

An Assessment of Knowledge on Type 2 Diabetes, the Means of Preventing it, and Attitudes
towards Preventing Type 2 Diabetes Mellitus in Middle-aged Nigerian Women.

By

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Abstract

Nigerian women commonly develop type 2 diabetes at about the age of onset of menopause. Metabolic syndrome is also common in menopausal Nigerian women (Ogbera, Fasanmade, & Kalra, 2011).

The purpose of this study is to assess the level of knowledge of type 2 diabetes, the means of preventing it, and the attitude towards preventing type 2 diabetes in middle-aged Nigerian women. This study used questionnaires to assess these criteria in middle-aged Nigerian women between ages 45 and 55, who attended the medical outpatient clinics at Ibeju-lekki, Akodo and Epe General Hospitals between September 8, 2014 and September 12, 2014. Logistic regression was used to perform the statistical analysis on the data collected from the survey. The findings showed there is a poor level of knowledge of type 2 diabetes mellitus and the means to prevent it, and a poor attitude towards preventing type 2 diabetes mellitus amongst middle-aged Nigerian women. It is hoped; however, that participation in this study increased the participants' knowledge of type 2 diabetes and the means of preventing it, and improved their attitude towards preventing type 2 diabetes mellitus. **45**

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Chapter 1

Introduction

Background

Globally, diabetes mellitus is a problem of huge public health concern with severe socioeconomic challenges (Mbanya, Motala, Sobngwi, Assah, Enoru, 2010). Every six seconds, someone dies from diabetes and/or its complications. In 2013, approximately 382 million people were living with diabetes and that figure is estimated to increase to 592 million by 2035 (International Diabetes Federation (IDF), 2014). In 2013, approximately 5.1 million deaths worldwide were caused by diabetes. Globally, diabetes cost approximately 548 billion US dollars (11% of total spending on adults) in health expenditures in 2013. There is a global increase in the incidence of type 2 diabetes mellitus due to behavioral and lifestyle changes such as sedentary lifestyles, overly rich nutrition, reduction in physical activities, and obesity (Zimmet, Alberti, & Shaw, 2001). The prevalence of obesity is increasing worldwide; hence, the “diabetes epidemic will continue even if levels of obesity remain constant” (Wild, Roglic, Green, Sicree, & King 2004; Mbanya et al., 2010).

Diabetes mellitus was rare in rural Africa until the last few decades; however, it has emerged as an important chronic non-communicable disease of huge public health concern in Africa (Mbanya et al., 2010). Sub-Saharan African (SSA) countries like Nigeria depend on other continents of the world for aid; 33 of the 40 SSA countries are poor, approximately 82% of the world’s poorest countries are located in SSA, and poverty controls SSA’s diabetes care agenda. In SSA, the cost of managing diabetes

competes with other health issues such as anti-retroviral drugs, malaria control programs, and tuberculosis treatment (Gill, Mbanya, Ramaiya, & Tesfaye, 2009). In Africa, diabetes accounts for 76% of deaths in people less than 60 years (IDF, 2014); hence, diabetes mellitus significantly contributes to SSA's poor health indices (Gill et al., 2009). The number of people living with diabetes in Africa will increase by 109.1% from 2013 to 2035 (Gill et al., 2009). The prevalence of diabetes in adults in Africa is 6% (IDF, 2014). Unfortunately, the type 2 diabetes epidemic is "out of control" in SSA countries (IDF, 2014). According to Shaw, Sicree, & Zimmet (2010), there is a growing burden of diabetes in developing countries like Nigeria. Furthermore, low-income countries like Nigeria are experiencing a "double burden" of communicable diseases such as HIV/AIDS, tuberculosis, and chronic non-communicable diseases such as diabetes mellitus. However, it is predicted that by 2020 chronic non-communicable diseases like diabetes mellitus will catch up with infectious diseases and leave infectious diseases behind as a major cause of mortality in SSA (Gill et al., 2009).

Type 2 diabetes mellitus is commonly reported in Nigerian women at the age of onset of menopause (Ogbera et al., 2011). Menopause is a physiological phenomenon that occurs at midlife and Nigerian women commonly develop type 2 diabetes mellitus at menopause (Ogbera et al., 2011). During menopause, there are changes in how the body stores and metabolizes fat; the uterus and menstrual cycle no longer use the hormones produced by fat. The body no longer stores its fat in the hips and breasts; it stores it in the waist. The body's metabolic rate reduces, weight increases, abdominal circumference increases, and there are changes in body configuration (Mamas Health, n.d.). Adiposity,

described as an increase in body-mass index (an indicator of total body obesity), waist and hip circumference, and waist-to-hip ratio (an indicator of abdominal obesity) and metabolic syndrome, which are both associated with diabetes mellitus develop during menopause (Mbanya et al., 2010). Type 2 diabetes mellitus develops insidiously and is characterized by insulin resistance, as an “early indication of metabolic syndrome,” which is a syndrome characterized by hypertension, hyperglycemia, “an above-average waistline,” high triglycerides, and low high-density lipoprotein cholesterol (Pick, 2014). Diabetes predisposes menopausal women to non-communicable diseases such as hypertension, heart attack, stroke, kidney failure, blindness, diabetic ulcers that lead to amputation, and infectious diseases such as tuberculosis (IDF, 2014), cystitis, and vaginitis (Mayo Clinic, 2012). Type 2 diabetes is preventable by maintaining a healthy weight, exercising regularly, consuming a healthy and balanced diet, quitting smoking, and reducing alcohol intake (American Diabetes Association, n.d.; Diabetes United Kingdom, 2014; State Government of Victoria, 2014).

When middle-aged Nigerian women have a poor level of knowledge on type 2 diabetes and the means of preventing it, and they possess a poor attitude towards preventing it, they stand a risk of developing type 2 diabetes mellitus, its attendant effects, and complications at menopause. This study used questionnaires to assess middle-aged Nigerian women’s knowledge on type 2 diabetes mellitus and the means of preventing it, and their willingness to take actions to prevent type 2 diabetes mellitus. In summation, type 2 diabetes mellitus, one of the leading causes of death worldwide, has become a major public health concern in SSA (Mbanya et al., 2010), having a specific

effect on menopausal Nigerian women, which can lead to the development of metabolic syndrome in them, resulting in higher rates of mortality and morbidity.

Thesis Statement

Type 2 diabetes is a major public health concern that is becoming an increasing threat in sub-Saharan African countries. Menopausal Nigerian women are at increased risk and identifying their levels of knowledge about type 2 diabetes, the means of preventing it, and their attitudes towards preventing type 2 diabetes mellitus will be helpful in identifying the best way to allocate resources and guide prevention efforts and curriculum development for healthcare personnel.

Purpose

The purpose of this study is to assess the knowledge on type 2 diabetes, the means of preventing it, and the attitude towards preventing type 2 diabetes mellitus in middle-aged Nigerian women.

Research Questions and Hypothesis

This study hypothesizes that menopausal Nigerian women have a poor knowledge of diabetes, the means of preventing it, and a poor attitude towards preventing type 2 diabetes. The research objective of this study was to assess the knowledge on diabetes, the means of preventing it, and middle-aged Nigerian women's attitudes towards preventing type 2 diabetes. It intends to test two hypotheses.

Hypothesis one;

H_0 = there is no relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their age, or educational status.

H_a = there is a relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their age, or educational status.

The outcome variable for this hypothesis is the amount of knowledge Nigerian women has on type 2 diabetes.

Hypothesis two;

H_0 = there is no relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their willingness to take preventive measures.

H_a = there is a relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their willingness to take preventive measures.

The outcome variable for this hypothesis is the relationship between the amounts of knowledge Nigerian women has on type 2 diabetes and their willingness to take preventive measures.

Theoretical Base

The theoretical base of this study is quantitative. This research is based on deductive reasoning which attempts to deduce the reason for the increasing incidence of type 2 diabetes mellitus amongst Nigerian women (Chukwu, Ezebuiro, Samuel, & Keyna, 2013).

Two social and behavioral theories support this study's first hypothesis.

- The Socio-Ecological Model
- The Social Cognitive Theory

The Socio-Ecological Model. The Socio-Ecological Model uses each of its environmental level to contribute to behavior. Individual health behavior is influenced by

each level of the Socio-Ecological Model from the innermost level to the outermost level of the Socio-Ecological Model (the individual, the family, relations, peers and the community, the society and culture respectively). Each of these five levels influences one another and influence individual behavior (Diclemente, Salazar, Crosby, 2013). The level of knowledge middle-aged Nigerian women have on diabetes is largely dependent on their socialization process, environment, and their ecological approach (DiClemente et al., 2013).

The Social Cognitive Theory. The Social Cognitive Theory describes human behavior in terms of a “three-way, dynamic, and reciprocal model in which personal factors, environmental influences, and behavior continue to interact (e Source, n.d.). The constructs of the Social Cognitive Theory are;

- a. Observational learning
- b. Reinforcement
- c. Self-control
- d. Self-efficacy (e Source, n.d.).

Some elements of behavior modification dependent on self-control, self-efficacy, and reinforcement are goal-setting, self-monitoring, and behavioral contracting (e Source, n.d.). According to the Social Cognitive Theory, middle-aged Nigerian women will learn about diabetes through their experiences, by observing others, and by the results of their observation of others (e Source, n.d.).

This study’s second hypothesis is supported by two health behavioral theories. The two health behavioral theories are;

- The Theory of Reasoned Action
- The Theory of Planned Behavior

The Theory of Reasoned Action. This is the effect of attitudinal influence on behavioral intention. The Theory of Reasoned Action makes two suggestions.

- I. Beliefs about health behaviors will shape behavioral intent to a large extent.
- II. Social influences influence behavioral intent in no small manner (Diclemente et al., 2013).

The essential constructs in the Theory of Reasoned Action are;

1. Attitudes towards the health behavior (it centers on beliefs and beliefs combine to form attitudes).
2. Subjective norms (it is predicted by opinion of referent others and motivation to comply) (Diclemente et al., 2013).
3. Intention (the formation of behavioral intent is independently contributed to by both the subjective norms and attitudes towards the health behavior).
4. Behavior (it associated with the level of intent) (Diclemente et al., 2013).

