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Prevention and Management of Type 2 Diabetes among African Immigrants in the United States: Using a Culturally Tailored Educational Intervention with a Focus on Dietary Plan, Physical Activity, and Stress Management

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Prevention and Management of Type 2 Diabetes among African Immigrants in the
United States: Using a Culturally Tailored Educational Intervention with a
Focus on Dietary Plan, Physical Activity, and Stress Management

A Capstone Project Presented

By

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Dedication

I dedicate this doctoral work to the glory of the Almighty God. I will keep on trusting Him for my future. Thank you, Lord.

Acknowledgement

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Abstract

Purpose: Close examination of epidemiological data revealed burdens of type 2 diabetes and complications particular to ethnic minorities in the United States including African immigrants. Literature reviews show poor dietary plan, physical inactivity, and poor stress management exist among African immigrants; contributing factors to these behaviors are cultural beliefs, barriers to physical activity, knowledge deficit in stress management, healthy food choices and portioning. This DNP project focused on implementing a culturally tailored diabetes education with the objective to increase participants' knowledge on dietary planning, physical activity, and stress management. Greater patient knowledge may lead to better diabetes management among African immigrants in the U.S.

Method: Three-sessions of culturally tailored diabetes education were delivered to African immigrant adults (N=9) with Type 2 diabetes in Rhode Island. Behavioral change education was based on three of the American Association of Diabetes (ADA) self-care behaviors: healthy eating, physical activity, and stress management. Each session lasted approximately 2.5 hours. Demographic information of the participants was obtained using a questionnaire. A pre/post-test was administered to measure participants' knowledge base before and after education intervention. Participants completed satisfactory survey questionnaires at the end of the program.

Results: All of the participants had significant improvements in the knowledge areas of dietary plan, physical activity, and stress management. One hundred percent (n=9) of the participants reported great satisfaction of the program.

Conclusion: The education program may serve as a model for up-to date culturally tailored diabetes education and information for African immigrants, and other ethnic minorities.

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Problem Statement

Caring for immigrants with chronic disease such as diabetes, demands more than knowledge of clinical practice guidelines. Diverse cultural views and a wide range of paradigms for health and illness play a major role in how immigrants understand chronic diseases like diabetes (Gele & Mbalilaki, 2013).

Increasing burden of type 2 diabetes (T2DM) and diabetes-related complications exist among ethnic minorities including African immigrants. Poor dietary habit, physical inactivity, and poor stress management are common practices among African immigrants. The factors contributing to the unhealthy behaviors among this ethnic group have been reported to be lack of information that include knowledge deficit on nutritionally appropriate food choices and portion control, or that physical activity and stress management could improve diabetes outcomes. Culturally tailored educational approach promoting healthy lifestyle habits and patient empowerment has shown to be an effective strategy with the potential to decrease the development of complications related to T2DM among ethnic minorities. Various diabetes education intervention programs based on essential content from the American Diabetes Association and the National Diabetes Education program have been translated into ethnic minority community settings and are tailored to address the needs of the target communities in which programs were implemented. These culturally tailored diabetes intervention programs have demonstrated positive results, yet there is a significant gap in literature on culturally-tailored programs for diabetes prevention in the African immigrant community in the U.S.

Evidence of the Problem

In 2011 immigrants made up 13 percent of the total U.S. population, meaning that one in every eight U.S residents was an immigrant (Center for American Progress [CAP], 2013).

African immigrants make up a highly racially diverse and rapidly growing group among ethnic minorities in the U.S. From 2000-2010, the African-born population in the U.S. grew from 881,300 to 1.6 million (Migration Information Source [MIS], 2011).

Chronic diseases such as diabetes affect 25.8 million people, or 8.3% of the U.S. population (Center for Disease Control [CDC], 2011). Diabetes has become a significant public health challenge for the U.S., affecting both Americans and the foreign-born population. Complications such as neuropathy affect up to 60-70% of people with diabetes. Neuropathy increases the chance of foot ulcers and limb amputation. Retinopathy from diabetes is the biggest cause of blindness in working aged adults in the U.S.; after 15 years of diabetes, ~ 2% of people become blind, and about 10% develop severe visual impairment. Approximately 30% of people with diabetes have renal failure (CDC, 2011). In addition, the increasing diabetes prevalence bears an additional financial burden to the health care system. The total cost of diagnosed diabetes in the U.S. in 2012 was \$245 billion; \$176 billion in direct medical costs, and \$69 billion in reduced productivity. After adjusting for population age and sex differences, average medical expenditures among people with diagnosed diabetes were 2.3 times higher than what expenditures would be in the absence of diabetes (American Diabetes Association [ADA], 2013).

A comprehensive review of epidemiological data revealed greater burdens of diabetes and diabetes complications among ethnic minorities including African immigrants. Compared to non-Hispanic white, Blacks in general are almost twice as likely to suffer from Type 2 diabetes (T2DM) and to experience diabetes-related blindness and lower-limb amputations. Blacks are also two to six times more likely to have kidney disease (CDC, 2011; African American Community Health Advisory Committee [AACHAC], 2009). Although, robust epidemiological data on diabetes health outcomes are lacking for the African immigrant population in the U.S.,

one major complicating factor is that the existing data tends to categorize blacks in general and foreign-born blacks in particular as a homogenous group (Shepard, 2008). However, the World Health Organization (WHO) data, the International Diabetes Federation (IDF) data, and research studies suggest high prevalence of T2DM in Africa, among the African immigrants to the U.S., Canada, and Europe (Shipp, Francis, Fluegge, & Asfaw, 2014; Creatore et al. 2010; Venters & Gany, 2009; WHO, 2008, IDF, 2003). In 2006, the number of people with diabetes in all African countries was 10.4 million and is expected to increase to 18.7 million by 2025 (WHO, 2008). The top five countries with the highest number of people affected by T2DM in Sub-Saharan Africa are Nigeria-about 1.2 million people, South Africa-841,000, the Democratic Republic of Congo-552,000, Ethiopia-550,000, and Tanzania-380,000 (IDF, 2003). The undiagnosed cases are estimated to be as high as 60% to 80% in Cameroon, Ghana, and Tanzania (WHO, 2008). The WHO also reported that in the year 2000, about 113,000 people in Africa died from diabetes, 561,600 were permanently disabled, and 645,800 experienced temporary disablement from diabetes (WHO, 2008). A systematic review of Moroccan immigrants in Europe found that there were higher rates of diabetes in these Moroccans than their European cohorts (Venters et al. 2009). Another study that explored the health status of Liberian immigrant subgroups showed that three of the leading health complaints in this population were diabetes, hypertension and anxiety/stress (Venters et al. 2009). Creatore et al. (2010) conducted a population-based study involving immigrants to Ontario, Canada to evaluate the distribution of risk for diabetes in this population. The authors found that, as compared with immigrants from Western Europe and North America, risk for diabetes was elevated among immigrants from sub-Saharan Africa (odd ratio [OR] for men 2.31, 95% CI 2.17-2.45; OR for women 1.83, 95% CI 1.72-1.95). Increased risk became evident at an early age (35-49 years) and was equally high or higher among women

as compared with men. T2DM and high blood pressure was reported as the most frequent and alarming emerging health condition among the East African immigrants (Somalia's and Ethiopians) in central Ohio. Some of these immigrants viewed diabetes as a new disease, and some of them referred to it as an epidemic (Shipp et al. 2014). In support of these reports, anecdotal evidence gathered from the African immigrant community in Rhode Island (RI) suggests that diabetes threatens the health of this population. Two interviewees living in RI stressed that the major question in their community is "Why do we have so many cases of diabetes?"

Poor dietary habit, physical inactivity, and poor stress management have been found to be relatively common among African immigrants (Abioye-Akanji, 2013; McGuigan, 2010; Ndiaye, 2009; Owens, Piccinin, & Lai, 2009; Uwakweh et al. 2013). When poor dietary habits are combined with sedentary lifestyle and poor stress management, it can quickly lead to obesity, high prevalence of diabetes and poor diabetes management and diabetes outcomes.

Diabetes prevention and management programs have shown the benefits of using lifestyle interventions such as a healthy diet, physical exercise, and stress management to reduce diabetes risks (ADA, 2013; Colberg et al. 2010; Ghosh et al. 2009; Tay et al. 2014; Umpierre et al. 2011). The National Diabetes Education Program [NDEP], (2009) suggested that diabetes prevention and management should focus on reducing and/or eliminating the high rates of diabetes-related morbidity and mortality through understanding of the cultural beliefs and behavioral factors that affect the self-management of diabetic patients.

Various diabetes education intervention programs have been translated into ethnic minority community settings and are tailored to address the needs of the target communities in which programs were implemented. These culturally tailored diabetes intervention programs

have been shown to demonstrate positive results (Bryan, 2010; Choi & Rush, 2012; Osborn, Amico, Cruz, O'Connell, Perez-Escamilla, Kalichman et al. 2010; Philis-Tsimikas, 2008; Rosal, Ockene, Restrepo, White, & Borg, 2011).

The purpose of this quality improvement (QI) project is to implement a culturally tailored diabetes management educational intervention program for African immigrants in the U.S. with a particular focus on dietary plans, physical activity, and stress management, in the hope of increasing participants' knowledge. Knowledge increase in dietary plans, physical activity, and stress management may lead to better diabetes management among African immigrants in the U.S.

Review of Literature

Data sources and searches

A review of the literature was conducted with search strategies that include the Medline, CINAHL, PubMed, and the National Guideline Clearinghouse databases. The following keywords were used: "*type 2 diabetes mellitus and disease management and meta-analysis*", "*type 2 diabetes mellitus and dietary practices and African immigrants*", "*type 2 diabetes mellitus and physical activity and African immigrants*", "*type 2 diabetes mellitus and stress management and African immigrants*", "*type 2 diabetes mellitus and ethnology and prevention*", "*culturally tailored diabetes education and African immigrants*", or "*African immigrants and type 2 diabetes and meta-analysis*" in combination with at least one of the following: "*cultural beliefs*", or "*education*", or "*knowledge deficit*". *Meta-analysis* was alternated with *randomized controlled trials*.

