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## The relationship among diabetes self-care, psychological adjustment, social support and glycemic control in the Lebanese population with type 2 diabetes mellitus

Ola Ali Sukkariéh  
*Northeastern University*

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Northeastern University  
Bouvé College of Health Sciences  
School of Nursing

Dissertation Research:

The Relationship among Diabetes Self-Care Psychological Adjustment, Social Support and  
Glycemic Control in the Lebanese Population with Type 2 Diabetes Mellitus

Committee Members:

Dr. Elizabeth Howard (chairperson)

Dr. Lynn Babington

Dr. Lina Badr

7/25/2011

## DEDICATION

I thank God for granting me faith and stamina to believe in myself and finish my PhD journey successfully.

I dedicate this work to my loving mother for her precious prayers and words of wisdom that helped me through my weakest times and my siblings, Firas, Omar and Rasha, who supported me through the entire process and for being there for me in every single sense. I would have never completed my dissertation without their love and support.

Last but not least, I dedicate this work to my beloved soul mate, Ramzi, who gave me tremendous encouragement and unconditioned care in the most critical phases of my dissertation that kept me going forward.

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## ABSTRACT

Diabetes Mellitus (DM), is a chronic disease characterized by chronic hyperglycemia. In Lebanon, the prevalence rate of type 2 DM was 5.9% (N= 1982). The purpose of this study was to assess the relationship between diabetes self care, psychological adjustment and social support and glycemic control (A1C levels) among the Lebanese adults with diabetes mellitus. The study was descriptive correlational design with convenience sample of adults (N=140) diagnosed with type 2 DM recruited from two diabetes clinics. The participants completed a set of questionnaires: Summary of Diabetes Self-Care Activities (SDSCA) translated to Arabic, Social Support-Arabic version and Problem Areas In Diabetes (PAID) - Arabic version, and a demographic and physiological sheet. Test statistics used were reliability analysis and Mixed Models Theory with fixed and random effects presented in unadjusted and adjusted univariate models at  $p < 0.05$  level using Package for the Social Sciences (SPSS) version 18.0. Research question one was supported partially only when SDSCA subscales were categorized (beta= 0.66, SE=0.29, p-value=0.02). There were statistically significant relationships between PAID scores and glycemic control (B= 0.02, SE= 0.01, P-value= 0.036), thereby supporting Research questions 2. Social support scores was significantly associated with glycemic control (B= 0.02, SE= 0.01, p-value=0.01), yet in a positive direction as opposed to having negative significant relationship stated in research question 3. Age, Gender, type of treatment, problems associated with DM and BMI demonstrated statistical significant relationship with glycemic control (beta= 1.36, SE=0.35, p= 0.000; beta= 0.53, SE= 0.25, p= 0.037; beta= 0.99, SE= 0.31, P= 0.002; beta= -1.006, SE= 0.24, p= 0.00; beta= 0.04, SE= 0.02. p= 0.033 respectively), thereby supporting some of the demographic and physiologic variables identified in research question 4. In research question 5, the aforementioned demographic and physiologic variables no longer demonstrated statistically significant association with A1C levels in the adjusted univariate model. In

conclusion, the participants did not generally adhere to their diabetes self-care regimen except for medication regimen. Denial prevailed in light of the uncontrolled levels of A1C when emotional adjustment was examined. Finally, social support was positively associated with A1C levels, thereby inferring that as participants demonstrated uncontrolled levels of A1C, they got more social support from their network.

## CHAPTER 1

### INTRODUCTION

Diabetes mellitus is a chronic, complex disease which ranks as the seventh leading cause of death in the United States (Centers for Disease Control and Prevention, 2007). Nearly 8.3% of the U.S population, approximately 25.8 million people, suffers from diabetes (CDC, 2011). There has been an increase of three million cases diagnosed with diabetes in the past two years (CDC, 2011). Additionally, 79 million people in the U.S are diagnosed with pre-diabetes, which predisposes them for increased risk of diabetes over the long term (CDC, 2011).

The World Health Organization (WHO) estimates that the prevalence of diabetes in developing countries will rise by 60% from year 2000 to year 2020, whereby more than 75% of the diabetics will be living in that region. Some Middle Eastern countries such as the United Arab Emirates, Saudi Arabia and Qatar report a younger age for the onset of diabetes type 2 (Khatib, 2006; WHO, 2005). There is scarce information and inconsistent estimates related to the prevalence of diabetes and its health related consequences in Lebanon. The most recent prevalence rate, per WHO estimates, is 11.8% (WHO, 2005) with an estimated increase from 146,000 in 2000 to 378,000 in 2030 (Hosseini, Kawar, & Nahas, 2008; Wild, Roglic, Green, Sicree, & King, 2004). A study conducted by Hirbili and colleagues (2005), noted the prevalence of diabetes among 3000 participants in greater Beirut, which is residence to 53.6% of the Lebanese population, to be 15.8%. In the latest nationally representative study (SIBAI & HWALLA, 2010) on assessing the prevalence of DM among other chronic diseases, the prevalence rate was 5.9% of the 1982 participants and 29.6% never measured their glycemic levels.

#### *Background*

Diabetes mellitus is the most common metabolic disorder characterized by chronic hyperglycemia (Carver & Abrahamson, 2008). The majority of diabetes mellitus diagnoses fall into one of two categories: type 1 which encompasses 5-10% of diabetes cases and type 2, the most common form encompassing 90-95% of diabetes cases (ADA, 2010). Type 1 is juvenile-onset diabetes characterized by insulin-dependent diabetes mellitus (IDDM). It is an autoimmune disease whereby the beta cells in the islet of the pancreas are destroyed, resulting in a total deficiency of insulin hormone and a tendency of developing a life threatening blood metabolic disorder called diabetic ketoacidosis (ADA, 2009; Carver & Abrahamson, 2008; CDC, 2007). Patients with type 1 diabetes need insulin replacement for survival. Type 2 is mainly caused by deficiency in insulin release or increased resistance to insulin uptake by the cells (mainly due to obesity). At the time of diagnosis, approximately 50% of beta-cell function would have been lost (Carver & Abrahamson, 2008). The disease is progressive in nature and needs a combination of medication adjustment, exercise, and nutrition adjustment as an effective regimen. Ultimately insulin replacement is required in advanced cases.

Gestational diabetes is another form of diabetes mellitus that develops during pregnancy which is managed with meal planning, activity, and, in some cases, insulin therapy to normalize blood glucose levels. Women with gestational diabetes deliver babies large in weight and commonly via cesarean section. Up to 60% of women with gestational diabetes develop type 2 diabetes five to ten years after their delivery (CDC, 2007; Carver & Abrahamson, 2008).

Other types of diabetes, which account for 1 to 5% of all cases, are caused by, but not limited to, diseases of the exocrine pancreas (cystic fibrosis), genetic defects in either beta-cell function or insulin action, and medication induced (such as in the treatment of AIDS or immunosuppressant drugs).

### *Consequences of the Problem*

The disease leads to microvascular (diabetic nephropathy, neuropathy and retinopathy) and macrovascular (coronary artery disease, peripheral vascular disease and stroke) problems, thus substantially jeopardizing the quality of life of the people with diabetes (ADA, 2009). Diabetic retinopathy is the most common microvascular complication that is the leading cause of blindness in the U.S (Fowler, 2008). Diabetic nephropathy is the leading cause of end stage renal disease in the U.S which leads to chronic dialysis. The occurrence of diabetic neuropathy is very common whereby up to 70% of the people with diabetes will exhibit some mild to severe forms of nervous damage manifested by impaired sensation, pain in the feet, erectile dysfunction and other nervous disorders. More significantly, more than 60% of non-traumatic lower limb amputations occur in people with diabetes (CDC, 2007; Fowell, 2008). The high prevalence of DM creates a dramatic economic burden on the national health care expenditures. DM claimed more than 284,000 lives in 2007 and remains the leading cause of blindness, end stage renal disease and non-traumatic lower limb amputations, all which impair an individual's quality of life. In the United States (US) U.S., the total estimated costs spent treating DM and its complications (direct and indirect) were \$174 billion (ADA, 2007; CDC, 2007). The direct costs accounted for \$116 billion resulting from treatment and hospitalizations. Approximately, \$58 billion were spent as indirect costs resulting from disability, work loss and premature mortality.

The Lebanese Ministry of Health (MOPH, 2008) reported that the number of hospitalized patients with DM in 2008 was 2,906 (1217 males and 1689 Females), which accounted for one of the highest numbers of hospitalizations for chronic illness. Thus, DM is becoming a pandemic illness that poses high economic expenditures and major medical complications (Hossain, Kavar, & Nahas, 2007; Wild, Roglic, Green, Sicree, 2004). Although the costs related to DM are exorbitant, studies have noted that

with effective management such as medication adherence, exercise, nutrition, and self monitoring blood glucose, complications are less likely to occur which in turn decreases costs (DCCT, 1993; UKPDS, 1998; Lorig et al., 1999). Ironically, almost all studies on the management and compliance of DM clients are found in Western countries, with very modest studies in the Middle East where the prevalence is as high.

Studies conducted in Lebanon have been mostly descriptive, correlational or predictive studies. Mainly researchers assessed the profile of the diabetic patients in terms of diabetes-related complications (Salti et al., 2008; Talib et al., 2008), examined the relationship between diabetes and obesity (Al Tannir et al., 2009) or assessed the relationship between cardiac diseases and diabetes, as a major predictor of worsening cardiac conditions (Abschee et al., 2006; Tohme, Jirjus & Estepahn, 2005). None of these studies have assessed other documented factors, such as self-care, psychological adjustment, or social support, that are associated with better glycemic outcomes (ADA, 2009, Funnell et al., 2009, Weigner & Carver, 2009).

### *Scope of the Problem*

Despite the above mentioned statistics on prevalence and costs related to diabetes mellitus, results from the Diabetes Control and Complications Trial (DCCT) research group and the United Kingdom Prospective Diabetes Study (UKPDS) research group reveal that with effective diabetes management such as medication adherence, exercise, nutrition, and self monitoring blood glucose, the occurrence of complications are less likely to prevail (DCCT, 1993; UKPDS, 1998). Diabetes is a chronic medical illness that mandates sustainable medical care and self management educational programs in order to prevent or delay the occurrence of complications (ADA, 2009; Funnell, Tang & Anderson, 2007; Funnell et al, 2009; Siminerio, 2008) and their subsequent impact on quality of life.

Diabetes self management is a complex regimen. The focal tasks of daily diabetes self-care include medication adherence, self monitoring blood glucose, nutrition adjustment, exercise, foot care, coping with the illness, and monitoring the disease symptoms and its progression (Funnell et al, 2009; Siminerio, 2008). These tasks mandate stamina, perseverance and confidence in carrying them out successfully. Because of the urgent need to maintain successful diabetes regimen and prevent/delay the occurrences of its resultant complications, Diabetes Self Management Education (DSME) programs were developed as a collective work of many experts in the field (Funnell et al., 2009). The key features of DSME are first, patient-centered; i.e., the education delivered is goal oriented and is essentially based on the patients' needs whereby the "one size fits all" patient education program no longer promote patient outcomes. Second, they are dynamic and evolve with time; i.e. they reflect the patients' real environment that is subject to major life changes whereby patients need to adjust accordingly. Hence, DSME takes into account financial status, social support and health care resources which make it responsive to the unique and individual lives of patients. Third, it is based on problem-solving rather than theoretical presentation of facts. In this sense, patients are taught skills to ensure behavioral adjustment and ultimately successful self-care.

The National Standards of DSME (Funnell et al., 2009) is a collective work of interdisciplinary teams (such as physicians, pharmacist, dieticians and nurses) from different task forces (such as American Diabetes Association, American Dietician Association, American Pharmaceutical Association). Every five years, the task force provides evidence based practice and defines quality diabetes management for all health care providers in the field. The overall objectives of DSME are to promote informed decision-making, effective problem-solving and support of the interdisciplinary team to optimize patient outcomes and quality of life. The basic guiding principles of the DSME are: diabetes education is effective

for improving, but not limited to, short term clinical outcomes; is no longer based on didactic educational approach but is based on empowerment conceptual frameworks; no one basic approach best describes the design of DSME but a culturally sensitive, group based, age specific and incorporating behavioral and psychological adjustments as well as the presence of social support is thought to be the approach documented in the literature; ongoing support is essential to pursue progress made by the participants during the DSME program, and finally behavioral goal setting is needed to maintain self-management behavior (Funnell, Tang & Anderson, 2007; Funnell et al., 2009)

A large body of knowledge (ADA, 2009; Funnell, Tang & Anderson, 2007; Funnell et al, 2009; Siminerio, 2008) supports the significance of diabetes self management educational programs that maximizes health-sustaining diabetes outcomes, thereby alleviating its resulting complications. Ever since the published results of DCCT, A1C has been the most important goal and clinical outcome of diabetes self care. Worldwide, A1C is considered the standardized test for diagnostic and prognostic evidence of diabetes. The joint committee of ADA, the European association for the study of diabetes, and the International Diabetes Federation recommended the use of A1C as a diagnostic test for diabetes (ADA, 2009). Lowering A1C to  $\leq 6.5\%$  can reduce microvascular and neuropathic complications of diabetes (ADA, 2010). Reduction in A1C levels by 1% has shown to reduce complications by 25% (UKPDS, 1998).

In an attempt to tailor the most appropriate DSME, several aspects need to be incorporated such as patient's age, occupation, level of activity, dietary patterns, social and psychological profile, cultural aspects, and the presence of any diabetes related complication or other medical problems. According to the National Standards of DSME (ADA, 2009), the multidisciplinary team (pharmacists, nurses, dieticians, educators) needs to contribute its expertise to develop the clinical care, educational methodologies, nutritional therapy and

psychological, social and behavioral aspects that shape the patients' self care. Accordingly, the team assembles the data collected and serves as the groundwork for tailoring the most appropriate DSME programs. In this respect, assessing all the aspects of diabetes self care along with psychological concerns and social context serve as focal features of behavioral change in the context of diabetes regimen adherence.

Current research cites the importance of emphasizing problem solving, collaborative care, psychological concerns, social context and adjustment and behavioral modification to support informed decisions in diabetes self care (Lorig et al, 2001; Piatt et al, 2006; Siminerio et al, 2005; Siminerio, 2008; Weigner & Leighton, 2008). Essentially, co-morbid chronic illnesses, mainly depression and other psychological issues can create considerable barriers to successful diabetes self care (McKellar, Humphreys & Peitte; 2004; Miller & Elsay, 2008; Peyrot et al, 2005; Peyrot et al, 2006; Weigner et al, 1997; Weigner & Lee, 2006; Weigner, 2007). These aspects need to be integrated into the plan of action to maximize outcomes. Social support favors better glycemic control and adherence to diabetes self-care (Tang et. al, 2008). Additionally, DSME needs to be an ongoing process in order to sustain the attained behavior. Essentially, the support provided throughout the process incorporates clinical, psychological, behavioral, and educational strategies. In this sense, the diabetes educator's role is to assess 1) the patient's perception of living with diabetes, 2) motivational level to introduce change in practice, 3) the negative effect influence, and 4) social factors that might boost or hinder optimal self-care. Accordingly, the diabetes educator will help the patient in setting achievable diabetes goals and support the patient through possible future obstacles (Parkin, 2009).

#### *Research Questions and Hypotheses*

The purpose of this study is to assess the relationship between diabetes self care, psychological adjustment and social support and glycemic control (A1C levels) among the Lebanese adults with diabetes mellitus.

Research Question 1: What is the relationship between relationship between diabetes self care and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 2: What is the relationship between relationship between psychological adjustment in diabetes and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 3: What is the relationship between relationship between social support and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 4: Are any demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) related to glycemic control (A1C levels)?

Research Question 5: Which of the variables assessed in this study (self care, psychological adjustment, social support, demographic characteristics and physiologic characteristics) best predict A1C levels?

Hypothesis 1: There will be a statistically significant negative relationship between diabetes self-care and glycemic control (A1C levels).

Hypothesis 2: There will be a statistically significant positive relationship between psychological adjustment in diabetes and glycemic control (A1C levels).

Hypothesis 3: There will be a statistically significant negative relationship between social support in diabetes and glycemic control (A1C levels).

Hypothesis 4: A certain set of demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of

diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) are related to glycemic control (A1C levels).

Research question 5 was not associated with a hypothesis since there is no published report on the best predictors of the glycemic levels (A1C) in the Lebanese context.

### *Definitions of Terms and Central Concepts*

#### Diabetes Self Care

*Theoretical Definition:* the performance of the needed health care behaviors to manage daily diabetes tasks in order to optimize health status (Toobert & Glasgow, 1994)

*Operational Definition:* Diabetes self care and diabetes self management are used interchangeably. Summary of Diabetes Self-Care Activities (SDSCA), 12 items, will be used to measure diabetes self care in terms of monitoring glucose, diet, exercise, and medication adherence, in the past 7 days.

#### Psychological Adjustment

*Theoretical Definition:* the ability to manage negative emotions associated with overall adjustment to diabetes self care and is thought to better carry out diabetes self care (Polonsky et al., 1995; Welch, Jacobson, & Polonsky, 1997).

*Operational Definition:* Psychological adjustment will be measured by Problem Area In Diabetes (PAID) scale (Polonsky et al., 1995) that assesses diabetes related distress and psychological adjustment in carrying out diabetes self care.

#### Social Support (SS support)

*Theoretical Definition:* the interaction that occurs between the patient with diabetes and his/her family and friends as means of providing information and emotional support as to help carry out diabetes regimen (Fitzgerald et al., 1996).

*Operational Definition:* Social support will be measured by the subscale Social support scale extracted from Diabetes Care Profile which measures the received and perceptual support of the patients with diabetes (Fitzgerald et al., 1996).

Glycemic control

*Theoretical Definition:* assess the quality of diabetes care and the effectiveness of the diabetes management plan patient self-monitoring of blood glucose (SMBG) or of interstitial glucose and measurement of A1C (Goldstein et al., 2004).

*Operational Definition:* glycated hemoglobin (HbA1c or A1C) is the result of the slow, irreversible reaction between hemoglobin molecules of red blood cells and glucose. It is used both as an index of mean glycemia over the past 3 months and as a measure of risk for the development of diabetes complications (Goldstein et al., 2004)

Lebanese diabetics: all Lebanese patients, age 18 and above with type 2 diabetes mellitus.

#### *Assumptions*

First, all respondents will respond truthfully and objectively on the self-administered tools (SDSCA PAID and SS support). Second, the assessment of the diabetes self care and emotional adjustment provides insight about the profile of the Lebanese population with Diabetes management which, thereby will reflect the culture of diabetes self management and its underlying emotional adaptation. The demographic and physiological characteristics are thought to be two important set of variables that influence the participants health practices and emotional status.

#### *Theoretical Framework*

The theoretical framework of this study will be based on Self-Efficacy Theory developed by Albert Bandura (1977). The theory elaborates on the concept of self-efficacy in health care practices. It highlights the four different channels that shape the development of self-efficacy in the context of adapting health practices.

People's behavior in their daily living is influenced by the way they perceive their own competencies. This self estimation is referred to as perceived self-efficacy which reflects the ability and determinism of a person to engage in activities that mandates behavioral changes and life style modifications. According to Bandura (1986 p.395), self efficacy is "people's judgment of their capabilities to organize and execute courses of action required to attain designated types of performance." According to this definition, self-efficacy is situational, task oriented and specific in nature. In other words, if individuals think that they are competent in a specific task, it does not imply they possess competence across all tasks evenly. These characteristics distinguish self-efficacy from self-esteem and self-confidence. The latter two tend to be more fixed, stable and general in influencing individuals' behavior (van der Bijl, van Poelgeest-Eeltink, & Shortridge-Baggett, 1999). Self-efficacy is a central construct of the social cognitive theory (Purdie & McCrindle, 2002). It regulates people's self-regulation, self-motivating and creating opportunities, and eventually controls their thoughts, emotions and actions. That said, self-efficacy impacts people's choices and decision making and the extensive process of perseverance and stress-related exertion to attain the desirable goal (van der Bijl, van Poelgeest-Eeltink, & Shortridge-Baggett, 1999).

Self-efficacy has been an attractive concept embedded in tailoring interventional programs in other health practices such as smoking cessation, weight control and wearing seatbelts (Purdie & McCrindle, 2002; van der Bijl et al., 1999). This versatile capacity makes self-efficacy an appealing concept for diabetes education, especially that self-care is essential in successful diabetes outcomes. Diabetes self-care mandates a series of daily decision making regarding diet regimen, physical exercise, blood glucose monitoring and medication adherence (Anderson, Funnell, Fitzgerald, & Marrero, 2000). For this reason, enhancing perceived self-efficacy to self-manage the required regimen is the cornerstone and ultimate goal of diabetes management and educational programs.

In the proposed theoretical framework, the implementation of self-efficacy is derived from four fundamental sources of information; performance accomplishments, vicarious experience, verbal persuasion, and physiological states (Bandura, 1977). Performance accomplishments refer to mastery of previous personal experience whether successes or failures. Accordingly, a person tends to generalize his capabilities to other similar situations that require equivalent mastery of performance. In this sense, strong efficacy expectations are products of successful experiences. Conversely, weak efficacy expectations are a result of previous failures. Vicarious experiences occur through observation of others performing behaviors successfully and without any adverse outcomes. The process of observation occurs mainly through role modeling. It is believed to be one of the most powerful sources of information to enhance one's self-efficacy. Verbal persuasion, on the contrary, is not thought to influence self-efficacy tremendously. It relies essentially on the support, encouragement and persuasion that produce confidence of the individual in the others' capabilities and performance. The latter two are predominantly shaped by the social context that might be promoting or hindering behavioral change. The stronger the influence of the social support, the higher the probability of adapting a new behavior. Finally, the emotional arousal, such as fear, anxiety, and physical agitation are thought to hinder self-efficacy. Repeated symbolic exposures may mitigate negative affective status. In this token, emotional change serves as a prominent feedback for cues of action (Bandura, 1977). Bandura also contends that in order to enhance learning and mastering the new skills, social support is needed through role modeling, sharing of successful experiences and use of social and verbal persuasion by others who are experienced in the desired activity. In this sense, through the observation of successful stories of behavioral change from within the individual's social network and exchange of information, advice and emotional support further the desired behavioral change. In summary, self-efficacy is the cornerstone of diabetes self-care. Based on the

conceptualization of Self-efficacy theory, Bandura highlights the significance of one's perceived estimation in carrying out the desired behavior. He also emphasizes the affectionate status associated with performing the task of interest. In this study, it is deemed crucial to understand the nature of the coexisting relationship between emotional status as measured by PAID and diabetes self-care as measured by SDSCA and Social Support subscale of the Diabetes Care Profile (DCP). It is hypothesized that the existence of each, separately and collectively, will predict the value of glycemic control in the Lebanese population with diabetes mellitus.