According to the Theory of Reasoned Action once middle-aged Nigerian women consider all relevant behavioral beliefs towards adopting health behaviors that enhance their ability to prevent diabetes, evaluates each belief as being good or bad; then, attitude formation regarding the health behaviors takes place. In addition, middle-aged Nigerian women will be motivated by their perception of what is considered normative and acceptable to others. Each normative belief will be weighed by their motivation to comply with the source of the normative belief. Both attitude towards the health behavior

and subjective norms will contribute to the formation of a behavioral intent (Diclemente et al., 2013). Behavioral intent can be measured by time frame for performance of the health behavior, an exact description of the action composing the behavior, the desired outcome of the behavior, and the context of the behavior (Diclemente et al., 2013). The theory of reasoned action recommends that one assess attitudes towards specific behaviors. Middle-aged Nigerian women might form an attitude towards preventing type 2 diabetes, consider their belief relative to taking measures to prevent type 2 diabetes, and evaluate their behavioral belief relative to “good versus bad” (Diclemente et al., 2013).

The Theory of Planned Behavior. This is the effect of attitudinal influence and beliefs on behavioral intention. According to Diclemente (2013), the Theory of Planned Behavior adds another construct (perceived behavioral control) to the Theory of Reasoned Action. Perceived behavioral control in this context is concerned with the extent to which middle-aged Nigerian women perceive they are able to control the outcome (preventing type 2 diabetes). This means that the health behavioral change (taking measures to prevent type 2 diabetes) is within the control of middle-aged Nigerian women (Diclemente et al., 2013). “According to the Theory of Planned Behavior if a behavior is perceived to be important (favorable attitudes) and subjective norms seem to support the behavior, then people are more likely to engage in that behavior if they also perceive that it is within their control” (Diclemente et al., 2013 p. 72 & 73).

This perception of control is dependent on personal perceptions which include facilitating factors, inhibiting factors, and the perceived power of these factors (Diclemente et al., 2013). Facilitating factors are actual external factors that will increase the likelihood that middle-aged Nigerian women will adopt health behaviors that will prevent diabetes. Inhibiting factors are external factors that will reduce the likelihood that middle-aged Nigerian women will adopt health behaviors that will prevent diabetes. The perceived power of these inhibiting and facilitating factors will be considered by middle-aged Nigerian women in the process of adopting a health-protective behavior such as taking measures to prevent type 2 diabetes (Diclemente et al., 2013).

Using the theoretical basis of this study (the Theory of Reasoned Action and the Theory of Planned Behavior), this researcher believes that if middle-aged Nigerian women had a greater knowledge on diabetes, they would have a better attitude towards preventing type 2 diabetes. These theories can be used to test this study's hypothesis and it enables one to better generalize this study's findings to larger populations.

Definition of Terms

Cystitis: medical term for bladder inflammation (National Health Service, 2013).

Diabetes: for the purpose of this paper, diabetes refers to type 2 diabetes mellitus.

Dyspareunia: medical term meaning painful intercourse (pain during sex)

(Patient.co.uk, 2013).

Hyperglycemia: increase in blood glucose level above the body's normal values.

IDF: International diabetes federation (International Diabetes Federation, 2014).

Insulin resistance: an inability of the body to use insulin properly.

JDRF: Juvenile Diabetes Research Foundation (Juvenile Diabetes Research Foundation, 2014).

Pathogenesis: the mechanism that causes a disease (Merriam-Webster, 2014).

Pathophysiology: “the functional changes associated with a disease” (dictionary.com, 2014)

Adipose tissue: “specialized connective tissue that functions as the major storage site for fat in the form of triglycerides” (Albright & Stern, 1998).

Post partum: after childbirth.

SSA: sub-Saharan Africa

Vaginitis: medical term meaning inflammation of the vagina (Medical News Today, 2010).

Assumptions

It was assumed that the participants provided honest responses to all questions in the questionnaire; circumstances promoting honesty were provided by making the questionnaire anonymous, not collecting *any* identifying information, not even a unique identifying code, and having them complete the questionnaire in a space with adequate personal space around them for privacy. It was also assumed that respondents were representative of typical, middle-aged Nigerian women. To maximize representativeness, two public hospitals that are utilized by 88% of the local population were chosen, typically excluding only the rich and those that are far away from these hospitals. Since the participants are seen at the medical outpatient clinic of these hospitals for different

ailments, it was assumed that any of them could have been randomly chosen off the streets had the location been somewhere other than a hospital.

Limitations

There is no way one can tell how truthful participants have answered the questions while completing the questionnaires or how thoughtful they were before picking their answers to the questionnaire. Illiterate participants had someone read the questionnaire out to them; however, the possibility exists that they could have simply completed the questionnaire without understanding it. The sample size was limited due to the time constraints of this project, which may have affected the generalizability of these findings. Another limitation of this study is the geographic setting. The two hospitals used in this study were located in rural and suburban Nigerian communities. This study did not evaluate the level of knowledge of type 2 diabetes and the means of preventing it, and the attitude towards preventing type 2 diabetes amongst middle-aged women in urban Nigerian communities; this too may have an effect on generalizability.

Delimitations

The study was conducted at the medical outpatient clinics at Ibeju-lekki, Akodo and Epe General Hospitals because the author is a practicing physician and surgeon at Ibeju-lekki General Hospital Akodo, and Epe General Hospital is the closest suburban General Hospital to Ibeju-lekki General Hospital Akodo. This research question and the variables that were studied were chosen because the author noticed an increasing incidence in the number of middle-aged Nigerian women diagnosed with type 2 diabetes

at the medical outpatient clinic of Ibeju-lekki General Hospital Akodo since the author began performing the duties of a deputy chief at the hospital's medical outpatient clinic.

The poor control of type 2 diabetes mellitus, poor compliance to both follow up visits and medical management, and the increasing mortality and morbidity rates of type 2 diabetes amongst middle-aged Nigerian women, are variables that also interested this author; however, they were not chosen. The sample population was a convenience sample selected for their accessibility and their likelihood of being representative of typical middle-aged Nigerian women. This study will assess the level of knowledge on type 2 diabetes and the means of preventing it, and the attitude towards preventing type 2 diabetes amongst middle-aged women in urban Nigerian communities.

Significance of the Study

These findings will help identify where funding should focus on for maximum effect on diabetes prevention programs by revealing the level of knowledge that middle-aged women have about diabetes and the methods of preventing it as well as their attitude towards preventing it. These results will also guide curriculum development for diabetes prevention programs and provider education courses so providers can learn what to discuss during clinic visits in order to maximize their time by focusing on knowledge deficits and strategies that will improve middle-aged women's attitudes towards preventing type 2 diabetes.

As a secondary effect, it is hoped that there will be an intervention effect and that this study will provide information on type 2 diabetes, the means of preventing it, and

improve middle-aged women's attitude towards preventing diabetes. This, in turn, could reduce the incidence of type 2 diabetes in Nigerian women, thereby improving their health and quality of life. In addition, this will reduce health indices across the board and reduce health care costs. Since there are currently no research studies specifically examining type 2 diabetes in middle-aged Nigerian women during menopause, this study will fill a gap in the literature.

Summary and Transition

According to Ogbera et al. (2011), Nigerian women commonly develop type 2 diabetes at menopause which leads to other health problems. Worldwide, type 2 diabetes is a major public health concern. Though previously not as big a problem for SSA countries, type 2 diabetes mellitus is on the rise in all African countries (Mbanya et al., 2010). In 2008, the cost of managing type 2 diabetes mellitus was close to or equal to the cost of managing communicable diseases in Nigeria (Gill et al., 2009). The aim of this quantitative study was use questionnaires to assess knowledge on diabetes and the means of preventing it, and measure attitudes towards prevention of type 2 diabetes in middle-aged Nigerian women. The results of this study will help guide prevention efforts for type 2 diabetes mellitus and curriculum development for healthcare professionals. **45/45**

Chapter 2

Literature Review

Introduction

Type 2 Diabetes Mellitus. Diabetes is a chronic and incurable medical disorder caused by inadequate insulin secretion, and excessive or inappropriate glucagon secretion which causes hyperglycemia and results in insulin resistance (Khardori & Griffing, 2013; McCulloch, Nathan, Mulder, 2014). Type 2 diabetes mellitus is a disorder of carbohydrate metabolism (Pick, 2014) and the commonest form of diabetes (Health24, 2014). It arises from complex interactions between environmental and genetic factors and it develops following the superimposition of a diabetogenic lifestyle (excessive caloric intake, inadequate caloric expenditure, and obesity) on a susceptible genotype (Khardori, & Griffing, 2013). “Patients with established type 2 diabetes display both β -cell dysfunction and insulin resistance (Dimas et al, 2014). Type 2 diabetes develops insidiously (Pick, 2014). Its onset might be approximately seven years before clinical diagnosis even in high-income communities like the United States. In adults, the prevalence of undiagnosed diabetes is approximately 3%. Furthermore, failure to detect diabetes increases with age. There is a higher percentage of undiagnosed diabetes in developing countries (Enang, Otu, Essien, Okpara, Fasanmade, Ohwovoriole, Searle, 2014).

Previously, type 2 diabetes was “a disease of affluence,” however, it is now very common among the poor (Hu, 2011). More diabetic patients live in urban areas in

comparison to rural areas (Enang et al., 2014). Type 2 diabetes is characterized by insulin resistance, which is “an early indication of metabolic syndrome” (Pick, 2014).

According to Colwell & Matveyenko (2014), circadian disruption and sleep loss contribute to the pathogenesis of type 2 diabetes and disturbs blood glucose control in type 2 diabetic patients. Shift work (an example of circadian disruption) alters the time of light exposure, meals, activity, and sleep, and also increases the risk of developing type 2 diabetes (Colwell & Matveyenko, 2014). Metabolic syndrome is a syndrome characterized by hypertension, hyperglycemia, “an above-average waistline,” high triglycerides, and low high-density lipoprotein cholesterol (Pick, 2014). Colwell & Matveyenko (2014) described disrupted sleep, circadian rhythms, and metabolic dysfunction as an inseparable triad. Obesity, sedentary lifestyles, and unhealthy diets contribute significantly to the development of type 2 diabetes (Pfizer, n.d.). Sedentary lifestyles such as watching television, spending time on other screen electronics (computer, ipads) significantly contribute to the risk of developing type 2 diabetes mellitus (Hu, Li, Colditz, Willett, & Manson, 2003).