Inclusion criteria consisted of articles that described African immigrants' beliefs regarding diabetes, and dietary, physical activity, and stress management practices, knowledge

deficits on diabetes management among African immigrants, diabetes educational programs for ethnic minorities, and a diabetes education program specifically for African immigrants.

Dietary Practices among African Immigrants a Function of their Cultural Practices and Beliefs

Culture influences the kind of foods people eat in each community. In every part of the society, people have diverse feeding habits that have been inherited from generation to generation (Oniang, Joseph, Mutuku, & Malaba, 2003). African immigrants are accustomed to foods high in carbohydrate, and spices in their diets. They often adhere to traditional eating habits, finding ingredients from back home in specialty African stores or substitutes in American grocery stores (Venters et al., 2009).

A review of literature revealed foods consumed in African communities are not the same throughout, although there are some striking similarities (Oniang et al. (2003). In exploring the dietary similarities, Oniang et al. (2003) found that with a few exceptions, all sub-Saharan African ethnic groups' staple food has the basic format that consists of starchy foods from complex carbohydrates eaten with a sauce soup or dip usually made with oils. As noted by the authors, white rice, yam, cassava, muufa, injera, burkaki (fried bread) are common starchy foods consumed regularly in African communities. Much of the fat content of African traditional diets comes from plant oils such as red palm oil, groundnut oil, coconut oil and sesame (USDA National Nutrient data base; FAO Agriculture, Food and Nutrition for Africa, [FAOAFNF], 1997). Common snacks include "plantain" fried in palm oil or vegetable oil, "akara" made from black eyed beans fried in palm oil, groundnut oil or vegetable oil, "fura/fula da nono", a millet meal mixed with cloves, ginger, peppercorn and rolled in millet flour into a ball, "gari", a cereal like food made from grated and dry-roasted cassava usually soaked in water, "fried yuca", a

snack made from cassava chips fried in palm oil or vegetable oil (Clarke & Herbert, 1986). Precise measuring of food is not common in traditional African cooking. Counting carbohydrates is an unfamiliar concept (McGuigan, 2010). Similarly, lack of knowledge of proper food portion sizes has been reported as part of barriers to diabetes management among African immigrants (Abioye-Akanji, 2013; Ndiaye, 2009). Studies conducted to gather dietary information from the Eritrean, Ethiopian and Somalia communities revealed poor vegetable consumption among these African immigrants in the U.S. because of fear of pesticides and lack of familiarity with many of the vegetables grown in the U.S. (McGuigan, 2010; Haq, 2003).

Exercise/ Physical Activity Practices among African Immigrants

African culture does not recognize recreational activities such as participation in physical activity as an integral part of good health and well-being; thus, walking for recreation and participation in any physical activities are viewed as a waste of time (Uwakweh, Rotich, & Okpala, 2013). Though physical activity, especially walking, has been reported as a normal part of everyday life in Africa, walking is viewed as a means of transportation in Africa. It is a common practice to walk to friends and relatives' houses to visit and walk to the shopping centers or walk to gather food menus from the grocery stores (Uwakweh et al. 2013). Evidence revealed that cultural perceptions of body weight validate sedentary lifestyle. Obesity is culturally and socially acceptable among Africans and therefore not usually recognized as a medical problem but rather as a sign of success, wealth, good health and happiness (McGuigan, 2010; Ndiaye, 2009; Uwakweh et al. 2013). Extreme cold or hot weather, lack of safe sidewalks, fear of walking alone and busy work schedules are other barriers have been reported by African immigrants in the U.S. (Abioye-Akanji, 2013; McGuigan, 2010). Therefore, the Western lifestyle which encourages driving rather than walking, coupled with socio-cultural barriers such

as perception of physical activity as related to health, environmental factors, social isolation, and cultural perception of body weight have been attributed to decreased physical activities among African immigrants in the U.S. (McGuigan, 2010; Ndiaye, 2009; Uwakweh et al. 2013).

Stress management among African Immigrants

Africans' perceptions of stress, anxiety, or depression appear to be influenced by their symptom expression. The words they use to describe symptoms of stress are somatic in nature such as body aches, physical tiredness, and headaches (Beru, 2006). The idea of Western psychotherapy is foreign to most Africans, and personal difficulties are usually discussed only within family members (Darman et al., 2001; Nwadiora, 1996). Africans are used to taking care of problems on their own or in the intimate circle of friends and family, and they seek assistance from religious/spiritual leaders and community elders as opposed to doctors or therapists (Beru, 2006).

Studies on lived experience of African patients with diabetes have shown that these patients experience emotional distress and depression in addition to the physical burden of diabetes (de-Graft, 2010; Famuyiwa, 1990; Nabel, Stevens, & Smith, 2009). A culturally constructed concept of diabetes and ignorance on the part of other members of the patients' community who are not diabetic was reported as a major stressor. Some patients turned to traditional healers who often made claims about their ability to cure diabetes because of the perception that the disease is caused by evil-spirits or bad blood. Among diabetic patients in West Africa (Nigeria), cases of dismissals from jobs due to erroneous belief that diabetes is contagious and harassment of patients by the police for possession of insulin has been reported (Famuyiwa, 1990).

Migration has been reported as a major cause of stress among diabetic and non-diabetic African immigrants. A study that explored the prevalence of mental illness among recently migrated sub-Saharan African populations in the Netherlands revealed a high prevalence of psychosocial stress and other mental health problems among African immigrants with chronic diseases (Knipscheer & Klebler, 2007). The author further noted that adapting to a new environment, lack of health insurance, difficulty finding a suitable job or earning a living abroad, and obligations towards families in Africa can be very challenging. Studies that explored the cultural information and diabetes management in the Ethiopian, Eritrean, Somalian, Nigerian, Liberian, and Ghanaian communities gathered that psychological stress associated with diabetes include self-denial of having the disease and the concerns of taking medication or insulin over a lifetime without cure. Medication is used on a short-term basis to “cure” disease in Africa, and chronic management of diabetes is perceived as foreign concept (Abioye-Akanji, 2013; McGuigan, 2010; Owens, Piccinin, & Lai, 2009).

Evidence Supporting Effective Management of Diabetes with Dietary Plan, Physical Activity, and Stress Management

Dietary Plan:

Nutrition plays an important role in the health of individuals and society as a whole. A healthy eating plan can reduce the risk of obesity and related chronic conditions such as diabetes, heart disease and stroke (National Institute of Health [NIH], 2013).

For many individuals with diabetes, the most challenging part of the treatment plan is determining what to eat (ADA, 2013). Therefore, it is the position of the ADA that people with diabetes should receive diabetes self management education according to national standards and diabetes self-management support when their diabetes is diagnosed and as needed thereafter.

Diabetes patients should receive individualized nutrition therapy as needed to achieve treatment goals, preferably provided by registered dietitians (ADA).

Monitoring carbohydrate intake, whether by carbohydrate counting or experience-based estimation remains a key strategy in achieving glycemic control (ADA, 2013). It is recommended that carbohydrate intake from vegetables, fruits, whole grains, legumes, and dairy products should be advised over intake from sugar containing carbohydrates and grain products such as pasta, rice, bread and processed foods. Substituting low or medium-glycemic load foods for higher-glycemic load foods may modestly improve glycemic control. Examples of low and medium glycemic index carbohydrates are converted rice, barley, brown rice, basmati rice, whole wheat, rye and pita bread, beans, peas, legumes, sweet potato, most fruits, non-starchy vegetables such as salad greens, cucumbers, broccoli, and carrots. Examples of high glycemic index carbohydrates are short grain white rice, puffed rice, rice pasta, macaroni and cheese, white bread or bagels, russet potato (ADA).

A randomized controlled trial study was conducted to compare the effects of a very low-carbohydrate, high-unsaturated/low-saturated fat (LC) diet (14% carbohydrate [<50 g/day], 28% protein, and 58% fat [$<10\%$ saturated fat]) with those of a high carbohydrate, low-fat (HC) diet (53% carbohydrate, 17% protein, and 30% fat [$<10\%$ saturated fat]) on glycemic control and cardiovascular disease (CVD) risk factors in type 2 diabetes (T2DM). Both diets were combined with structured exercise for 24 weeks. The outcomes measured were as follows: glycosylated hemoglobin (HbA1c), glycemic variability (GV; assessed by 48-h continuous glucose monitoring), antiglycemic medication changes (antiglycemic medication effects score [MES]), and blood lipids and pressure. The study showed that both diets achieved improvements for several clinical glycemic control and CVD risk markers. The improvements and reductions in

GV and antiglycemic medication requirements were greatest with the LC compared with HC. LC achieved greater reductions in triglycerides (-0.5 ± 0.5 vs. -0.1 ± 0.5 mmol/L), MES (-0.5 ± 0.5 vs. -0.2 ± 0.5), and GV indices; $P \leq 0.03$. LC induced greater HbA1c reductions ($-2.6 \pm 1.0\%$ [-28.4 ± 10.9 mmol/mol] vs. $-1.9 \pm 1.2\%$ [-20.8 ± 13.1 mmol/mol]; $P = 0.002$) and HDL cholesterol (HDL-C) increases (0.2 ± 0.3 vs. 0.05 ± 0.2 mmol/L; $P = 0.007$) in participants with the respective baseline values HbA1c $>7.8\%$ (62 mmol/mol) and HDL-C <1.29 mmol/L. The study suggests that a LC diet with low saturated fat may be an effective dietary approach for T2DM management (Tay et al 2014).

Given that nutrition therapy is a core tenet of diabetes management, the new evidence-based position statement recommendation for nutrition therapy in the management of adults with diabetes emphasizes portion control as a method for weight loss and maintenance and also advocates that clinicians ensure that patients know which foods contain carbohydrates (ADA, 2013). Contrary to 2008 ADA dietary recommendations, the 2013 ADA guidelines focus on overall eating patterns and patient preference. The new guidelines do not recommend specific proportions of daily calories from carbohydrates, fats, and proteins in the diet. There is not a “one-size-fits-all” eating pattern for individuals with diabetes. It is recommended that diabetic patients choose nutrient-dense, high-fiber foods as opposed to processed foods with added sodium, fat, and sugars, and to avoid sugar-sweetened beverages. According to the guidelines recommendation, “personal preferences” such as tradition, culture, religion, health beliefs, metabolic and economic goals should be considered when recommending one eating pattern over another, and combinations of different foods or food groups are acceptable.