### *Significance*

The current health care literature fails to document the measurement of diabetes self care among the diabetic patients as an essential element in DSME needed to optimize diabetes outcomes. The studies conducted in Lebanon have been mostly related to assessing the profile of the diabetic patients in terms of prevalence and determinants of diabetic retinopathy and albuminuria (Salti et al., 2009; Talib et al., 2008), examined the relationship between diabetes and obesity (Al Tannir et al., 2009) or assessed the relationship between cardiac diseases and diabetes, as a major predictor of worsening cardiac conditions (Abschee et al., 2006; Tohme, Jirjus & Estepahn, 2005).

Diabetes is becoming a pandemic illness that poses detrimental consequences on quality of life and economic expenditures of the individuals with diabetes. Similarly, the Lebanese population with diabetes is not an exception from the current situation, in terms of prevalence, co-morbidities and health expenditures posed by the disease process.

Therefore, in order to conduct a well fit DSME in the Lebanese context, certain measures need to be obtained beforehand namely, diabetes self care and emotional status. With the lack of appropriate assessment as the National guidelines of DSME, diabetes self care might fail to address the needs of the designated population.

This study is thought to give a better insight into the nature of the relationship between diabetes self care and glycemic control, between psychological status and glycemic control and between social support and glycemic control as well. More importantly, the combined relationship is thought to be predictive of glycemic control whereby individuals with low diabetes self care, high emotional arousal and low social support are more likely to have uncontrolled glycemic control. Additionally, certain categorical sets of the Lebanese population of corresponding demographic and physical characteristics may answer differently on the self administered tools which bring about different glycemic control levels as cultural context plays an integral part in diabetes self care (K. Weinger, 2007) Hence the results of the diabetes self care and emotional status will be analyzed from the lens of demographic and physical characteristics in relation with the glycemic control.

#### *Contributions to Future Knowledge*

Adapting the application of DSME in the Lebanese context is deemed crucial to optimize diabetes outcomes. Accordingly, patients will practice self awareness by identifying the major gaps in performing diabetes self management. Health care providers will have a better insight on the needs of the Lebanese patients with diabetes. Comprehensive assessment that entails behavioral, psychological and social status is the fundamental step to initiate DSME, and serve as evaluative measures of the DSME and clinical care as well. Ultimately, the most appropriate educational program that best fits their needs and capabilities will be tailored prospectively. These educational programs will be tested for the effectiveness in terms of optimizing glycemic outcomes and will developed into standards of care to be used in advancing research studies and clinic visits.

## CHAPTER 2

### LITERATURE REVIEW

The literature review provides an overview of research conducted on the adaptation of Bandura's theory of self-efficacy, diabetes self-care/self-management, psychological adjustment and social support in relation to glycemic control. The final section summarizes related research in Lebanon, highlighting the gaps in the literature and the contributions that this study will make to the health care field in Lebanon.

The electronic search, CINAHL, PsychINFO, PubMed, Cochrane Library, MEDLINE, and dissertation abstracts data bases were used to produce and compile the literature documented in this section. The following key words were used: diabetes, A1C (HbA1c), prevalence, types, clinical guidelines, economical burden, Lebanon, self-care, self-management, self-efficacy, psychological adjustment, social support, diabetes self management education.

#### *Self-Efficacy Theory*

Self-efficacy theory, founded by Albert Bandura (1977), serves as the theoretical background that provides the framework for the interconnectivity of the diabetes self-care, psychological adjustment and social support in relation to glycemic control. Bandura's theory has its roots based in Social Cognitive Theory. People have the cognitive capabilities that enable them to evaluate events and circumstances to make decisions in modifying their behaviors (Bandura, 1986, 1995, 1997). Self-efficacy also determines one's emotional reactions during actual and anticipated interactions with one's environment and one's actual performance of behaviors. In this case, self-efficacy theory explores how people judge a certain behavior that can lead to a specific outcome (Bandura, 1986, 1997).

Self-efficacy consists of two major concepts, efficacy expectancy and outcome expectancy. Efficacy expectancy is a "judgment of one's capability to accomplish a certain

level of performance” (Bandura, 1986, p.391) represented in one’s competency. Outcome expectancy is “the judgment of the likely consequence a behavior will produce” (Bandura, 1986, p.391) which represents belief in results. This is particularly applicable when one is newly engaged in certain behaviors, such as diabetes self-care, and where metabolic control is a product of physiological and emotional factors. For instance, individuals may perceive that adapting diabetes self-care tasks is efficacious, but may not believe in their own capability to carry out the required behavior successfully (Girdwood, 2004). Hence, including outcome expectancies into diabetes self-care is deemed essential to help understand the complex phenomenon of self-care.

Self-efficacy theory assumes that one’s perceived capability to cope with a situation is an important feature in successful coping mechanisms (Bandura, 1986). In this sense, one’s self-perception of performing certain behavior influence: 1) the choice of behavior embedded in a certain context that will be eventually avoided or sought after; 2) the effort exerted in the attempted behavior; 3) the time spent on the behavior; and 4) the emotional reaction towards the threat of failure in executing the behavior (Johnson, 1996).

#### Self- Efficacy Theory as a Predictor of Behavior

Numerous studies document the relationship between self-efficacy beliefs and prospective behavioral performance in various health areas. Bandura (1977) identified self-efficacy to be the strongest predictor of behavioral change as in health promoting or altering certain performances/behavior. The literature cites various studies that adapted self-efficacy theory as the guiding framework for tailoring interventions. Self-efficacy has been an attractive concept embedded in tailoring interventional programs in other health practices such as smoking cessation and relapses (O’Leary, 1985), eating and weight control (Cerin, Barnett, & Baranowski, 2009), breast feeding cessation (Nichols, Schutte, Brown, Dennis, & Price, 2009) and wearing seatbelts (Purdie & McCrindle, 2002; van der Bijl et al., 1999).

Similarly, self-efficacy was integrated in the designed interventions of chronic diseases management (Farrell, 2002) such as post-stroke rehabilitation (Shaughnessy & Resnick, 2009), management of multiple sclerosis (Betts, 2008); and barriers to overcome physical inactivity in older adults (Lee, Arthur, & Avis, 2008). The literature indicates the significance of self-efficacy as a fundamental component to predicting prospective performance in a diversity of situations. According to Bandura, the psychological factors may mediate the effect of social support on self-care practices, whereby these factors may vary in their ability to affect self-care practices. For instance, social support can alleviate depression related to diabetes self-care which would promote self-efficacy in return. The social contextual factors, within which social support occurs, includes formal health care providers, informal social network members and physical environment that in return influence significantly behavior change through modifying self-efficacy primarily (Gallant, 2003).

#### *Diabetes Self-Care*

The concept of self-efficacy introduces a revolutionary change in managing diabetes. Health care providers acknowledge that optimizing patient management is no longer a byproduct of didactic education, whereby passing knowledge merely to patients does not guarantee the execution of the prescribed regimen and optimizing glycemic control. Lutfey and Wishner (1999) in their review of the literature on the past existing medical, nursing and scientific research in diabetes self-care explored the change of concepts from “compliance” to “adherence”. Compliance refers to which the patient’s behavior (taking medications and changing certain life styles) coincides with the medical advice. In this regard, the patient passively yields to the will of the health provider without taking into consideration other pressing factors, namely social, environmental, economic and psychological factors that shapes the patients decisions (Lutfey & Wishner, 1999). The term evolved into “adherence” which characterizes the patient as autonomous, active and prudent enough to set and pursue

his goals for his medical treatment. Glasgow and Anderson (1999) postulated the paradigm shift beyond the term “adherence” and added the concept of empowerment as an integral part of medical management. Johnson and colleagues (1986, 1992) as well as Glasgow and colleagues (1985), criticized the term “adherence” for lacking the characteristics of diabetes regimen that changes with the demographic and psychosocial characteristics of the patients and multidimensional for involving different aspects of lifestyle modifications. The authors then proposed the use of “self-care” or “self management” to describe the set of tasks the patient needs to perform. There is no distinguishing definition between the latter two sets of terms. The American Diabetes Association and other organizations adopted the term, self-management over “compliance” and “adherence”. From another perspective, chronic diseases need to be managed different than acute or episodic illness. Collaborative goal setting and continuous self-management support are highlighted as the key elements of successful management in any chronic illness (Glasgow, 2002).

Diabetes self-care is demanding and multifaceted. To optimize diabetes outcomes, the individual needs to possess knowledge (ADA, 2009; Glasgow, Toobert, & Hampson, 1996), cognitive skills focusing on self assessment, problem solving, informed decision making, psychomotor skills to perform specific tasks (Orem, 1995) and belief in one’s own capabilities to perform a certain set of tasks leading to well-being (Bandura, 1986, 1997). Ultimately, when the individual incorporates diabetes self-care in daily living, thoroughly and successfully, he/she is more likely to attain glycemic control which, in return, delays, or prevents the occurrence of diabetes complications (DCCT, 1993; UKPDS, 1998).

Diabetes is managed on a daily basis by patients and their families, whereby self-management is the cornerstone to achieve glycemic control. Self-management strategies include weight loss, eating a healthy diet, engaging in regular physical activity, and blood glucose self-monitoring. However, managing diabetes on a day-to-day basis is not always

easy, as individuals must balance self-management behaviors with their preferences or desires for food or activity (McEwen, Baird, Pasvogel, & Gallegos, 2007; McEwen & Slack, 2005; Vincent, Clark, Zimmer, & Sanchez, 2006; Whittemore, Melkus, & Grey, 2005).

#### Multi-Disciplinary Collaborative Educational Programs

The literature cites the importance of having a multidisciplinary collaborative model that involves all health care providers in diabetes educational programs. Particularly, the nurse case manager approach resulted in most desirable patient outcomes. One randomized control trial study (Gary et al., 2003) randomly assigned 186 patients into 4 parallel arms (usual care, usual care & Nurse Case Manager (NCM), usual care & Community Health Worker (CHW), usual care & NCM/CHW). Adopting the PRECEDE-PROCEED behavioral model where the intervention included patient counseling regarding self-care practices resulted in favorable outcomes of decline in A1C, triglycerides & blood pressure in the combined group NCM & CHW. Similarly, two studies (Gary et al., 2003; Penprase, 2002) highlighted the importance of the role of nurses in delivering diabetes education to ethnically diverse and underserved older adults. In both studies, there was a remarkable improvement in diabetes outcomes. One pilot study (Skelly, Carlson, Leeman, Holditch-Davis, & Soward, 2005) examined the effect of symptom focused diabetes management among American women. The study revealed in the experimental group that in-home, nurse delivered interventions assured the best results in diabetes outcomes.

From another perspective, one systematic review conducted by Miller and colleagues (2002) reviewed 98 randomized control trials and cited the importance of the role of nutritionist as part of the collaborative multidisciplinary model. Based on Social Cognitive Theory, the educational programs incorporated group learning, weekly goal setting and monitoring of serum blood glucose levels and dietary intake. Favorable diabetes outcomes were attained by the end of the study.

Currently the Chronic Care Model (CCM) is the paradigm that is being adapted for chronic disease management in primary care settings (Blaum, Ofstedal, Langa, & Wray, 2003). CCM is based on mobilizing and developing partnership with the existing community resources, establishing goals and formulating policies to redesign the health care delivery system. Enhancing patient empowerment supports the most favorable health outcomes and CCM involves the design of a health information system that keeps record of patients' health status (Blaum et al., 2003; Piatt et al., 2006). With another study done by Piatt and colleagues (Piatt et al., 2006) in primary care setting in Pittsburg, CCM proved efficient and was implemented in all its aspects. Results revealed favorable clinical and behavioral outcomes of diabetes. Moreover, diabetes knowledge tests scores and patient empowerment scales were aligned with the successful implementation of CCM.

Both the American Diabetes Association (ADA) and the American Association of Diabetes Educators consider self-management to be a core component of diabetes care (ADA, 2005; Mensing et al., 2005). Adequate self-management has been shown to improve blood glucose levels, lower glycosylated hemoglobin (A1C) levels, and improve dietary habits (ADA, 2005; Diabetes Prevention Program Research Group, 2002; Eakin, Bull, Glasgow, & Mason, 2002; Norris, Engelgau, & Narayan, 2001). Tight glycemic control has been demonstrated to decrease the incidence of microvascular complications such as retinopathy and nephropathy and macrovascular ones, mainly cardiovascular diseases (United Kingdom Prospective Diabetes Study Group, 1998; Holman, Paul, Bethel, Matthews, & Neil, 2008).

### *Psychological Adjustment*

One of the basic components of self-efficacy theory is emotional state associated with the behavior to be performed. Individuals with a negative physiological and emotional state are more likely to have lower self-efficacious assumptions and exhibit poor diabetes self-care

(Concha, Kravitz, Chin, Kelley, Chavez, & Johnson, 2009; Snoek, 2002; van der Ven, Lubach, Hogenelst, van Iperen, Tromp-Wever, Vriend, A., et al. 2005). Stressor depression is experienced in dealing with the behavior and influences how much one can accomplish (Bandura, 1977). As diabetes self-care is a complex regimen, adaptation is essential to maximize self-efficacy in carrying out tasks.

Diabetes self-care demands perseverance and self-determination to maintain glycemic control and manage complications and negative emotions due to weight gain and its resultant social stigmatization (Weigner & Carver, 2009). Extensive research documents the presence of clinical depression with diabetes as high as 30% of all diabetic patients (Anderson, Freeland, Clouse, & Lustman, 2001; Lin et al., 2004; UKPDS, 1983). Patients with diabetes and depression tend to exhibit poor self-care. They demonstrate inadequate adherence to medications, proper nutrition, and exercise, have higher A1C levels, and are more likely to be obese compared to non-depressed patients with diabetes (Engum, Mykletum, Midthjell, Holen & Dahl, 2005; Lin et al, 2004; UKPDS, 1983).

Yi and colleagues (2008) studied associations between anger coping styles, diabetes-related psychological distress and A1C in 100 diabetic patients. The findings revealed that the provoked diabetes –related distress promoted poorer glycemic control. Another study by Weigner and colleagues (2000), examined emotional barriers in attitudes of 55 patients undergoing intensive diabetic treatment and education for 4-5 months. One of the main findings was that treatment related frustration and emotional distress are strong motivators initially, but can become barriers to effective treatment. Patients who could not maintain glycemic control started worrying about the complications which resulted in “burn out” with the diabetes regimen (Funnell et al, 2007). The burn out feeling may lead to lack of motivation to pursue the adequate diabetes self-care tasks and eventually worsen the diabetes condition (Polonsky et al., 1997).

In the Arab Region, Suleiman and colleagues (2010) conducted assessed the psychological distress and its association with the glycemic levels in Emiratis patients with type 2 DM. Participants demonstrated the fatalistic approach and mitigated their anxiety by alluding to God's will, disregarding the possible medical treatment for DM. In the same manner, African American women demonstrated fatalism and passive acceptance of DM as to soothe their anxiety resulting of uncontrolled glycemic levels (Newlin, Melkus, Tappen, Chyun, & Koenig, 2008).

### *Social Support*

Social support is manifested in several areas such as emotional support (acceptance of the illness, showing affection), instrumental support (financial support for diabetes regimen, assistance with self-care), informational support (providing education and information), and affirmational support (acknowledging diabetes self-care efforts exerted) (Taylor, 1999).

Social Support is a crucial factor in diabetes self-care that has received tremendous attention in recent years. The connection between self-care and social support arose in the late 1980s when studies started documenting the strong relationship between higher levels of social support and optimal diabetes self-care (Gallant, 2003; Kaplan & Hartwell, 1987). Afterwards, the need for more research that explores the relationship between social support and chronic illness self-care emerged (Gallant, 2003; Kaplan & Hartwell, 1987).

Diabetes self care is not limited to a list of laboratory tests and instructing the patients with a task of what to do and what to avoid. It is the collective teamwork, whereby patients, their families and friends, along with their health care providers collaborate to maximize the regimen outcome (Snoek, 2002). The literature documents numerous studies on the importance of social support to carry out diabetes regimen successfully and cope with the emotional burden accompanied with self-care including amount of support received, satisfaction with support, sources of support, type of support and size of support network

(Huang et al., 2010; Kanbara et al., 2008; Khattab et al., 2010; Tang et al., 2008; Toth & James 1992; Wang & Fiske 1996; Robinson et al., 1998).

For patients with DM, inadequate social support is associated with poor wellbeing (van Dam et al., 2005; Wysocki & Greco, 2006); poor diabetes outcomes (in terms of glycemic control, complications and mortality) (Huang et al., 2010; Kanbara et al., 2008; Song, 2010; Tang, Pang, Chan, Yeung, & Yeung, 2008;) and higher hospital admission rates (Kelly Balcou-Debussche M & X., 2009; Westaway, Seager, Rheeder, Van Zyl, 2005). Therefore, a complete understanding of the societal context favors better outcomes of self-care in chronic diseases such as diabetes and has significant implications to tailor interventions taking social context into account (Kreig, 2008). Interventions that improved chronic treatment often incorporated psychological counseling, family therapy, support groups, provision of education and guidance such as self-monitoring and problem-solving, use of telephone or computer-based follow-up reminders and simplified medication management (Kreig, 2010).

Family ties are considered to be the corner stone of the social structure, whereby strong family support system that is based on the extended family lifestyle shapes the density of social network (Kandel, Morad, Vardi, Press, & Merrick, 2004; Zahr & Hattar-Pollara, 1998). Diabetes self-care tasks require family and friends' support for meal planning, glucose testing or medication administration. Accordingly, family and friends can be supportive in these instances. Thus, when practical and emotional assistance is received, social support has a positive effect on diabetes self-care generally. Another study by Tang and colleagues (2008), after controlling for demographic characteristics, studied the relationship between social support and diabetes-specific quality of life and self care behaviors. Participants who were satisfied with support reported higher levels of diabetes quality of life ( $r = -0.579$ ,  $P < .001$ ) and glycemic monitoring ( $r = 0.258$ ,  $P < .05$ ). More precisely, positive support

behavior predicted adherence to healthy diet ( $r=0.280$ ,  $P <.05$ ), spacing out carbohydrates throughout the day ( $r=0.367$ ,  $P <.01$ ) and engaging in at least 30 minutes of physical exercise ( $r=0.296$ ,  $P <.05$ ). On the other hand, negative support predicted poor adherence to medication regimen ( $r=-0.348$ ,  $P <.01$ ).

Another body of literature supports the importance of social support influencing diabetes outcomes among certain ethnic/race groups. A cross-sectional study conducted by Rosland and colleagues (2008) with 164, type 2 DM African American and Latino adults revealed that the family and friends' support was strongly associated with glucose monitoring compared to other diabetes related tasks. Shaw and colleagues (2006) found that family and friends' support was highly associated with diet and foot care.

A qualitative study (Halabi, 1997) studied women's experience and management of DM while living in a refugee camp. In addition to highlighting their lack of control over DM, these women alluded to their Islamic beliefs as a way to deal with DM. Their faith in God, family and children were highlighted as the surviving elements of their lives and possible coping strategies to survive the hardship of DM. The lack of control over one's life and complete reliance on God and social support to cope with DM fairly justifies the positive relationship between social support and glycemic levels.

In summary, self-care tasks are highly associated with the existing social support. In the diabetes context, diet adherence, may be more susceptible to the influence of social network than other tasks executed on an individual basis, such as taking oral hypoglycemic medications. Simultaneously, social support shapes emotional adjustment especially for tasks that are highly susceptible to periods of psychological distress (Kreig, 2008).

### *Glycemic Control*

Researchers and major diabetes organizations such as the American Diabetes

Association and other National groups recommend glycosolated hemoglobin (A1C) as an objective measure of patient self-care (Martha M. Funnell et al., 2009; Siminerio, 2009; Katie Weinger & Carver, 2009). According to the ADA guidelines (ADA, 2007), A1C level should be less than 7 %, pre-prandial capillary plasma glucose of 90-130 mg/dl (5.0-7.2 mmol/L) and peak postprandial capillary plasma glucose, less than 180 mg/dl (< 10.0 mmol/L) (ADA, 2007) in order to achieve glycemic control in patients with diabetes. On the other hand, the American Association for Clinical Endocrinologists (AACE) are more aggressive on glycemic control and recommends for A1C of 6.5% or less, pre-prandial glucose level of 110 mg/dl (6.1 mmol/L) or less, and postprandial glucose level of 140 mg/dl (7.7 mmol/L or less) (AACE, 2002). Nonetheless, diabetes self-care is a complex regimen and adherence is not likely to be measured by A1C alone. The limitations of using A1C solely are soon realized. In this case, poor glycemic control cannot specify which aspect of diabetes self-care is not well-controlled.

Glasgow and colleagues (1987) acknowledged that A1C levels may be influenced by many factors such as other disease states, co-morbidities, aggressiveness of the regimen, genetic predisposition, social support, hormonal changes, economic factors, and response to stressors (Glasgow, 1999; Johnson, 1996). Physiologic parameters measured by A1C are often not strongly related to what might be considered the ultimate diabetic outcomes of patient functioning and of quality of life.

Given the multiple attributes to successful diabetes regimen, the most commonly used method for assessing diabetes self-care are self-report tools that measure psychological aspects, attitudes, beliefs, quality of life and glycosolated hemoglobin (A1C).