According to International Diabetes Federation (2014), type 2 diabetes can be prevented by adopting healthy lifestyle changes such as maintaining a healthy body weight and an increased level of physical activity. Type 2 diabetes is largely preventable through diet and lifestyle modifications (Hu, 2011).

There is a dearth of data on the prevalence of diabetes in SSA countries such as Nigeria (Mbanya et al., 2010); however, this literature review will address three areas of research related to the increasing prevalence of type 2 diabetes in SSA and Nigeria, the

role of obesity in the development of diabetes, and research based strategies that will be effective in reducing the prevalence of diabetes. In the first section, research studies related to the prevalence of diabetes in Nigeria and SSA will be addressed. In the second section, there will be a discussion on the relationship between obesity, menopause, and the development of type 2 diabetes. Finally, the last section will focus on research-based strategies that will be effective in reducing the prevalence of type 2 diabetes.

The Global Impact of Type 2 Diabetes on Health. The prevalence of diabetes globally was 8.3% in 2011 and it is estimated to be 9.9% by 2030; however, the number of people living with diabetes is probably more than the current estimates because of the large proportion of undiagnosed patients with type 2 diabetes in the population (Enang et al., 2014). According to the World Economic Forum, diabetes is one of the three most likely and severe, risks to both the global economy and global stability (The University of Sydney, 2011). Approximately 371 million persons are living with diabetes across the globe. It is estimated that 552 million people will be living with diabetes worldwide by 2030 (Juvenile Diabetes Research Foundation (JDRF), 2014). “Globally healthcare expenditures on diabetes are estimated to be at least \$465 billion for 2011 and \$595 billion in 2030.” Both microvascular (retinopathy, neuropathy, and nephropathy) and macrovascular (coronary artery disease, peripheral vascular disease, and stroke) complications are associated with diabetes (Pfizer, n.d.).

In 2011, diabetes caused approximately 4.6 million deaths (Enang et al., 2014). Diabetes is the seventh leading cause of death in the United States. It is a major cause of

heart disease and stroke. Heart attacks are responsible for 60% of deaths in diabetic patients while, strokes are responsible for 25% of deaths in people living with diabetes (The New York Times, 2014). Diabetes is a leading cause of renal failure, non-traumatic lower-limb amputations, and new cases of blindness among adults in the United States (JDRF, 2014). Out of the people living with diabetes 20% - 40% will develop diabetic nephropathy, 15% will have serious foot problems, and 2.5% will develop neuropathic arthropathy (The New York Times, 2014). Diabetes doubles the risk of pre-mature death in affected persons (JDRF, 2014). People living with diabetes stand a great chance of being depressed (Pfizer, n.d.), an increased risk of respiratory tract infection such as pneumonia and influenza, and an increased risk of developing Alzheimer's disease (The New York Times, 2014). People living with diabetes use the emergency room twice as much as unaffected persons and are at an increased risk of developing cancer of the bladder (Khardori, &Griffing, 2013).

Diabetes Mellitus in Sub-Saharan Africa and Nigeria

Diabetes mellitus is a major public health problem in Nigeria. It is the commonest endocrine-metabolism disorder in Nigeria. Nigeria is estimated to experience a 170% increase in diabetes between 1995 and 2025 (Ekpenyong, Akpan, Ibu, & Nyebuk, 2012). It is estimated that by the year 2030, 4.8million Nigerians will have developed diabetes mellitus. In Nigeria, the risk of diabetes increases 3 to 4 times after age 44, the incidence of diabetes peaks between age 45 and 50, and increases with age because insulin resistance worsens with age and increased physical inactivity (Ekpenyong et al., 2012).

The purpose of the article by Ekpenyong and colleagues (2012) was “to determine

the age and sex specific prevalence of type 2 diabetes mellitus in Southeastern Nigeria.” Ekpenyong et al (2012) conducted a quantitative study amongst 3,500 civil servants in Southeastern Nigeria between October 2008 and November 2010. The participants which included 1,532 male and 1,968 female civil servants between ages 18 and 60 were randomly selected and studied for the period of twenty-six months using structured questionnaires, anthropometric and blood sugar measures (Ekpenyong et al., 2012). The variables measured by this study were risk factors of type 2 diabetes (age, poor dietary habits, high adiposity indices, physical inactivity, positive family history of diabetes, smoking status, alcohol consumption, and educational status). Differences in risk factors for both sexes were compared using Chi-square test and t-tests while the relationships between associated factors were tested using logistic regression analysis (Ekpenyong et al., 2012). The overall type 2 diabetes prevalence reported was 10.5% (9.7% represented diagnosed cases and 0.8% represented undiagnosed cases. In males, a type 2 diabetes prevalence of 9.6% was reported, while in females, a type 2 diabetes prevalence of 11.6% was reported.

The age and sex specific prevalence was also reported. In males aged 18–25, 26–35, 36–45, and 46–60years; 2.74%, 8.50%, 16.54%, and 23.70% were reported respectively. In females aged 18–25, 26–35, 36–45, and 46–60years; 3.95%, 9.70%, 13.01%, and 29.39% were reported respectively. Risk factors such as age, poor dietary habits, high adiposity indices, physical inactivity, positive family history, and educational status were significantly associated with type 2 diabetes in both males and females. Smoking status was significantly associated with diabetes in only males, while alcohol

consumption was not significantly associated with diabetes in both sexes (Ekpenyong et al., 2012). Ekpenyong et al. (2012) concluded that the increase in prevalence of type 2 diabetes mellitus in Nigeria is attributable to age, positive family history, educational status and lifestyle changes such as physical inactivity, poor dietary habits, obesity or being overweight. In addition, the increase in prevalence of type 2 diabetes mellitus in Nigeria is attributable to cigarette smoking in males (Ekpenyong et al., 2012). Ekpenyong and colleagues (2012) inferred the current magnitude, prevalence, and incidence of the diabetes in Nigeria and predicted the future of type 2 diabetes in Nigeria. This author proposes that the study by Ekpenyong et al. (2012) was limited by its inability to determine the age and sex specific prevalence of type 2 diabetes mellitus in other geo-political zones of Nigeria. Type2 diabetes substantially affects health and economy and has become a pandemic because it assumes epidemic proportions globally; its global burden is huge (Ekpenyong et al., 2012).

The corresponding increase in prevalence of type 2 diabetes in SSA is largely attributable to rural–urban migration, which is associated with a “shift in lifestyle from a healthy traditional pattern to the urban scenario of low level of physical activity (Hu, Li, Colditz, Willett, & Manson, 2003), increased food quantity and quality, smoking, increased alcohol consumption” and epidemiological transition (Gill et al., 2008). Developing countries like Nigeria are at greatest risk for type 2 diabetes mellitus (Mbanya et al., 2010) and approximately 80% of people living with diabetes are found in low- and middle-income countries like Nigeria (IDF, 2014). Type 2 diabetes mellitus is emerging as an epidemic of huge public health concern in developing countries like

Nigeria (Mbanya et al., 2010). Type 2 diabetes most commonly affects the “economically viable age group” between ages 40 and 59 (IDF, 2014; Mbanya et al., 2010).

The purpose of the study by Mbanya and his colleagues (2010) was to identify and describe the “root cause and trend in the epidemiological transition” of increasing prevalence and burden of diabetes in SSA. The qualitative research presented an overview of the effect of diabetes and the health-care challenges experienced due to the increasing burden of diabetes in SSA (Mbanya et al., 2010). The study took place in 10 SSA countries including Cameroun, Ghana, Guinea, Kenya, Mali, Mauritania, Nigeria, Sudan, South Africa, Togo, and Tanzania. This qualitative research was conducted by searching PubMed with keywords such as “diabetes and Africa,” “diabetes prevalence and Africa,” “risk of diabetes and Africa,” “epidemiology of diabetes and Africa,” “urbanization/urban/rural/migration and diabetes and Africa,” “physical activity and diabetes and Africa,” “genetics of diabetes and Africa,” “mortality and diabetes and Africa,” “HIV and diabetes and Africa” and “diabetes and by Ethiopia/ Zimbabwe/ Cameroun/Ghana/ Guinea/Kenya/Mali/Mauritania/Nigeria/Sudan/South Africa/Togo/Tanzania/Côte d'Ivoire/Benin/Congo/Democratic Republic of Congo,” published peer-reviewed reports and reviews and book chapters were used and websites of the World Health Organization (WHO), International Diabetes Federation, World Bank, and United Nations were accessed for relevant information (Mbanya et al., 2010).

Variables measured in this study include risk factors of diabetes (diet, adiposity, physical activity) and cultural issues. The age-adjusted prevalence of impaired glucose

tolerance, impaired fasting glucose, and diabetes mellitus of these 10 SSA countries were estimated using the oral glucose tolerance test method according to the 1985 and 1988 WHO criteria and the 1997/2003 American Diabetes Association criteria (Mbanya et al., 2010). Prevalence estimates largely depend on the method of diagnosis a study uses. Use of the oral glucose tolerance test for evaluation of prevalence in African population is supported because it allows for identification of persons with impaired glucose tolerance (Mbanya et al., 2010). There is a high prevalence of microvascular complications of diabetes in African populations, which can be attributable to hypertension, poor blood glucose control, and lack of access to diabetes care; however, there is a low proportion of macrovascular disease in this population (Mbanya et al., 2010). According to Mbanya et al. (2010), the prevalence of diabetes increases with age in SSA because age is a relevant risk factor for diabetes. The peak onset for diabetes in 2010 in SSA was 40–59 years by 2030; the highest prevalence will be in the oldest age group (60 – 79 years). Furthermore, as the diabetes epidemic matures, the age at onset of diabetes will shift to younger age groups.