Physical Activity:

Regular physical activity has been shown to improve blood glucose, prevent or delay T2DM, positively affect lipids, blood pressure, cardiovascular events, mortality, and quality of life (Colberg et al. 2010; Kirwan, Solomon, Wojta, Staten, & Holloszy, 2009; Liebreich, Plotnikoff, Courneya, & Boule, 2009; Umpierre et al. 2011). In a recent meta-analysis, aerobic, resistance, and combined exercise training were found to be associated with a decline in HbA1c levels as compared with a control group in patients with type 2 diabetes following 12 or more weeks of training (-0.67%; 95% confidence interval [CI], -0.84% to -0.49%; I(2), 91.3%) compared with control participants. In addition, structured aerobic exercise (-0.73%; 95% CI, -1.06% to -0.40%; I(2), 92.8%), structured resistance training (-0.57%; 95% CI, -1.14% to -0.01%; I(2), 92.5%), and both combined (-0.51%; 95% CI, -0.79% to -0.23%; I(2), 67.5%) were each associated with declines in HbA(1C) levels compared with control participants (Umpierre et al. 2011). However, as noted by the authors, structured exercise exceeding 150 min/week was associated with greater glycemic benefit (0.89% lower HbA1c) than 150 min or less (0.36% reduction). Conversely, making small changes in daily activity levels, such as taking a 5-min walking break every hour, also likely benefits weight management (Swartz, Squires, & Strath, 2011). In older individuals with T2DM, simply undertaking 20 min of self-paced walking after the dinner meal has been shown to be effective at lowering its glycemic impact compared with pre-meal walking or no exercise at all (Colberg et al. 2010). American Diabetes Association guidelines recommended individuals with type 2 diabetes to engage in a minimum of 150 min/week (30 min, 5 days/week) of moderate exercise or 60 min of vigorous physical activity (20 min on 3 days/week). For most people with type 2 diabetes, brisk walking is a moderate-intensity exercise (NDEP, 2009; NDEP, 2008). At least 150 min/week of moderate-intensity

exercise is associated with reduced morbidity and mortality in observational studies in all populations (Physical Activity Guidelines Advisory Committee [PAGAC], 2008).

Stress Management:

There is evidence that simple stress management like relaxation, breathing, and mindfulness-based techniques have positive effects on psychological and glycemic outcomes among patients with T2DM (Koloverou, Tentolouris, Bakoula, Darviri, & Chrousos, 2014; Rosenzweig, Reibel, Greeson, Jasser, & McMearty, 2007; Whitebird, Kreitzer, & O'Connor, 2009). A recent randomized control trial that investigated the efficacy of stress management intervention (relaxation breathing) on levels of stress and glycemic control in adults with T2DM suggests that overall, these approaches may not only be beneficial in reducing stress and related negative emotions, but may also be effective in improving glycemic control. In that study, a total of 53 patients with T2 DM were randomly assigned to undergo either an 8-week stress management program, consisting of 10 minutes of diaphragmatic breathing and 15 minutes of progressive muscle relaxation twice per day (n=25, intervention group), or not (n=28, control group). Perceived stress scores (PSS) and HbA1c levels were measured before and after the intervention. The study showed a significant decrease in PSS in the intervention group with moderate effect size (Cohen's $d=0.71$, $p=0.011$), after controlling for baseline PSS and interaction with the group. For HbA1c, moderate reduction with medium effect size (Cohen's $d=0.73$, $p=0.015$) was observed (Koloverou et al. 2014). One clinical trial of mindfulness-based stress management that involved an uncontrolled pilot study of 14 patients with T2DM found improvements in diabetes control, decreased symptoms of depression, anxiety, and general psychological distress (Rosenzweig et al. 2007). Several other studies conducted in the early-to mid 2000s showed promise in improving diabetes control. Individually delivered, biofeedback-

assisted relaxation training was found to reduce symptoms of anxiety and depression, muscle tension, and improve diabetes control in a small trial of 30 patients with T2DM (McGinnis, McGrady, Cox, & Grower-Dowling, 2005). T2DM patients who completed a program consisting of five group-based sessions involving training in progressive muscle relaxation, guided imagery, and instruction in behavioral and cognitive skills to recognize and reduce stress showed improvement in glycemic control over 12 months, relative to control patients (Surwit et al., 2002). Family support, community and religious affiliations have also been reported as good coping strategies for immigrants with chronic diseases (African Alliance of Rhode Island [AARI], 2011; Nabel, Stevens, & Smith, 2009; Renzaho, 2010). In a focus group study conducted in Rhode Island (RI) by the African Alliance of Rhode Island (AARI, 2011), religious affiliation, strong family and community supports were reported as excellent stress coping strategies. Many participants in the focus group reported that talking, laughing, or sharing feelings with friends and family members have helped them deal with stress. Some participants mentioned that their churches have provided strong supports when faced with stressful situations like illnesses, loss of loved ones, and loss of jobs. Community groups were also reported to be excellent sources of support around health issues by some of the participants.

Evidence Supporting Culturally Tailored Diabetes Education Intervention in Ethnic Minorities

A leading team of nursing educators conducted a systematic review of existing research on the efficacy of culturally tailored type 2 diabetes interventions among African Americans (Carter, Barba, & Kautz, 2013). The authors reviewed 10 educational intervention studies specifically designed for African Americans with type 2 diabetes that included Randomized Control Trials (RCTs), experimental studies and descriptive pilot studies. The review reported

that in one of the trials, culturally tailored interventions including changing dietary behaviors like cooking traditional southern-style foods deeply embedded in culture using simple low-cost, low-fat, low cholesterol recipes, and encouraging patients to identify foods using easy to-complete flow sheets were strongly associated with good glycemic control among African Americans; a 7% reduction in A1C was noted in the experimental group (7.5%-7.0%) compared to 4% in the control group (8.3-8.0%). The authors concluded that culturally tailored diabetes education may lead to improvements in self-care, prevent complications, and may decrease the cost of health care for African Americans with type 2 diabetes.

A randomized control trial entitled; *Latinos en Control intervention* was conducted to investigate the effectiveness of a theory-based, literacy, and culturally tailored self-management intervention on glycemic control among low-income Latinos with type 2 diabetes (Rosal, Ockene, Restrepo, White, & Borg, 2011). The researchers reported that the intervention resulted in improved health outcomes among 252 low-income Latinos with type 2 diabetes. A significant difference in HbA1c change between the groups was reported at 4 months (intervention -0.88 [-1.15 to -0.66] versus control -0.35 [-0.62 to 0.77], $P < 0.01$). The intervention also resulted in significant differences in diabetes knowledge ($P = 0.001$), self-efficacy ($P = 0.001$), blood glucose self-monitoring ($P = 0.02$), dietary quality ($P = 0.01$), kilocalories consumed ($P < 0.001$), percentage of fat ($P = 0.003$), and percentage of saturated fat consumed ($P = 0.04$) at 12 months. The study results showed that the difference in HbA1c measure decreased and lost statistical significance at 12 months (intervention -0.46 [-0.77 to -0.13] versus control -0.20 [-0.53 to 0.13], $P = 0.293$).

Another randomized control trial evaluated a culturally tailored intervention's effect on glycemic control and diabetes self-care behaviors among Puerto Ricans with type 2 diabetes was

conducted by Osborn et al. (2010). The study used the Information-Motivation-Behavioral skills (IBM) model of diabetes self-care to explore the barriers and facilitators of diabetes self-care behaviors among this population, and developed a culturally tailored intervention protocol to address those barriers. One hundred and eighteen adults participated in the study. The intervention group was exposed to group education and open discussion that focused on blood glucose monitoring, reading food labels, meal planning, portion control, physical activities and life style choices. HbA1c and self-care behaviors were measured. The results showed that the mean HbA1c values decreased in the intervention and the control groups, but only the intervention group showed significant improvement from baseline ($M = 7.76$, $SD = 1.37$) to follow-up ($M = 7.28$, $SD = 1.29$; $p < .008$). A close analysis of the study's results showed that the control decrease from baseline ($M = 7.45$, $SD = 1.58$) to follow-up ($M = 7.18$, $SD = 1.54$) was not significant. The results also showed that the intervention group improved significantly in self-care behaviors in terms of food label reading from baseline ($M = 2.36$, $SD = 1.30$) to follow-up ($M = 3.50$, $SD = 1.11$; $p < .008$). The results also showed a significant improvement in terms of diet adherence from baseline ($M = 3.15$, $SD = 1.89$) to follow-up ($M = 4.42$, $SD = 1.82$; $p < .04$). The author concluded that adapting diet recommendations that incorporate culturally familiar foods may improve adherence to dietary recommendations.

Choi & Rush, (2012) conducted a quasi-experimental study on the effect of a short-duration culturally tailored community based self-management education intervention. The study was conducted at a non-clinic affiliated community center. Culturally tailored education sessions were led by an experienced bilingual family nurse practitioner and the focus was on traditional diet, calories, portion sizes, and nutrition label reading. Forty-one Korean adults ($n=41$) participated in the study. The researchers concluded that a culturally tailored diabetes self-

management program for type 2 diabetic Korean immigrants may be associated with a significant decrease in HbA1c level from baseline to 3-months follow-up; 7.3% to 6.8% ($t[39] = 5.13, p < .001$), and a significant increase in HDL from baseline to follow-up; 44.1 to 47.8 mg/dl ($t[36] = -3.52, p < .01$). A decrease in waist circumference from baseline to follow-up; 38.5 to 37.3 inches ($t [40] = 4.89, p < .001$) was also reported. In terms of improvement in behavioral measures, the number of reported feet checks per week increased significantly from baseline across 3 different assessments; 1.7 to 2.8 to 3.1 times ($F[2,80] = 12.70, p = < .001$). There was also a trend-level increase in participants score on the exercise subscale of the SDSCA ($F [1.71, 68.37] = 2.88, p < .10$). The findings in this study demonstrated that a culturally-tailored educational program may be an effective approach to improve diabetes management in Korean immigrants.