#### *Diabetes in Lebanon*

The prevalence of diabetes is on rise worldwide, and so is the case in Lebanon (WHO, 2003). The literature fails to document sufficient research conducted in the area of diabetes,

generally, and in diabetes self-care particularly within this study. The unexplored concept of diabetes self-care in the Lebanese population mandates prompt attention in order to address the rising incidence of diabetes in Lebanon control the pending hazard of the current situation. Two qualitative studies explored the concept of self-care in two different illnesses among the Lebanese population. Doumit and colleagues (2007) explored the lived experience of 54 oncology patients receiving palliative care. Among the merged themes, being dependent on others was highly verbalized by the patients. In other words, the Lebanese culture perceives the patient with cancer weak and incapable of meeting his own needs. Additionally, the strong familial ties dictate that the family members take over the patient's own self-care which breeds the patient's feeling of weakness, dependency and lack of self-control. This finding reflects that self-care is impaired not because of the illness but due to cultural perceptions and values (Doumit, Hujier & Kelly, 2007). The other qualitative study, a doctoral dissertation, analyzed the concept of self-care extensively among 15 cardiac patients and 13 primary caregivers in Lebanon (Dumit, 2008). The participants struggled in defining the term self-care where definitions were associated with taking pills on time and eating properly. Although they demonstrated the concept of self-care along with the tremendous help of their caregivers, the finding sheds light on the fact that the Lebanese context does not reveal the concept of self-care explicitly and highlights the need for further patient/family education that is culturally sensitive to their understandings, values and overall context (Dumit, 2008). Another study by Doumit et al (2010) reported that the interviewed women with breast cancer described cancer to be more accepted than DM, since the latter mandates complex self-care and close monitoring to maintain controlled glycemic levels. In Jordan (Khattab, Khader, Al-Khawaldeh, & Ajlouni, 2010), 81.4% of the DM patients did not adhere to the recommended diet regimen, two thirds did not engage in any kind of physical activity and 38.1% self-monitored their blood sugars. Nonetheless, the majority of the

participants (92%) adhered to their medication regimen. Sibai and Hwalla (2010) reported in their nationally representative study, that only one third (n=113, 38.1%) of the diabetic patients performed foot care.

The literature documents scarce information on the diabetes profile in Lebanon. The few studies that exist were descriptive correlational design. Taleb and colleagues (2008) studied vascular complications in a Lebanese diabetic population recruited from a crowded diabetes out-patient clinic in greater Beirut. The cross-sectional study revealed that 220 had type 2 diabetes for the past 8.2 years ( $\pm$  6.6), 30% had A1C < 7%, 50.5% were obese, 40.7% were hypertensive. Microvascular complications accounted for 46.3% albuminuria, 39.9% neuropathy and 33% retinopathy. Macrovascular complications accounted for 19.3% with coronary artery disease, 18.3% with peripheral vascular disease and 4.1% with cerebrovascular disease. Based on the findings, the authors call for immediate attention to diabetic patients due to the poor control and high prevalence of vascular complications in Lebanon (Taleb et al, 2008). A prospective observational study conducted by Taleb and colleagues (2008) assessed the prevalence of albuminuria in the diabetic type 2 Lebanese patients recruited from the same center aforementioned. Of the 222 patients (aged 56.4 years old with of mean duration of 8.6 years of standing diabetes), 33.3% had microalbuminuria and 12.7% had macroalbuminuria. Presence of neuropathy, and retinopathy and were highly associated by bivariate analysis to macroalbuminuria in addition to glycemic control, insulin use, duration of diabetes, hypertension elevated mean arterial pressure (MAP) and dyslipidemia. The findings highlight that both glycemic control and blood pressure need to be better targeted in its management.

Salti and colleagues (2009) followed 500 consecutive patients with type II diabetes mellitus in a prospective observational study to determine the prevalence and risk factors for diabetic retinopathy (DR). One hundred seventy-five patients presented with diabetic

retinopathy. Macular edema was clinically significant in 42 patients. On bivariate analysis, the risk factors significantly associated with DR were microvascular and macrovascular diabetic complications, duration of disease, glycemic control, presence of hypertension, systolic blood pressure, and insulin use. The high risk profiles of diabetic patients with DR demands prompt medical intervention to control the worsening of the situation (Salti et al., 2009).

Other studies reported the significance of diabetes as a major co-morbidity to other chronic illnesses. In two cardiovascular studies, diabetes was enlisted as a major co-occurrence (Tohme, Jirjus & Estepahn, 2005) and independent predictor (Abchee et al., 2006) that worsened the condition of cardiac patients. A study by Al-Tannir and colleagues (2009), reported that among the 346 adult Lebanese assessed for prevalence of physical activity, inactive obese participants were about three times more likely to report hypertension and diabetes than inactive normal weight participants. Metabolic Syndrome (MetS) prevalence (Chedid, Gannage- Yared, Khalife, Halaby & Zoghbi, 2009) was assessed in another study among 381 Lebanese students using different MetS classifications. Anthropometric and biological parameters (waist circumference [WC], systolic and diastolic blood pressures, fasting plasma glucose, triglycerides, total cholesterol, high-density lipoprotein cholesterol, and homeostasis model assessment [HOMA] index to assess insulin resistance) were obtained. The prevalence rates of Mets were comparable with other countries; whereby the findings highlight the risk of its development to cardiovascular disease or diabetes.

In summary, diabetes self-care has witnessed a paradigm shift from the didactic approach of managing the regimen and the mere reliance on physiologic measures (A1C levels) to integrating a multidisciplinary involvement of health care team and considering the whole picture of assessing behavioral and psychological aspects as major contributors to the success of diabetes self-care.

Self-efficacy theory is perceived to be a fundamental theoretical framework that conceptualizes diabetes self-care through the lens of one's own estimation of carrying out a certain task. Emotional arousal has a strong affects on personal judgment and executing behaviors. That being said, the American Diabetes Association (2009) set guidelines that guide health providers in assessing the psychological aspect of diabetes self-care in addition to other factors.

Glycemic control measured by A1C is used broadly as a measure of adequate glycemic control. Nevertheless, the shortcoming of the physiologic measure is recognized lately as not the ultimate measure of diabetes self-care given the complexity of the diabetes regimen. A1C along with other self-report tools that assess behavioral and emotional aspects of diabetes regimen is thought to be appropriate in providing the health providers a holistic assessment of the patients' situation.

In Lebanon, limited studies are published in the field of diabetes self-care. Little is known about coping, adaptation and level of self-care carried out by the Lebanese population with diabetes mellitus. Hence, the purpose of this study is to provide insight about certain aspects of diabetes self-care in this understudied population of interest. Assessing diabetes self-care carried out by patients, along with the psychological adjustment to the prescribed regimen and the social support provided in relation to the glycemic control is thought to contribute to the understanding of diabetes context in the Lebanese population.

## CHAPTER 3

### METHODOLOGY

The major purpose of this study was to examine level of diabetes self-care, and psychological adjustment to glycemic control among the Lebanese adults with diabetes mellitus. Self-care is the cornerstone of diabetes control (van der Bijl, et al., 1999; van der Ven, Weinger, Yi, & Snoek, 2001). As conceptualized by the Self-Efficacy Theory, the emotional status, such as depression, fear, avoidance and anxiety, along with the context of the social support, highly influences one's own estimation in carrying out the desired diabetes self-care (Bandura, 1977). It is hypothesized that the level of diabetes self-care, psychological adjustment to diabetes and social support, separately and collectively, are associated with glycemic control (A1C levels) in the Lebanese population with diabetes mellitus.

The purpose of this study was to assess the relationship between diabetes self care, psychological adjustment and social support and glycemic control (A1C levels) among Lebanese adults with diabetes mellitus.

Research Question 1: What is the relationship between diabetes self care and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 2: What is the relationship between psychological adjustment in diabetes and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 3: What is the relationship between social support and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 4: Are any demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) related to glycemic control (A1C levels)?

Research Question 5: Which of the variables assessed in this study (self care, psychological adjustment, social support, demographic characteristics and physiologic characteristics) best predict A1C levels?

Hypothesis 1: There will be a statistically significant negative relationship between diabetes self-care and glycemic control (A1C levels).

Hypothesis 2: There will be a statistically significant positive relationship between psychological adjustment in diabetes and glycemic control (A1C levels).

Hypothesis 3: There will be a statistically significant negative relationship between social support in diabetes and glycemic control (A1C levels).

Hypothesis 4: A certain set of demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) are related to glycemic control (A1C levels).

A descriptive correlational design was best thought to answer the research questions proposed. This type of design describes the relationship among variables of interest.

Utilization of this approach provided a preliminary framework about the relationship between self-care management and glycemic control as well as between psychological adjustment, social support and glycemic control. This information provided a foundation for further advanced research designs, including experimental designs to expand the knowledge of this disease and how to treat and manage it most successfully and in culturally sensitive mode (Burns & Grove, 2004).

In Lebanon, there are no published reports on diabetes self-care and related factors that construct or influence the individuals' practices of self-care management. The existing literature provides limited descriptive information on the problem of diabetes in Lebanon; thus, not truly representing the extent of this disease. Adapting a level II research design, may

provide better insight into the nature of the relationship between diabetes self-care and glycemic control and between psychological status and glycemic control as well. More importantly, the combined relationship is thought to be predictive of glycemic control, whereby individuals with low diabetes self care and high emotional arousal are more likely to have higher glycemic levels. A descriptive correlational design best studied the nature of the existing variables, solely and with multiple variables, simultaneously. The findings will enlighten the health care providers of the reality of adherence to diabetes regimen and how Lebanese individuals cope with this disease.

Diabetes Self Management Education (DSME) is a well-structured paradigm that guides health care providers to assess, approach and evaluate diabetes context and needs. DSME guidelines are based on self-efficacy, level of adherence, and psychological status of patients with diabetes to tailor the most appropriate educational designs that best fit the needs of patients. With the high prevalence of diabetes in Lebanon, DSME is deemed crucial and will not be adopted appropriately if the fundamental variables are not studied beforehand. Having better insight of the Lebanese context, DSME programs may be tailored to improve the care provided to this population using an interventional design.

### *Sample*

#### Sample Size

A convenience sample of adults diagnosed with diabetes mellitus was recruited from two diabetes clinics; University Medical Center Rizk hospital (UMCRH) AND American University of Beirut Medical Center (AUBMC). In the absence of published meta-analysis studies that might determine accurate sample size using “effect size,” previous correlational designs will be used to determine sample size for this study. Using the continuous outcome variable (A1C), the sample size calculated based on an estimated  $r$  between 0.25 and 0.30 and a minimum established power of 0.8 is between 126 and 182 (Polit & Beck, 2007). It was

estimated that 10% of the population adhere to diabetes regimen, where by the estimated percentage was based on an expert's opinion. Hence, the calculated size was 140 subjects.

$$Z = 1.96, p = .10, d = .05$$

$$N = \frac{1.96 (.10 (1-.10))}{.05^2} = \frac{3.84 (.09)}{0.0025} = \frac{0.3456}{0.0025} = 138.24 = 138 \text{ was the sample size.}$$

### Sample Selection

A target population of Lebanese adults, age 18 or older, with type 2 diabetes mellitus was used to recruit the sample for this study. All participants must be able to speak, read and write Arabic and have a diagnosis of diabetes for at least one year. Participants who are alcoholic, anemic, on chemotherapy or steroid therapy, or had a major surgery in the past 90 days will be excluded from the study because these factors alter A1C level. Additionally, participants with diagnosed major mental or psychiatric illness were excluded as this may affect their responses and their ability to comprehend the administered self-report questionnaires. The recruitment lasted four months as the clinic sees 10 patients a day and some clinic patients were not fit the criteria for inclusion or may refuse to participate.

### Data Collection

Two clinics, both in the greater Beirut area, were used as the setting for the study. Patients were referred to these clinics by their general practitioners from area hospitals or they were walk-ins. Both clinics have a waiting room where the researcher approached the clients and told them about the study. Beforehand, the physician referred the eligible patients prior to the scheduled clinic visit, in order to assure eligibility to be included in the study before obtaining verbal/written consent. Any client who has a record of mental or psychiatric illness, except depression, was excluded. Recruitment of participants concluded when the number fulfills the sample size. Interested participants were taken individually to a private room. The researcher asked for their verbal/written consent to review their medical records

and to complete the questionnaire. People who agreed to participate received a copy of the signed consent. The researcher interviewed the participants through asking them all the questions stated in the scales and questionnaire. The researcher assured the participants that they can seize the interview whenever they get tired. Recruitment of participants concluded when the number fulfilled the sample size.

### Questionnaires

The participants completed a set of questionnaires in the following order: Summary of Diabetes Self-Care Activities (SDSCA) translated to Arabic, Social Support-Arabic version and Problem Areas In Diabetes (PAID) - Arabic version, and a demographic assessment. This last section, the participant information sheet, collected data on demographic characteristics (age, gender, marital status, educational level, occupation, income rate, presence of insurance, previous diabetes education through a formal education program or dietician/nutritionist and physiological characteristics (height, weight), family history of diabetes, number of years with diabetes, type of diabetes, treatment (insulin, oral hypoglycemic, both, others), presence of micro and macrovascular complications and smoking. A copy of the data collection tools are contained in Appendices. The questionnaires were addressed in an interview sense to the participants before or after their clinic visit. The researcher requested the A1C levels (not older than 3 months) brought in by the participants for the clinical visits.

The data collection tools used in this study are the Summary of Diabetes Self-Care Activities tool (SDSCA) developed by Toobert and Glasgow (1994), Social Support scale developed by Fitzgerald and colleagues (1996) and the Problem Areas in Diabetes (PAID) scale developed by Polonsky and colleagues (1995). The participant demographic information sheet was developed by the researcher for the purposed of this study.

#### *Summary of Diabetes Self-Care Activities (SDSCA)*

There are major difficulties in assessing adherence and level of self-care in diabetes regimen. Toobert and colleagues (1994) discussed fundamental barriers to assessing self-care. First, prescriptions of lifestyle adjustments are not clearly defined or documented in patients' medical records. For instance, exercise is prescribed under diabetes regimen modification without specifying the characteristics of exercise or follow-up documentation in the patient's medical chart (Toobert & Glasgow, 1994). Second, the inability to differentiate between patient's errors in reporting skills deficiency as opposed to patient no adherence is another subtle limitation to measure diabetes adherence. More importantly, similar to the concept of specificity in self-efficacy to certain task(s), adherence to a certain regimen does not imply consistent adherence across all required diabetes tasks. Hence, the concept of adherence to diabetes regimen is complex, whereby each set of tasks needs to be examined separately and combined with other sets, in order to ensure capturing the nature of diabetes self-care (Toobert & Glasgow, 1994). Given the complex nature of diabetes regimen, the term level of diabetes self-care is utilized throughout the tool for the frequency or consistency of regimen behaviors per week that best estimates the day-to-day activities.

SDSCA tool (Appendix 1) is a brief self-report questionnaire and consists of 12 items divided into four self-care activities: diet, exercise, self-monitoring of blood glucose and diabetes medication. The five questions related to diet measure adherence to the diet and levels of diet management in terms of degree of following dietary regimen and identifying the percentage of specific diet content consumed per week. The three questions related to exercise assess the frequency of 30 minutes of exercise per week. Two questions address glucose testing, assessing the number of glucose tests and the percentage of these activities performed per week. Diabetes medication consists of two questions that assess the number of pills taken or insulin injections done in the past week. SDSCA is scored by taking the raw score from each set of self-care tasks and converting it to a standardized score with a mean of

zero and standard deviation of 1. The standardized scores are then averaged to form a composite score for each area, thereby giving items with different scales equal weighting.

Three studies provided sufficient information on validity and reliability of SDSCA. Concurrent validity with exercise, glucose testing, level of self-care and adherence was demonstrated through correlations with dietary logs, glucose meter recordings, behavior inventories and interviews (Toobert & Glasgow, 1994). Predictive validity was not obtained between metabolic control as measured by A1C and SDSCA subscales. Yet significant relationships were obtained between desirable weight and fasting blood glucose for some of the studies (Toobert & Glasgow, 1994). The literature tends to use physiological measures as indicators of self-management. Nonetheless, the level of metabolic control is dependent on factors other than adherence. Variability in adherence to diabetes regimen and inadequate control of A1C may be due to, but not limited to, variations in endogenous insulin secretion, stress, aggressiveness of medication regimen and effects, and autonomic neuropathy.

Content validity was established since the inception of SDSCA by Schafer and colleagues (1983). The diabetes-regimen variables obtained from the medical literature underwent revision using consensus, via Delphi procedure, till the final version was constructed. The instrument has face validity as it inquires only about diabetes regimen for which patients need to implement on daily basis.

Reliability of the SDSCA was established through internal consistency and test-retest reliability. Internal consistency reliability was established through inter-item reliability, due to the small number of items in each subscale (Toobert & Glasgow, 1994). The overall inter-item correlation was above .5 demonstrating 0.59 to 0.74 for diet subscale, 0.74 to 0.78 for exercise and 0.38 to 0.76 for glucose testing (Toobert & Glasgow, 1994).

The second version of SDSCA resulted after undergoing subsequent revision (Toobert, Hampson, & Glasgow, 2000) following 7 studies (5 randomized interventions and

2 observational studies). The average inter-item correlations resulted in 0.47, whereby the specific diet item resulted in moderate test-retest correlation (mean= 0.4). Criterion validity of the diet and exercise subscales (mean = 0.23) was supported by developing correlations with other measures of diet and exercise (Toobert, Hampson, & Glasgow, 2000). Based on the psychometric properties, the revised scales included two new subscales on smoking and foot care. Some items were deleted, such as diabetes regimen medication, due to the resultant high ceiling effects and lack of variability among the respondents. There are no published studies that have used the new SDSCA, containing 14 additional optional items (Toobert, Hampson, & Glasgow, 2000).

Eigenmann and colleagues (2009) appraised the suitability, validity, feasibility and sensitivity to change of available psychometric instruments that measure Diabetes Education outcomes as identified by the National Consensus on Outcomes and Indicators. The search in various databases yielded 37 diabetes-specific and generic measurement tools. According to the authors' appraisal checklist developed for the purpose of the study, only three tools met the criteria set, and the SDSCA was among them. According to their findings, SDSCA has been recommended in a Canadian consensus for the standardized evaluation of the quality improvement interventions in type 2 diabetes (Majumdar, 2005). SDSCA has been translated to Chinese (Tang, Pang, Chan, Yeung, & Yeung, 2008), Spanish (Vincent, McEwen, & Pasvogel, 2008) and Portuguese (Bastos, Severo, & Lopes, 2007).

#### *SDSCA Instrument Translation*

Currently, the SDSCA is not translated to Arabic. For the purpose of this study, the scale was translated using a well documented process of instrument translation. The translation of an instrument is complex and necessitates capturing the meaning of words, ensuring that it is well-understood by the target population. Researchers are particularly concerned with preserving the original meaning of translated instruments. The literature cites

many translation methods (Beaton, 2002; Cha, Kim, & Erlen, 2007; Maneesriwongul & Dixon, 2004) for achieving linguistic translations. The researcher used the most commonly used method, (Cha, et al., 2007; Mason, 2005; Yu, Lee, & Woo, 2004), back translation which coincides with the World Health Organization's guidelines for instrument translation (WHO, 2007). As the method entails, the researcher, who is bilingual and her native language is Arabic, with another bilingual translator, translated the instrument from the original version (English) to the targeted language (Arabic), hence known as forward translation. Then the other bilingual translator translated the translated version blindly to the original language, hence known as backward translation. Afterwards, both produced translations were compared for equivalence in meaning. The process was repeated by another bilingual translator and the researcher until there were no discrepancies detected between the original work and the translated version (Duffy, 2006). Instruments may be literally translated, which may be grammatically awkward. Translators may not be familiar with the area of interest, which may jeopardize the translation. In this case, the translators need to be familiar with medical terms in order to achieve content equivalence (Cha, et al., 2007; Weeks, Swerissen, & Belfrage, 2007). A panel of experts in diabetes and behavioral medicine compared the two final versions for content and conceptual equivalency (validity). Content equivalence of each item in the instrument were relevant in the original and the target cultures (Hilton & Skrutkowski, 2002). Conceptual equivalence emphasized that the instrument measures the same theoretical concept in both versions. Then after the final translated version was approved, it was pilot tested with 10 patients who have the same characteristics as the participants in the study. The participants were recruited from the researchers' personal contacts and snowballing. Then the reliability and whether or not the participants had difficulty understanding any of the translated items was established. Internal consistency reliability was established through inter-item reliability, due to the small number of items in each subscale.

### *Problem Areas in Diabetes (PAID) Scale*

The PAID is a 20- item self-report scale was developed at the Joslin Diabetes Center, Boston, Massachusetts (See Appendix 2). It measures diabetes-specific emotional distress. PAID covers a range of emotional problems, which patients with diabetes might encounter while carrying out their diabetes self-care. Questions included are related to diabetes knowledge, dietary attitudes, negative effect associated with hypoglycemia, distress, and treatment adherence. The tool uses a Likert scale from 0 to 4 (“Not a problem” to “Serious Problem”) for each item. It is scored by multiplying the sum of the items by 1.25 to transfer the final score 0-100 (Polonsky et al., 1995; Welch et al., 1997). A cut-off point of 50 denotes high emotional distress, “emotional burnout,” and mandates immediate intervention. An extremely low score (0-10) with poor glycemic control indicates denial (Polonsky et al., 1995; Welch, Jacobson, & Polonsky, 1997).

The psychometric properties of the PAID were established from its use in three groups of patients with diabetes (Polonsky, et al., 1995; Welch, et al., 1997). The tool was initially used at the Joslin Diabetes Center with 451 female patients with type 1 and type 2 DM (Polonsky et al., 1995). Another study (Welch et., 1997) supported the reliability, internal consistency, discriminant and concurrent validity through its administration to 256 patients with both types of diabetes. Internal consistency was established through Cronbach’s alpha ( $r= 0.90$ ). Test-retest was determined by re-administering the tool two months after its completion ( $r=0.83$ ). Concurrent validity was demonstrated through correlation with other well established instruments (Diabetes Social Support Scale, the Health Belief Model attitudes scales and subscales of ATT39 (Welch, Dunn, & Beeney, 1994), and Diabetes Coping Measure (Welch, 1994).

Predictive validity was established through correlation with A1C and perceived adherence to the diabetes regimen. In cross-sectional studies, PAID was found to be weakly

correlated with A1C and not related to diabetes duration, education, and gender after adjustment for age (Polonsky et al., 1995; Welch et al., 1997). The relationship between PAID and glucose control may be clearer with longitudinal studies, whereby a careful tracking of emotional functioning and glycemic control were elaborated. Multiple regressions were used to establish discriminant validity of between-group mean differences, in relation to the PAID, when adjusted for gender and age at onset of diabetes (Welch et al., 1997). Type 1 patients with diabetes scored significantly higher, i.e., more emotionally distressed, than type 2 patients. A literature review conducted by Eigenmann and colleagues (2009), revealed that the PAID scale was among the three diabetes related tools that is well established and has been translated to Brazilian (Gross, Scain, Scheffel, Gross, & Hutz, 2007), Dutch (Snoek, Pouwer, Welch, & Polonsky, 2000), Swedish (Amsberg, Wredling, Lins, Adamson, & Johansson, 2008), Japanese, German, Chinese, Croatian, Danish, Portuguese and Arabic.