Both ethnic origin and migration have an effect on the prevalence of diabetes. SSA is experiencing urbanization at a very fast pace; more than 33% of its population live in urban areas due to persistently high fertility rates, longer life expectancy, and very high rural urban migration rates. Urban residence increases the risk of diabetes or impaired glucose tolerance by approximately two to five times (Mbanya et al., 2010). Very high obesity rates (58–65%) were reported in diabetic persons in SSA. In SSA, health beliefs, knowledge, lay perceptions, and health behavior strongly interact. Obesity

is viewed as a social indicator of affluence in SSA; it confers respect and influence. Because of these misconceptions, appropriate diabetes prevention and control means are not employed (Mbanya et al., 2010). Mbanya et al. (2010) concluded that the rapid increase in the prevalence and burden of type 2 diabetes in SSA is attributable to rapid uncontrolled urbanization and major changes in lifestyle. The limitation in the Mbanya et al. (2010) study is the unavailability of information on the use of glycosylated haemoglobin (HbA1c) as a diagnostic technique for diabetes in sub-Saharan Africa. In addition, Mbanya and his colleagues (2010) identified and described the “root cause and trend in the epidemiological transition” of increasing prevalence and burden of diabetes in only 10 of the 52 SSA countries. Five of the SSA countries in which this study took place are located in West Africa. Rapid uncontrolled urbanization and major lifestyle changes contribute significantly to the increasing prevalence and burden of type 2 diabetes in SSA. In the face of limited resources, this increase results in a significant public health and socioeconomic burden (Mbanya et al., 2010). There is a need for a multisectoral approach to diabetes control and care in SSA because it will allow for expansion of socio-culturally appropriate diabetes programs (Mbanya et al., 2010). According to the WHO, Nigeria has the largest number of people living with diabetes in Africa (Chinenye, Uloko, Ogbera, Ofoegbu, Fasanmade, Fasanmade, & Ogbu, 2012). The purpose of the article written by Chinenye et al. (2012) was to assess the clinical and laboratory profile of Nigerian diabetics, evaluate their quality of healthcare, and plan improved diabetics care. This qualitative study was conducted in seven tertiary health centers representing six geo-political zones in Nigeria, including Abuja, Lagos, Port-

Harcourt, Kano, Enugu, and Ibadan. Chineye et al. (2012) randomly recruited diabetic Nigerians into a study and assessed their clinical parameters, concluding there is a need for improved diabetic care in Nigeria. The participants were 531 diabetic patients of African descent (209 males and 322 females) who had being diagnosed for an estimated 8.8 ± 6.6 years with a mean age of 57.1 ± 12.3 years. An estimated 95.4% of the participants had type 2 diabetes mellitus while, 4.6% of them had type 1 diabetes mellitus (Chineye et al., 2012).

Every third consenting patient attending the adult diabetic clinic was recruited into the study. Demographic characteristics and the clinical and laboratory parameters of participants who attended adult diabetic clinics at the tertiary centers in which the study was conducted for a minimum of 12 months, were recorded and evaluated between March and August 2008 (Chineye, 2012). Forms provided for the participants were used to record the data. The data was collated centrally, entered into a database by double data entry and analyzed using the Statistical Package for Social Sciences, version 16.0. The variables measured in this study are risk factors, clinical parameters of diabetic patients such as type of diabetes, anthropometry, blood pressure status, long-standing complications of diabetes, and types of treatment; as well as laboratory parameters such as fasting blood glucose, 2-hour postprandial glucose levels, glycated hemoglobin, urinalysis, serum lipids, electrolytes, urea, and creatinine (Chineye, 2012).

Chineye et al. (2012) recorded mean fasting blood glucose, 2-hour postprandial glucose, and a glycated hemoglobin of 8.1 ± 3.9 mmol/L, 10.6 ± 4.6 mmol/L, and $8.3 \pm 2.2\%$, respectively. Approximately 32.4% and 20.4% of participants achieved the

glycemic targets of the American Diabetic Association and International Diabetes Federation, respectively. An estimated 72.8% of participants did not monitor their blood glucose levels themselves. Approximately 60.9% of participants were hypertensive and 59.2% had complications of diabetes. Chineye et al. (2012) concluded that a large proportion of diabetic Nigerians have suboptimal glucose control, are hypertensive, and have long-term complications of diabetes mellitus. In Nigeria, there is a need to improve the quality of care in diabetics and enhance treatment in order to reduce morbidity and mortality from diabetes-related causes. This study was limited by its inability to include a high proportion of cigarette smokers. Apparently, the low proportion of cigarette smokers in the study was probably responsible for the low cases of severe atherosclerosis recorded by the researchers (Chineye et al., 2012).

In summary, lifestyle changes, age, positive family history, and educational status are associated with the steady increase in the prevalence of type 2 diabetes in Nigeria, (Ekpenyong et al., 2012) and the rapid increase in the prevalence and burden of type 2 diabetes in SSA countries such as Nigeria is of significant public health concern (Mbanya et al., 2010). The majority of Nigerians have suboptimal blood glucose control, are hypertensive, are not meeting blood pressure targets, and have chronic complications of diabetes mellitus (Chineye, 2012).

Diabetes Mellitus in Menopausal Nigerian Women

Diabetes is more commonly reported in women in Nigeria. A large number of elderly Nigerian women are living with diabetes. Nigerian women are less physically active. This reduction in physical inactivity enhances the worsening insulin resistance

they experience with increasing age (Ekpenyong et al., 2012). Adiposity indices and the prevalence of type 2 diabetes is high in Nigerian women because Nigerian women tend to be obese, gain weight during pregnancy, and do not shed this weight post partum (Ekpenyong et al., 2012). The body proportions and fat distribution of Nigerian women are a result of the estrogen effect on fat metabolism. The increase in body mass index, waist circumference, and waist hip ratio and extensive fat distribution common in Nigerian women increases their risk of developing diabetes. “Central (intra-abdominal) deposits of fat are more strongly linked to insulin resistance and thus, type 2 diabetes mellitus than are peripheral fat deposits.” Furthermore, “expanded intra-abdominal fat stores” affect insulin metabolism by releasing free fatty acids, which reduce insulin hepatic clearance and lead to insulin resistance and hyperinsulinemia. Fat cells secrete signaling factors such as leptin, adiponectin, interleukin 6, and tumor necrosis factor α which enhance the development of insulin resistance. Biochemical and physiological changes that occur in pregnancy predispose women to subsequent development of type 2 diabetes in mid life (Ekpenyong et al., 2012).

Diabetes is predominant amongst women as compared to men. Women are in charge of food and the kitchen. Some women eat while cooking, some eat junk starchy food in between meals, and starchy meals are more stable in Nigerian homes (Chukwu, Ezebuio, Samuel & Kenya, 2013). Chukwu et al. (2013) explained the reason for the gender difference in the incidence of diabetes in Nigeria by generalizing the results of a study conducted in the Udi local government area of Enugu state, Nigeria. A higher incidence of diabetes mellitus in females was reported at the Udi local government area

of Enugu state, Nigeria from 2008 to 2012 (Chukwu et al., 2013). This gender difference in the incidence of diabetes can also be ascribed to the secretion of human placental lactogen (a hormone that opposes insulin secretion) during pregnancy; hence, genetically susceptible women might develop diabetes during pregnancy. Nigerian women consume sweetened foods despite being aware of its harmful effects (Chukwu et al., 2013). Poor dietary habits, central and general obesity, positive family history of diabetes, and physical inactivity increase Nigerian women's risk of developing type 2 diabetes (Ekpenyong et al., 2012).

The purpose of the Chukwu et al. (2013) study was to find out the gender differential in the incidence of diabetes mellitus among the patients in the Udi local government area of Enugu State. The research questions of this study were;

1. What is the incidence of diabetes among diabetic patients attending health facilities in the Udi local government area of Enugu State?
2. What is the incidence of diabetes among diabetes patients based on gender?
3. What is the difference in fasting blood sugar level of diabetes patients based on gender?

The hypothesis of this study was "there is no significant difference in the fasting blood sugar level based on gender" (Chukwu et al., 2013).

This study was conducted on diabetic patients from six health facilities in the Udi local government area Enugu State. The participants included 343 diabetic patients who were randomly selected from diabetic patients who attended these six health facilities in the Udi local government area of Enugu State from 2008-2012. A data documentary DM

profoma (DMP) was designed for the collection of information concerning cases of diabetes mellitus in the six selected health facilities in the Udi local government area Chukwu et al. (2013). This data DMP recorded information in respect of patient's gender and fasting blood level. Research questions were answered using frequency and percentage and the null hypothesis was tested using a chi-square analysis (Chukwu et al., 2013).

The results of the Chukwu et al. (2013) study were presented based on the research questions and the hypothesis. The null hypothesis was tested at 0.05 level of significance (Chukwu et al., 2013). The number of diabetes mellitus cases was highest in 2012 (30%), followed by 2011 (25.9%), followed by 2009 (20.7%), followed by 2010 (20.4%), and followed by 2008 (2.9%) The proportion of diabetes recorded was higher in females (56%) as compared to males (44%). The incidence of diabetes increased progressively in males from 2008. Females (192, 56%) recorded a higher percentage of fasting blood sugar level as compared to males (151, 44%). An increase in fasting blood sugar levels is more pronounced in females on 201-280mg /dl followed by 121-200mg/dl. The chi-square analysis that tested the null hypothesis showed no significant difference in the fasting blood sugar level based on gender. The reported χ^2 value was 3.295 at 3 degrees of freedom with a p value of .348, which is greater than the 0.05 level of significance. As a result, the null hypothesis, which states that there is no significant difference in the fasting blood sugar level based on gender was accepted (Chukwu et al., 2013).

The variables measured in this study were incidence of diabetes, incidence of diabetes based on gender, and differences in fasting blood sugar based on gender. Chukwu et al. (2013) concluded that the incidence of diabetes mellitus in the Udi local government area in 2012 was high. The incidence of diabetes was higher in females compared to males, the percentage of fasting blood sugar was higher in females as compared to males, and based on gender, there was no significant difference in the fasting blood sugar level. The limitation of the Chukwu et al. (2013) study was its inability to measure its variables in other local government areas in Nigeria. There is a need for improved diabetic care in Nigeria (Chukwu et al., 2013).