Another quasi-experimental study was conducted to assess the effectiveness of a culturally tailored diabetes self-management education program among Chinese American adults ($n=23$). The education intervention curriculum was based on ADA standards. The commonly practiced Chinese activities and their food items were incorporated into the curriculum. The post intervention results showed a statistically significant decrease in the HbA1c over 6 months from baseline; ($t [18] = - 4.04, p<0.001$). At baseline and 6 months, the group mean of A1C were $7.87\% \pm 0.97\%$ (95% CI, 7.40% - 8.34%) and $7.11\% \pm 0.62\%$ (95% CI, 6.81 % - 7.41%) respectively. A significant increase in diabetes knowledge score was also reported at 6 months; ($t [22] = 3.06, p = 0.006$), a mean diabetes knowledge score of 2.70 ± 1.40 (95% CI, 2.09 -3.30) at baseline, and a mean diabetes knowledge score of 3.74 ± 0.81 (95% CI, 3.39 -4.09) at 6 months. The authors concluded that the results demonstrate the potential efficacy of a culturally

tailored diabetes self-management intervention for Chinese Americans (Sun, Tsoh, Saw, Chan, & Cheng, 2012).

Bryan, (2013) conducted a quasi-experimental study to examine the effectiveness of a community-based culturally tailored diabetes education program among the Ethiopians in the U.S. The study was conducted at two clinics that serve a large number of East African patients. A dietician and a diabetes nurse specialist led the educational sessions, and focused on diet, exercise, and diabetes self-care. Ethiopian foods were used to demonstrate appropriate portion size. The handouts written in simple plain English that could easily be translated by interpreters were provided. Illustrations of recommended exercises showed women with appropriate covering. Post intervention results showed an improvement in the HbA1c values. More than 80 % of patients who had a pre-intervention HbA1c levels above 8% had at least 0.3 % reduction in their HbA1c levels over 6 month period. Those participants with HbA1c levels below 8% maintained that level of control during the program. The results of the study demonstrated a potential efficacy of culturally tailored diabetes educational intervention in the improving the health outcomes of East African populations.

Synthesis

It is apparent that burdens of diabetes and diabetes complications exist among African immigrants in the U.S. There is evidence that poor dietary plans, physical inactivity, and poor stress management are common in migrant African groups, and are the key contributing risk factor to high prevalence of diabetes and poor diabetes outcomes for these individuals. The above literature review clearly revealed the barriers and challenges associated with these unhealthy lifestyles, and the cultural beliefs associated with such lifestyles; Africans do not consider overweight and obesity as a disease, but rather as a sign of success, wealth, good health

and happiness, and the same perceptions still exist among African immigrants (Uwakweh et al. 2013; McGuigan, 2010; Ndiaye, 2009). Perceptions of chronic management of diabetes as a foreign concept have also created undue stress to African immigrants with diabetes (Abioye-Akanji, 2013; McGuigan, 2010; Owens, Piccinin, & Lai, 2009). Traditional African food rotates around complex carbohydrates such as white rice, yam, cassava, banku, muufa; counting carbohydrates is an unfamiliar concept, and knowledge about food portion sizes is lacking among these individuals (Abioye-Akanji, 2013; Oniang et al. 2003).

It has been established that in the management of T2DM, adherence to prescribed pharmacological treatment alone without a healthy lifestyle may be insufficient to improve patient outcome (ADA, 2008). Lifestyle changes such as a healthy diet, increased physical activity, and stress management can have a significant impact on long-term glucose control and can prevent complications and improve the quality of life in people with diabetes (ADA, 2013; Colberg et al. 2010; Ghosh et al. 2009; Tay et al 2014; Umpierre et al. 2011). Evidence has shown that greater patient knowledge may lead to better diabetes prevention and self-management behaviors and, therefore, better disease control, and can have a tremendous impact on health care spending.

To motivate the African immigrant population with T2DM to improve their eating habits, stress management strategies, and to increase their physical activity levels, culturally tailored health education programs need to be implemented. The education curriculum should include more information about typical African food products and preparation, and food portion sizes. The curriculum should teach simple stress management strategies like deep breathing, and meditation. Advice could suggest more enjoyable and culturally sensitive forms of Physical activity such as walking to nearby grocery stores, engaging in home yard work, and dancing.

Theoretical Framework

Madeleine Leininger's cultural care diversity and universality conceptual framework formed the basis for this DNP quality improvement project. Leininger (1978) argues there are many ways by which different cultures explain normal and abnormal health. Health must be studied and defined within the context of specific cultures. It is therefore safe to assume that the way an individual understands health and disease such as diabetes is culturally influenced. Models of nursing decision-making and subsequent actions, "cultural care preservation", "cultural re-patterning", and "cultural care accommodation" were proposed by Leininger to facilitate the provision of culturally congruent care.

Cultural care preservation refers to nursing actions that safeguard cultural practices of the patient to maintain health and care. Within diabetes care, this view may consist of considering what the diagnosis means to the individual, and perhaps how the person can continue to eat traditional foods without a negative impact on blood glucose levels, and how the person can incorporate physical activity and stress management into their daily routines. This concept was used to identify the effects of cultural values and beliefs of African immigrants on management of diabetes; the findings guided the development of the educational curriculum for this QI project. *Cultural re-patterning* relates to changing client behavior to promote health and care. In diabetes care, this could involve health providers changing their dietary management approach from a standard diet plan to a customized dietary plan based on the culture of the client. It could mean providing information (knowledge) to patients on how to make nutritionally appropriate food choices, ways to reduce food portion sizes, and ways to reduce high carbohydrate content foods. *Cultural care accommodation* refers to flexible adaptation of nursing actions or negotiation to promote health. In diabetes care, this may take the form of

increasing patients' knowledge about the benefits of physical exercise and stress management in relation to diabetes management. It may take the form of teaching patients about ways they could incorporate physical activity and stress management into their daily routines; it may also take the form of demonstration and return demonstration of physical activity and relaxation techniques. The concepts of *Cultural re-patterning* and *Cultural care accommodation* were used to implement and evaluate the QI educational intervention. The educational materials were presented in such a way that the participants learned other available and healthier traditional foods. The participants understood how they can cook, appropriately portion, and eat traditional foods in healthier ways. They also understood various ways to incorporate physical activities and stress management techniques into their daily routines.

Project Setting Description

Description of Group, Population, Community Setting, and the key Stakeholders

The DNP QI project (culturally tailored diabetes education) was provided to African immigrants living in Rhode Island (RI) who have been diagnosed with T2DM. Inclusion criteria to participate in the project consisted of the following: male or female African immigrant; age 18 or older; non-pregnant; self reported as diagnosed with T2DM; ability to read, understand and speak English language; willingness to participate in two education sessions at the African Alliance of Rhode Island (AARI) education center in Providence for easy accessibility. The inability to read and understand English language is an exclusion criterion because of difficulty in interpreting the various African dialects. The project was carried out at the AARI education center in Providence, RI. The AARI has a strong link to the African immigrants' community in RI. In 2013, the population of African immigrants was over 75,000 from 40 African countries (AARI, 2014). African Alliance of Rhode Island is a non-profit organization dedicated to

improving the lives of Africans living in the state of RI. AARI partnered with the RI Department of Health to conduct a series of focus group studies with African immigrants and refugees in RI in the year 2011. The purpose of the focus group studies was to determine the African immigrants' level of knowledge on prevention of common diseases, and to investigate the best way to provide preventive information to this group in RI. Reports from the studies showed that some of the participants had limited knowledge on preventative health. Therefore, community approaches to preventive health education was recommended, as it may help improve health outcomes of African immigrants. The AARI conducts an African health summit annually to educate the African immigrants on healthy living, disease prevention that includes free health screenings, and various health promotion programs. The 2013 and 2014 health summit program included a workshop on chronic disease management, and responses from a significant number of the workshop participants revealed a knowledge deficit on diabetes management.

The key stakeholders of the DNP quality improvement project included the participants, the African immigrants' community leaders, and the president of the AARI who served as a mentor for the DNP (c), and provided critical input on each step of the project implementation to ensure the project was culturally appropriate for the target population.

Description of Resources, Facilitators, Constraints, or Barriers to Implementation

The project curriculum and the educational materials were adapted by the DNP (c) from the ADA, NDEP *Power to Prevent* program, and the NDEP Guiding Principles for Diabetes Care. Nutritional information of African foods was obtained from the USDA national Nutrient Database and Dietary Guidelines. Additionally, findings from a comprehensive review of African immigrants' dietary, physical activity, and stress management practices were used to inform inclusions of culturally relevant topics and strategies in the curriculum and educational

materials. The educational materials were reviewed by a diabetes educator and an African nutritionist. In addition, the DNP (c) created recipes for healthy substitutes and variations of commonly eaten traditional foods. The recipes were also reviewed by the African nutritionist. To facilitate sample recruitment for the QI project, flyers were posted at the AARI location, and were distributed to various African immigrants' event centers like churches, mosques, and multiple African grocery store locations. The DNP (c) met with many African organization leaders to discuss the purpose of the project, and reached out to some of the organization leaders through the president of the AARI who served as a mentor for this QI project. The DNP (c) is a member of the African immigrant community in RI; this also helped facilitate the recruitment of samples and implementations of the project. Other available resources used to assist in implementation of this project included usage of the education room, teaching aids, power point presentations, and diabetes education hand-outs. In addition, free resources such as self-care diaries, food scales, measuring cups, measuring spoons, meditation journals, water bottles, glucometers, and pedometers were provided to the participants. Fruit and vegetable snacks were served during the education sessions. All of the teaching materials were developed in English. One major barrier to the implementation of the QI project was a challenge of a small sample size, given the short period of time available to recruit participants, implement the project, and complete the capstone.