*Diabetes Care Profile (DCP): Social Support Scale*

DCP is a self-administered questionnaire that consists of 14 scales with 234 items that measure social and psychological factors related to diabetes and its treatment (Fitzgerald et al., 1996) (See Appendix 3). This tool is derived from an earlier instrument called the Diabetes Education Profile (DEP) that is based on the Health Belief Model. Self-Efficacy Theory is related to Health Belief Model as it shares the founding concept of self-efficacy as an essential construct to introduce behavioral change. As social support shapes diabetes self-care, the social support subscale was incorporated in this study.

Based on Health Belief Model, DEP measured the major constructs of the model; perceived severity of the disease, perceived susceptibility to complications, benefits of adherence and barriers to adherence (Janz & Becker, 1984). The 14 scales assess the patients' demographic information, diabetes self-care practices and diabetes attitudes and beliefs in two studies with two different populations, yet of Caucasian origin predominantly. The

overall reliability was calculated using Cronbach's coefficient alpha of the 14 scales ranged between 0.6 and 0.9 (Fitzgerald, et al., 1996). In the other population, the internal reliability measured by Cronbach's alpha ranged between 0.66 to 0.94 (Fitzgerald, et al., 1996). The Social Support Scale tested in two studies resulted in a coefficient of  $r=0.69$  in the community-based study and  $r= 0.73$  in the hospital based one (Fitzgerald, et al., 1996).

To establish the psychometric properties of the scale with African Americans residing in Detroit, Michigan, the authors compared the population of interest with the Caucasians. The scale reliability was measured by Cronbach's alpha that ranged between 0.70 to 0.97 for African Americans (Fitzgerald et al., 1998). Similarly, the Caucasians' reliabilities ranged between 0.68 to 0.96 (Fitzgerald, et al., 1998). The reliability of social support was high (0.93 with African American study and 0.92 with the Caucasian) whereby, the African American reported more social support from the direct social network than the Caucasians (Fitzgerald, et al., 1998). The DCP Social Support subscale consists of two questions that represent social support received and social attitudes. Each question consists of six items labeled "a" through "f" that makes it a total of 12 items, where each item is measured on 6-point Likert Scale (Strongly disagree=1, Somewhat Disagree= 2, Neutral=3, Strongly Agree=4, Somewhat Agree=5, Does not Apply= 6). The cumulative score ranges between 0 being least supported and 60 being best supported by family and friends about diabetes and its treatment. The scale has been translated to Arabic and used with 51 adolescents with type 1 diabetes resulting in a Cronbach's alpha Reliability coefficient of 0.65 (Al-Akour, 2003).

#### *Demographic Information*

Demographic information was collected using an information sheet developed by the researcher and based on prior research (Aljasem, Peyrot, Wissow, & Rubin, 2001; Kaplan, Billimek, Sorkin, Ngo-Metzger, & Greenfield, 2010; Rees, Karter, & Young, 2010; Song, 2010). Demographic characteristics (age, gender, education, income, presence of medical

insurance, previous diabetes education through a formal education program or dietician/nutritionist) and physiologic characteristics (BMI, duration of diabetes, type of treatment, presence of microvascular or macrovascular complications), were included in the data analyses. Other demographic variables in the questionnaire (marital status and employment status) and physiologic variables (presence of family history and smoking status) were collected for the purpose of descriptive statistics only (Appendix 4).

#### *Protection of Human Subjects*

The proposal for this study was submitted to the Institutional Review Board (IRB) for the protection of human rights at Northeastern University, Office of Human Subject Research Protection for approval prior to initiating the recruitment of subjects and data collection. Consent from each participant was attained before enrollment in the study. The informed consent consisted of cover letter that explains the purpose of the study approved by the IRB-Northeastern University and the consent form where the participants provide their signature as a written document of their voluntary participation (See Appendix 5).

Participation in the study was strictly voluntary, and participants may refuse to participate or withdraw anytime from their study anytime they wish. Participants were assured that their withdrawal would not affect the care rendered by the institution where they receive their medical care.

Confidentiality of data collected from the participants was maintained throughout the data collection, data analysis and documentation processes. Only the researcher had information linking the participants with their data. Data was shared with dissertation committee members and will be stored in a locked safe with the researcher, where no one can access them. Upon completion of the final report, all data will be destroyed.

#### *Data Analysis*

The data was analyzed using Statistical Package for the Social Sciences (SPSS) version 18.0 located at Lebanese American University. The test statistics used for the purposes of data analyses are: descriptive statistics, reliability analysis, and Mixed Models Theory with fixed and random effects presented in unadjusted and adjusted univariate models. All statistically significant results were based on a  $p < 0.05$  level. Four steps were utilized. First, descriptive statistics was used to summarize the demographic and physiologic characteristics of the participants with means and Standard Deviations (SD) for continuous variables and percents for nominal variables. Second, the inter-item reliability of the three scales was assessed using either Cronbach's alpha or the average inter-item correlation, while validity was measured using predictive validity with A1C. Third, Mixed Models Theory was used in two approaches; 1) unadjusted univariate testing for the relationship between independent variables; PAID, SDSCA, Social Support, demographic characteristics (age, gender, educational level, presence of insurance, previous diabetes education through a formal education program or dietician/nutritionist) and physiological characteristics (BMI, number of years with diabetes, treatment, presence of micro and macrovascular complications, and the dependent variable (A1C) with random effect for center (site where participants were recruited from), 2) adjusted univariate testing for the relationship between the independent variables (PAID, SDSCA, Social Support) and the dependent variable (A1C) with covariates that turned statistically significant in the previous unadjusted univariate model, namely demographic and physiologic characteristics and random effect for center as well. Regarding the reliability of the instruments, SDSCA-Arabic version was examined for their psychometric properties using inter-item correlations, since the number of items is relatively small to use alpha coefficient. A reliability measure of 0.70 for a new translated scale is considered appropriate. Cronbach's alpha coefficient will be used to establish the

reliability of PAID. The results of both instruments were compared to the original published scales.

The study hypotheses were tested as follows:

Hypothesis 1: There was a statistically significant negative relationship between diabetes self-care (as measured by SDSCA) and A1C.

Mixed Model theory with unadjusted univariate approach and random effect for center was used, as the two interval variables (SDSCA scores and A1C) were assessed for any statistically significant negative association.

Hypothesis 2: There was a statistically significant positive relationship between psychological adjustment (as measured by PAID) in diabetes and A1C.

Similarly, mixed analysis theory using unadjusted univariate model with random effect for center was utilize.

Hypothesis 3: There was a statistically significant negative relationship between social support (as measured by Social Support Scale) and A1C.

Similarly, mixed model analysis using unadjusted univariate model with random effect for center as a test statistic was computed as the two interval variables (SS scores and A1C) were assessed for any statistically significant negative association.

Hypothesis 4: Diabetes self-care, psychological adjustment and social support measures predicted glycemic control in Lebanese diabetic adults.

Similarly, mixed model analysis using unadjusted univariate model with random effect for center were used to determine if diabetes self-care, psychological adjustment and social, support predict glycemic control. Another approach was used with mixed models which was adjusted univariate approach whereby covariates where introduced, such that demographic and physiologic characteristics that turned statistically significant with A1C were introduced with random effect for center.

### *Applicability of the Research Design*

The literature scarcely documents the profile of the diabetic patients in Lebanon. More specifically, no published descriptive or interventional studies document the diabetes self-management status in the Lebanese population.

Descriptive correlational studies were Level II designs, which primarily examined if there is a certain relationship between a certain set of variables. It served as a ground work for more advanced research studies that would take the results a step further, and specifically determine causality. The results of the study enabled health care providers to tailor diabetes self-management educational programs to best fit the needs of the Lebanese diabetic patients, rather than adapting blindly generic diabetes programs tailored by the western societies. More specifically, the use of the translated version of SDSCA, PAID and FF scale enabled better insight of the problem areas for the Lebanese patients with diabetes. The authors of SDSCA eliminated the medication items, because of the strong ceiling effect that these items exhibited. In other words, all patients with diabetes adhered to their medication regimen entirely, which made it meaningless to assess in this scale. Nevertheless, this conception, i.e. elimination of the medication items from the instrument, cannot be done in Lebanon since the area of diabetes self-care is understudied.

One major limitation with this study was the lack of randomization. The setting chosen was thought to be attended by patients who are underprivileged, and most of them lack any kind of medical insurance. Ultimately, with the use of a descriptive correlational design, the nature of the relationship between diabetes self-care, psychological adjustment, social support and A1C were examined. Additionally, the mediating effect of the demographic and physiologic characteristics of the participants was highlighted in the same context. In this case, self-selection bias influenced the relationship between the variables (SDSCA, PAID, SS and A1C) studied. The interpretation of results was generalized to the

population that attended the chosen setting. Eventually, health care providers will better understand the most problematic areas for Lebanese patients with diabetes.

## CHAPTER 4

### ANALYSIS OF DATA

#### *Introduction*

The purpose of this study was to assess the relationship between diabetes self care, psychological adjustment, and social support with glycemic control (A1C levels) among the Lebanese adults with diabetes mellitus. It is hypothesized that the level of diabetes self-care, psychological adjustment to diabetes, and social support, separately and collectively, along with other demographic and physiologic characteristics, are associated with glycemic control (A1C levels) in the Lebanese population with diabetes mellitus.

Four surveys were used for the purpose of this study. SDSCA tool (Appendix 2) is a brief self-report questionnaire and consists of 12 items divided into four self-care activities: diet, exercise, self-monitoring of blood glucose, and diabetes medication. For the purpose of this study, the scale was translated into Arabic using the most common method, (Cha, et al., 2007; Mason, 2005; Yu, et al., 2004), back translation which coincides with the World Health Organization's guidelines for instrument translation (WHO, 2007). The PAID-Arabic version is a 20-item self-report scale that measures diabetes-specific emotional distress. The Social Support Scale-Arabic version consists of two questions that represent social support received and social attitudes. Finally, the Participant's Information sheet, developed by the researcher and based on previous studies consists of demographic information (age, gender, education, income, presence of medical insurance, previous diabetes education through a formal education program or dietician/nutritionist) and physiologic characteristics (BMI, duration of diabetes, type of treatment, presence of microvascular or macrovascular complications).

#### *Organization of Data Analysis*

The results of the data analysis are divided into four sections. The first two sections present demographic and physiologic characteristics of the participants, in addition to the

descriptive analyses of the instruments used in the study (namely, SDSCA-Ar, PAID-Arabic, and Social Support-Arabic). The third section provides the reliability analyses and predictive validity of the instruments. The findings of the hypotheses testing are described in the fourth part of this chapter. Finally, a summary of the results is provided.

The test statistics used for the purposes of data analyses are: descriptive statistics, reliability analysis, and Mixed Models Theory with fixed and random effects presented in unadjusted and adjusted univariate models.

### *Characteristics of Respondents*

#### *Age*

The majority of the participants were between the ages of 50-59 years (n= 52, 37.1%), followed by 60-69 years (n=35, 25%) and more than 70 years (n=32, 22.9%). Fourteen participants (10%) were between 30 and 39, three (2.1%) were between 30 and 39 years and the smallest cohort was between 18 and 29 (1.4%). Table 1 summarizes the distribution of respondents' ages.

Table 1

#### *Age of the Patient*

		Frequency	Percent
Age	18-29	2	1.4
	30-39	3	2.1
	40-49	14	10.0
	50-59	52	37.1
	60-69	35	25.0
	>70	32	22.9
<b>Total</b>		140	100.0

#### *Gender*

Gender was unevenly represented with the majority of the respondents females. Of the 140 participants, 80 (57.1%) were females and 60 (42.9%) were males.

#### *Marital status*

Marital status was categorized using the following labels, “Single”, “Married”, “Divorced”, “Widowed”, and “Separated”. The largest group of participants were married (n= 102, 72.9%). Then widowed and single were almost equal representing 13.6% and 11.4 % respectively. Only 2 participants (1.4%) reported being divorced. None of the participants was separated.

#### *Years of Formal Education*

The fourth item on the participants’ information sheet inquired about the participants’ educational level. The choices were “less than 10 years of education”, “12 years or high school”, “13-14 years or technical degree”, “15-16 or university degree” and “more than 16 years or graduate degree”. The majority of the participants (n= 71, 50.7%) had less than 10 years of education. Participants with 12 years of education or high school and 15- 16 years of education or university degree were almost equivalent (n= 22, 15.7% and n= 23, 16.4% respectively). Only 13 participants (9.3%) reported having more than 16 years of education or a graduate degree while 5 participants (3.6%) reported having 13-14 years of education or technical degree.

#### *Employment Status*

Employment status was categorized into “Employed full time”, “Employed part time”, Unemployed (but physically able to work)”, “Unable to work due to health problems”, “Housewife”, and “Retired”. In Lebanon, housewives only assume household responsibilities and therefore, are not gainfully employed. Retired persons do not hold any other positions. One half of the participants were housewives (n=60, 42.9%). Almost one third of the participants (n=48, 34.3%) were employed full time, 15 of them (10.7%) were employed part time, while 9 (6.4%) were retired. As for the unemployed, 2 (1.4%) were unemployed but physically able to work, while only one participant (10.7%) was unable to work due to health problem.

### *Monthly Income*

The sixth question assessed the monthly income and categorized into “less than \$500”, “\$500- 1,499\$”, “\$1,500-\$2,999”, and “more than \$3,000”. Slightly more than one third of the participants’ reported a monthly income of less than \$500 (n=52, 37.1%), and another one third (n= 45, 32.1%) reported a monthly income between \$500- \$1,499. Only 20 participants (14.3%) reported a monthly income between \$1500 and \$2,999, while 17 (12.1%) of them reported a monthly income more than \$3,000.

### *Health Insurance*

The next item of the questionnaire assessed the participants’ health insurance status. Of the 140 participants, the majority indicated having a health insurance coverage (n=115, 82.1%), while only 25 (17.9%) reported having none.

### Physiologic Characteristics of the Participants

#### *Body Mass Index (BMI)*

Under the category of the physiologic characteristics one item inquired about the BMI of the participants. The mean BMI was 29.46 (SD= 6.34) ranging between 17.33 and 56.8.

#### *A1C*

The ninth item inquired about the A1C levels of the participants. The mean A1C of the sample was 7.62% (SD= 1.49), ranging between 5.4% and 13%. The A1C levels were done within the past 3 months and retrieved from the patients’ lab reports they brought in for their clinical visit. The researcher retrieved the results from the patients’ medical records.

#### *Length of time diagnosed with Diabetes*

To assess for length of chronic disease, the choices were “less than five years”, “5-10 years”, “11-16 years” and “more than 17 years”. For the total sample, one third (n=48, 34.3%) was diagnosed with diabetes less than 5 years. Slightly less than one third of the participants (n= 38, 27.1%), had been diagnosed with diabetes 5-10 years. Almost equally

distributed are those diagnosed with diabetes more than 17 years (n= 29, 20.7%) and those diagnosed between 11 and 16 years of diabetes (n= 25, 17.9%).

#### *Family history of diabetes*

Another item of the questionnaire asked the participants to report the family history of diabetes. More than three quarters of the sample (n= 75.5) reported having a family member with diabetes mellitus, while 30 (21.4%) reported no family history of diabetes mellitus.

#### *Medication for Diabetes*

The twelfth item assessed whether or not the participants are prescribed medications for diabetes. Of the 140 participants, almost all (n=133, 95%) were put on medication and very few were not (n= 7, 5%).

#### *Type of Treatment*

The next item complemented the preceding one and inquired about the type of treatment received. The item was categorized into “Insulin”, “pills”, “both” and “no medication”. Three quarters of the total sample were on oral hypoglycemic (n=105, 75%). Of the 140 participants, 22 (15.7%) reported being on Insulin and oral hypoglycemic; 7(5 %) were not prescribed any medication and the smallest group of them (n=5, 3.6%) was prescribed insulin.

#### *Diabetes Education*

The fourteenth item assessed whether or not the participants received diabetes education from a health care professional (physician, nurse, or dietician). Most of them (n=125, 89.3%) reported receiving diabetes education while fourteen (10%) reported receiving none.

#### *Problems associated with Diabetes Mellitus*

The fifteenth item assessed the problems associated with diabetes mellitus. The choices were: “Low blood sugar (< 80 mg/dl)”, “High blood sugar (>300mg dl)”, “Heart

problems”, “Sexual difficulties”, “Nerve damage”, “Kidney problem”, “Retinopathy” and “None of the above”, such that the participants can indicate more than one problem experienced simultaneously, if applicable. As presented in Table 2, one half of the sample (n= 76, 54.3%) indicated not experiencing any problem associated with diabetes mellitus. Of the 140 participants, 27 (19.3%) reported having two or more problems, 13 (9.3%) having nerve damage, 9 (6.4%) having low blood sugar (< 80 mg/dl), 4 (2.9%) having retinopathy, 4 (2.9%) having sexual problems, 3 (2.1%) having high blood sugar (>300mg dl) and 2 (1.4%) having kidney problems

Table 2

*Problems Associated with Diabetes Mellitus*

	N	Percent
Associated Problems		
Low Blood Sugar (< 80 mg/dl)	9	6.4
High blood Sugars (> 300 mg/dl)	3	2.1
Heart Problems	2	1.4
Sexual Difficulties	4	2.9
Nerve Damage	13	9.3
Kidney Problems	2	1.4
Retinopathy	4	2.9
None of the Above	76	54.3
2 or More Problems Combined	27	19.3
Total	140	100.0

*Smoking status*

The final item of the participants’ information survey assessed the smoking status of the participants. Of the sample, 67 (47.9%) reported never smoked, 47 (33.6%) reported being current smokers and 24 (17.1%) of them quit smoking.

### *Descriptive Characteristics of the Instruments*

In this section, the descriptive analyses of the instruments used in the study are presented in Table 3.

#### *SDSCA-Ar*

In parallel with the scoring guidelines of the original SDSCA, the following mean scores were obtained of each subscale by averaging the standard scores (Score of the General Diet, Score of the specific Diet, Score of the exercise, score of blood sugar testing, score of foot care and score of medication adherence). The authors of the instrument (Toobert & Glasgow, 1994) justified that this computation will give equal weight to each item of the different subscales, regardless of the number of items present.

The first two questions related to general diet, measured adherence to a healthy dietary regimen consumed in the past week such that zero means health dietary regimen was not followed in the past week and a score of seven means that health dietary regimen was consumed all seven days out the week. The mean score of the general diet subscale was 4.186 days in the past week (SD= 2.81) ranging between 0 and 7days. The second subscale assessed specific dietary questions related to fruit and vegetables consumption and full fat dietary products consumed in the past week, whereby the responses on the latter item reflected inadequate adherence to a low-fat diabetes regimen. While doing data entry, the full fat dietary products' consumption was reverse coded, then scored accordingly The mean score of the specific diet subscale was 3.07days in the past week (SD= 1.92) ranging between 0 and 7 days. The mean score of the exercise subscale was 1.36 days in the past week (SD= 2.09) ranging between 0 and 7 days. The mean score of blood sugar testing was 2.496 days in the past week (SD= 2.48) ranging between 0 and 7 days. The lowest mean score of the SDSCA-Ar was the foot care with a mean of 1.18 days in the past week (SD= 2.11) ranging

between 0 and 7 days. On the other hand, the medication adherence scored the highest with mean of 6.58 days in the past week (SD= 1.62) ranging between 0 and 7 days.

### *Social Support Scale*

The second administered instrument was the social support scale divided into two sections: received support and support attitudes. The overall score of the instrument is 60 and the lowest is zero, combining the two subscales (each scoring the lowest zero and highest 30). On the received support, the mean score was 20.49 (SD= 6.620) ranging between 0 and 30. On the score of the support attitudes, the mean score was 19.24 (SD= 5.24) ranging between 0 and 27. The overall mean score of the social support scale was 39.69 (SD= 10.73) ranging between 0 and 57 (60 being highest score combining the received support and support attitudes).

### *PAID*

The third administered instrument was the PAID that measured emotional adjustment to diabetes regimen. The overall score of the tool is 100 and the lowest is zero. In order to allow for adequate interpretation with missing data obtained on PAID scale, mean substitution was used. In this method, it is assumed that a missing value for a participant on a given variable is estimated by the mean for the non-missing observations for that variable.

The average score for the respondents was 11.94 (SD= 10.42) with a minimum score of zero and a maximum score of 66.25. Scores of 50 and above indicates high emotional distress, “emotional burnout,” and mandates immediate intervention. Low extremely low score (0-10) with poor glycemic control indicates denial (Polonsky, et al., 1995; Welch, et al., 1997).

Table 3

*Descriptive Statistics of the Instruments*

	N	Mean	SD
<i>SDSCA-Ar</i>			
Score of the General Diet	140	4.18	2.81
Score of the Specific Diet	137	3.07	1.92
Score of the Exercise	140	1.36	2.09
Score of the Blood Sugar Testing	139	2.49	2.48
Score of the Foot Care	140	1.18	2.11
Score of the Social Support	134	39.68	10.7
PAID	140	11.94	10.42

## Reliability Analyses

The analyses of internal consistency reliability of the three instruments were computed. Cronbach's alpha coefficients were used for PAID (Arabic version) scale and Social Support Scale (Arabic version). Internal consistency for the SDSCA-Ar was established with inter-item correlations with significance at  $P < .05$ .

*SDSCA-Ar*

The SDSCA was translated to Arabic using back-translation method for the purpose of this study (Brislin, 1970; Cha, et al., 2007; Mason, 2005; Yu, Lee, & Woo, 2004) which coincides with the World Health Organization's guidelines for instrument translation (WHO, 2007). The SDSCA-Ar was pilot-tested with 15 participants who were diagnosed with DM type 2 for more than one year, do not suffer of any psychiatric illness and were able to read and write Arabic. The internal consistency was assessed using inter-item correlation as per the directions of the original scale. The SDSCA-Ar showed an acceptable internal consistency ranging between .432 and .925. The overall Cronbach's alpha was good ( $\alpha=.72$ ,  $N=15$ , 10 items excluding medication taking). The Cronbach's alpha was 0.87 for the two general diet items, 0.43 for the two specific diet items, 0.86 for the two exercise items, 0.92

for the two self-monitoring of blood glucose, and 0.76 on the two foot care items. Cronbach's alpha could not be conducted on the two items related to medication taking, because rarely did the participants take oral hypoglycemic and insulin simultaneously. Thus, the items were excluded from the reliability analysis.