Obesity increases the risk of developing diabetes. Globally approximately 1.1 billion adults are overweight and 312 million of them are obese; as a result, “obesity is a high priority for the prevention of diabetes” (Franz, 2007). In addition, diabetes is detrimental to human productivity (IDF, 2014). Type 2 diabetes mellitus increases bone mineral density in menopausal women, increases their risk of fracture, and reduces their fracture-healing rate (Schwartz, 2003). Managing insomnia becomes more difficult for menopausal women living with diabetes; their risk of dyspareunia also increases (Mayo Clinic, 2012). In women, diabetes increases the risk of heart problems and death from heart disease (The New York Times, 2014). Menopause is cessation of menstrual periods for at least six months without occurrence of pregnancy. Usually, menopause occurs between age 45 and 55. It is characterized by reduced fertility, hot flashes, urogenital changes, cystitis, vaginitis, dermatitis, moods swings, and sexual dysfunction (Howland & Nosek, 2000).

The purpose of the Ogbera, Fasanmade, & Kalra (2011), study was to determine the frequency of occurrence of metabolic syndrome, the age of onset, and the pattern of menopause symptoms in Nigerian women with type 2 diabetes. This cross-sectional study took place in 201 menopausal Nigerian women between ages 40 and 85 who had developed type 2 diabetes. Ogbera and colleagues (2011) conducted a cross-sectional study, which correlated the age of onset of type 2 diabetes to the age of onset of menopause in Nigerian women. This quantitative study measured and recorded anthropometric indices, fasting lipid values, glucose parameters, uric acid, and glycated hemoglobin of the participants. The National Cholesterol Panel-ATP definition was used to determine the presence of metabolic syndrome while, the Menopause-specific Quality of Life (MENQOL) questionnaire was used to determine the presence of symptoms of menopause (Ogbera et al., 2011). The variables measured in this study are anthropometric indices, fasting lipid values, glucose parameters, uric acid, and glycated hemoglobin. The test statistics used were the t test, the χ^2 , and the correlation coefficient.

Ogbera et al. (2011) reported the mean age of onset of menopause as 50.3years, the median age of onset of menopause is 50years, the age range of onset of menopause is 40 – 57 years, the frequency of occurrence of symptoms of menopause varied from 14% to 76%, and the prevalence of metabolic syndrome was 69%. The pattern of occurrence of the symptoms of menopause was comparable in subjects with and without the metabolic syndrome. A 42% frequency of occurrence of hyperuricemia was reported in the participants. Serum uric acid concentration correlated significantly with body mass

index though; it did not correlate significantly with high-density lipoprotein cholesterol (Ogbera et al., 2011). The Ogbera et al. (2011) study concluded, “the age of onset of menopause in Nigerian women with type 2 diabetes mellitus is comparable to the age that is commonly reported and metabolic syndrome is highly prevalent in this group of women.”

The purpose of the Schuster (2010) article was to understand the role of fat tissues in hormone secretion, inflammation, appetite stimulation, and the pathophysiology of obesity related diseases such as diabetes. Schuster (2010) described the function of fat cells in the development of type 2 diabetes (an obesity related disease). The study was a qualitative study which described the functions of adipose tissue in humans, the genetics of obesity, pathophysiology of increasing adiposity, consequences of increased free fatty acids in the body, the function of physical inactivity in the development of obesity and a mediator of metabolic syndrome (a pre-diabetes state) (Schuster, 2010). The relationship between obesity and the development of diabetes was examined by reviewing previous studies, which reported the characterization of obesity by oxidative stress, a chronic inflammatory state, an abnormal regulation of adipocytes, insulin resistance, and metabolic fat. Variables measured in this study are obesity and adiposity. Oxidative stress, chronic inflammatory state, the abnormal regulation of adipocytes, insulin resistance and metabolic fat in humans are all-instrumental in the development of diabetes (Schuster, 2010).

Schuster (2010) concluded that there is an association between obesity, increased production of pro-inflammatory cytokines, insulin resistance, and changes in body fat

distribution. Also, several complex, and redundant biochemical pathways which impact the body in a local and systematic manner gives to insulin resistance and chronic inflammation, increases their effect, and encourages the development of diabetes.

In summary, the development of diabetes is encouraged by obesity, insulin resistance, and changes in body fat distribution (Schuster, 2010). “The age of onset of menopause in Nigerian women with type 2 diabetes mellitus is comparable to the age that is commonly reported and metabolic syndrome is highly prevalent in this group of women” (Ogbera et al., 2011).

Research-based strategies that will effectively reduce the prevalence of type 2 diabetes mellitus in Nigerian women

According to Schuster (2010), obesity encourages the development of diabetes. Nigerian women are prone to develop diabetes at middle age because they tend to be obese due to their lifestyle and diet. Additionally, the Nigerian culture and society favors obese women (Ekpenyong et al., 2012; Chukwu et al., 2013). As a result, one can postulate that reducing obesity and obesity rates in Nigerian women can effectively reduce the prevalence of type 2 diabetes in Nigerian women. There is an urgent need for the political will to develop a national action plan for the prevention of type 2 diabetes in Nigeria.

The purpose of the Tuomilehto, Schwarz, & Lindstrom (2011) study was to provide evidence on the effects of a healthy lifestyle in the general population and to establish the potential and long-term effectiveness of lifestyle intervention on preventing type 2 diabetes in high-risk individuals. The study by Tuomilehto and colleagues (2011)

is an evidence-based study, which provides scientific evidence that lifestyle intervention will prevent type 2 diabetes. Tuomilehto, Schwarz, & Lindstroms' (2011) study is a qualitative study that conducted a meta-analysis on major clinical trials of diabetes prevention such as the Finnish Diabetes Prevention Study and the Malmö Feasibility Study. These studies were conducted in developed countries. The independent variables measured in the study by Tuomilehto et al. (2011) include multiple lifestyle factors such as the level of physical activity, dietary habits, smoking habits, alcohol use, and adiposity measures. Tuomilehto et al. (2011) reported that a long-term increase in physical activity, dietary modification, and weight reduction amongst overweight participants delay and or prevent the development of type 2 diabetes and reduce the incidence of diabetes.

Tuomilehto et al. (2011) concluded that one can delay or prevent type 2 diabetes amongst high risk individuals through lifestyle interventions. The experience gained from the Tuomilehto et al. (2011) study and from the “real world” resulted in the birth of IMAGE (Development and Implementation of a European Guideline and Training Standards for Diabetes Prevention) Study Group. The deliverables from IMAGE include a European evidence-based guideline for type 2 diabetes prevention, a toolkit for type 2 diabetes prevention in Europe, and the quality indicators for the prevention of type 2 diabetes in Europe. The limitations of the study by Tuomilehto et al. (2011) included an inability to conduct a meta-analysis on a major clinical trial conducted in a developing or an under-developed country.

Generally, physical activity levels in Nigerian women are low because they pay more attention to the home front and family priorities. They are also unable to exercise in public places because of religious beliefs (Chukwu et al., 2013). Ogwumike, Kaka, Adegbemigun, & Abiona (2012), investigated the physical activity levels of Nigerian women aged 40–60 years of age and found that menopausal women in Nigeria reported a moderate physical activity level. According to Ogwumike, Arowojolu, & Sanya (2011), participating regularly in exercise programs is unusual among Nigerian women because they are preoccupied with household and homemaking chores. There is little or no focus on exercise in Nigeria because of industrialization and urbanization (Ogbera & Chineye, 2013).

The purpose of Jeon, Lokken, Hu, & Dam's (2007) study was to methodically assess the relationship between the risk of type 2 diabetes and moderate physical activity. The study by Jeon et al (2007) provided scientific evidence of the role of regular moderate physical activity in the prevention of type 2 diabetes. This study was conducted in populations from the United Kingdom, Finland, and the United States. Jeon et al. (2007) conducted this quantitative and qualitative study by examining 10 prospective cohort studies and six cross-sectional studies that assessed moderate physical activity and type 2 diabetes (five of which assessed the role of walking) and impaired glucose tolerance. A meta-analysis was conducted for the 10 cohort studies by two independent investigators who retrieved information on study design, participant characteristics, assessment of physical activity, and outcomes and estimates of associations by searching EMBASE and Medline through March 2006 and retrieved 979 articles. Two articles were

selected by examining the reference lists of retrieved articles. Studies that did not involve human subjects, assess moderate physical activity with vigorous or light activity, and did not present age-adjusted estimates were not included (Jeon et al., 2007). In total, 10 prospective cohort studies of physical activity of moderate intensity and type 2 diabetes, including 301,221 participants and 9,367 incident cases, were identified. Five of these prospective cohort studies investigated the role of walking (Jeon et al., 2007).

Summary relative risks were calculated using “a random-effects model for the highest versus the lowest reported duration of activities.” Approximates of relative risk and information about their variance were reported. Random-effect models were used to calculate summary measures, Cochran’s Q test was used to calculate for *p* values, and body mass index unadjusted and adjusted results from original results were analyzed to assess the role of physical activity independent of its relationship with weight (Jeon et al., 2007). The summary relative risk of type 2 diabetes was 0.69 for regularly participating in moderate physical activity as compared with a sedentary lifestyle. The relative risk for regular walking was 0.70 as compared with little or no walking (Jeon et al., 2007). According to Jeon et al. (2007), “the associations remained significant after adjustment for body mass index and similar associations were observed in men and women and in the United States and Europe.

Jeon et al. (2007) reported statistically significant associations between type 2 diabetes and moderate physical activity after adjusting for body mass index. Meta-analysis of the Jeon et al. (2007) study was only observational studies as a result; summary estimates of these studies could have been influenced by confounding and other

biases. Furthermore, all studies adjusted for age but not all studies adjusted for risk factors of diabetes such as dietary factors, alcohol consumption, cigarette smoking, and waist-to-hip ratio. Jeon et al. (2007) concluded that regular involvement in moderate physical activity such as walking briskly reduces the risk of developing type 2 diabetes. Residual confounding factors could have occurred because the Jeon et al. (2007) study did not adjust for all risk factors of diabetes, sedentary activities, and light-intensity physical activity.