Design/Methods

Project design/ Protocol/Plan

IRB approval was not needed for this DNP QI project. The QI project was implemented over a 7 week period. Eight sample participants were recruited over the first 4 weeks, one additional participant was recruited after the start of the program, making a total of nine

participants. All samples met the inclusion criteria as immigrants from Africa, diagnosed with Type 2 diabetes, over 18 years of age, and able to understand, read, and speak English. In addition, all agreed to participate in two education sessions at the AARI location in Providence RI. During the 4th week, the DNP (c) met one-on-one with the potential participants at a convenient location for each participant to develop a rapport. At the initial one-on-one meeting, the DNP (c) discussed the schedule, and provided a general overview of the educational sessions, and answered questions the participants had concerning the program. A participant questionnaire was also administered to each participant to gather demographic information (Appendix A). Each meeting lasted approximately one hour.

Class Structure

The diabetes education intervention was delivered at the AARI location in Providence RI, and it consisted of three interactive group sessions. Sessions were held once a week, during the weekend and early afternoon hours to accommodate participants' schedules. Each participant was given a folder that contained a notepad, a pencil, handouts and power point materials for the lesson to be covered during the educational session. The first session which was delivered during the fifth week of the project focused on healthy nutrition. It also included a brief review of diabetes, blood glucose monitoring, and the importance of checking blood glucose. Participants were shown how to use the self-care diaries. Group activities: Display of healthy food items, cooking demonstrations, use of a kitchen scale to measure ingredients, and food label reading were incorporated into the session. The second education session that was delivered at the 6th week of the project included the physical activity and the stress management educational interventions. Deep breathing exercises, and physical exercise demonstrations that included the use of pedometers to count activity steps, distance, and calories burned were incorporated into

this session. The first and the second session lasted approximately two hours. The third session was a make-up session for participants that missed the first session, and for the participant that enrolled after the start of the program. The session was conducted at the 7th week of the project; the session included all the topics that were discussed during the first and the second sessions, and lasted approximately 3.5 h. Group activities were also incorporated into this session.

Culturally relevant topics, individualized challenges, strategies, and action plans for improving diet and physical activity and reducing stress were discussed. Cultural tailoring healthy nutrition education included information about typical African food products, and food portion sizes. Monitoring food portions was discussed using the “9-inch plate method” to help the participants understand the concept of recommended portions of vegetables (1/2 plate), protein (1/4 plate), and (1/4 plate) of carbohydrates (USDA, 2011; ADA, 2013). Participants were taught on how to adapt the traditional African diets that are high in carbohydrates such as substituting brown rice, quinoa, or wheat couscous, and other whole grains for white rice, substituting teff-fufu or whole wheat-fufu, green plantain-fufu for cassava-fufu, yam-fufu, banku, and kenkey, and substituting olive oil for palm oil, and reducing sugar intake. Calories and carbohydrate information on common traditional foods and food label readings and healthy food choices were discussed. Participants were also taught the benefits of engaging in 30 to 60 minutes of moderate–intense physical activity most days of the week. A more enjoyable and culturally sensitive form of physical activity such as walking to nearby grocery stores, engaging in home yard work, dancing, and actively playing with children like playing soccer, or basketball and using the stairs instead of elevators were discussed. Participants also learned that moving around more frequently from a sitting position, like taking a 10-minute walk three times a day can also help increase physical activity (ADA, 2013; NDEP, 2009). Other discussions included

impact of stress on blood glucose. Simple stress management strategies like meditation, and deep breathing were taught, and a deep breathing exercise activity was incorporated into the session.

Pre-test/post-test questions were administered for the three focused education interventions to test the participants' knowledge on self-care behaviors: healthy eating, physical activity, and stress management (Appendix B, C, and D) respectively. The test items had been previously reviewed by members of the African immigrant community for clarity, and modified based on different feedback. The same set of test items were used for both pre-test and post-test to ensure reliability of the instrument. At the completion of the sessions, a satisfactory survey was administered to measure the patients' satisfactory outcome and assess the feasibility and acceptability of the culturally tailored education program (Appendix E).

Goals and Objectives

This DNP(c) planned on having all the recruited participants attend the educational sessions. The expected outcome of the project was to see an improvement in the participants' diabetes-related nutritional, physical activity, and stress management knowledge when the pre-test and post-test scores were compared, and a high satisfaction score regarding the education program, as these will indicate the efficacy and acceptability of this program. (ADA, 2008). The main objective of this QI project was to improve diabetes outcomes among the African immigrant population with T2DM living in Rhode Island. It is assumed that increased knowledge within the cultural context of the participants would increase the motivation and self care behaviors related to T2DM.

The eight participants that were initially recruited attended the first session (dietary plan). Six participants returned for the second session (physical activity and stress management), the two participants that did not return could not make it because of their work schedule and they

requested for a make-up session. After the second session, one new participant heard about the program and asked if she could attend the make-up session. The third session which was a make-up session included all the topics that were discussed during the first and the second sessions. A total of nine participants attended the dietary, physical activities, and stress management education intervention sessions.

Cost

The total cost of implementing this DNP QI project was approximately \$855 as shown in figure 1

Figure 1

- Printing of flyers for recruitment- \$45.00
- Educational materials - \$ 130.00
- Food materials for cooking demonstration - \$125
- Snacks, and water served during the sessions - \$95
- Free resources (gift bags, self-care diaries, glucometers, food scales, measuring cups, measuring spoons, reusable water bottles, and pedometers) - \$480
- Total cost - \$875
- Planning tasks - not reimbursable

Results, Data Analysis, and Interpretation

Results

Prior to discussing the results of the statistical tests, descriptive statistics of the demographic data and the QI project outcome were presented, followed by testing for normality, and parametric testing of the data.

Demographic Characteristics

There were a total of nine participants. As illustrated on Table 1, all participants (n=9) reported to have T2DM. The participants were diagnosed with T2DM in the years ranging from 1991 to 2010. For the country of birth, 77.8 percent (n=7) of the participants were born in Nigeria, while 22.2 percent (n=2) were born in Ghana. For the age of participants, 22.2 percent (n=2) were aged 41-50 years old, 55.6 percent (n=5) were aged 51-60 years old, and 22.2 percent (n=2) were age above 60 years old. For the gender of participants, 33.3 percent (n=3) were male, and 66.7 percent (n=6) were female. The majority of the participants had a university education (66.7 percent; n=6), while a small share had a post-graduate level education (11.1 percent; n=1), and another small share had a high school level education (22.2 percent; n=2). For the employment status of participants, 77.8 percent (n=7) are currently employed, while 22.2 percent (n=2) are retired. There was only one participant who reported to have previous participation in a culturally tailored diabetes education for African immigrants.

Table 1: Demographic characteristics of participants (N=9)

Participant's country of birth	Age	Gender	Educational level	Employment status	Type of Diabetes	Year diagnosed	Previous Participation in a Culturally Tailored Diabetes Education for African Immigrants
Nigeria	51-60 years old	F	College	Employed	Type II	1991	No
Nigeria	>60 years old	M	Post Graduate	Retired	Type II	2008	Yes
Ghana	51-60 years old	F	College	Employed	Type II	2006	No
Nigeria	>60 years	F	College	Retired	Type II	2009	No

	old						
Ghana	41-50 years old	F	College	Employed	Type II	2003	No
Nigeria	41-50 years old	F	High School	Employed	Type II	2008	No
Nigeria	51-60 years old	M	College	Employed	Type II	2006	No
Nigeria	51-60 years old	M	College	Employed	Type II	2006	No
Nigeria	51-60 years old	F	High School	Employed	Type II	2010	No

Data Analysis

Data for the outcome variables was gathered through scoring pre- and post- tests to evaluate participants' diabetes knowledge on: healthy nutrition, physical activity, and stress management. Each test was scored in a percentage basis, with 100% being the highest (perfect) score, and 0% being the lowest. The test questionnaire for nutrition was a 16-item questionnaire, that for physical education was a 10-item questionnaire, and that for stress management was a 6-item questionnaire. Analyses were conducted using IBM SPSS version 23.

Table 2 presents the descriptive statistics of the pre- and post-test scores for the three knowledge areas in terms of percentage. For the pre-test scores for nutrition, the lowest score was 25%, and the highest was 81%, with an average of 65% ($SD=17\%$). For the post-test scores for nutrition, the lowest score was 88%, and the highest was 100%, with an average of 96% ($SD=5\%$). For the pre-test scores for physical activity, the lowest score was 30%, and the highest was 80%, with an average of 58% ($SD=17\%$). For the post-test scores for physical activity, the lowest score was 90%, and the highest was 100%, with an average of 94% ($SD=5\%$). For the pre-test scores for stress management, the lowest score was 50%, and the

highest was 83%, with an average of 69% ($SD=13\%$). For the post-test scores for stress management, the lowest score was 83%, and the highest was 100%, with an average of 96% ($SD=7\%$).

Table 2

Descriptive Statistics of Pre-test/Post-test Scores for the Three Knowledge Areas (N=9)

	Minimum	Maximum	Mean	Std. Deviation
Nutrition Pre-test Scores	.25	.81	.6467	.17378
Nutrition Post-test Scores	.88	1.00	.9600	.05196
Physical Activity Pre-test Scores	.30	.80	.5778	.17159
Physical Activity Post-test Scores	.90	1.00	.9444	.05270
Stress Management Pre-test Scores	.50	.83	.6856	.12866
Stress Management Post-test Scores	.83	1.00	.9622	.07496

Test for Normality

The statistical test selected was comparison of means test, with paired samples t-test as the parametric statistical test, where data should be normally distributed. The Kolmogorov-Smirnov test was conducted to determine whether the data follows a normal distribution. The results for the Kolmogorov-Smirnov test are presented in Table 3.