In this study, the average inter-item correlation for the diet (4 items) was 0.32. The average inter-item correlation for the exercise (2 items) was 0.61. The average inter-item correlation for the Glucose testing was 0.79. The average inter-item correlation for the foot care (2 items) was 0.57. The reliability analysis of the medication subscale was eliminated, because the participants predominantly answered one of the two questions resulting in lack of variability among respondents. Rarely were participants prescribed both oral hypoglycemic and insulin simultaneously, which resulted in insufficient sample to perform reliability analysis on the medication subscale.

The authors of the SDSCA scale (Toobert & Glasgow, 1994) used average inter-item correlations to assess the internal consistency of the tool given the small number of items (2-4 items) in each subscale. According to the established psychometric studies of the SDSCA, the average of the diet subscale, exercise subscale, glucose testing, foot care were 0.59-0.74, 0.74- 0.78 and 0.38- 0.76 respectively. In the SDSCA studies, the medication subscale resulted in high ceiling effect and lack of variability in the respondents' answers. Thus, the medication subscale was eliminated in the consecutive studies. Yet, in the studies where medication subscale was used, inter-item correlations resulted in  $r = -0.05$  (Toobert et. al, 2000).

According to the present study, the reliability analyses were similar to the SDSCA scale reliability analysis, whereby most of the inter-item correlation was relatively high ( $r > 0.5$ ) as presented in Table 4.

Table 4

*Reliability of the SDSCA-Ar*

SDSCA	Inter-items Correlations ( <i>r</i> )	
	SDSCA-Ar	SDSCA Average Values
Diet (4 items)	0.32	0.59-0.74
Exercise (2 items)	0.61	0.74-0.78
Glucose Testing (2 items)	0.79	0.38-0.76
Foot Care (2 items)	0.57	0.24-0.30
Medication (1Item)	-	
Self care activities (11 Items)	0.42	

Reliability analysis of Medication subscale was not performed.

*Support Scale (Arabic)*

In the current study, Cronbach's alpha was 0.88 which is higher than the published instrument's alpha (Fitzgerald et. al., 1996) of 0.65 as shown in Table 5.

*PAID (Arabic)*

In the current study, Cronbach's alpha resulted in *r* of 0.91 which was close to published instrument's alpha of 0.90 as presented in Table 5.

Table 5

*Reliability Analyses of all Instruments Used (SDSCA-Ar, Social Support and PAID)*

Scales	Average Inter-item Correlation / Cronbach's Alpha ( $\alpha$ )	
	Current Scales' Values	Original Scales' Values
SDSCA-Ar/SDSCA		
Diet (4 items)	0.32	0.59-0.74
Exercise (2 items)	0.61	0.74-0.78
Glucose Testing (2 items)	0.79	0.38-0.76

Foot Care (2 items)	0.57	0.24-0.30
Medication (1Item)	-	
Self care activities (11 Items)	0.42	
Social Support (12 Items)	0.88	0.65
PAID ( 20 items)	0.913	0.90

### Predictive Validity

In order to compute the predictive validity of the three instruments (SDSCA-Ar, PAID scale-Arabic version and Social support scale- Arabic version), Pearson's correlation was used. The social support scale predicted A1C levels at  $p < 0.05$ ; thus there existed a weak positive prediction ( $r = 0.21$ ). The PAID scale predicted A1C levels at  $p < 0.05$ ; thus there exists a positive correlation ( $r = 0.179$ ). On the other hand, SDSCA subscales (Score of the general diet (2 items), Score of the specific diet (2 items), Score of the exercise (2 items), Score of blood sugar testing (2 items), score of foot care (2 items) and score of medication (2 items) did not predict A1C levels; thus there is no correlation between SDSCA subscales and A1C levels.

Hence, both Social Scale support and PAID instruments predicted glycemic control (A1C levels).

### *Research Questions and Associated Hypotheses*

The primary purpose of this study is to assess if there's an association among diabetes self-care, social support and psychological adjustment and glycemic control, measured by A1C levels in the Lebanese population. The secondary purposes of this study is to identify relationships, if any, between selected demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular

complications) are related to glycemic control (A1C levels). Finally, certain set of variables (self care, psychological adjustment, social support, demographic characteristics and physiologic characteristics) were examined to assess which ones among them are the strongest best predictors of glycemic control (A1C levels).

Research Question 1: Is there an inverse relationship between diabetes self care and glycemic control (A1C) in Lebanese diabetic adults?

Research Question 2: Is there a positive relationship between psychological adjustment in diabetes and glycemic control in Lebanese diabetic adults?

Research Question 3: Is there an inverse relationship between social support and glycemic control (A1C) in Lebanese diabetic adults?

Research Question 4: Are any demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) related to A1C levels?

Research Question 5: Which of the variables assessed in this study (self care, psychological adjustment, social support, demographic characteristics and physiologic characteristics) best predict A1C levels?

Hypothesis I: There will be a statistically significant negative relationship between diabetes self-care and glycemic control (A1C levels).

Hypothesis II: There will be a statistically significant positive relationship between psychological adjustment in diabetes and glycemic control (A1C levels).

Hypothesis III: There will be a statistically significant negative relationship between social support in diabetes and glycemic control (A1C levels).

Hypothesis IV: A certain set of demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of

diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) are related to glycemic control (A1C levels).

### *Analysis of Data*

Mixed Models Theory was used as the test statistic and adapted thoroughly through proposed research questions and their associated hypothesis. Mixed methods contain Fixed and Random effects. Fixed effects are variables for which the only levels considered are kept in coding of those effects. Random effects are variables for which the only levels considered are kept in coding of those factors that are a random sample of the total number of levels in the population for that factor.

Random effect was allocated to the center where participants were recruited from. Center 1 was coded for University Medical Center-Rizk Hospital and center 2 was coded for American University of Beirut Medical Center, thus taking into account for correlation of observations within each clinic. Fixed variables are the covariates (set of demographic and physiologic variables) that are thought to be statistically significant in predicting A1C levels. Thus, the integration of covariates was used for predicting the statistically significant variables in the variance of A1C levels. In this sense, mixed models provide the accurate standard errors for random or fixed effects.

### *Research Question 1*

Research Question 1- Is there an inverse relationship between diabetes self care and glycemic control (A1C) in Lebanese diabetic adults?

Hypothesis I - There will be a statistically significant negative relationship between diabetes self-care and glycemic control (A1C levels).

In order to fulfill the purpose of the hypothesis, Mixed model with random effect for center for testing the statistically significant relationships at  $p < 0.05$  between the SDSCA subscales (independent variables) and the glycemic control (dependent variable). SDSCA

subscales are composed of specific diet (SD), general diet (GD), exercise, self-monitoring of blood sugars, and foot care.

According to the results, the hypothesis was not supported at  $p < 0.05$ ; i.e., there was no statistically significant relationship between SDSCA subscales and glycemic control (A1C).

Table 6

*Mixed model presenting unadjusted univariate analysis SDSCA subscales (SD, GD, Foot, exercise, Sugar) with center as random effect*

SDSCA subscales	B	SE	P-value
General Diet	-0.06	0.04	0.18
Specific Diet	-0.004	0.06	0.94
Exercise	0.05	0.06	0.36
Self-monitoring of Blood Sugar	0.04	0.05	0.42
Foot Care	0.019	0.05	0.74

Another method of analysis was used for the purpose of this research question, whereby the SDSCA subscales were transformed into categories. The author of instrument was contacted for that purpose and suggested presenting both results having used SDSCA as continuous scores as previously presented and as categories as follow. By categorizing SDSCA subscores into categories, non-linear relations with A1C levels were detected as opposed to using continuous scores only. Fitting mixed models with a random effect for center, the effect of each subscale as a continuous variable was not significant. However, when each subscale dichotomized or split into three groups, the effect turned statistically significant for some of them. Thus, SDSCA subscales were categorized by using the median as the cut-off based on the frequency distribution of the participants' responses, such that SD was categorized into two groups ( 0-3.5 days and >3.5days), GD was categorized into two

groups (0-3 days and more than 3 days), exercise was categorized into two groups (0-3 days and >3 days), self- monitoring of blood sugars was categorized into three groups (0 days, >0-3days and > 3days) and foot care was categorized into two categories (0 days and more than 1 day). Several trials in terms of categorizing SDSCA subscales were attempted, such as choosing the median or mean as the cut-off point that yielded same results. Thus, cut-off points were used based on frequency distribution of responses.

Table 7

*Mixed model presenting unadjusted univariate analysis SDSCA subscales (SD, GD, Foot, exercise, Sugar) in categories with center as random effect*

SDSCA sub-scales	Beta	SE	P-value
<b>Specific Diet</b>			
0-3.5 days	0.65	0.28	0.02
>3.5-7 days	0(reference)	0	.
<b>General Diet</b>			
0-3 days	0.51	0.26	0.057
>3days	0 (ref)		
<b>Self-Monitoring Blood Sugar</b>			
0 days	-0.26	0.31	0.41
>0-3days	-0.24	0.30	0.43
>3days	0	0	.
<b>Exercise</b>			
0-3days	-0.15	0.30	0.61
>3days	ref		
<b>Foot Care</b>			
0 days	-0.33	0.27	0.23
At least once/week	(ref)		

Patients with Specific diet (SD) value score as low had on average A1C value that were 0.66 points higher than patients with SD value score categorized as high (beta= 0.66 SE=0.29, p-value=0.02). This difference was statistically significant which supported the research hypothesis in one aspect by having a positive association between specific diet and

A1C levels. Since this item was reverse coded, then interpretation needs to be reversed as well, implying that patients who consumed diet rich in full fats on an average of 3.5 days and more had higher A1C levels than consuming it less than 3.5 days per week. Other SDSCA subscales did not demonstrate a statistically significant relationship with A1C levels as hypothesized.

### *Research Question 2*

Research Question 2- Is there a positive relationship between psychological adjustment in diabetes and glycemic control in Lebanese diabetic adults?

Hypothesis II - There will be a statistically significant positive relationship between psychological adjustment in diabetes and glycemic control (A1C levels).

In order to fulfill the purpose of the hypothesis, Mixed model with random effect for center for testing the statistically significant relationships at  $p < 0.05$  between the PAID scale (independent variables) and the glycemic control (dependent variable).

The research hypothesis supported at  $p < 0.05$ , i.e., there was a positive but weak significant association between the A1C level and the PAID, whereby for every unit increase in PAID, the A1C score increase by 0.025 ( $B = 0.02$ ,  $SE = 0.01$ ,  $P\text{-value} = 0.036$ ).

### *Research Question 3*

Research Question 3: What is the relationship between social support and glycemic control (A1C levels) in Lebanese diabetic adults?

Hypothesis 3: There will be a statistically significant negative relationship between social support in diabetes and glycemic control (A1C levels).

In order to fulfill the purpose of the hypothesis, Mixed model with random effect for center for testing the statistically significant relationships at  $p < 0.05$  between the Social Support scale (independent variables) and the glycemic control (dependent variable).

The research hypothesis was not supported, i.e., while there are significant results, they are not in the directed hypothesized but rather in the opposite direction. For every unit increase in SS, the A1C score increase by 0.02 (B= 0.02, SE= 0.01, p-value=0.01).

#### *Research Question 4*

Research Question 4- Are any demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) related to glycemic control (A1C levels)?

Hypothesis 4- A certain set of demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) are related to glycemic control (A1C levels).

In order to fulfill the purpose of the hypothesis, Mixed Model theory with random effect for center was implemented to test the relationship between the independent variables (age, health insurance, marital status, years of education, employment status, monthly income, BMI, years of DM, family history, medication, type of treatment, received diabetes education) and the dependent variable (glycemic control). For the purpose of analysis, years of DM and type of treatment were collapsed into 2 categories, because of lack of variability in the all the categories of the examined variables. Years of Diabetes was re-categorized into “less than 10 years” and “more than 10 years” and type of treatment into “insulin” and “no insulin”.

Age, gender, type of treatment, presence of microvascular or macrovascular complications and BMI demonstrated a statistically significant relationship with the glycemic control (A1C levels). Other variables, namely education, income, presence of medical insurance, duration of diabetes, BMI, and diabetes education, were not significant

*Age:* Mixed model was used to detect the relationship between age categories and A1C. There is a statistically significant relationship between age and the A1C level at  $p < 0.05$ . For the purpose of this analysis, age was re-grouped into two categories (49 years or less and 50 years and more) as there were few respondents in some categories and was entered as a continuous variable as well. In this sense, age demonstrated a stronger association with A1C and when entered as a covariates variable later on. Patients who were 49 years and less had 1.36 % higher of A1C levels than those who are 50 years and more (beta= 1.36, SE=0.35,  $p = 0.000$ ).

*Gender:* Mixed model was used to detect the relationship between gender and A1C. There is a statistically significant difference in A1C levels between males and females. Male patients had a statistically significant higher A1C levels (beta= 0.53, SE= 0.25,  $p = 0.037$ ) than female patients.

*Type of treatment:* Mixed model was used to detect the relationship between type of treatment and A1C. For the purpose of this analysis, the categories under type of treatment (Insulin, pills, insulin and pills, no medication) were re-categorized into two variables; Insulin, (consisting of “pills and insulin” and “insulin”) and no insulin consisting of (“pills” and “no medications”), since there was low frequencies of certain categories that contributed to low variability. There was a statistically significant difference between type of treatment and A1C levels at  $p < 0.05$ , whereby participants on “insulin” had an average A1C of 0.99 higher than those who are not (beta= 0.99, SE= 0.31,  $P = 0.002$ ).

*Problems associated with DM:* Mixed model was used to detect the relationship between problems associates with DM and A1C that resulted in statistically significant difference at  $p < 0.05$ . For the purpose of this analysis, the categories under problems associated with DM were re-categorized into two variables; no problem and at least one problem, since there were low frequencies of certain categories that contributed to low

variability. Patients with no problems associated with DM had 1.006 less values of A1C levels than patients who had at least one problem (beta= -1.006, SE= 0.24, p= 0.00).

*BMI*: Mixed model was used to detect the relationship between problems associated with DM and A1C that resulted in statistically significant difference at  $p < 0.05$ . BMI demonstrated a statistically significant positive relationship with A1C in the positive direction such that for every unit increase in BMI, the A1C score increase by 0.04 (beta= 0.04, SE= 0.02. p= 0.033).

In summary, hypothesis 4 is supported with respect to having statistically significant differences in means at  $p < 0.05$  between the independent variables, namely, age, gender, type of treatment, problems associated with diabetes and BMI and the dependent variable, glycemic control (A1C).

Table 10

*Model of Univariate analysis of select variables of demographic and physiologic characteristics with A1C*

variables	Beta	SE	P-value
<b>Age</b>			
49 years and less	1.36	0.35	0
50 years and more	0a	0	.
<b>Gender</b>			
Male	0.53	0.25	0.03
Female	(ref)		
<b>Education</b>			
<10 yrs	-0.30	0.30	0.31
11-14 yrs	0.035	0.37	0.92
≥15 yrs	(ref)		
<b>Employment</b>			
employed	-0.39	0.25	0.118
Not employed	(ref)		
<b>Income</b>			
<\$500	0.17	0.32	0.60
\$500-\$1499	0.30	0.33	0.35
>\$1500	(ref)		

Health Insurance			
yes	0.36	0.32	0.27
No	(ref)		
DM complications			
no problems	-1.00	0.24	0
one problems	0a	0	.
2 or more combined	(ref)		
Years with DM			
>10 yrs of DM	0.40	0.25	0.12
<10 yrs of DM	(ref)		
Family history			
yes	0.46	0.30	0.12
no	(ref)		
Treatment			
Insulin	0.99	0.31	0.002
No insulin	(ref)		
Education			
yes	0.22	0.41	0.59
no	(ref)		
Smoking			
still smoking	0.24	0.28	0.40
quit smoking	0.01	0.36	0.96
never smoked	(ref)		
	0.04	0.01	0.03
BMI			

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#### *Research Question 5*

Research Question 5 - Which of the variables assessed in this study (self care, psychological adjustment, social support, demographic characteristics and physiologic characteristics) best predict A1C levels?

There was no associated hypothesis for Research Question 5 as the literature fails to document significant predictors of A1C in the Lebanese population. The variables aforementioned (age, gender, type of treatment, and problems associated with diabetes, SDSCA subscales, PAID scale and Social Support scale) were analyzed separately in an adjusted univariate model along with covariates (age, gender, BMI, problems associated with

DM, and Treatment) keeping random effect for center. None of the previously significant variables (social support, Aid and specific diet of SDSCA) showed statistical significance as with unadjusted univariate model. However, when both scales, social support and PAID, were treated like SDSCA subscales and categorized depending on the frequency distribution of responses, statistically significant association with A1C was revealed. Social support scale was categorized into two groups (0-42 and 43 and more). Results revealed that patients with lower social support will demonstrate -0.53 points lower on A1C levels (Beta= -.54, SE= 0.24, p= 0.028). Similarly, the case was with PAID scores.

Table 11

*Model of Adjusted Univariate analysis of select variables of demographic and physiologic characteristics with A1C*

	B	SE	P-value
General Diet			
0-3 days	0.48	0.23	0.03
>3days			
Gender			
Males	-0.70	0.21	0.002
Age			
≤ 49 years	-1.30	0.32	0
Treatment			
Insulin	-0.69	0.28	0.01
BMI	0.04	0.01	0.02
DM complications			
no problems	-0.66	0.23	0.005
One Problem	0a	0	.
Specific diet			
0-3.5 days	0.46	0.25	0.07
>3.5-7 days			
GENDER			
Males	-0.76	0.22	0.00
≤ 49 years	-1.36	0.32	0
Treatment			
Insulin	-0.63	0.29	0.03
BMI	0.04	0.01	0.01
DM complications			
No Problem	-0.53	0.23	0.02
≥1 problem	0a	0	.

Exercise			
0-3days	-0.21	0.26	0.40
>3days	0a	0	.
Gender			
Males	-0.66	0.22	0.003
≤49years	-1.42	0.32	0
No Insulin	-0.70	0.28	0.01
BMI	0.04	0.01	0.01
DM complications			
No problems	-0.61	0.23	0.01
≥1problem	0	0	.
Self-Monitoring blood			
Sugars			
0 days	0.36	0.29	0.21
>0-3days	0.41	0.28	0.14
>3days	0a	0	.
Males	-0.68	0.22	0.003
≤49years	-1.42	0.31	0
No insulin	-0.87	0.30	0.004
BMI	0.04	0.01	0.008
DM complications			
no problems	-0.69	0.23	0.004
One Problem	0	0	.
Foot Care			
0 days	0.01	0.26	0.96
At least once/week			
Males	-0.67	0.22	0.003
age2gp	-1.40	0.32	0
No insulin	-0.71	0.29	0.015
BMI	0.04	0.01	0.022
DM complications			
No Problems	-0.62	0.25	0.016
≥1 problem	0	0	.
Social Support Scores			
0-42	-0.53	0.24	0.028
>43			
Males	-0.69	0.22	0.002
<49 years	-1.09	0.33	0.001
No Insulin	-0.65	0.29	0.025
BMI	0.04	0.01	0.014
No problems	-0.34	0.24	0.16

>1problem	0	0	
PAID Scores			
0-12	-0.50	0.25	0.048
≥12	0	0	
Males	-0.68	0.21	0
≤49years	-1.30	0.32	0.002
No insulin	-0.68	0.28	0
BMI	0.03	0.01	0.019
No Problems of DM	-0.49	0.24	0.03
>1problem	0	0	0.041
Social Support (Not categorized)			
	0.01	0.01	0.321
Gender	-0.73	0.22	0.001
≤49years	-1.20	0.33	0
Treatment	-0.65	0.29	0.028
BMI	0.04	0.01	0.011
No problems of DM	-0.45	0.24	0.065
1 problem of DM	0	0	.
PAID (not categorized)			
	0.01	0.01	0.325
Gender	-0.71	0.22	0.002
≤49years	-1.32	0.33	0
Treatment	-0.69	0.29	0.019
BMI	0.04	0.01	0.022
No Problems of DM	-0.58	0.23	0.015
> 1 problem	0	0	.

The results above should be broken down into a few tables.

### *Summary of Findings*

SDSCA subscales did not demonstrate a statistically significant relationship with A1C levels. Nonetheless, when alternate approach was used, Specific Diet was the only subscale that was statistically associated with A1C levels. Research question 1 was not supported using the original method of analysis yet partially supported with the alternate approach. There were statistically significant relationships between PAID scores and glycemic control, thereby supporting Research questions 2 and its corresponding hypothesis. Social support scores was significantly associated with glycemic control, yet in a positive direction as opposed to having negative significant relationship stated in research question 3 and its

corresponding hypothesis. Age, Gender, type of treatment, problems associated with DM and BMI demonstrated statistical significant relationship with glycemic control, thereby supporting some of the demographic and physiologic variables identified to be examined in research question 4 and its related hypothesis. As for research question 5, the aforementioned variables of demographics and physiologic characteristics that demonstrated significance with glycemic levels were integrated as covariates in the adjusted and unadjusted univariate mixed models with random effect for center. With the adjusted univariate, i.e. integration of covariates, social support, specific diet and PAID, the statistical significant association with A1C levels was no longer demonstrated. Nonetheless, when social support and PAID were categorized, the statistically significant relationship with A1C levels was preserved.

Internal consistency was demonstrated in the PAID, Social support and SDSCA-Ar, sub-scales (general diet, specific diet, exercise, foot care, glucose self-monitoring). Medication taking subscale did not have the acceptable requirements to perform reliability analysis. As for the predictive validity, PAID and Social support predicted A1C subscales.

The next chapter will discuss the findings, conclusion and implications for clinical practice and future research.

## CHAPTER 5

### FINDINGS, CONCLUSIONS, and IMPLICATIONS

#### *Introduction*

This chapter presents the discussion, conclusion, and implications of the study in light of the adapted Self-Efficacy Theory as the conceptual framework and the supporting literature. Findings will be discussed in reference to the proposed research questions and their associated hypotheses. Further discussion will elaborate on implications for nursing practice and recommendations for future research to contribute to the body of knowledge in diabetes self-care practices among Lebanese patients.