There is sufficient scientific evidence to support the fact that type 2 diabetes can be prevented by non-pharmacological lifestyle interventions. These evidences have lead to increased efforts to develop concepts to prevent diabetes (Schwarz, 2011).

The purpose of the Schwarz (2011) study was to understand mechanisms of preventing diabetes and develop effective interventions to prevent diabetes. An analysis was conducted on the European curriculum for the training of diabetes prevention managers (a deliverable of the European IMAGE project) (Schwarz, 2011). This study is a qualitative study conducted in Europe. According to Schwarz (2011), the European curriculum for the training of diabetes prevention managers is “a unified training curriculum for healthcare professionals who deliver preventive interventions in Europe.” This curriculum is available online and one is encouraged to download it free, adapt its learning goals and teaching strategies to one’s environment and use it to deliver diabetes preventive interventions in one’s environment because there is scientific evidence that this procedure will improve the development of expertise by knowledge transfer for the prevention of type 2 diabetes. It will also develop type 2 diabetes prevention managers

and present them as persons known for a high quality delivery of preventive intervention in Europe and worldwide (Schwarz, 2011).

The Schwarz (2011) study enjoined us all to prevent diabetes and concludes that establishing public health-based quality management strategies for diabetes prevention is the only way to achieve high quality intervention and benchmarking between different preventive strategies. In an attempt to prevent type 2 diabetes in middle-aged Nigerian women, one would borrow an idea from the Schwarz (2011) study and establish public health-based quality management strategies for diabetes prevention.

The limitation of the Schwarz (2011) study is its inability to establish public health-based quality management strategies for preventing diabetes. The variables measured in this study are the barriers that impede successful prevention of diabetes in the real world. Schwarz (2011) reported that despite the current guidelines developed for diabetes prevention, there is still a need to develop more targeted and effective intervention programs for diabetes prevention in order to combat the epidemic of type 2 diabetes. In summary, regular moderate physical activity reduces the risk of developing type 2 diabetes (Jeon et al., 2007). It is essential to pay attention to all factors that interplay and result in the development of type 2 diabetes and not just to obesity alone (Tuomilehto et al., 2011). The European curriculum for the training of diabetes prevention managers can be adapted for use in our environment to combat the surge of type 2 diabetes and there is a need for public health practitioners in Nigeria to establish public health-based quality management strategies for diabetes prevention (Schwarz, 2011).

Summary

Obesity, which is viewed as an indicator of affluence, is on the rise in SSA. Recent urbanization, rising obesity rates, health beliefs, knowledge, and lay perceptions contribute, in no small manner, to the increasing prevalence of diabetes, a predictable early onset of the disease, and development of diabetes at the onset of menopause in SSA (Mbanya et al., 2010; Schuster, 2010). According to Jeon et al. (2007), participating regularly in moderate physical activity such as walking briskly reduces the risk of developing type 2 diabetes. Females have an increased incidence of diabetes compared to males (Chukwu et al., 2013).

Middle-aged Nigerian women stand an increased risk of developing type 2 diabetes because of the biochemical and physiological changes that occur in pregnancy, fat redistribution that occurs during climacteric changes (Ekpenyong et al., 2012); increasing rates of obesity in SSA, urbanization, health beliefs, knowledge, and lay perceptions, physical inactivity (Mbanya et al., 2010), and the high prevalence of metabolic syndrome in this age group (Ogbera et al., 2011).

Long-term lifestyle interventions such as regularly engaging in moderate physical activity, reducing obesity, eating healthy diet such as foods high in fiber and low in cholesterol, quitting cigarette smoking, and consuming alcohol moderately all interplay and reduce the risk of developing type 2 diabetes (Jeon et al., 2007; Tuomilehto et al., 2011).

Literature gaps filled by this research

Despite the increasing prevalence of obesity rates and type 2 diabetes in Nigeria, and the poor attitude towards the prevention of diabetes; there are no studies examining type 2 diabetes in middle-aged Nigerian women during menopause. This study will fill this gap in the literature. Adequate health education on type 2 diabetes and health promotion efforts on preventing type 2 diabetes in Nigeria will increase middle-aged Nigerian women's knowledge of type 2 diabetes, the means of preventing it, and improve their attitude towards preventing type 2 diabetes mellitus. This will eventually enhance the quality of life of middle-aged Nigerian women. **48/49**

Chapter 3

Research Method

Introduction

This study used a quantitative, correlational research design with descriptive statistics and logistic regression for the statistical analysis. The level of knowledge of middle-aged Nigerian women on diabetes and prevention methods and their attitudes towards preventing type 2 diabetes was measured through a survey (Appendix A). Participants were selected using convenience sampling as this researcher works as a physician at Ibeju-lekki, Akodo General Hospital. In the second week of September 2014, the survey was administered by clinic personnel to Nigerian women whose birth dates fell between 1969 and 1954 (ages 45– 60 years) attending medical outpatient clinics at Ibeju-lekki, Akodo and Epe General Hospitals. Epe General Hospital is the closest semi-urban General Hospital to Ibeju-lekki, Akodo. Using clinic personnel and excluding the author eliminated the possibility of research bias in the sampling methodology. Data from the survey was collected and analyzed using a logistic regression test.

Setting

This study took place at the medical outpatient clinics at Ibeju-lekki, Akodo and Epe General Hospitals. These hospitals were chosen because the researcher works at one and the other is the health facility closest to it. Doctors in the Nigerian government facilities embarked on a seven-week strike on July 1, 2014. Despite the strike, some doctors volunteered to attend to patients at both health facilities because these hospitals are located in hard to reach areas (semi-urban and rural areas), these areas are large

contributors to the poor health indices of Nigeria, and community dwellers have no other option to get health care; both communities have only one private health facility each. The doctor's strike was suspended on August 25, 2014. Following the suspension of the strike, Ibeju-lekki, Akodo and Epe General Hospitals experienced a large volume of patient attendance because of these unusual circumstances. Since the suspension of the strike, these hospitals have both recorded an increase in the number of patients seen.

A letter of consent was obtained from both of the health care facilities (Appendix B & C) participating in this study prior to its commencement. During the second week of July, the survey was administered at each facility concurrently on five working days for four hours each day. This cumulated into 20 hours at each health care facility and 40 hours in total. Participants were recruited by the clinic personnel distributing informed consent forms (Appendix D), which explained the purpose of the study, to patients in the waiting area of the medical outpatient clinics after they checked in for their appointments. This gave the subjects an opportunity to decide if they wanted to participate in the study.

Sample/ Participants

The sample was selected using convenience sampling. Participants of this research study included Nigerian women aged 45–60, who attended the medical outpatient clinics at Ibeju-lekki, Akodo and Epe General Hospitals. These facilities were also selected because they were from rural and semi-urban communities in Nigeria. Both of these hospitals are used by approximately 88% of the local population; thus, it is believed the subjects are representative of the typical middle-aged Nigerian woman.

There is homogeneity found in the sample by using the populations attending the Ibeju-lekki, Akodo and Epe General Hospitals. Thus, the data from the clinics at all the facilities can be combined and used in aggregate form without having to account for the variation in treatment facility. The populations using the health services at both Epe and Akodo General Hospitals are similar even though Epe is a semi-urban community while Ibeju-lekki is a rural community. Both Epe and Akodo are the focal towns in each of their local governments respectively. Both communities are in close proximity to each other and are bounded on one side by the fresh water and on the other side by the Atlantic Ocean. The indigenous people of Epe and Ibeju-lekki local government are the Yoruba ethnic group of Lagos State. However because both communities are riverine communities, other Nigerian ethnic groups and other West African nationalities who engage in occupations that involve the riverine communities, also inhabit these environments. Social amenities such as transportation, electricity, housing and rents, water supply, and sanitation are similar in these environments. The socioeconomic status in both environments is basically the same.

Instrument

This study was conducted using a self-designed survey titled, “*Survey on the Level of Knowledge on Diabetes, the Methods for Preventing it, and Attitudes towards Preventing Type 2 Diabetes.*” The purpose of the self-designed instrument was to assess the participant’s demographic characteristics, their level of knowledge of diabetes and methods of preventing diabetes, and their attitudes towards preventing type 2 diabetes

mellitus. The participant's attitude towards preventing type 2 diabetes mellitus was assessed using a Likert-type scale.

Validity and Reliability

This self-designed instrument was assessed for content and face validity by the researcher who developed it, a university professor knowledgeable in research and survey methodology, a university professor of endocrinology, and a class of Master's in Public Health students in research and survey methodology. This researcher is a physician and has the expertise to assert that the questions on the survey are adequate to measure knowledge and attitudes appropriate to this research topic. In addition, a split half analysis reliability test was conducted to assess the reliability of the survey. The responses of the first 16 respondents to this survey were split into two parts and both split halves were run on the test of knowledge and attitude.

The variables in this study are demographic characteristics including age, ethnicity, nationality, highest educational level attained, and employment status, whether or not participants are knowledgeable on type 2 diabetes, whether or not participants are knowledgeable on the methods of preventing type 2 diabetes, and whether or not participants are willing to take measures to prevent type 2 diabetes.

Data Collection/ Procedures

Written consent to conduct this research at Ibeju-lekki, Akodo and Epe General Hospitals was obtained from the human resources departments before the survey was administered. Participants were recruited by being asked if they would like to participate in a study to help one of their doctors complete her research when they checked in for

their appointment. They were also given an informed consent document, explaining the purpose of the study, to read and sign prior to their participation in the study.

On average, it took participants a total of 20 minutes to complete the survey. After completing the questionnaire, participants were given a handout on type 2 diabetes (Appendix E). The process of recruiting the participants, completing the questionnaire, and distributing the diabetes handout took approximately 30 minutes.

Data Analysis

The variables in this study included demographic characteristics including age, ethnicity, nationality, highest educational level attained, and employment status. Other variables examined were whether participants were knowledgeable on type 2 diabetes, the methods of preventing type 2 diabetes, and/or willing to take measures to prevent type 2 diabetes.

For the purpose of this study, descriptive data was collected along with percentages of participants knowledgeable on type 2 diabetes, the methods of preventing type 2 diabetes, and their willingness to take specific measures to prevent type 2 diabetes cross tabulated by age, ethnicity, nationality, the highest educational level attained, and employment status. The percentage of women willing to take measures to prevent diabetes and measures they were most willing to take was described using descriptive statistics.