Table 3

Kolmogorov-Smirnov Normality Test for Participants' Knowledge Variables

	Statistic	df	Sig.
Nutrition Pre-test Scores	.265	9	.068

Nutrition Post-test Scores	.335	9	.004
Physical Activity Pre-test Scores	.125	9	.200
Physical Activity Post-test Scores	.356	9	.002
Stress Management Pre-test Scores	.230	9	.188
Stress Management Post-test Scores	.471	9	.000

As observed in the above table, the Kolmogorov-Smirnov tests revealed that not all variables followed a normal distribution. All variable pairs have at least one variable that was not normally distributed ($p < 0.05$). Thus, Wilcoxon signed rank tests were conducted to explore the following three hypotheses:

- Hypothesis one examined whether there were improvements in the participants' knowledge on T2DM dietary plan after a culturally tailored educational intervention
- Hypothesis two examined whether there were improvements in the participants' knowledge on T2DM physical activity plan after a culturally tailored education intervention.
- Hypothesis three examined whether there were improvements in the participants' knowledge on T2DM stress management plan after a culturally tailored educational intervention

Outcome Results from Intervention

Tables 4 and 5 present the result of the Wilcoxon signed rank test for hypotheses one to three. From the ranks table, it is shown that all nine participants had higher scores after the education intervention for all three areas of knowledge. These were reported to be statistically significant as can be observed in the p -values in Table 5 ($p < 0.05$).

Table 4

Ranks Table

		N	Mean Rank	Sum of Ranks
Nutrition Post-test Scores -	Negative Ranks	0	0.00	0.00
Nutrition Pre-test Scores	Positive Ranks	9	5.00	45.00
	Ties	0		
	Total	9		
Physical Activity Post-test	Negative Ranks	0	0.00	0.00
Scores - Physical Activity	Positive Ranks	9	5.00	45.00
Pre-test Scores	Ties	0		
	Total	9		
Stress Management Post-test	Negative Ranks	0	0.00	0.00
Scores - Stress Management	Positive Ranks	9	5.00	45.00
Pre-test Scores	Ties	0		
	Total	9		

Table 5

Wilcoxon Test Statistics Table

	Nutrition Post-test Scores - Nutrition Pre-test Scores	Physical Activity Post- test Scores - Physical Activity Pre-test Scores	Stress Management Post-test Scores - Stress Management Pre-test Scores
Z	-2.677	-2.680	-2.682
Asymp. Sig. (2-tailed)	.007	.007	.007

A Wilcoxon signed rank test showed that a culturally tailored diabetes educational intervention with a focus on dietary plan, physical activity, and stress management can significantly improve the African immigrants' knowledge on dietary plan ($Z=-2.677, p=0.007$), physical activity plan ($Z=-2.680, p=0.007$), and stress management plan ($Z=-2.682, p=0.007$).

From the results of the statistical analyses, it was revealed that a culturally tailored educational intervention in the prevention and management of T2DM for African immigrants in the U.S. with a focus on dietary plan, physical activity, and stress management could foster statistically significant improvements in the knowledge areas of dietary plan, physical activity, and stress management, and thus improve diabetes outcomes.

Participant Satisfaction

At the completion of the educational sessions, satisfaction survey questionnaires were administered to measure the participants' satisfaction outcomes and to assess the feasibility and

acceptability of the culturally tailored diabetes education program. Table 6 presents the result of the satisfaction survey.

Table 6

Participant Satisfaction Survey Report

Survey Questions	% Agree	% Don't agree	% Not Sure	% Does Not Apply
1. The diabetes education classes helped me get a better understanding of diabetes Self-Management through dietary planning, exercise and stress management	100%	0	0	0
2. The classes were taught in a way I could understand	100%	0	0	0
3. Handouts I received in the diabetes sessions were helpful, easy to read and understand	100%	0	0	0
4. The nutrition education class will help me make healthy changes in the way I eat	100%	0	0	0
5. The diabetes education was provided in a way that respects me and my cultural beliefs and knowledge	100%	0	0	0
6. An interpreter in my own language would have made the diabetes education easier to understand What language? _____	0	0	0	100%
7. I know my target goal for HbA1c	100%	0	0	0
8. I understand the importance of exercise and stress management in controlling diabetes and I am going to start exercising, and start managing my stress	100%	0	0	0
9. I know what the serious complications of diabetes are and how to avoid them	100%	0	0	0
10. After attending this diabetes program, I will be able to monitor my blood sugar and modify my diet at home to get better diabetes control	100%	0	0	0
11. I will recommend this culturally tailored diabetes program to friends, family and other African immigrants if the program is offered at another time	100%	0	0	0

12. How can we improve? _____

This last question elicited a response from one participant:

Participant's response: *"I wish more people could attend this diabetes education workshop. I suggest you give more time to advertise this program so that you can create more awareness of this great program. Great work!"*

The culturally tailored diabetes educational intervention program was well accepted by the participants. All the participants were satisfied, and indicated that they would recommend the program to family and friends who have T2DM, even after the program was completed some participants and many others who did not attend the program called the DNP (c) to inquire about the time of next education program. A number of the comments made by the participants about the program were overwhelmingly positive. The participants reported that they enjoyed the topics covered and expressed that they learned a lot from the program, particularly information provided on alternative choices of healthy traditional foods, and portion control using the plate method. The participants also mentioned that information on various ways to increase physical activities without necessarily going to the gym was very valuable, as going to the gym was mentioned as a barrier to engaging in physical activity by many of the participants. The participants further mentioned that they felt that they now had culturally sensitive information to help them better manage their diabetes. Below are comments from some of the participants when they were asked about their experiences regarding the program during one of the group activities?

One participant stated

"My experience is great... I have learned a lot, and--- I believe everyone has learned a lot too from this program. I have started implementing it in my house. For instance, I have cooked egg plant sauce, and wheat couscous, and I have started adding a lot of vegetables to what I cook at home. I love it, my children love it too"

Another participant stated

“The sessions are very educative. For us to learn and to know what to eat, for us to be healthy...and to manage our diet is very very good. Teff, looks like amala... it even has a better taste than amala, people should be more aware, and eat healthier. The portion control method is good and simple to understand”

Another participant stated

“Next time, let everyone of us create more awareness... invite more people, put flyers everywhere, invite as many people as we can, I know it is difficult to get our people to come out for events like this... but we all need it, we Africans we really need it ...it’s gonna help us. Someone likes me that do catering for parties, some people will ask for alternatives, and varieties of food, some people will not eat rice, or iyan... If I give them something like this... vegetable mixture, I’m sure they will try it”

One participant stated

“I have attended cooking demonstrations at African farmer’s markets, but they were nothing compared to this, and I have never attended a physical activity and stress management program, this program is the first of its kind for African immigrants in Rhode Island”.

Another participant stated

“I have been in the United States for over 30 years; I have never attended a program like this for Africans. This is a great program, let us do it more often”

These statements reflect that the participants actually made dietary changes based on this program and the food choices were culturally acceptable.

Discussion

This culturally tailored diabetes education program focused on increasing knowledge in the areas of healthy nutrition, physical activity, and stress management among African immigrants with Type 2 diabetes for optimal diabetes management and good outcomes. Poor dietary habit, physical inactivity, and poor stress management were documented in the literature as common health behaviors among African immigrants (Abioye-Akanji, 2013; Darman et al., 2001; McGuigan, 2010; Ndiaye, 2009; Nwadiora, 1996; Owens, Piccinin, & Lai, 2009;

Uwakweh et al. 2013). An explanation for the above mentioned habits may be that Africans do not consider overweight and obesity as a disease, but rather as a sign of success, wealth, good health and happiness (Uwakweh et al. 2013; McGuigan, 2010; Ndiaye, 2009). Likewise, African culture does not recognize recreational activities such as participation in physical activity as an integral part of good health and well-being, thus participation in any physical activities are viewed as a waste of time (Uwakweh et al. 2013). Additionally, traditional African food rotates around complex carbohydrates, and food portion control is an unfamiliar concept among these individuals (Abioye-Akanji, 2013; Oniang et al. 2003). Also, the idea of stress management and western psychotherapy is foreign to most Africans (Darman et al., 2001; Nwadiora, 1996).

Lack of knowledge in these focused areas were associated with poor diabetes management, and complications such as retinopathy, kidney failure, amputations, and heart problems (ADA, 2013; Colberg et al. 2010; Ghosh et al. 2009; Tay et al 2014; Umpierre et al. 2011). However, literature documents that education on lifestyle changes such as a healthy diet, increased physical activity, and stress management can have a significant impact on long-term glucose control and can prevent complications and improve the quality of life in people with diabetes (ADA, 2013; Colberg et al. 2010; Ghosh et al. 2009; NDEP, 2009; NDEP, 2008; Tay et al 2014; Umpierre et al. 2011).

This DNP(c) QI diabetes educational program was based on the ADA standards and recommendations. It was modeled after the NDEP *Power to Prevent* program, but was modified to be culturally appropriate for African immigrants with T2DM. The NDEP *Power to Prevent* program was derived from the Diabetes Prevention Program (DPP) and was designed to help the African American community take steps to bring healthier habits into their lives to prevent diabetes, and diabetes complications. The Diabetes Prevention Program has been translated into

community settings and has been modified to be culturally-adapted for different ethnic populations (Bryan, 2010; Choi & Rush, 2012; Ockene, Tellez, Rosal, Reeds, Mordes, Merriam et al. 2012; Osborn, Amico, Cruz, O'Connell, Perez-Escamilla, Kalichman et al. 2010; Philis-Tsimikas, 2008; Rosal, Ockene, Restrepo, White, & Borg, 2011).

The use of Madeleine Leininger's cultural care concepts provided a framework for this QI project, allowing for adaptation of the diabetes education program to be culturally appropriate for the African immigrants. Leininger's concept of *Cultural care preservation* was used to identify the effects of cultural values and beliefs of African immigrants on management of diabetes. The Concept of *Cultural re-patterning* was used to modify dietary management approaches from a standard diet plan to a customized dietary plan based on the culture of the participants, and the *Cultural care accommodation* was used to negotiate health promotion and to increase patients' knowledge about the benefits of a healthy diet, physical exercise and stress management in relation to diabetes management. These three concepts guided the implementation and evaluation of the educational intervention. Additionally, this DNP(c) is an African immigrant, who is familiar with African culture, and has expertise working with African immigrants, community, and was able to culturally tailor her teaching style, curriculum, handouts, dietary, physical activity, and stress management recommendations to fit participants' needs and culture.