#### *Summary of Study*

This correlational study was designed to assess the nature of the relationship between diabetes self-care and glycemic control, between psychological status and glycemic control and between social support and glycemic control. It was hypothesized that the existence of the three independent variables, separately and collectively, would predict the value of glycemic control in the Lebanese population with diabetes mellitus. In brief, individuals with low diabetes self care, high emotional arousal and low social support are more likely to have poor glycemic control. Additionally, the results of the diabetes self care, emotional status and social support were analyzed from the lens of demographic and physical characteristics in relation to glycemic control.

The guided framework of this study was based on the conceptualization of Self-Efficacy Theory (Bandura, 1977, 1982, 1997) incorporating the concepts of diabetes self-care (Toobert & Glasgow, 1994), psychological adjustment to diabetes (Polonsky et al., 1995) and social support (Fitzgerald, et al., 1996) in achieving the desired behavior as measured by glycemic control (A1C levels). Self-efficacy theory emphasizes that those with high perception of carrying out a certain behavior (conceptualized in this study as diabetes self-

care), along with affectionate status associated with performing the task of interest (conceptualized as psychological adjustment to diabetes) and the presence of supportive environment (conceptualized as social support) are factors that influence the desired outcome (controlled glycemic levels).

None of the published studies to date on the Lebanese with DM assessed significant factors such as diabetes self-care, psychological adjustment and social support that have been associated with better glycemic control in the Western literature. The examined research questions about DM self-care, psychological status and social support in relation to glycemic control were as follows:

Research Question 1: What is the relationship between diabetes self care and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 2: What is the relationship between psychological adjustment in diabetes self-care and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 3: What is the relationship between social support and glycemic control (A1C levels) in Lebanese diabetic adults?

Research Question 4: Are any demographic characteristics (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular or macrovascular complications) related to glycemic control (A1C levels)?

Research Question 5: Which of the variables assessed in this study (self care, psychological adjustment, social support, demographic characteristics and physiologic characteristics) best predict A1C levels?

The sample consisted of 140 adults (above 18 years), diagnosed with DM for at least one year, who could read and write Arabic and had no psychiatric illnesses. IRB Approval from Northeastern University was obtained from the targeted diabetes clinics to allow for the

recruitment of eligible participants. The researcher interviewed participants to fill the questionnaires/tools and obtained their A1C levels recorded in the last three months in their medical records. A signed consent form was obtained prior to the participants' enrollment in the current study.

### *Findings*

#### *Demographic Characteristics*

With the absence of recent published data on the Lebanese demographics and more precisely the lack of DM based data, the results of this study were compared to a nationally representative report conducted by the American University of Beirut in collaboration with the World health Organization (SIBAI & HWALLA, 2010) for demographic and physiologic characteristics of the patients with DM.

The nationally representative sample consisted of 1982 participants, whereby the majority of the sample were between 25-34 years (35.7%) with lower representation of the other age groups as follows; 35-44; n= 575 (29%), 45-54; n= 414 (20.9%) and 55-64; n= 286 (14.4%) .

The majority of participants were married (n=1399, 70.6%), followed by separated (n= 466, 23.5%) and minor representations of the other categories. The highest level of education completed was a high school degree (n= 543, 27.4%) with a lesser representation as follows; 539 completed complementary school (27.2%), 443 completed university education (22.4%), 285 completed primary school (14.4%), 71 completed post graduate degree (3.6%) and with minor representation of less than primary school and no formal schooling achieved. The majority of the sample were unemployed (n= 860, 43.4%) and the rest were employed either by the private economic sector (n=443, 22.4%), by the public sector (n=170, 8.6%) or self-employed (n=503, 25.4%).

In this study, most participants were between 50 and 59 years (n= 52, 37.1%), predominantly women (n=80, 57%), married (n=102, 72.9%), had less than 10 years of education (n= 71, 50.7%), were fully employed (n= 48, 34.3%), and earned less than \$500 per month (n=52, 37.1%), yet had medical insurance (n=115, 82.1%).

### *Physiologic Characteristics*

Physiologic characteristics of the participants were assessed. The majority of the participants never smoked (n=67, 47.9%). They were mainly overweight according to the BMI calculated ( $\bar{x} = 29.47$ ,  $SD= 6.34$ ). The glycemic status was uncontrolled ( $\bar{x} = 7.62\%$ ,  $SD=1.49$ ) as per the guidelines of the American Diabetes Association that mandates a glycemic control of  $A1C \leq 6.5\%$ . Unfortunately, the highest average of A1C (11.2%) was among 30-39 age group, yet those between 50 and 59 had the highest prevalence of DM (n= 53,  $A1C= 7.4\%$ ,  $SD=1.2$ ). The majority of the participants had DM less than 10 years (n=86, 61.4%) and more than three quarters had a family history of DM. Substantially, they were prescribed medications (n= 133, 95%), mainly oral hypoglycemic agents (n= 113, 80.7%).

Predominantly, participants reported receiving DM education from a health care worker (n= 125, 89.3%), and not experiencing complications related to DM (n=76, 54.3%). The fact that half of the study participants did not report any complication related to DM is to be expected, since most were diagnosed with DM for less than five years, a time period not sufficient enough to develop complications. Complications associated with DM demonstrated a statistically significant association with A1C levels, whereby patients with less DM complications had with lower A1C levels. This result support the value of using A1C values as a good assessment of diabetes control and those with higher levels are more likely to develop complications.

Nevertheless, having A1C of 7% in the youngest participants (between 18 and 29) is detrimental as the literature documents that the earlier the onset of DM, the more likely the

participants will experience the complications of DM (Thomas, Elliot, & Naughton, 2009). This finding is quite alarming for health care practitioners, since this reflects lack of proper diabetes self-care, lack of control or lack of awareness on the hazardous consequences resulting from improper glycemic control (Goudswaard, Stolk, Zuithoff, & Rutten, 2004; WALLACE & MATTHEWS, 2000).

These results are comparable in some aspects to the nationally representative report published recently (SIBAI & HWALLA, 2010). For example, in the national study the majority of the participants never smoked (n=1119, 56%) and the rest were current smokers (n=862, 38.5%). Of the 1982 participants diagnosed with DM, around 20 participants between ages 25-34 were, 56 between 35-44 yrs, 168 were 45-55 yrs and 402 were 55-64. These findings were in line with the current research findings revealing the prevalence of DM at an early age and increases as the participants' age. Also the participants were substantially overweight, their BMI ranged between 25 and 29.9 (n= 85%) and reported having a family history of DM (n= 1056, 53.3%) with the second largest cohort having a family history of cardiac disease. Similarly, most of the participants diagnosed with DM were prescribed oral hypoglycemic medications (n= 113, 7.7%) and the rest received Insulin as part of their DM regimen (n=109, 7.3%). However, in the nationally representative study, more males were diabetic (n=893, 7.2%) compared to females (n=1089, 4.8%). This is inconsistent with the current study since the majority of the sample was female. The current study is not a nationally representative study. Also, the study investigated extensively DM education given to participants that was quite substantial covering all DM related tasks. Results will be discussed later in this chapter.

#### *DM Self-care Practices, Social Support and Emotional Adjustment*

On the general diet subscale of the SDSCA, the participants consumed a healthy diet an average of 4 days per week, had 5 portions per day of fruit and vegetables and full fat

products (mainly dietary and red meat) on an average of 3 days per week. Participants were not engaged sufficiently in exercise, whereby 30 minutes workout sessions were practiced an average of 1.4 days per week. Participants tested their blood sugar levels around 2.5 days per week. The lowest score attained on SDSCA-AR was the foot care subscale, whereby participants examined their feet on an average of 1 day per week. On the other hand, participants strongly adhered to their medication regimen (average of 6.58 days per week).

Regarding the Social Support scale, the score was relatively high which indicated high social support received by the participants. Precisely, the average subscore of received support was 20.49 out of 30 and the average subscore of support attitudes was 19.24 out of 30, thereby making the overall score of the Social Support 39.69. The score of the Social Support is reported in the literature as a cumulative score and not broken down into the subscales. It is worth mentioning the sub-score of each subscale so as to highlight the participants' perceptions on social support, which confirms the equivalence between the factual social support received in terms of carrying out diabetes self-care tasks and the perceptual attitudes towards social support in the DM context. The third administered instrument was PAID that measured emotional adjustment to diabetes regimen. This instrument is scored on a scale of 0 to 100 such that a cut-off point of 50 and above indicates burnout related to diabetes illness. Scores below 50 with uncontrolled A1C levels indicates denial. The average score attained by the sample was 11.94, which is interpreted as denial of accepting DM as a major illness that requires careful adherence to regimen from the participants.

The three instruments aforementioned were subject to reliability analyses. The SDSCA-Arabic inter-item correlations were similar to the SDSCA original scale thereby, confirming relatively good psychometric properties. Similarly, Social Support Scale and PAID reliability analyses revealed similar reliability analyses compared to the original scales.

It can be inferred that the three instruments used resulted in acceptable to high reliability analysis which reflected the stability of the instruments used.

### *Conclusions*

It is well documented in the literature the adaptation of Self-Efficacy Model as the conceptual framework for tailoring Diabetes Self-Management Programs. This paradigm conceptualizes the interdependency of many concepts on optimizing glycemic outcomes in patients with DM. First, the patient needs to have a strong understanding of diabetes regimen as the tasks required are perplexing and demand strong follow-up on the part of the patients as to prevent hazardous complications, mainly hypoglycemic events. Because these tasks are complicated, patients might be overwhelmed with handling them and managing resultant complications simultaneously. That said, they might develop a range of negative affections, such as fear, anger, frustration or even denial. Thus, emotional adjustment to DM management is an essential element for better controlling glycemic levels. Another essential aspect that is taken into account is the social support. The patients need to be supported by their health care providers and their significant others in their social network. The integration of all of these factors is thought to maximize glycemic levels.

### *Diabetes Self-Care*

The main purpose of this study was to examine the relationship between diabetes self-care and glycemic control among the Lebanese population with type 2 DM. It was hypothesized that there would be a statistically significant inverse relationship between diabetes self-care (measured by SDSCA-Ar) and glycemic control (A1C levels). The variations in scores on the subscales were expected because, consistent with the literature, adapting self-care in one area does not imply automatically the same level of self-care in the other areas (R. Glasgow et al., 2002; R. E. Glasgow, McCaul, K. D., Schafer, L. C., 1987). Findings in this study did not support the research hypothesis. None of the subscales of the

SDSCA-Ar (General diet, specific diet, blood glucose self-testing, exercise and foot care) revealed statistically significant relationship with Glycemic control. Another analysis was implemented whereby the scores of SDSCA-Ar were categorized to better represent the distribution of values. With this analytic approach, the Specific Diet subscale demonstrated statistically significant relationship with A1C levels, whereby participants who consumed unhealthy diet (full fat food such dairy products and red meat) less than 3.5 days per week were more likely to have lower A1C than those who consumed them all over the week. This particular finding is quite significant since it reflects the existing relationship between unhealthy diet consumed and glycemic levels; i.e. inadequate adherence to the healthy diet will result in uncontrolled A1C levels. This method of categorizing the subscales instead of using the continuous scores for reporting results has not been performed in any published report. The author of the instrument was consulted regarding categorizing the subscales of the instrument and did not totally disapprove on the method yet pinpointed that categorizing the subscales might not be the ideal way of reporting the results of SDSCA subscales. Toobert and colleagues (2000) argued that successful diabetes self-care cannot be measured strictly through the use of measures of glycemic control. Other significant factors that can be associated with poorer glycemic control are co-morbidities, aggressiveness of the regimen, genetic predisposition, social support, hormonal changes, economic factors, and response to stressors (Glasgow, 1999; Johnson, 1996). Physiologic parameters measured by A1C are often not strongly related to what might be considered the ultimate diabetic outcomes of patient functioning and quality of life.

From another perspective, SDSCA original instrument did not reveal strong relationships with glycemic control in descriptive correlational studies for the above explained reasons. For this reason, interventional studies using SDSCA and glycemic control, might best examine relationships as causality will be determined, which is a stronger

association than just looking at existence of relationship solely. This raises a point for consideration. It is conceivable that, since there are no published interventional studies on diabetes self-care and glycemic control in Lebanon, it was best thought to embark on examining the existence of a relationship before hand as a building block for more advanced research designs. Moreover, medication subscale was eliminated from the studies using SDSCA instrument because of its resulting high ceiling effect in interventional studies. In the same vein, medication subscale was kept for the purpose of this study to examine to the adherence of the participants to medication adherence which resulted in high adherence rates.

Since the SDSCA was translated to Arabic for the first time, there are no published studies on diabetes self-care in the Arabic region using SDSCA. Nonetheless, some studies examined certain aspects of diabetes self-care. In the nationally representative study of DM and other chronic diseases conducted in Lebanon (SIBAI & HWALLA, 2010), foot care was examined among diabetic patients. Results revealed that among those previously diagnosed with DM, almost one third performed foot care (n=113, 38.1%). Similarly, foot care was low in this study. Participants who performed foot care or were cognizant of the task, had a family history of foot amputations due to DM complications and articulated the fear of ending up with this particular complication which was acted as a pending threat to perform foot care.

The level of diabetes self-care was consistent with a study conducted in Jordan (Khattab, Khader, Al-Khawaldeh, & Ajlouni, 2010). In an attempt to assess the factors associated with poor glycemic control in patients with type 2 DM, the authors found that almost 81.4% of the DM patients did not adhere to the recommended diet regimen, two thirds did not engage in any kind of physical activity and 38.1% self-monitored their blood sugars. Nonetheless, the majority of the participants (92%) adhered to their medication regimen.

### *Social Support*

The second hypothesis in this study predicted a statistically significant negative relationship between social support and glycemic control. The hypothesis was not supported in the hypothesized direction. On the contrary, Social Support demonstrated a statistically significant positive association with A1C levels in the unadjusted univariate model. The literature documents the importance of social support in the context of chronic illnesses. For example, Khattab et al (2010) noted that the majority of diabetic patients had family support. Nonetheless, when covariates (age, gender, BMI, Type of treatment and DM complications) were controlled for, the relationship was no longer statistically significant (Khattab et al., 2010). It is worth mentioning that when Social Support was categorized into two categories (low scores and high scores); the scale demonstrated a statistically significant relationship with the covariates aforementioned. Thus Social Support scale demonstrated a positive association with A1C levels when used as a continuous score in the unadjusted univariate model and when converted into two categories in the adjusted univariate model as well. During interviews, the participants frequently verbalized that their families, spouses, children or any other significant other in their social network supported them in their self-care, glycemic control and nutrition and were encouraged to sustain healthy practices in the DM context broadly

Participants articulated almost constantly that although they had the proper support, they never listened to what their significant others encouraged or supported them to do. Participants again assured the researcher that if they had followed what they were told to do, they wouldn't have had uncontrolled glycemic levels or would not have developed DM related complications. Furthermore, participants also mentioned that the worse their glycemic levels are, the more attention they got from their significant others. This point was highly elucidated in the support attitudes subscale of the social support instrument that assessed the level to which the participants perceived being well followed up on their DM status, being

attentive to their feelings, and being accepted for having DM. Previous studies did not report the score of each subscale of the Social Support instrument separately. It was deemed crucial to highlight in this study the high score obtained in each subscale as to shed the light on the informal/unstructured comments articulated by the participants during their interviews on the social support experienced in the context of DM.

Participants persistently revealed fatalistic justifications of their sickness, mainly saying that it is God's will and they have to accept this illness, because they cannot do anything about it. A qualitative study conducted by Doumit and colleagues (2010) assessed the coping strategies adopted by Lebanese women with breast cancer. Surprisingly, the interviewed women compared cancer to DM in terms of complexity and chronicity. Some of the participants thought that cancer is easier than DM, because they do not have to restrict themselves to certain diet and medication regimen as in DM and that the consequences of DM are worse than cancer. Others believed that cancer might not be as scary and fatal as DM. It has not been reported in the literature the comparison done between a hazardous and possibly fatal disease like cancer and DM, which has a better prognosis and is not as dysfunctional. The researcher strongly believes that this crucial finding highlights that Lebanese diabetic patients may perceive their disease to be worse than cancer and become fatalistic.

Another qualitative study (Halabi, 1997) studied women's experience and management of DM while living in a refugee camp. In addition to highlighting their lack of control over DM, these women alluded to their Islamic beliefs as a way to deal with DM. Their faith in God, family and children were highlighted as the surviving elements of their lives and possible coping strategies to survive the hardship of DM. These two qualitative studies strongly highlight the perception of DM as a dysfunctional and uncontrollable illness, such that patients with DM get more attention and thus more social support to survive the

illness. The lack of control over one's life and complete reliance on God and social support to cope with DM fairly justifies the positive relationship between social support and glycemic levels.

Another qualitative study by Egede and Bonadonna (2003) explored the construct of fatalism in adults with type 2 diabetes. The themes emerged from the transcribed interviews that participants felt powerless, hopeless and this response was associated with diabetes self-care.

It can be concluded from this finding that the Lebanese culture does not believe in preventive medicine that screens for the disease occurrence at early stages or pursue close follow up on the disease progression. Hence, when the disease occurs, the Lebanese patients would allude to the fatalistic approach as an explanation for the disease occurrence. In that sense, when the clinical manifestations of the disease erupt or escalate, they get more attention from their social network as they are perceived as helpless and powerless, whereby nothing much can ameliorate the situation and hence social support is needed by their significant others.

### *Psychological Adjustment*

The third research hypothesis predicted a statistically significant positive relationship between emotional adjustment and glycemic control. The findings of this study supported the research hypothesis; thereby there was a statistically significant positive relationship between PAID and A1C levels. Nonetheless, when covariates (age, gender, BMI, Type of treatment and DM complications) were controlled for using the mixed model approach, the relationship was no longer statistically significant. It is also worth noting that when PAID was categorized into two categories (low scores and high scores), PAID demonstrated a statistically significant relationship with the covariates aforementioned. The PAID scale measures the negative emotions associated with DM management, such that high scores, above 50 indicate

burn out, frustration or anxiety and low scores indicate lack of negative emotions if the Glycemic level is within normal range or denial if the glycemic level was uncontrolled ( $\geq 6.5\%$ ). In this study, the mean score of PAID was 11.94, which infers that the participants were in denial phase given the uncontrolled A1C levels with an average of 7.5%.

Conceptually, this finding further confirms the phenomenon of denial and lack of control of the participants' DM regimen. As previously pinpointed, participants relied on God to cope with their illness, which indicates total loss of one's responsibility towards managing his own DM and denying the significance of being pro-active in handling one's own illness. For this reason, participants were substantially passive and in rejection of their current situation. A study done in United Arab Emirates (Sulaiman, Hamdan, Tamim, Mahmood, & Young, 2010), explored the effect of psychological distress and its correlation with diabetes self-care. The authors stressed the high stigmatization in the culture of reporting mental or psychological problems. Thus, participants believed in God's will as dictating one's life and events, whereby they refer to His will and accept it passively, disregarding the medical and psychological treatments available (Sulaiman, et al., 2010). This study sheds the light on another fact that participants might be underreporting their psychological status for fear of stigmatization. Another study explored religiosity and spirituality on DM measured by A1C levels among African American women. The participants with uncontrolled A1C levels ( $\geq 7\%$ ) demonstrated statistically significant relationship with religion and spirituality, such that participants alluded to God to buffer their emotional distress (Newlin, et al., 2008).

In this study, PAID was positively associated with age, whereby the older population was more emotionally distressed than the younger population. Also PAID was negatively associated with type of treatment such that with no insulin prescription, participants didn't report high levels of distress. It is possible that with age, participants witnessed decline in health status and overall physiologic functionality which made them pay more attention to

their health at an older age. Polonsky and colleagues (1995) and Welch and colleagues (1997) reported that the PAID is weakly influenced by age and, type and duration of diabetes. The authors inferred that it is possible that older patients with longer duration of diabetes adapt well to the disease, especially if they have other co-morbidities that distract from DM related complications solely. The only published report of PAID in Arabic was with Kuwaiti patients (Aragum, 2008), where female participants with higher level of education, physically inactive and prescribed insulin had higher scores on PAID. Similarly, the study findings were in line with Kuwaiti population except that education did not reveal any statistically significant relationship with PAID. Regarding the overall scoring of PAID, the author indicated the Kuwaiti DM patients scored statistically lower than other American populations (Snoek et al., 2000; Trief et al., 2003; Welch et al., 1997), Hispanic and non-Hispanic participants (Welch et al., 2007), Brazilian females (Gross et al., 2007). It can be inferred from this study that the discrepancy in reported emotional distress, as measured by the PAID survey, can be related not only to cultural differences, but also to the health services provided in each culture. In other words, the quality and content of education given to the patients in the Diabetes clinic was not assessed for the purpose of this study. Thus, patients might not have received the proper education from the health care providers that might change their fatalistic approach and empower them to carry out the DM regimen required.

With the absence of sufficient published reports on the use of PAID instrument in an Arabic-speaking population, comparing results with the western countries remain inconclusive. Studies have shown the positive association between PAID scores and high levels of A1C indicating emotional distress and consequently maladaptation to diabetes regimen (Nozaki et al., 2009; Yi, Yi, Vitaliano, & Weinger, 2008). None have reported low scores with uncontrolled glycemic levels which indicate denial or maladaptation to diabetes regimen as was the case with current study findings. This may be interpreted as the inherent

cultural factor that may have affected the results whereby, negative affect was channeled through fatalism as aforementioned or unawareness of the pending complications that may result from inappropriate glycemetic levels. Another reason may be due to inadequate health care services or access which needs to be further explored so as to understand how the health care system in the Lebanese population can affect the spread of knowledge and education of diabetes self-care among the diabetic patients.

