore, the third question model did not detect significant associations between diabetes knowledge and diabetes self-management when adjusting for diabetes fatalism and diabetes distress. The diabetes knowledge variable prediction result in Research Question 3, after adjusting for diabetes distress and diabetes fatalism, agrees with that of Kurnia et al. (2017), who conducted regression analysis found that diabetes knowledge did not significantly predict the variance in diabetes self-management, but adjusting for perceived self-efficacy, social support, and situational influences. This finding contrasts with that of Alanazi (2021), who found an increase in diabetes knowledge was statistically significantly associated

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with a better (an increase in the level of) diabetes self-management behaviors, but only after adjusting for BMI, psychological adjustment to diabetes, and A1C. These findings did not support the link between the two variables as were suggested by Ryan and Sawin's Individual and Family Self-management Theory indicate the proximal outcome (self-management behaviors) influences distal outcome (health status).

The current study revealed that increased diabetes knowledge correlates with lower A1C levels. Interestingly, the regression model in the third question found that an increase in diabetes knowledge is statistically significantly associated with higher A1C levels, adjusting for diabetes fatalism and diabetes distress. Moreover, in the fifth question model, an increase in diabetes knowledge was found to be associated with an increase in the level of A1C. These findings are different from that of Walker et al. (2014c), who found that diabetes knowledge is not significantly associated with the levels of A1C, adjusted for age, gender, race, and health literacy. These findings in the third question model and the fifth question model also contrast with that of Bukhsh et al. (2019), which found a statistically significant association of higher diabetes knowledge with low A1C levels and better self-diabetes self-management practices among individuals with type 2 diabetes.

Diabetes Self-Management and A1C Level

The overall scores in this study ranged from 3.40 to 8.94, with a mean score of 6.21 ± 1.30. Therefore, some participants were below the optimal score, which demonstrated that participants have different self-management levels. This level of diabetes self-management is lower than is found in other studies of 7.11 ± 1.40

(Summers-Gibson, 2019) and 7.093 ± 0.853 (Calvo-Maroto et al., 2016). The fourth research question in this study was to determine the direct association of diabetes self-management with A1C level and in the second question when adjusted for diabetes fatalism. Contrary to expectations, this study did not find a significant correlation between diabetes self-management A1C levels. Diabetes self-management is shown to be correlated with the level of A1C (Azami et al., 2020; Schmitt et al., 2013). This finding is inconsistent with that of Schmitt et al. (2021), which found that self-management practices such as diabetes-adjusted diet, medication adherence, glucose monitoring, physical activity, physician contact significantly correlate with low A1C levels. However, the weighted least square regression showed that diabetes self-management has a statistically significant association with A1C level. In a different study design, Azami et al. (2020) found that diabetes self-management behaviors were statistically negatively associated with A1C level, but adjusting for difficulty paying for basic needs, efficacy expectation, outcome expectation, quality of life, social support, and depression. Furthermore, inconsistent with Walker et al.'s (2014c) study, diabetes self-care components (medication adherence, knowledge, general diets, exercise, blood sugar testing, foot care) were not associated with A1C levels after adjusting for age, gender, race, and health literacy. The link between the two variables using this weighted least square test supports the link stated earlier in Ryan and Sawin's Individual and Family Self-management Theory which indicates the proximal outcome (self-management behaviors) influences distal outcome (health status). The inconsistent results with the

literature indicated necessity and worth in exploring other variables that influence the relationship between diabetes self-management and the level of A1C.

The Socio-Demographics and Diabetes self-Management and A1C Level

The sixth research question was to explore the effect of selected socio-demographic characteristics and diabetes-related characteristics (age, years in the U.S., years with diabetes, gender, marital status, education, presence of health insurance, diabetes education, and income) on diabetes self-management and A1C. It is somewhat surprising that none of age, years in the U.S., years with diabetes, gender, marital status, education, presence of health insurance, diabetes education, and income correlated with diabetes self-management. In the same vein, using the regression model showed no association between these variables and diabetes self-management level. Similarly, Azami et al. (2020) found that age, gender, education status, and diabetes duration did not correlate with diabetes self-management behaviors. Another study by Schmitt et al. (2021) found no significant association between gender, years of education, years of diabetes, and diabetes self-management except age in years. Similar to this study's findings, age, education attainment, and employment were not associated with diabetes self-care management practices (Alodhayani et al., 2021). Comparable to the current study, the presence of health insurance has not been associated with diabetes self-care behaviors such as daily glucose checks and performing the recommended physical activities (Felix et al., 2018). Inconsistent with this study, higher income was associated with diabetes self-management practices (Werfalli et al., 2020). Moreover, gender and

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marital status have been found to be associated with diabetes self-care management

practices (Felix et al., 2018).