As seen in the outcomes of this diabetes educational intervention program, adapting diet, physical activity, and stress management recommendations, and incorporating culturally familiar diet and activities showed statistically significant improvement in knowledge, and changes the areas of dietary plan, physical activity, and stress management among the participants. These outcomes demonstrated the impact of the intervention, and are also consistent with previous

culturally tailored diabetes education programs which revealed positive effects among other ethnic minorities (Bryan, 2010; Choi & Rush, 2012; Ockene, Tellez, Rosal, Reeds, Mordes, Merriam et al. 2012; Osborn, Amico, Cruz, O'Connell, Perez-Escamilla, Kalichman et al. 2010; Philis-Tsimikas, 2008; Rosal, Ockene, Restrepo, White, & Borg, 2011).

The QI project was implemented in the African immigrants' community setting with involvement of and resources from the community-based organization (AARI). This community-based approach and the strong connectedness of the intervention with community resources and cultural norms and values was an integral contribution towards the success of the program. Health promotion incentives that were provided at no cost to the participants were well received and encouraged changes in their health behaviors and aided their diabetes management. For example, the self-care diary served as a reinforcement tool for a weekly meal log and for recording and monitoring change in blood glucose. The gifts of pedometer and water bottle encouraged physical activity. Incorporation of a physical activity demonstration, breathing exercises, and cooking demonstrations were other strengths of the diabetes intervention program. The display of healthy food choices, and the participants' involvement in cooking of the healthy foods, showing a sample of a 9-inch plate size, and using MyPlate method for demonstrations of food portion control greatly enhanced participants' knowledge. In addition, the participants reported making changes to their cooking and diets in their comments about the program. This indicates that there were behavior changes as a result of the program. All the above mentioned strategies may be of value to others who are developing similar programs, particularly if they are seeking to replicate or expand on this QI program in different settings. The retention rate observed was very high (100%), and all the participants (100%) were satisfied with the program and would recommend the program to friends and family. Having the same educator throughout

the program, and availability of the DNP(c) throughout the program to answer questions and provide support during and after class meetings may have contributed to the participants' high retention, and satisfaction. The support group format also provided an intimate setting which enhanced participants' trust for and rapport with each other, and with the DNP(c). This rapport allowed participants to comfortably share their thoughts and challenges with others.

The two hour nutrition educational intervention was adequate and effective. However, improvements to this program may include delivering the stress management and the physical activity intervention at separate sessions and extending the contact time for each session to two hours, in order to increase the amount of time spent on physical exercise demonstrations, and increasing the time spent on open forum discussions about stress management. Also, more education sessions that include several follow-up booster sessions over an extended period of time might be more effective.

Findings from this QI project will be shared with the hosting community organization; AARI. It will also be shared with the Rhode Island Department of Health. The results will be disseminated through the National Diabetes Education professional conference presentations. It will be submitted for publication in a diabetes education journal.

The QI Program Limitations

Despite the positive results, there are some factors that this DNP (c) viewed as barriers and limitations to the program that should be acknowledged. First, the sample size for this QI program was relatively small. Second, the majority of the participants 77.8% (n=7) are from Nigeria, while 22.2 percent (n=2) are also from Ghana. There was no participant from other African countries. These two barriers may have been due to the anticipated difficulty of getting subjects to enroll within a short period allowed for the project completion. The DNP (c) made a

considerable effort to reach out to various African immigrants' communities in RI through their organization and community leaders, and through the AARI within the limited time frame of the project. Recruitment flyers were also distributed to different African communities. The above mentioned barriers limit the generalizability of this program to the African population. Thus, this QI project should be viewed as a pilot study which can be built upon in future diabetes education intervention program in this population. Future programs should consider addressing these limitations and examine a similar intervention with a larger sample size consisting of different African immigrants' subgroups, and a longer duration.

After implementing the dietary plan intervention, one feasibility barrier noted by the DNP (c) was a limited supply of healthy food alternatives in traditional/ethnic food stores. Some of the traditional whole grain foods were not readily available. The DNP(c) partially addressed this challenge by meeting with a few of the African food store owners in RI, to discuss about the culturally tailored diabetes education program, and the possibility of making the traditional whole grains available, and the possibility of offering greater availability of more healthy food choices across food groups. Before the end of the program, one of the African stores had two of the healthy whole grain food alternatives in stock, participants were notified and were very glad to purchase the whole grain foods. Strategies to fully address this challenge may be to conduct a community food assessment in the African immigrants' community. Community food assessments can be powerful tools for raising awareness of food system issues and for creating a lasting, positive change in a community (Columbus Health Department, 2005). This DNP (c) has a future plan to partner with a PHNL-DNP, and partner with the AARI to address this challenge as a broader public health intervention.

Conclusions

Greater burdens of diabetes and diabetes complications exist among ethnic minorities including African immigrants. There is evidence that lack of knowledge in the areas of dietary plan, physical activity, and stress management are the key contributing risk factors to high prevalence of diabetes and diabetes complications among migrant African groups and lifestyle changes in these areas may help prevent complications and improve their diabetes outcomes.

This QI program is the first to report on the results of a T2DM educational intervention with a specific focus on dietary plan, physical activity, and stress management that is culturally tailored to meet the needs of African immigrants living in RI. Thus the program may serve as a model for up-to date culturally tailored diabetes education and information for African immigrants, and other ethnic minorities. As such, it fills a significant gap in literature on culturally-tailored educational programs for diabetes prevention in the African immigrant community in the U.S. The findings in this QI project, and positive comments from the participants reinforced satisfaction and acceptability of the diabetes intervention program in this community. The findings also showed that the program helped promote life-style changes in nutrition, physical activity, and stress management, which are important components of diabetes prevention and management.

Given that the rates of diabetes among Africans are rising worldwide, the findings in this program support the necessity of more effective and culturally-tailored diabetes interventions to alleviate the burden of diabetes in this population.

Implications and Recommendations

Despite the limitations of this program, the findings have important implications for healthcare organizations and for the delivery of diabetes prevention and management strategies

in the African immigrants' community and in other minority groups. Healthcare delivery policies and strategies are needed to recognize the unique needs and barriers facing this specific immigrant population. Community information sharing networks and community based informal and formal support systems should be considered as the foundation for diabetes prevention education and health promotion strategies (NDEP, 2009). Culturally appropriate health education efforts should utilize all available means such as community groups, religious forums, word of mouth, and intra-cultural media to reach out to this population regarding diabetes prevention, management, and care. DNPs and other APRNs must address patient education on a regular basis, not just at diagnosis. Education should explain how dietary management, physical activity, and stress management are central to effective Type 2 diabetes care. Collaborations of health practitioners and African community organizations are needed to develop a health promotion and awareness strategy, support healthy diets, encourage physical activity, and stress management for optimal diabetes management and outcomes in this high risk population.

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Appendix A

Culturally Tailored Diabetes Education Program for African Immigrants Participants' Demographic Questionnaire

Check box that applies to you

1. Which of the following best describes your gender?

- Male
 Female

2. Which of the following best describes your age?

- 18-30
 31-40
 41-50
 51-60
 >60

3. What is the highest grade you completed in school? (Check one box)

- Elementary School High School College Post Grad

4. Are you employed? Yes No Retired

5. Do you have Diabetes? Yes No

If yes, what type? 1 2 Gestational

6. When were you diagnosed with Diabetes? (What year?) _____

7. Have you participated in a culturally tailored diabetes education program in the past? Yes
No

8. How did you hear about our class? AARI African store Church Mosque
Other_____

Participant #_____

Appendix B

Culturally Tailored Diabetes Education for African Immigrants Diabetes Knowledge on Nutrition

Pre-test

Circle the correct answer(s) for each question

1. Select from the following food groups which should be included in a healthy diet
 - a. Vegetables
 - b. Fruits
 - c. Grains
 - d. Dairy (milk, egg, cheese, yogurt)
 - e. Protein
 - f. All of the above

2. You can reduce food portions by reducing your meal plate size to a 9 inch plate
 - a. True
 - b. False

3. What portion of your plate should be filled with grains?
 - a. 1/4
 - b. 1/2
 - c. 1/3
 - d. The whole plate

4. What portion of your plate should be filled with vegetables and fruits?
 - a. 1/4
 - b. 1/2
 - c. 1/3
 - d. The whole plate

5. You can also fill 1/2 of your plate with non-starchy vegetables like spinach, cucumber, lettuce, tomatoes, mushroom, garden-eggs
 - a. True
 - b. False

6. Diabetes patient should never eat carbohydrates

- a. True
 - b. False
7. Select starchy foods that can raise blood sugar levels, and that you should reduce or avoid
- a. White rice
 - b. White bread
 - c. White pasta
 - d. Cassava (garri, yucca, eba)
 - e. All of the above
8. To avoid a rapid rise in blood glucose levels, which of the following foods can you eat instead of white rice?
- a. Brown rice
 - b. Wheat
 - c. Quinoa
 - d. All of the above
9. Teff, Whole wheat, and green Plantain fufu are better choices than Cassava to help control blood sugar level
- a. True
 - b. False
10. Starchy vegetables are high in fiber and protein. Choices of starchy vegetables include:
- a. Plantain
 - b. Corn
 - c. Beans
 - d. All of the above
11. It is always good to broil, grill, roast, or bake meat, chicken, turkey, or fish instead of frying to reduce fat calories
- a. True
 - b. False
12. Which of the following are better oils to cook with? Select all that apply.
- a. Olive oil
 - b. Canola oil
 - c. Vegetable oil

- d. Palm oil
- e. Coconut oil

13. How can you best manage your diet for better diabetes control?

- a. Watch your food portions
- b. Eat from all food groups
- c. Increase vegetables and fibers
- d. Limit sugars
- e. All of the above

14. What information is important to look at when reading a food label?

- a. Serving size and grams of total carbohydrates, fibers, or sugars per serving
- b. Serving size and calories per serving
- c. Grams of sugar per serving
- d. All of the above

15. If you choose to drink alcohol, women should not drink more than one serving of drink per day, and men should not drink more than two servings per day

- a. True
- b. False

16. One serving glass of wine is the same as

- a. 5 oz glass of wine
- b. 8 oz glass of wine
- c. 12 oz bottle of wine
- d. None of the above