#### *Demographic and Physiologic Factors*

The fourth research hypothesis examined whether certain set of demographic variables (age, gender, education, income, presence of medical insurance) and physiologic characteristics (BMI, duration of diabetes, type of treatment, diabetes education, presence of microvascular and macrovascular complications) are related to glycemetic control (A1C levels). The findings of this study supported a sub set of the variables examined, namely age, gender, type of treatment, and presence of micro and macrovascular complications were associated with glycemetic control. The guidelines of National Institute of Health (NIH, 2008) and the National standards for Diabetes self-management Education programs (M. M. Funnell et al., 2008) emphasized integrating demographic, psychosocial, behavioral and cultural factors in DM self-management programs since these factors strongly influence daily DM self-management and ultimately glycemetic levels. In this study, younger age, female gender, being on insulin and the presence of micro and macrovascular complications (mainly having high blood sugar levels) demonstrated differences in means. At a more complex level of analysis, these variables were entered into a linear regression model to examine which of them predicted glycemetic control in the participants. The direction of beta coefficient for female gender indicated less association with A1C levels than for males. On the other hand, the younger age categories, 30-39 and 40-49, and having two or more complications associated with DM demonstrated strong predictors of A1C levels in a positive direction

( $\beta=2.90$  and  $\beta=2.28$  respectively). This finding indicated that being 30-39 and 40-49 years old and having two or more combined problems related to DM increases the level of A1C levels. This finding is in line with what the literature documents. Goudswaard and colleagues (2004) assessed the characteristics of the patients with type 2 DM attending a primary care center that predicted uncontrolled glycemic levels (A1C=7%). After conducting multiple regression and hierarchical multiple regression, the study revealed that among other characteristics, such as longer duration of DM, higher BMI, higher blood glucose levels at diagnosis and dyslipidemia, patients of younger age and being treated with insulin or oral hypoglycemic medications predicted poor glycemic levels. More precisely, those treated with oral hypoglycemic medications and insulin revealed the worst glycemic levels (Goudswaard, et al., 2004). Similarly, another study conducted by Nichols and colleagues (2000), revealed similar findings, whereby younger age, was highlighted as contributing to uncontrolled A1C amongst other predictors such as lower BMI and increased emotional distress measured by PAID scale.

Other factors such as education, income, receiving DM education, BMI and family history did not demonstrate any significant relationship with glycemic control. This may be explained in light of fatalism, such that regardless of other demographic or physiologic characteristics, participants tend to allude to God during acute illness and may soothe related anxiety and emotional distress related to DM. This was manifested by the referral to God's will and the resultant powerlessness over DM control and DM self-care (Koenig et al., 2001).

#### *Limitations*

Certain factors limit the generalizability of this study to the Lebanese population with type 2 DM. First, the sampling method followed the convenience sampling since randomization was not possible. In this sense, the demographic and physiologic

characteristics were not fully controlled although they were taken into account in the data analysis and integrated in different statistical models.

Another limitation was the use of the SDSCA-Ar that was newly translated to Arabic by the researcher for the purpose of the study. In this sense, the psychometric properties of the scale were not as rigorous as other well established instruments.

An inherent limitation of the use of self-report questionnaires is social desirability whereby the interviewee might tend to report favorable results. Hence, participants might have answered favorably on items of the questionnaires. For example, participants might have over reported adhering to the required DM diet although their A1C levels were uncontrolled whereby the latter is highly improved and controlled for by adhering to the right regimen. From another perspective, it could be possible that participants did not report anxiety or negative affect (as measured by PAID scale) as they were fearful of being judged as mentally sick which is substantially not accepted in the Arab Cultures.

### *Implications*

This study has implications for various areas of nursing. Results may contribute to clinical practice and health policy that is supposed to construct progressively the understanding of diabetes self-care, establish collaborations with other researchers in this area nationally and internationally and strengthen the integration of inter-disciplinary professions (physicians, pharmacists, dieticians, and psychologists) to manage the topic of inquiry holistically as to maximize diabetes outcomes. Nonetheless, cultural-sensitive strategies must be constructed to tackle the specific needs of the Lebanese patients with DM.

Diabetes is becoming a pandemic illness that poses detrimental consequences on quality of life and economic expenditures of the individuals with diabetes globally and locally. This study was thought to give a better insight into the nature of the relationship between diabetes self care, psychological status and social support with glycemic control.

The results of the diabetes self-care, emotional status and social support were analyzed from the lens of demographic and physical characteristics in relation with the glycemetic control.

The ultimate goal of the research program was to address diabetes as a pressing health problem that mandates crucial management at the level of health policy making. Better screening and health promotion at the primary care level needs to be supported by the health policy makers as to start tackling this health illness at the early stages of pre-diabetes or high risk population. Health awareness campaigns need to cover all health centers regardless of the socioeconomic factors such as income, education and employment status were not significantly associated with glycemetic control. In that sense, more financial resources need to be allocated to cover diabetes-related expenses and to support health awareness campaigns. Additionally, a paradigm shift in the management of chronic diseases in academic health-related education needs to be embraced. Better understanding of the chronic illness will enable health care providers in supporting informed decision making of managing diabetes.

From the clinical perspective, health care providers need to acknowledge the cultural interpretation of this illness and approach the patients accordingly. Probably more intensive campaigns tackling the importance of handling the disease as a medical illness rather than passively embrace it might alter the cultural perspective though slowly. Fortunately, the Lebanese culture is well connected at the family level. This is a major asset for helping the patients be more pro-active at initiating self-care and stop the chain of negative adjustment or denial. Thus, interventional studies need to include the significant others of the patients with DM as to get a stronger support and follow up on the patients' side. It is worth mentioning that verbalizing about religiosity and spirituality were limited to the participants thereby none of them mentioned the same level of thinking or interpretation of the illness from their family members. This further strengthen the notion that it might be possible that the participants solely developed this coping as to live with the disease in dissociation of what their

significant others believe. Hawthorne and colleagues in their systematic review of the literature on culturally tailored educational programs for DM self-management, participants from ethnic minorities who received culturally appropriate health educational programs had better glycemic control than participants in the usual care. This indicates that the delivery of education needs to be learner-centered, adopting mother tongue language and addressing cultural sensitive issues precisely and dietary modifications that embraces social, cultural and religious beliefs as well (Hawthorne, Robles, Cannings-John, & Edwards, 2008).

As nurses, the effectiveness of our interventions needs to be assessed in terms of patient outcomes.. Nurses are in a unique position to teach the patients about DM self-care and the importance of handling the illness at its early stages. Also, nurses are the strongest chain of communication between physicians and the patients and are perceived as the strongest collaborators and advocates of the patients' situation as to enhance patient education.

#### *Future Research*

Comprehensive assessment that entails behavioral, psychological and social status is the fundamental step to initiate DM educational programs, and serve as evaluative measures of the DM education and clinical care as well. Ultimately, the most appropriate educational program that best fits the patients' needs and capabilities will be tailored prospectively. Health care providers will have a better insight on the needs of the Lebanese patients with diabetes. These educational programs will be tested for the effectiveness in terms of optimizing glycemic outcomes and will be developed into standards of care to be used in advancing research studies and clinic visits. Ultimately, powerlessness over DM control was the "flagging" reason behind the results obtained. Other factors studied were either buffered or overshadowed in light of fatalism. Hence, it is deemed crucial to investigate the effect of religion or spirituality on DM self-care. In this sense, Self-Efficacy Theory might not be the

best model to study the current situation extensively or base an interventional study on its constructs as the National standards of DSME address.

The following recommendations for future research might tackle diabetes self-care in Lebanon based on the findings of this study. First, a replication of this study conducted with a larger sample better represents and addresses the concept of diabetes self-care, psychological adjustment, social support and glycemic control among the Lebanese population at large. This nationwide study will examine the needs of the Lebanese population more precisely, thereby gaining a better picture of the DM context as the cultural aspect is strongly embedded in the understanding of DM as verbalized by the Lebanese.

A qualitative study using interviews with participants who either fully succeed or fail to carry out diabetes self-care may lead to better understanding of the facilitators/ barriers that lead to the results obtained in addition to administering self-report instruments to validate the findings between self-report and the actual implementation of DM self-care.

Additionally, establishing an electronic diabetes database might enhance better documentation of medical profiles and follow-ups as documented in the literature is deemed crucial.

Evidently, the fatalistic approach seemed an inevitable means of coping with DM. Thus, it seems that using the Self-Efficacy theory may not be the best approach to tailor DSME programs for the Lebanese population. Conducting interventional studies with the context of a spiritual and religious conceptual framework may best address the problem with this population.

Finally, establishing a diabetes center that manages diabetes as a chronic illness is a building block towards addressing DM at a national level. For this purpose, national and international collaboration will be sought to pool in proficient resources and standardize the level of care given with the international guidelines of Diabetes management.

### *Summary*

In summary, interesting results emerged from this study that opens the door for a broader investigation of the pending DM situation among the Lebanese population. Few of the research hypotheses posed were supported and others were rejected. There was no association between Diabetes self-care and glycemic control. Psychological adjustment was positively correlated with glycemic control though it was a weak correlation. Nonetheless, revealing low scores of PAID with uncontrolled A1C levels indicated denial on the patients' side of acknowledging the illness and manage it accordingly. Social support was positively correlated with A1C which is mainly interpreted as the Lebanese interpretation of DM and the support exerted on the family side to support the patient with DM in coping with the illness. Additionally, having the notion of comparing DM to cancer further created the image of dysfunctionality and complexity the patients with DM are perceived. There a difference in means of age, gender, type of treatment, and problems associated with DM and A1C levels. Younger patients with DM developed more DM related complications and worse glycemic control than their counterparts. On the other hand, being a female patient with DM negatively predicted A1C levels implying that female patients might be better at controlling their A1C levels than males although in this sample females did not attain the optimal glucose levels yet their mean A1C levels were less than the counter males' participants.

In conclusion, the participants did not generally adhere to their diabetes self-care regimen except for medication regimen. In the same vein, diabetes self-care did not predict glycemic levels except when the scores were categorized to which only the specific diet subscale demonstrated a statistically significant association with A1C levels. As far as the emotional adjustment to diabetes self-care is concerned, denial prevailed in light of the uncontrolled levels of A1C. Finally, social support was positively associated with A1C levels, thereby inferring that as participants demonstrated uncontrolled levels of A1C, they

got more social support from their network. This particular finding was totally not consistent with the literature findings which mandate further investigations in future research studies. Finally, the predictors of self-efficacy theory, diabetes self-care, emotional adjustment and social support need to be further investigated in the Lebanese context as to better understand the best predictors of glycemic levels and optimize glycemic outcomes in a culturally sensitive context.

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## APPENDICES

## APPENDIX 1

### Summary of Diabetes Self-Care Activities (SDSCA)

Developed by D. Toobert and R. Glasgow

### The Summary of Diabetes Self- Care Activities (SDSCA)

The questions below ask you about your diabetes self-care activities during the past 7 days. If you were sick during the past 7 days, please think back to the last 7 days that you were not sick

#### Number of days

##### Diet

1. How many of the last SEVEN DAYS have you followed a healthful eating plan? 0 1 2 3 4 5 6 7

2. On average, over the past month, how many DAYS PER WEEK have you followed your eating plan? 0 1 2 3 4 5 6 7

3. On how many of the last SEVEN DAYS did you eat five or more servings of fruits and vegetables? 0 1 2 3 4 5 6 7

4. On how many of the last SEVEN DAYS did you eat high fat foods such as red meat or full-fat dairy products? 0 1 2 3 4 5 6 7

##### Exercise

5. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking). 0 1 2 3 4 5 6 7

6. On how many of the last SEVEN DAYS did you participate in a specific exercise session (such as swimming, walking, biking) other than what you do around the house or as part of your work? 0 1 2 3 4 5 6 7

##### Blood Sugar Testing

7. On how many of the last SEVEN DAYS did you test your blood sugar? 0 1 2 3 4 5 6 7

8. On how many of the last SEVEN DAYS did you test your blood sugar the number of times recommended by your health care provider? 0 1 2 3 4 5 6 7

##### Foot Care

9. On how many of the last SEVEN DAYS did you check your feet? 0 1 2 3 4 5 6 7

10. On how many of the SEVEN DAYS did you inspect the inside of your shoes?

0 1 2 3 4 5 6 7

**Medications**

11. On how many of the last SEVEN DAYS, did you take your recommended diabetes medication?

0 1 2 3 4 5 6 7

OR

12. On how many of the last SEVEN DAYS did you take your recommended insulin injections?

### ملخص عن الانشطة المتعلقة بالعناية الشخصية لمرض السكري

الاسئلة الواردة ادناه هي عن الانشطة المتعلقة بعنايتك الشخصية لمرض السكري خلال السبعة الايام الماضية. اذا كنت مريضا خلال السبعة الايام الماضية , يرجى اعادة التفكير الى السبعة الايام الاخيرة التي لم تكن فيها مريضا.

#### عدد الايام

#### الغذاء :

● كم يوم من الايام السبعة الماضية اتبعت نظاما غذائيا صحيا ؟

7 6 5 4 3 2 1 0

● على مدى الشهر الماضي ,وبمعدل كم يوم في الاسبوع, اتبعت نظاما غذائيا صحيا خاصا بك؟

7 6 5 4 3 2 1 0

● كم من الايام السبعة الماضية تناولت خمس حصص او اكثر من الفاكهة او الخضار؟

7 6 5 4 3 2 1 0

● كم من الايام السبعة الماضية تناولت الاطعمة ذات الدهون العالية مثل اللحوم الحمراء او منتجات الالبان الكاملة الدسم؟

7 6 5 4 3 2 1 0

#### ممارسة الرياضة :

● كم من الايام السبعة الماضية مارست نشاط رياضي لمدة 30 دقيقة على الاقل ( مجموع الدقائق من النشاط المتواصل, بما فيه المشي)؟

7 6 5 4 3 2 1 0

● كم من الايام السبعة الماضية مارست تمرينا رياضيا معيناً ( مثل السباحة, المشي, ركوب الدراجة), غير الذي تفعله في المنزل او كجزء من عملك؟

7 6 5 4 3 2 1 0

#### اختبار نسبة السكر في الدم:

● كم من الايام السبعة الماضية فحصت نسبة السكر في الدم؟

7 6 5 4 3 2 1 0

● كم من الايام السبعة الماضية فحصت نسبة السكر في الدم اي عدد المرات التي اوصى بها الفريق الصحي؟

7 6 5 4 3 2 1 0

#### العناية بالقدم:

● كم من الايام السبعة الماضية قمت بفحص قدميك؟

7 6 5 4 3 2 1 0

● كم من الايام السبعة الماضية تفقدت ما بداخل حذائك؟

7 6 5 4 3 2 1 0

#### الدواء :

● كم من الايام السبعة الماضية تناولت الدواء الخاص بالسكري الموصوف لك؟

7 6 5 4 3 2 1 0

او

● كم من الايام السبعة الماضية اخذت حقن الانسولين الموصوفة لك؟

7 6 5 4 3 2 1 0

## Appendix 2

### Problem Areas In Diabetes (PAID)

Developed by W. Polonsky and colleagues

## Problem Areas In Diabetes (PAID)

### Questionnaire

INSTRUCTIONS: Which of the following diabetes issues is currently a problem for you? Circle the number that gives the best answer for you.

	<b>Not a Problem</b>	<b>Minor Problem</b>	<b>Moderate Problem</b>	<b>Somewhat Serious Problem</b>	<b>Serious Problem</b>
1. Not having clear and concrete goals for your diabetes care	0	1	2	3	4
2. Feeling discouraged with your diabetes treatment plan?	0	1	2	3	4
3. Feeling scared when you think about living with diabetes?	0	1	2	3	4
4. Uncomfortable social situations related to your diabetes care (e.g., people telling you what to eat)?	0	1	2	3	4
5. Feelings of deprivation regarding food and meals?	0	1	2	3	4
6. Feeling depressed when you think about living with diabetes?	0	1	2	3	4
7. Not knowing if your mood or feelings are related to your diabetes?	0	1	2	3	4
8. Feeling overwhelmed by your diabetes?	0	1	2	3	4
9. Worrying about low blood sugar reactions?	0	1	2	3	4
10. Feeling angry when you think about living with diabetes?	0	1	2	3	4
11. Feeling constantly concerned about food and eating?	0	1	2	3	4
12. Worrying about the future and the possibility of serious complications?	0	1	2	3	4
13. Feelings of guilt or anxiety when you get off track with your diabetes management?	0	1	2	3	4
14. Not "accepting" your diabetes?	0	1	2	3	4
15. Feeling unsatisfied with your diabetes physician?	0	1	2	3	4
16. Feeling that diabetes is taking up too much of your mental and physical energy every day?	0	1	2	3	4
17. Feeling alone with your diabetes?	0	1	2	3	4
18. Feeling that your friends and family are not supportive of your diabetes management efforts?	0	1	2	3	4
19. Coping with complications of diabetes?	0	1	2	3	4
20. Feeling "burned out" by the constant effort needed to manage diabetes?	0	1	2	3	4

## إستبيان حول مشاكلك مع مرض السكر

تعليمات : أي من المشاكل التالية المتعلقة بمرض السكر تعاني حاليا ؟

ضع دائرة حول الرقم الذي يمثل أفضل أجاباتك . الرجاء الإجابة على جميع الأسئلة .

مشكلة خطيرة	مشكلة خطيرة نوع ما	مشكلة ذات تأثير معتدل	مشكلة بسيطة	ليست مشكلة	
.....4	.....3	.....2	.....1	.....0	1- عدم وجود أهدافا واضحة في رعايتكم لمرض السكر ؟
.....4	.....3	.....2	.....1	.....0	2- الشعور بالإحباط في إتباع خطة علاجك لمرض السكر ؟
.....4	.....3	.....2	.....1	.....0	3- الشعور بالخوف عندما تفكر في أنك سوف تعيش مع مرض السكر ؟
.....4	.....3	.....2	.....1	.....0	4- مواقف اجتماعية غير مريحة تتعلق برعايتكم لمرض السكر؟ (مثلا : يملئ الناس عليك ما تأكل )
.....4	.....3	.....2	.....1	.....0	5- الشعور بالحرمان بخصوص الطعام والوجبات ؟
.....4	.....3	.....2	.....1	.....0	6- الشعور بالاكئاب عندما تفكر في الحياة مع مرض السكر ؟
.....4	.....3	.....2	.....1	.....0	7- عدم معرفة إذا كانت حالتك المزاجية أو مشاعرك ذات صلة بمرض السكر لديك ؟
.....4	.....3	.....2	.....1	.....0	8- الشعور بأن مرض السكر قد قهرك وتغلب عليك ؟
.....4	.....3	.....2	.....1	.....0	9- القلق من مضاعفات انخفاض السكر في الدم ؟
.....4	.....3	.....2	.....1	.....0	10- الشعور بالغضب حين تفكر في الحياة مع مرض السكر ؟
.....4	.....3	.....2	.....1	.....0	11- الشعور المستمر بالقلق تجاه الأكل والطعام ؟
.....4	.....3	.....2	.....1	.....0	12- القلق من المستقبل واحتمال حدوث مضاعفات صحية خطيرة ؟
.....4	.....3	.....2	.....1	.....0	13- الشعور بالذنب أو التوتر عند عدم الالتزام بإتباع خطة علاج مرض السكر ؟
.....4	.....3	.....2	.....1	.....0	14- عدم "تقبل" إصابتك بمرض السكر ؟
.....4	.....3	.....2	.....1	.....0	15- الشعور بعدم الرضا عن طبيبك المعالج لمرض السكر ؟
.....4	.....3	.....2	.....1	.....0	16- الشعور بأن مرض السكر يستولي على الكثير من طاقتك العقلية والجسدية كل يوم ؟
.....4	.....3	.....2	.....1	.....0	17- تشعر بأنك وحيد مع مرض السكر ؟
.....4	.....3	.....2	.....1	.....0	18- الشعور بعدم مؤازرة أصدقائك وعائلتك بجهدك المبذول للسيطرة على مرض السكر ؟

- 19- التعامل مع مضاعفات مرض السكر ؟  
.....0 .....1 .....2 .....3 .....4
- 20- الشعور "بالإرهاق" بسبب الجهد المستمر الذي تتطلبه عملية السيطرة على مرض السكر ؟  
.....0 .....1 .....2 .....3 .....4

مركز جوسلين لمرض السكر 1999

Appendix 3

Social Support Scale

Developed by J. T Fitzgerald and colleagues

## Social Support Scale

Q1. My family or friends help and support me a lot to:

(Circle one answer for each line)

	<b>Strongly Disagree</b>	<b>Somewhat Disagree</b>	<b>Neutral</b>	<b>Somewhat Agree</b>	<b>Strongly Agree</b>	<b>Does Not Apply</b>
a) follow my meal plan.	1	2	3	4	5	N/A
b) take my medicine.	1	2	3	4	5	N/A
c) take care of my feet.	1	2	3	4	5	N/A
d) get enough physical activity.	1	2	3	4	5	N/A
e) test my sugar.	1	2	3	4	5	N/A
f) handle my feelings about diabetes.	1	2	3	4	5	N/A

Q2. My family or friends: (circle one answer for each line)

	<b>Strongly Disagree</b>	<b>Somewhat Disagree</b>	<b>Neutral</b>	<b>Somewhat Agree</b>	<b>Strongly Agree</b>
a) accept me and my diabetes.	1	2	3	4	5
b) feel uncomfortable about me because of my diabetes.	1	2	3	4	5
c) encourage or reassure me about my diabetes.	1	2	3	4	5

d) discourage or upset me about my diabetes.	1	2	3	4	5
e) listen to me when I want to talk about my diabetes.	1	2	3	4	5
f) nag me about diabetes.	1	2	3	4	5

### قياس الدعم العائلي و دعم الاصدقاء

1. يقوم كل من الدعم العائلي و دعم الاصدقاء (ضع دائرة حول رمز الاجابة الصحيحة لكل سطر)

غير مطابق	موافق بشدة	موافق بعض الشيء	متردد	أعارض بعض الشيء	أعارض بشدة	
6	5	4	3	2	1	1. اتباع خطة الطعام
6	5	4	3	2	1	2. تناول الأدوية
6	5	4	3	2	1	3. العناية بالقدمين
6	5	4	3	2	1	4. القيام بالتمارين الرياضية
6	5	4	3	2	1	5. القيام بفحص السكر
6	5	4	3	2	1	6. الاهتمام بمشاعري تجاه السكري

2. العائلة و الاصدقاء (ضع دائرة حول رمز الاجابة الصحيحة لكل سطر)