Logistic regression was conducted to understand the relationship between the amount of knowledge Nigerian women have on type 2 diabetes and the demographic factors such as age or educational status and the relationship between knowledge about type 2 diabetes and the willingness to take measures to prevent it.

Protection of Human Participants

The Concordia Institutional Review Board approved this study. The purpose and procedures of the study were explained to each participant and informed consent was obtained from each respondent prior to participation in the study. This study was conducted in accordance with the guidelines dictated in the Declaration of Helsinki. Data was kept secure and only the principal and co-principal investigators had access to the data. Raw data is available on request from the author.

Chapter 4

Results

Introduction

The risk of developing type 2 diabetes in middle-aged Nigerian women is increasing. This increase is largely due to the rising prevalence of obesity in this age group, the recent urbanization in Nigeria, and changes in lifestyle and socio-economic factors. As the Nigerian woman grows older, her risk of developing obesity also increases due to a reduction in physical activity, an increase in body weight, and menopause (Iloh, Amadi, Nwankwo, & Ugwu, 2011). Menopause predisposes the Nigerian woman to central obesity as peripheral fat becomes diverted to central sites and the intra-abdominal/visceral fat stores increase. This contributes, in no small manner, to a risk of developing type 2 diabetes. Unfortunately, obesity, a known risk factor for type 2 diabetes, is not recognized as a medical problem in Nigeria. It is culturally and socially acceptable amongst Nigerians (Iloh et al., 2011). The high prevalence of type 2 diabetes amongst Nigerian women calls for concern (Osuji, Nzerem, Dioka, Meludu, & Onwubuya, 2012).

This study will report middle-aged Nigerian women's level of knowledge on type 2 diabetes, methods of preventing it, and their attitude towards preventing it. These results will provide the needed information and act as a guide for the public health community to promote health by developing diabetes prevention programs for Nigerian women. These results will also identify the need and areas for future research and the need to improve the Nigerian health care services to cope with the burden of type 2 diabetes in Nigerian women.

This study used a self-designed survey to assess the level of knowledge on type 2 diabetes mellitus, the means of preventing it, and the attitude towards taking measures to prevent type 2 diabetes mellitus, amongst middle-aged Nigerian women. A logistic regression test was conducted to analyze the data collected from the survey.

Participants

The measurement tool used in this study was a self-designed survey titled, “*Survey on the Level of Knowledge on Diabetes, the Methods for Preventing it, and Attitudes towards Prevention.*” The participants in the study were from diverse ethnic backgrounds. Even though 195 surveys were collected from women between the ages of 45 and 60, 15 of the surveys from those over 55 were excluded. The 180 women whose surveys were analyzed were between the ages of 45-60years. This was the inclusion criteria for participation in the study. This inclusion criterion for participation in the study allowed for five years worth of non-participants. As a result, only 180 of those that completed the survey met the inclusion criteria for the analysis (45–55 years old). The average age of respondents was 49.73years. Of those, the majority (70%) was from the Yoruba ethnic group and 92.22% were Nigerian. This can be attributed to the location and geographical setting in which the survey was conducted. Most of the respondents (64.64%) had some form of education and 42.22% were employed full-time.

Because of the similarities already noted between Ibeju-lekki, Akodo and Epe General Hospitals, it was expected that the patient population at both hospitals would be similar, as well. This turned out to be true. For example, of the 106 participants who attended the medical outpatient clinic at Ibeju-lekki, Akodo General Hospital, 96 met the

inclusion criteria for analysis, while of the 90 participants attending the medical outpatient clinic at Epe General Hospital, 84 of them met the inclusion criteria for analysis. Of those who attended Ibeju-lekki, Akodo General Hospital, 68.75% were Yorubas, 91.67% of them were Nigerians and their education levels were very varied. Most (61.46%) had some form of education. The vast majority (41.67%) were fully employed. Of the 84 middle-aged Nigerian women who attended Epe General Hospital's medical outpatient clinics, more than half (71.43%) of them were Yorubas, 92.86% were Nigerians, and again, the education levels were varied; in this hospital, however, 66.67% had of some form of education. Approximately, the same proportion (41.67%) was fully employed.

Table 1.

Demographic Data on all Respondents

	Total		Ibeju-lekki, Akodo		Epe	
	<i>N</i>	%	<i>n</i>	%	<i>n</i>	%
Participants	180	100	96	100	84	100
Ethnicity						
Yorubas	126	70	66	68.75	60	71.42857
Ibos	22	12.22222	11	11.45833	11	13.09524
Hausas	10	5.555556	8	8.333333	2	2.380952
Other	22	12.222222	11	11.45833	11	13.09524
Nationality						
Nigerian	166	92.22222	88	91.66667	78	92.85714
Ghanaians	5	2.777778	3	3.125	2	2.380952
Togolese	5	2.777778	3	3.125	2	2.380952
Benenoians	4	2.222222	2	2.083333	2	2.380952
Others		0	0	0	0	0
Education						
PhD	1	0.552486	1	1.030928	0	0
Master's	6	3.314917	3	3.092784	3	3.571429
Bachelors	14	7.734807	8	8.247423	6	7.142857
Higher						
Diploma	5	2.762431	3	3.092784	2	2.380952
Ordinary						
Diploma	14	7.734807	7	7.216495	7	8.333333
S.S.S.	41	22.65193	20	20.61856	20	23.80952
J.S.S	18	9.944751	8	8.247423	10	11.90476
Primary						
School	17	9.392265	9	9.278351	8	9.52381
No						
education	64	35.35912	37	38.54167	28	33.33333
Employment						
Full-time	76	42.22222	40	41.66667	35	41.66667
Part-time	47	26.11111	23	23.95833	25	29.7619
Homemaker	30	16.66667	19	19.79167	11	13.09524
Unemployed	26	14.44444	13	13.54167	13	15.47619
Other	1	0.555556	1	1.041667	0	0

More than half (63.18%) of the survey questions on knowledge of type 2 diabetes were left unanswered by the participants; this suggests that middle-aged Nigerian women know very little about type 2 diabetes. The surveys with unanswered questions were not excluded from analysis because there were such a significant number of them and relevant data was obtained from the analysis of the questions that were answered. Each test was worth 63 points. Once the mean score of the responses of each question were calculated, non- responses were handled by using the mean score for each missing response. The range of scores for the knowledge portion of the exam was 21% – 65%. The mean total score of the knowledge portion of the exam was 37%, the median was 36%, with a variance was 0.009 and a standard deviation of 0.09. The attitude portion of the test had questions with Likert-type responses. The categorical values that were assigned to the responses, which indicated a willingness to take certain actions from a list that would prevent diabetes were: 0= *I will not*, 1 = *I will think about this*, 2 = *I am not certain*, 3 = *I will try to do this*, 4 = *I will definitely do this*, and 5 = *I am already doing this*. The range of scores for the attitude portion of the exam was 0.375 – 4.75. The mean total score of the attitude portion of the exam was 2.25, the median was 2.125, the variance was 0.535, and the standard deviation was 0.732. Using the categorical numbers, the qualitative translation of the data means the range was between those “*unwilling to do anything*” and those “*willing to definitely*” take some of the measures, with the majority falling in-between “*I am not certain*” and “*I will try to do this*” (the average score of 2.25 indicates there more slightly more that opted to say “*I am not certain*”). The quantitative demographic variables for the survey were age and educational status. The mean score

for age was 49.73 years with a standard deviation of 3.14. The levels of education were categorized numerically between 0–8 with 0 = *no education*, 1 = *primary school*, 2 = *junior secondary school*, 3 = *senior secondary school*....and 8 = *PhD or other doctoral degree*. The median point was equal to someone with a junior secondary school. The most common (mode) level of education was no form of education. The numerical average was a 2.17, which suggests that the average level of education among the respondents was between the junior secondary and the senior secondary levels. In fact, 78% of the respondents had a senior secondary level education or lower.

Survey Responses

Causes of Diabetes. The first eight survey questions asked participants about the causes of diabetes. No one responded to all eight questions. “*Diabetes is caused by: (1) being overweight or obese, (2) by having intercourse with someone who is diabetic, (3) having a diabetic parent, (4) growing older, (5) by touching someone who is diabetic, (6) eating too much and not getting enough exercise, (7) being inflicted by witchcraft, and (8) being poor.*” These test questions were worth eight points. The range of scores for this knowledge section of the exam on causes of diabetes was 0.077 – 4.867. The mean score of the section on causes of diabetes for the knowledge portion of the exam was 2.72 with a standard deviation of 0.80. The reason none of the calculations on the tests results are whole numbers is because a means method was used for non-responses. These results show that fewer than half of the respondents, less, if you were to believe respondents who left the answers blank did so because they did not know the answer and could not correctly identify what causes diabetes.

On the knowledge section of the exam on causes of diabetes, most participants (26.11%) missed question two “*diabetes is caused by having intercourse with someone who is diabetic*” 41.67% got question one correct “*diabetes is caused by being overweight or obese,*” and (81.11%) inaccurately responded to question eight by selecting “True” to “*diabetes is caused by being poor.*”

Symptoms of Diabetes. The next six survey questions asked participants about the symptoms of diabetes. “*Some symptoms of diabetes are:(1) low blood sugar, (2) urinating often and in large amounts when one urinates, (3) waking up more than thrice at night to urinate, (4) falling sick often, (5) losing weight despite eating more, and (6) being thirsty all the time.*” These test questions were worth six points. The range of scores for this section of the knowledge portion of the exam on symptoms of diabetes was 1.17 – 5.17. The mean score of the section on causes of diabetes was 2.81 with a standard deviation of 0.96. Again, respondents’ performance fell just below the 50% level, but on this portion of the exam no one got everything wrong, as seen in the previous section.