Source: Adapted from American Diabetes Association, the National Diabetes Education Program, and the USDA

Appendix B

Culturally Tailored Diabetes Education for African Immigrants Diabetes Knowledge on Nutrition

Post-test

Circle the correct answer(s) for each question

1. Select from the following food groups which should be included in a healthy diet
 - g. Vegetables
 - h. Fruits
 - i. Grains
 - j. Dairy (milk, egg, cheese, yogurt)
 - k. Protein
 - l. All of the above

2. You can reduce food portions by reducing your meal plate size to a 9 inch plate
 - c. True
 - d. False

3. What portion of your plate should be filled with grains?
 - e. 1/4
 - f. 1/2
 - g. 1/3
 - h. The whole plate

4. What portion of your plate should be filled with vegetables and fruits?
 - e. 1/4
 - f. 1/2
 - g. 1/3
 - h. The whole plate

5. You can also fill 1/2 of your plate with non-starchy vegetables like spinach, cucumber, lettuce, tomatoes, mushroom, garden-eggs
 - c. True
 - d. False

6. Diabetes patient should never eat carbohydrates
- c. True
 - d. False
7. Select starchy foods that can raise blood sugar levels, and that you should reduce or avoid
- f. White rice
 - g. White bread
 - h. White pasta
 - i. Cassava (garri, yucca, eba)
 - j. All of the above
8. To avoid a rapid rise in blood glucose levels, which of the following foods can you eat instead of white rice?
- e. Brown rice
 - f. Wheat
 - g. Quinoa
 - h. All of the above
9. Teff, Whole wheat, and green Plantain fufu are better choices than Cassava to help control blood sugar level
- c. True
 - d. False
10. Starchy vegetables are high in fiber and protein. Choices of starchy vegetables include:
- e. Plantain
 - f. Corn
 - g. Beans
 - h. All of the above
11. It is always good to broil, grill, roast, or bake meat, chicken, turkey, or fish instead of frying to reduce fat calories
- e. True
 - f. False
12. Which of the following are better oils to cook with? Select all that apply.
- f. Olive oil
 - g. Canola oil
 - h. Vegetable oil

- i. Palm oil
 - j. Coconut oil
13. How can you best manage your diet for better diabetes control?
- f. Watch your food portions
 - g. Eat from all food groups
 - h. Increase vegetables and fibers
 - i. Limit sugars
 - j. All of the above
14. What information is important to look at when reading a food label?
- a. Serving size and grams of total carbohydrates, fibers, or sugars per serving
 - b. Serving size and calories per serving
 - g. Grams of sugar per serving
 - h. All of the above
15. If you choose to drink alcohol, women should not drink more than one serving of drink per day, and men should not drink more than two servings per day
- c. True
 - d. False
16. One serving glass of wine is the same as
- e. 5 oz glass of wine
 - f. 8 oz glass of wine
 - g. 12 oz bottle of wine
 - h. None of the above

Source: Adapted from American Diabetes Association, the National Diabetes Education Program, and the USDA

Appendix C

Participant # _____

Culturally Tailored Diabetes Education for African Immigrants Diabetes Knowledge on Physical Activity

Pre-test

1. Diabetes can be better managed through which of the following lifestyle changes?
 - a. Regular physical activity
 - b. Eating a healthy diet
 - c. Stress management
 - d. All of the above

2. How much moderate-intensity physical exercise do you need to improve your health?
 - a. At least 1 hour every day
 - b. At least 45 minutes, 2 days in a week
 - c. At least 30 minutes, 5 days in a week
 - d. None of the above

3. Only people who need to lose weight will benefit from taking part in regular physical exercise
 - a. True
 - b. False

4. You have to train at a gym for hours in order to become fit and healthy
 - a. True
 - b. False

5. Which of the following are benefits of exercising?
 - a. It helps lower your blood glucose level
 - b. It helps lower your blood pressure
 - c. It helps you reduce stress
 - d. All of the above
 - e. None of the above

6. You can get your required daily physical activity by doing which of the following:
(circle all that apply)
 - a. Walking to nearby grocery stores instead of driving

- b. Engaging in home yard work
 - c. Dancing
 - d. Stair climbing
 - e. Actively playing with your child like playing soccer, or basketball
7. A small change in daily activity levels, like taking a _____ minute walk on three separate occasions in one day can count as the recommended physical activity per day
8. What is the **first** thing you should do before starting an exercise plan *if* you have not been physically active, and have a health condition like high blood pressure or have concerns about your health?
- a. Discuss with your healthcare provider, and do a check up
 - b. Start slow
 - c. Make a plan
 - d. Find an exercise activity you like
9. The older you are, the less active you need to be
- a. True
 - b. False
10. If you have a low blood sugar during exercise, what can you eat to quickly raise your blood sugar back up?
- a. Glucose tablets or fruit juice or hard candies
 - b. Diet soda
 - c. Rice, plantain, or nuts
 - d. All of the above

Source: American Diabetes Association and the National Diabetes Education Program

Appendix C

Participant # _____

Culturally Tailored Diabetes Education for African Immigrants Diabetes Knowledge on Physical Activity

Post-test

1. Diabetes can be better managed through which of the following lifestyle changes?
 - e. Regular physical activity
 - f. Eating a healthy diet
 - g. Stress management
 - h. All of the above

2. How much moderate-intensity physical exercise do you need to improve your health?
 - e. At least 1 hour every day
 - f. At least 45 minutes, 2 days in a week
 - g. At least 30 minutes, 5 days in a week
 - h. None of the above

3. Only people who need to lose weight will benefit from taking part in regular physical exercise
 - c. True
 - d. False

4. You have to train at a gym for hours in order to become fit and healthy
 - c. True
 - d. False

5. Which of the following are benefits of exercising?
 - f. It helps lower your blood glucose level
 - g. It helps lower your blood pressure
 - h. It helps you reduce stress
 - i. All of the above
 - j. None of the above

6. You can get your required daily physical activity by doing which of the following: (circle all that apply)

- f. Walking to nearby grocery stores instead of driving
 - g. Engaging in home yard work
 - h. Dancing
 - i. Stair climbing
 - j. Actively playing with your child like playing soccer, or basketball
7. A small change in daily activity levels, like taking a _____ minute walk on three separate occasions in one day can count as the recommended physical activity per day
8. What is the **first** thing you should do before starting an exercise plan *if* you have not been physically active, and have a health condition like high blood pressure or have concerns about your health?
- e. Discuss with your healthcare provider, and do a check up
 - f. Start slow
 - g. Make a plan
 - h. Find an exercise activity you like
9. The older you are, the less active you need to be
- c. True
 - d. False
10. If you have a low blood sugar during exercise, what can you eat to quickly raise your blood sugar back up?
- e. Glucose tablets or fruit juice or hard candies
 - f. Diet soda
 - g. Rice, plantain, or nuts
 - h. All of the above

Source: American Diabetes Association and the National Diabetes Education Program

Appendix D

Participant # _____

Culturally Tailored Diabetes Education for African Immigrants Diabetes Knowledge on Stress Management Pre-test

1. How does stress affect you?
 - a. Physically
 - b. Psychologically
 - c. Behaviorally
 - d. All of the above

2. Physical symptoms of stress may include:
 - a. Headache, sleep problems, stomach pain
 - b. Fatigue
 - c. Muscle pain, muscle tension, and muscle ache
 - d. All of the above

3. Stress can block insulin secretion in your body and therefore raise your blood sugar
 - a. True
 - b. False

4. Chronic stress can raise your blood cholesterol level.
 - a. True
 - b. False

5. You can use a “to do” list to help focus on your most important tasks, and help you reduce stress.
 - a. True
 - b. False

6. Which of the following is a relaxation option to help reduce stress?
 - a. Regular physical exercise
 - b. Deep-breathing exercises for several minutes twice a day
 - c. Meditation
 - d. All of the above

Source: Adapted from the National Diabetes Education Program

Appendix D

Participant # _____

Culturally Tailored Diabetes Education for African Immigrants Diabetes Knowledge on Stress Management Post-test

1. How does stress affect you?
 - e. Physically
 - f. Psychologically
 - g. Behaviorally
 - h. All of the above

2. Physical symptoms of stress may include:
 - e. Headache, sleep problems, stomach pain
 - f. Fatigue
 - g. Muscle pain, muscle tension, and muscle ache
 - h. All of the above

3. Stress can block insulin secretion in your body and therefore raise your blood sugar
 - c. True
 - d. False

4. Chronic stress can raise your blood cholesterol level.
 - c. True
 - d. False

5. You can use a “to do” list to help focus on your most important tasks, and help you reduce stress.
 - c. True
 - d. False

6. Which of the following is a relaxation option to help reduce stress?
 - e. Regular physical exercise
 - f. Deep-breathing exercises for several minutes twice a day
 - g. Meditation
 - h. All of the above

Source: Adapted from the National Diabetes Education Program

Appendix E

Culturally Tailored Diabetes Education for African Immigrants Participant Satisfaction Survey

Date: / /

Sex: M / F

Age:

Based on your experience in the diabetes education class:

Rate the diabetes education program according to the following scale.

	Agree	Don't agree	Not Sure	Does Not Apply
1. The diabetes education classes helped me get a better understanding of diabetes Self-Management through dietary planning, exercise and stress management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. The classes were taught in a way I could understand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Handouts I received in the diabetes sessions were helpful, easy to read and understand	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. The nutrition education class will help me make healthy changes in the way I eat	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. The diabetes education was provided in a way that respects me and my cultural beliefs and knowledge	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. An interpreter in my own language would have made the diabetes education easier to understand What language? _____	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. I know my target goal for HbA1c	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I understand the importance of exercise and stress management in controlling diabetes and I am going to start exercising, and start managing my stress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. I know what the serious complications of diabetes are and how to avoid them	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. After attending this diabetes program, I will be able to monitor my blood sugar and modify my diet at home to get better diabetes control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. I will recommend this culturally tailored diabetes program to friends, family and other African immigrants if the program is offered at another time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How can we improve?: _____