غير مطابق	موافق بشدة	موافق بعض الشيء	متردد	أعارض بعض الشيء	أعارض بشدة	
6	5	4	3	2	1	1. قبولي و قبول مرض السكري
6	5	4	3	2	1	2. الشعور بعدم الراحة نحوي بسبب مرض السكري
6	5	4	3	2	1	3. تشجيعي و دفعي نحو مرض السكري
6	5	4	3	2	1	4. عدم تشجيعي و احباطي نحو مرض السكري
6	5	4	3	2	1	5. الاستماع لي حين أريد اتكلم عن مرض السكري
6	5	4	3	2	1	6. الحديث معي حول مرض السكري

APPENDIX 4

PARTICIPANT INFORMATION FORM

### Participant Information Form

**Instructions: Please check the answer that best describes you.**

1. What is your age?

- ? 18- 29
- ? 30-39
- ? 40-49
- ? 50-59
- ? 60-69
- ? 70 and above

2. What is your gender?

- ? Male
- ? Female

3. What is your current marital status? (Check one):

- ? Single
- ? Married
- ? Divorced
- ? Widowed
- ? Separated

4. Years of completed education

- ? Less than 10
- ? 12 years or High school
- ? 13-14 years or Technical degree
- ? 15-16 or University degree
- ? More than 16 or Graduate degree

5. What is your current employment status? (check one)

- ? Employed full time
- ? Employed part time
- ? Unemployed (but physically able to work)
- ? Unable to work due to health problems
- ? Retired

6. What is your monthly income from all sources (circle one):

- ? <\$500
- ? \$500- \$1499
- ? \$1500- \$2999
- ? ≥ \$3000

7. Do you have health Insurance?

- ? Yes
- ? No

8. What is your Height :\_\_\_\_\_ (cm) &  
Weight:\_\_\_\_\_ (Kg)

9.. How many years have you lived with diabetes

- ? Less than 5 years
- ? 5-10 years
- ? 11-16 years
- ? 17 years and above

10. Do you have a family history of diabetes?

- ? Yes
- ? No

11. Do you take medication for diabetes?

- ? Yes
- ? No

12. If yes, then please indicate the type of treatment:

- ? Insulin
- ? Pills
- ? Both
- ? No medications

13. Have you ever received diabetes education from physician/dietician/nurse in the past?

- ? Yes
- ? No

14. Which if any, of the following problems sometimes associated with diabetes have you experienced? (check all that apply):

- ? Low blood sugar (<80mg/dl)
- ? High blood sugars (>300 mg/dl)
- ? Heart problems
- ? Sexual difficulties
- ? Damage to the retina of the eye
- ? Nerve damage (e.g. numbness or tingling of the hands or feet, or foot ulcers)
- ? Kidney problems
- ? None of the above

15. Do you smoke?

- ? Still smoking
- ? Quit smoking
- ? Never smoked

8. لظوظ و ه ام (\_\_\_\_\_ ) وتفتين  
لغز و (\_\_\_\_\_ ) ففك

9. ؟يركشلا ضررم نم نيين اع قس لمي

تاونيس سمخ نم لقا

10-5 تاونيس

16-11 قس

17 قف امو قس

10. ؟يركشلا ضررم نم لفتها اع دافأ نم دحأ يناعي له

مقي

ل

11. ؟يركشلا ضرر لمي اود ذخغ له

مقي

ل

12. مقي لباوج نك اذا , ج لقا عون يديع اعجل

ريلوين

صاقأ

ريلوين او صاقأ

اود لوقا ل

13. نم ىركشلا ضررم نع تامل عم قبلرلا في نيوقت له  
بيططا , ضررم لها وا نغيا يبطخا

مقي

ل

14. نيين اع قى ركشلا ضررم قلص لها يلملا لكش لها نم قيا  
اقم

ركشلا صرفلخا بقرن في طوف) نم لقا 80mg/dl

ركشلا بقرن غلتر في طوف) نم لقا 300 mg/dl

بلقلا في لكشم

يبرن لجا طلرلا في لكشم

بلس عال فلقت) وأ و ريم قلا في زخو وا يديع روغلا

مولا تاحرت وأ ريليا)

لظلا في لكشم

هلاع وركذلملا لكش لها نم قيا يلى سويلا

15. ؟نخت له

نخدا تلزام

ريكشلا نع نقيوت

لبا نخدا ل

لكرش لها نع عماع قس  
قيلندا قسلا نع قباجل اعجل :

1. ؟كرم و ه ام

29-18

39-30

49-40

59-50

69-60

70 قف امو

2. ؟لنر ج و ه ام

ركدم

نشوم

3. يعلنجال محمول و ه ام ؟

بزاع / ملزاع

جوت مة)

قلم مة)

لجر مة)

لصفين مة)

4. ؟قارلا تاونيس ددع

تاونيس رشع نم لقا

12 عماع تيوت وا قس

14-13 يقي هم عجرد وا

16-15 يقي عماع قداش وا

نم لقا 16 كيلع تاداش وا قس

5. ؟يل الحيا ينها لكشم و ه ام

غوت م للشب لمقيا

يهزج م اوب لمقيا

لمقيا نع لطاق) لمقيا علىع قيس لجا هر قلا يلى نللي

قيس لكشم بسبب لمقيا علىع رديع

6. ؟يوسرلا لظوظ دم و ه ام

نم لقا \$ 500

\$1499-\$500

\$ 2999-\$1500

\$ 3000 قف امو

7. ؟يحص ناض ليل له

مقي

ل

APPENDIX 5

INFORMED CONSENT

Northeastern University: School of Nursing

Investigator Names: Elizabeth Howard and Ola Sukkarieh

Title of Project: The Relationship among Diabetes Self-care, Psychological Adjustment, Social Support and A1C Levels in the Lebanese population

### **Informed Consent to Participate in a Research Study**

We are inviting you to take part in a research study. This form will tell you about the study, but I will explain it to you first. You may ask me any questions regarding the study. When you are ready to make a decision, you may tell me if you want to participate or not. You do not have to participate if you do not want to. If you decide to participate, I will ask you to sign this statement and you will receive a copy for you to keep.

### **Why am I being asked to take part in this research study?**

We are asking you to be in this study because you have type 2 diabetes mellitus.

### **Why are you doing this research study?**

The purpose of this study is to explore whether diabetes self care, emotional status and social support are related to glycemic control among Lebanese with type 2 diabetes.

### **What will I be asked to do?**

If you decide to take part in this study, we will ask you to complete 4 brief questionnaires. The first questionnaire asks short questions about your self-care for diabetes. The second one asks about your feelings toward diabetes in general. The third questionnaire asks about how much support you get from your family and friends in managing your diabetes. The fourth survey asks general questions about your background and your health status with diabetes. It will take approximately 20 minutes to complete all of the questionnaires. If you have any difficulty reading or understanding the questions, the researcher will be available to help you.

### **Where will this take place and how much of my time will it take?**

You will be asked to fill the questionnaires before or after your medical appointment and in a place at the clinic that is convenient for you.

### **Will there be any risk or discomfort to me?**

There will be no serious risks to you. You may get tired completing the questionnaire. It will take about 20 minutes to complete. If you get tired, tell me and you can take a break.

### **Will I benefit directly from this research?**

There will be no direct benefit to you from participating in this research. The information learned from this study will help us better understand how people manage diabetes and the medical team will have a better understanding that will help them in better managing patients with diabetes.

### **Who will see the information about me?**

Your part in this study will be confidential. Only the researcher on this study will see the information about you. No reports or publications about the research will use information that can identify you in any way.

### **Can I stop my participation in this study?**

Your participation in this research is completely voluntary. You do not have to participate if you do not want to. Even if you begin the study, you may quit at any time. If you do not participate or if you decide to quit, you will still receive the same medical treatment that you always had.

### **Who can I contact if I have questions or problems?**

Ola Sukkarieh, Northeastern University, Boston, MA 02115-5000  
[sukkarieh.o@neu.edu](mailto:sukkarieh.o@neu.edu)

**Who can I contact about my rights as a participant?**

If you have any questions about your rights as a participant, you may contact Human Subject Research Protection, Division of Research Integrity, 413 Lake Hall, Northeastern University, Boston, MA 02115 tel. 617-373-7570. You may call anonymously if you wish.

**Will I be paid for my participation?**

You will not receive any monetary or other form of reimbursement for participating in the research study.

**Is there anything else I need to know?**

This research is being supported by Lebanese American University

\_\_\_\_\_  
Signature of person agreeing to take part in the study

Date \_\_\_\_\_

\_\_\_\_\_  
Printed name of person above

\_\_\_\_\_  
Signature of person who explained the study to the participant above and obtained consent

Date

\_\_\_\_\_  
Printed name of person above

**You may keep a copy of this information sheet and consent form for your records. Thank you!**

Your name

## أقرار الموافقة على المشاركة في البحث

### العلاقة بين العناية الشخصية بمرض السكري الوضع النفسي الدعم الاجتماعي ونسبة تخزين السكر عند اللبنانيين

#### أقرار الموافقة للمشاركة في الدراسة

نحن ندعوك للمشاركة في الدراسة . هذه الوثيقة ستخبرك عن البحث ولكن في البداية سوف اشرحها لك. مشاركتك في الدراسة ليست اجبارية. اذا اردت المشاركة سوف اطلب منك ان توقع على هذه الوثيقة وستحصل على نسخة لتحفظها معك .

#### لماذا طلب مني المشاركة في هذه الدراسة؟

نحن نطلب منك المشاركة في هذه الدراسة لانك تعاني من مرض السكري (النوع الثاني)

#### لماذا تقوم بهذه الدراسة ؟

هدف هذه الدراسة هو لمعرفة ما اذا كانت العناية الشخصية بمرض السكري, الوضع النفسي, والدعم الاجتماعي يتعلقون بنسبة تخزين السكر عند اللبنانيين الذين يعانون من مرض السكري (النوع الثاني).

#### ماذا سيطلب مني ؟

اذا قررت المشاركة في هذه الدراسة سيطلب منك ان تكمل اربعة استبيانات موجزة. يطرح الاستبيان الاول اسئلة عن عنايتك الشخصية بمرض السكر. يطرح الاستبيان الثاني اسئلة عن رايك تجاه مرض السكري بشكل عام. يتناول الاستبيان الثالث اسئلة عن نسبة الدعم الاجتماعي الذي تحصل عليه من عائلتك او اصدقائك اتجاه تعاطيك مع مرض السكري. اما الاستبيان الرابع فيطرح اسئلة عن خلفيتك وعن وضعك الصحي. اجابتك عن مجموعة الاستبيانات ستأخذ حوالي 20 دقيقة. اذا كان لديك اية صعوبة في القراءة او ايضاح عن الاسئلة, سيكون الباحث متواجد لمساعدتك.

#### اين سيحدث ذلك وكم من الوقت سيستغرق؟

سوف يطلب منك الاجابة عن الاسئلة قبل او بعد موعدك الطبي وفي مكان ملائم.

#### هل سيكون هناك من مخاطر؟

من المحتمل ان تشعر بتعب خلال اكمال الاستبيانات. اذا شعرت بالتعب الرجاء اعلامي ويمكنك اخذ استراحة.

#### من سيطلع على المعلومات عني؟

سنتكون البيانات التي سنتلي عنها في سرية تامة. الباحث فقط هو الذي سيطلع عليها. لن ترد اية تقارير او منشورات بمعلومات التي يمكن ان تعرف عنك بأي شكل من الاشكال.

#### هل يمكنني التوقف عن المشاركة في هذه الدراسة؟

ان مشاركتك تطوعية في هذه الدراسة ويمكنك التوقف متى تشاء حتى لو بدأت بالمشاركة. قرارك بالتوقف او عدم المشاركة في الدراسة لن يؤثر على العناية الطبية التي لطالما حصلت عليها.

#### بمن يمكنني الاتصال اذا كانت لدي اي اسئلة؟

Ola Sukkarieh, Northeastern University, Boston, MA 02115-5000

[sukkarieh.o@neu.edu](mailto:sukkarieh.o@neu.edu)

Human Subject Research Protection, Division of Research Integrity, 413 Lake Hall, Northeastern University, Boston, MA 02115 tel. 617-373-7570. You may call anonymously if you wish.

#### هل ساحصل على فوائد مادية ؟

لن تحصل على فوائد مادية أو اية فوائد أخرى لمشاركتك بالبحث

تقوم الجامعة اللبنانية الاميركية بدعم هذه الدراسة.

Table 1

*Descriptive statistics of Demographic characteristics (N= 140)*

	Categories	Frequency	Percent
Admission center	UMCRH	92	65.7
	AUBMC	48	34.3
Age	18-29	2	1.4
	30-39	3	2.2
	40-49	14	10.1
	50-59	52	37.7
	60-69	35	25.4
	>70	32	23.2
Gender	Male	60	42.9
	Female	80	57.1
Marital Status	Single	16	11.5
	Married	102	73.4
	Divorced	2	1.4
	Widowed	19	13.7
Education	< 10 years	71	53
	12 years -high school	22	16.4
	13-14 years -technical	5	3.7
	15- 16 years -university	23	17.2
	> 16 years or graduate	13	9.7
Employment Status	Employed full time	48	35.6
	Employed part time	15	11.1
	Unemployed; physically able to work	2	1.5
	Unable to work due to health problems	1	0.7
	Housewife	60	44.4
	Retired	9	6.7
Monthly Income	< 500\$	52	38.8
	500-1499\$	45	33.6
	1500-2999\$	20	14.9
	>3000\$	17	12.7
Health Insurance	Yes	115	82.1
	No	25	17.9

Table 2a

*Descriptive Statistics of Physiologic Characteristics (N=140)*

	Categories	Frequency	Percent
Years of DM	>10 years	54	38.6
	<10 years	86	61.4
Family History	Yes	106	77.9
	No	30	22.1
Medication	Yes	133	95
	No	7	5
Treatment	Insulin	27	19.3
	No insulin	113	80.7
Diabetes Education	Yes	125	89.9
	No	14	10.1
DM complications	Low blood sugar (< 80 mg/dl)	9	6.4
	High blood sugars (>300mg/dl)	3	2.1
	Cardiac problems	2	1.4
	Sexual difficulties	4	2.9
	Nerve damage	13	9.3
	Kidney problems	2	1.4
	Retinopathy	4	2.9
	None of the above	76	54.3
	2 or more problems combined	27	19.3
Smoking	Still smoking	47	34.1
	Quit smoking	24	17.4
	Never smoked	67	48.6

Table 2b

*Descriptive Statistics of Physiologic Characteristics (N=140)*

	Minimum	Maximum	Mean	Std. Deviation
Body Mass Index	17.33	56.80	29.4718	6.34903
A1C level	5.40	13.00	7.6271	1.49258

Table 3a

*Descriptive Statistics of the Instruments*

	Minimum	Maximum	Mean	SD
<b>SDSCA-Ar</b>				
Score of General Diet	0	7	2.81	1.84
Score of the Specific Diet	0	7	3.07	1.92
Score of the Exercise	0	7	1.36	2.09
Score of the Blood Sugar Testing	0	7	2.49	2.48
Score of the Foot Care	0	7	1.18	2.11
Score of the medication taking	0	7	6.58	1.62
Score of the Social Support	0	57	39.68	10.7
PAID	0	66.25	11.94	10.42

Table 3b

*Reliability Analyses of all Instruments Used (SDSCA-Ar, Social Support and PAID*

	Average Inter-item Correlation/Cronbach's Alpha ( $\alpha$ )	
	Current Scales' Values	Original Scales' Values
<b>SDSCA-Ar/SDSCA</b>		
Diet (4 items)	0.32	0.59-0.74
Exercise (2 items)	0.61	0.74-0.78
Glucose Testing (2 items)	0.79	0.38-0.76
Foot Care (2 items)	0.57	0.24-0.30
Medication (1Item)	-	
Social Support (12 Items)	0.88	0.65
PAID (20 items)	0.913	0.90

Table 4

*Predictive Validity between the three instruments and A1C levels*

	1	2	3	4	5	6	7	8
Specific Diet	-	0.003	-0.142	0.031	-0.138	0.044	-0.009	-0.001
General Diet	0.003	-	0.161	0.065	0.045	0.061	0.038	-0.12
Exercise	-0.142	0.161	-	0.118	0.003	0.043	-0.13	0.083
Self-Blood Sugar								
Testing	0.031	0.065	0.118	-	.176*	.179*	.174*	0.076
Foot care	-0.138	0.045	0.003	.176*	-	.268**	.278**	0.028
Social Support	0.044	0.061	0.043	.179*	.268**	-	.269**	.218*
PAID	-0.009	0.038	-0.13	.174*	.278**	.269**	-	.179*
A1C	-0.001	-0.12	0.083	0.076	0.028	.218*	.179*	-

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

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

Table 5

*Mixed model presenting unadjusted univariate analysis of SDSCA subscales (SD, GD, Foot, exercise, Sugar), SS and PAID with center as random effect*

	B	SE	P-value
SDSCA-Ar			
General Diet	-0.06	0.04	0.18
Specific Diet	-0.004	0.06	0.94
Exercise	0.05	0.06	0.36
Self-monitoring of Blood Sugar	0.04	0.05	0.42
Foot Care	0.02	0.05	0.74
Social Support	0.02	0.01	0.013
PAID	0.02	0.01	0.03

Table 5a

*Mixed model presenting unadjusted univariate analysis SDSCA subscales (SD, GD, Foot, exercise, Sugar) in categories with center as random effect*

SDSCA sub-scales	Beta	SE	P-value
Specific Diet			
0-3.5 days	0.65	0.28	0.02
>3.5-7 days	0(ref)	0	.
General Diet			
0-3 days	0.51	0.26	0.057
>3days	0 (ref)		
Self-Monitoring Blood Sugar			
0 days	-0.26	0.31	0.41
>0-3days	-0.24	0.30	0.43
>3days	0	0	.
Exercise			
0-3days	-0.15	0.30	0.61
>3days	ref		
Foot Care			
0 days	-0.33	0.27	0.23
At least once/week	(ref)		

Table 5b

*Model of univariate analysis of select variables of demographic and physiologic characteristics with A1C*

Variables	Beta	SE	P-value
<b>Age</b>			
49 years and less	1.36	0.35	0.00
50 years and more	0a	0	.
<b>Gender</b>			
Male	0.53	0.25	0.03
Female	(ref)		
<b>Education</b>			
<10 yrs	-0.30	0.30	0.31
11-14 yrs	0.035	0.37	0.92
≥15 yrs	(ref)		
<b>Employment</b>			
Employed	-0.39	0.25	0.11
Not employed	(ref)		
<b>Income</b>			
<\$500	0.17	0.32	0.60
\$500-\$1499	0.30	0.33	0.35
>\$1500	(ref)		
<b>Health Insurance</b>			
Yes	0.36	0.32	0.27
No	(ref)		
<b>DM complications</b>			
No problems	-1.00	0.24	0.00
One problems	0a	0	.
2 or more combined	(ref)		
<b>Years with DM</b>			
>10 yrs of DM	0.40	0.25	0.12
<10 yrs of DM	(ref)		
<b>Family history</b>			
Yes	0.46	0.30	0.12
No	(ref)		
<b>Treatment</b>			
Insulin	0.99	0.31	0.002
No insulin	(ref)		
<b>Education</b>			
Yes	0.22	0.41	0.59
No	(ref)		
<b>Smoking</b>			
Still smoking	0.24	0.28	0.40
Quit smoking	0.01	0.36	0.96
Never smoked	(ref)		
BMI	0.04	0.01	0.03

Table 6

*Model of adjusted univariate analysis of select variables of demographic and physiologic characteristics with AIC*

	B	SE	P-value
General Diet			
0-3 days	-0.48	0.23	0.04
>3days			
Gender			
Males	-0.70	0.21	0.00
Age			
≤ 49 years	-1.30	0.32	0.000
Treatment			
Insulin	-0.69	0.28	0.01
BMI	0.04	0.01	0.02
DM complications			
no problems	-0.66	0.23	0.00
Specific diet			
0-3.5 days	0.46	0.25	0.07
>3.5-7 days			
Gender			
Males	-0.76	0.22	0.00
≤ 49 years	-1.36	0.32	0.000
Treatment			
Insulin	-0.63	0.29	0.03
BMI	0.04	0.01	0.01
DM complications			
No Problem	-0.53	0.23	0.02
Exercise			
0-3days	-0.21	0.26	0.40
>3days	0a	0	.
Gender			
Males	-0.66	0.22	0.00
Age			
≤49years	-1.42	0.32	0.000
Treatment			
No Insulin	-0.70	0.28	0.01
BMI	0.04	0.01	0.01
DM complications			
No problems	-0.61	0.23	0.01
Self-Monitoring blood Sugars			
0 days	0.36	0.29	0.21

>0-3days	0.41	0.28	0.14
>3days	0a	0	.
Gender			
Males	-0.68	0.22	0.00
Age			
≤49years	-1.42	0.31	0.000
Treatment			
No insulin	-0.87	0.30	0.00
BMI	0.04	0.01	0.00
DM complications			
no problems	-0.69	0.23	0.00
Foot Care			
0 days	0.01	0.26	0.96
At least once/week			
Gender			
Males	-0.67	0.22	0.00
Age			
≤ 49years	-1.40	0.32	0.000
Treatment			
No insulin	-0.71	0.29	0.01
BMI	0.04	0.01	0.02
DM complications			
No Problems	-0.62	0.25	0.01
Social Support Scores			
0-42	-0.53	0.24	0.028
>43			
Gender			
Males	-0.69	0.22	0.002
Age			
≤49 years	-1.09	0.33	0.001
Treatment			
No Insulin	-0.65	0.29	0.025
BMI	0.04	0.01	0.014
DM complications			
No problems of DM	-0.34	0.24	0.16
PAID Scores			
0-12	-0.50	0.25	0.048
≥12	ref		
Gender			
Males	-0.68	0.21	0.000
Age			
≤49years	-1.30	0.32	0.002
Treatment			

No insulin	-0.68	0.28	0.000
BMI	0.03	0.01	0.01
DM complications			
No Problems of DM	-0.49	0.24	0.03
			.
Social Support (continuous variable)	0.01	0.01	0.32
Gender	-0.73	0.22	0.00
≤49 years	-1.20	0.33	0.000
No insulin	-0.65	0.29	0.02
BMI	0.04	0.01	0.01
No DM complication	-0.45	0.24	0.06
PAID (continuous variable)	0.01	0.01	0.32
Gender	-0.71	0.22	0.002
≤49 years	-1.32	0.33	0.000
No Insulin	-0.69	0.29	0.01
BMI	0.04	0.01	0.02
No DM complication	-0.58	0.23	0.01

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