None of the years in the U.S., gender, marital status, education, presence of health

insurance, diabetes education, and income statistically significantly correlated with A1C.

However, increased years of diabetes correlated with poor levels of A1C (higher levels of

A1C). Although age did not statistically significantly correlate with A1C, the regression

model indicated that an increase in age was associated with higher A1C levels. In the

same vein, the regression model detected that individuals with diabetes for a longer time

(more years with diabetes) associated with lower A1C levels. Differently, Schmitt et al.

(2021) found no significant association between gender, age, duration of diabetes, and

diabetes self-management except the increased years of education associated with lower

A1C level. In the same vein, education and income have not been found to be associated

with A1C level, adjusted for age, gender, race, and health literacy (Walker et al., 2014c).

Unlike the current study, Cansu et al. (2017) found that attending diabetes education

programs significantly associated with decreased levels of A1C. Employment and

diabetes education have been found to be associated with A1C, adjusted for age, gender,

race, and health literacy (Walker et al., 2014c). Unlike the current study, Pan et al. (2015)

found that diabetes duration is statistically significantly positively associated with

diabetes self-management. In the same vein, Sukkarieh-Haraty et al. (2018) found that

educating individuals with diabetes about diabetes was associated with improvement in

diabetes self-care activities such as diet, self-monitoring blood glucose and lead to a

statistically significant decrease in A1C level. Unlike this study, lacking health insurance

has been associated with worse (higher) levels of A1c. Thus, it is essential to consider additional social determinants of health and their impact on diabetes self-management and outcomes.

Strengths

One of the strengths of this study is that it represents a satisfactory initial examination of diabetes self-management, related factors, and outcomes among Arab adults living in the selected southern, eastern states. Another strength of this study is the assessment of diabetes fatalism, diabetes distress, diabetes self-management using a quantitative measure. Previous studies explored diabetes self-management using qualitative methods (Bertran et al., 2015; DiZazzo-Miller et al., 2017; Fritz et al., 2016; Masri et al., 2018). Finally, this study reported the A1C level in selected southeastern states and examined its association with the related factors such as socio-demographic characteristics. This population-based study would help provide baseline data about diabetes self-management. The relationships among the major concepts were both similar and not similar to the previous studies, perhaps due to the younger age of these Arabs with diabetes. Nonetheless, this study provides important information regarding the complexity of diabetes care and management among Arabs in the U.S.

The current study adds to the expectations of the Individual and Family Self-Management theory. Ryan and Sawin's Individual and Family Self-management Theory was useful in examining the relationships between diabetes fatalism, diabetes knowledge, diabetes distress, diabetes self-management, A1C levels, and other sociodemographic characteristics of this population. Consistent with the theory, this study found that

diabetes fatalism, years of diabetes, and diabetes distress were related to diabetes self-management. Moreover, diabetes knowledge, diabetes self-management, age, and years of diabetes were related to A1C level.

Limitations

Several numbers of important limitations need to be considered. This study was limited by using a cross-sectional design, which is trying to capture a complex health phenomenon at a single point and lack the ability to examine the causal relationship. Another limitation of the study is that this sample was of convenience with snowballing technique and the recruitment locations were North Carolina and a few participants from Florida, which may not be applicable to Arab Adults living in other geographic locations. Moreover, the majority of respondents were the first generation which may not reflect middle and older-aged Arabs. Another source of uncertainty is that the use of self-administered questionnaires, which make it subject to respondent bias when answering the questions. Such a method may carry a risk to validity.

Finally, the use of A1C and self-reported A1C at this study, since self-reported A1C are subject to respondents' bias. Moreover, some concepts were not consistent with the theory. These unexpected findings might be a result of not using all the variables in the theory and not using the full scope of the theory, such as investigating the role of acculturation in influencing study variables. The theory involves many variables, and designing tools that capture all relevant information or hidden factors that influence study results and analyze them would be challenging. Therefore, the generalizability of these results is subject to limitation.

Implications for Nursing Practice, Research, and Healthcare

This study is building on the work of the previous researchers by using an in-depth literature review on diabetes fatalism, diabetes distress, diabetes knowledge, diabetes self-management, and A1C, and other diabetes-related characteristics. Consequently, this study brought together the relationship between these concepts and diabetes-related characteristics and diabetes outcomes. Moreover, this study adds new knowledge to the cumulative science of nursing and health science in the area of diabetes among minorities, which is diabetes among Arab adults living with diabetes in the United States. The studying findings have important implications for developing and improving diabetes education programs for Arab Adults with type 2 diabetes.

Diabetes fatalism is associated with diabetes self-management and may be an imperative target for improving diabetes self-management education for this minority group. Furthermore, the effect of diabetes fatalism is independent of diabetes knowledge and diabetes distress, indicating that the intervention that targets diabetes distress and diabetes knowledge may not be sufficient to deal with diabetes fatalism during diabetes self-management education programs. Moreover, the improvement of cultural competency in health care related to the role of diabetes fatalism in their patients' lives across cultures would be beneficial. Prevention and management of diabetes complications among Arab adults with diabetes should be considered during diabetes management education and address during diabetes care with their healthcare providers and nurses. However, more future studies on the area of diabetes self-management among Arabs adults in the United States need to be undertaken before the associations among

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diabetes fatalism, diabetes distress, diabetes knowledge, diabetes-related characteristics, and diabetes self-management and glycemic control (A1C) are more clearly understood.

Future studies should investigate the changes in the effects that could be attributed to the moderation or mediation effect of diabetes fatalism, diabetes knowledge, diabetes distress, age, gender, years of diabetes, marital status, education, diabetes education, income, presence of health insurance, and years in the United States on their relationships with diabetes self-management and A1C level. The analysis of mediators' or moderators' effects would provide more in-depth information about their effects and would reveal which variables would have independent or dependent effects on diabetes self-management practices and glycemic control, which in turn helps healthcare providers and researchers to improve the health of people with diabetes. Although the Revised Michigan Diabetes Knowledge Test was previously validated in a sample of Arab population out of the U.S., it performed poorly in this study sample, and future studies may consider revising this tool, using a different tool, or developing a better tool to assess diabetes knowledge among Arabs in the U.S.

Most participants in this study originated from Sudan; therefore, future studies might recruit a larger sample size to explorer if there is a difference among the Arabs in the U.S. in terms of diabetes fatalism or explore this phenomenon in qualitative methods among this population. A future study investigating diabetes fatalism along with social stigma may provide more insight into the factors that influence diabetes self-management among this population. Larger and different sampling techniques are needed to fully understand how to tailor interventions for Arabs living in the U.S.

Summary

The current study provided an overview of the current state of science concerning diabetes self-management and diabetes-related factors and outcomes among Arab Adults with type 2 diabetes. The study also sought to explore the impact of age, gender, years of diabetes, marital status, education, diabetes education, income, presence of health insurance, and years in the United States on diabetes self-management and A1C level. The Individual and Family Self-Management Theory provided a framework that helped to explain the complexity of diabetes self-management. The major findings were that diabetes fatalism, years of diabetes, and diabetes distress were related to diabetes self-management. Moreover, diabetes knowledge, diabetes self-management, age, and years of diabetes were related to A1C level. These major findings may impact outcomes indirectly, and younger Arabs with diabetes living in the U.S. are not the same as older Arabs in the United States and other countries in terms of diabetes fatalism, diabetes knowledge, diabetes distress, diabetes self-management, and outcomes. The study provides a foundation on which to examine further and intervene. Moreover, the findings may help researchers and diabetes care providers develop culturally appropriate diabetes self-management education for this population.

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