On the knowledge section of the exam on symptoms of diabetes, most participants (17.2%) missed questions one and six, “*a symptom of diabetes is low blood sugar*” and “*a symptom of diabetes is being thirsty all the time*” respectively, 40.56% got question three correct, “*a symptom of diabetes is waking up more than thrice at night to urinate,*” and 73.33% did not answer question four “*a symptom of diabetes is falling sick often.*”

Prevention of Diabetes. The next three survey questions asked participants about the prevention of diabetes. “*Diabetes can be prevented by: (1) exercising, (2) losing*

weight, and (3) eating healthy.” These questions were worth three points. The range of scores for this section of the knowledge portion of the exam on prevention of diabetes was 0.63 – 3.0). The mean total score of the section on prevention of diabetes for the knowledge portion of the exam was 1.12 with a standard deviation of 0.62.

On the knowledge section of the exam on prevention of diabetes, most participants (1.67%) missed question one “*diabetes can be treated by exercising,*” 25% got question three correct “*diabetes can be prevented by eating healthy,*” and 81.1% did not answer question two, “*diabetes is can be prevented by losing weight.*”

Treatment of Diabetes. The next four survey questions asked participants about the treatment of diabetes. “*Diabetes can be treated by: 1) using herbs and concoctions, (2) using drugs prescribed by a doctor, (3) using insulin, and (4) spiritual healing.*” These test questions were worth four points. The range of scores for this section of the knowledge portion of the exam on treatment of diabetes was 0.28 – 4.0. The mean score of the section on prevention of diabetes for the knowledge portion of the exam was 1.38 with a standard deviation of 0.51. Again, respondents got just under half of these answers correct.

On the knowledge section of the exam on treatment of diabetes, most participants (29.44%) missed question one “*diabetes can be treated using herbs and concoctions,*” 71.67% got question two correct, “*diabetes can be treated using drugs prescribed by a doctor,*” and 82.78% did not know the answer to question three, “*diabetes can be treated using insulin.*”

Can Diabetes Be Cured? The next survey question was; “*Can diabetes be cured?*” Only 18.3% of the participants responded correctly to this question; 75% of the participants missed this question and 6.7% did not answer the question.

Survey questions 1 to 22 assessed participant’s level of knowledge on type 2 diabetes and the methods of preventing it. These questions were worth 22 points. The survey questions on the test of knowledge of diabetes had a mean result of 37% (0.3738), a median of 36%, variance of 0.009, and standard deviation of 0.09 (0.093). A score of 75% was defined as being knowledgeable on type 2 diabetes for the purpose of testing the hypothesis. The range of scores on the knowledge portion of the survey was 21%–65%). Thus, no participant scored 75% or above (and thus were characterized as knowledgeable) on the portion of the survey questions that assessed participant’s level of knowledge on type 2 diabetes.

On the knowledge portion of the survey questions, most participants (75%) missed question 22, “*can diabetes be cured?*” 71.67% got question 19 correct, “*diabetes can be treated by using drugs prescribed by a doctor,*” 82.78 did not answer question 20 “*diabetes can be treated by using insulin.*”

Table 2.

Summary of Means, Ranges, and Standard Deviations for each Section on the Test on Knowledge on Diabetes.

Mean	Range	Standard Deviation
Causes of diabetes	2.715992	0.077–4.867
Symptoms of diabetes	2.805096	1.17–4.00
Prevention of diabetes	1.11943	0.62–2.37
Treatment of diabetes	1.382965	0.28–3.71

Attitudes towards Preventing Diabetes. The next eight survey questions assessed participants' attitude towards preventing diabetes by assessing their willingness to adopt methods to prevent diabetes. *"To prevent diabetes, I would be willing to ...:(1) get a fasting blood sugar routinely (e.g. take a painless test in the morning after not eating all night), (2) maintain a healthy weight by eating healthy (3-5 servings of fruits and vegetables per day), (3) quit cigarette smoking, (4) reduce consumption of egg yolk, butter, margarine, red meat, palm oil, chicken, and turkey, (5) drink water instead of sugary drinks, (6) eat in moderate quantities, (7) limit alcohol consumption to one glass a day, and (8) engage in exercise moderately (walking 30 minutes daily) to maintain a healthy weight."*

Only 15% (15) of the participants indicated they were willing to *try* to take actions to prevent diabetes. Only 2.7% (5) indicated they *would* take measures to prevent diabetes.

The measure participants were most willing to take was to take a routine fasting blood sugar (13.33%). The top three measures Nigerian women are willing to take to prevent diabetes are:

- Take a routine fasting blood sugar (13.33%)
- Maintain a healthy weight by eating healthy (taking three to five servings of fruits and vegetables daily, reduce eating fatty foods) (11.11%)
- Engage in moderate exercise (10%)

The measures Nigerian women are least willing to take to prevent diabetes are:

- Eat in moderate quantities (8.33%)
- Quitting cigarette smoking (7.78%)
- Limit alcohol consumption to one glass a day (7.22%).

Table 4.

Ranked Ordered with Measure Participants are willing to take to Prevent Diabetes.

Measure	Number	Percentage (%)
Getting a routine fasting blood sugar test	24	13.33
Willingness to maintain a healthy weight by eating healthy	20	11.11
Engaging in moderate exercise daily	18	10
Reeduce consumption of high cholesterol meals	17	9.44

Drinking water instead of sugary drinks	16	8.89
Eat in moderate quantities	15	8.33
Quitting cigarette smoking	14	7.78
Limit alcohol consumption to one glass a day	13	7.22

Desire to Learn More about Diabetes. One of the last survey questions assessed participants' desire to learn more about diabetes and how to prevent diabetes by asking, "*I would like to learn more about diabetes and how to prevent it*" and providing the responses "yes" and "no" to select from. All of the respondents expressed a desire to learn more about diabetes and how to prevent diabetes.

Relationship between Knowledge of Diabetes and Willingness to Change Behaviors

The final survey question assessed participants' willingness to modify their lifestyle if they knew more about diabetes. "*I would be more willing to change my habits if I knew more about diabetes.*" This again followed with a "yes" or "no" response space; 61.88% of the respondents expressed a willingness to modify their lifestyle if they knew more about diabetes.

Reliability

The reliability of the self-designed survey was determined by running a split half reliability test on the test of knowledge and attitudes of participants on type 2 diabetes. The responses of the first 16 respondents to this survey were split into two parts and both split halves were run on the test of knowledge and attitude. Data indicated that the survey was reliable.

The correlation coefficient and the spearman-brown correlation of the split half scores were calculated using excel formulas. The spearman-brown correlation of these scores was 0.658882. The split half reliability of this survey was calculated using the formula

$$\text{Split half reliability } (p) = \frac{2r}{(1+r)} = \frac{2 * 0.658882}{(1+0.658882)} = 0.794369 \approx 0.8$$

Where r is the spearman-brown correlation.

The value 0.794369 shows a good reliability and indicates that the self-designed survey is reliable (Zaiontz, 2014).

Statistical Analysis

A logistic regression test was conducted to test the statistical significance of this study's variables. The outcome variables in this study are the amount of knowledge Nigerian women has on type 2 diabetes and the attitude of Nigerian women towards preventing type 2 diabetes. Each of these outcome variables is a dichotomous outcome. The independent variables in this study are:

- Demographic characteristics such as age, ethnicity, nationality, highest educational level attained, and employment status. The quantitative demographic characteristics are age and the highest educational level attained.
- Whether or not participants are knowledgeable on type 2 diabetes and the methods of preventing type 2 diabetes.
- Whether or not participants are willing to prevent type 2 diabetes.

This study tested two hypotheses.

Hypothesis one;

H_0 = there is no relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their age, or educational status.

H_a = there is a relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their age, or educational status.

The outcome variable for this hypothesis is the amount of knowledge Nigerian women has on type 2 diabetes. This can be coded as outcome 0 and outcome 1, where outcome 1 indicates that middle-aged Nigerian women are knowledgeable on type 2 diabetes and outcome 0 indicates that middle-aged Nigerian women are not knowledgeable on type 2 diabetes. The results of the study showed that none of the participants was knowledgeable on type 2 diabetes. A logistic regression test was performed using the data. According to the correlation matrices from the logistic regression test run on the data obtained in this study, neither age nor education has a relationship with the women's knowledge on type 2 diabetes.

Table 5.

Logistic Regression on Knowledge on Type 2 Diabetes

Standardized coefficients (Variable scores)						
Source	Value	Standard error	Wald Chi-Square	Pr>Chi ²	Wald Lower bound (95%)	Wald Upper bound (95%)
Age	-0.02391	0.015307	2.440713	0.118222	-0.05391	0.006087
Education	0.082148	0.034844	5.558152	0.018395	0.013854	0.150442

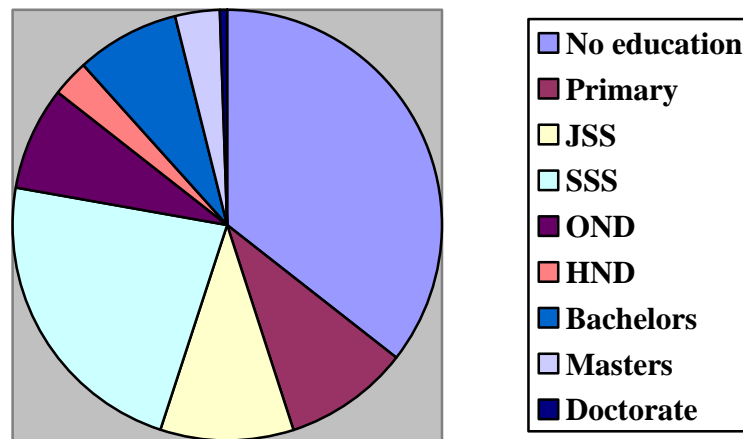


Figure one. Educational Status of Participants

Hypothesis two;

H_0 = there is no relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their willingness to take preventive measures.

H_a = there is a relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their willingness to take preventive measures.

The outcome variable for this hypothesis is the relationship between the amounts of knowledge Nigerian women have on type 2 diabetes and their willingness to take preventive measures. This can be coded as outcome 0 and outcome 1, where outcome 1 indicates there is a relationship between the amount of knowledge they have on type 2 diabetes and their willingness to take preventive measures; outcome 0 indicates there is no relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their willingness to take preventive measures.

The result of the logistic regression test conducted on hypothesis two does not show any relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their willingness to take preventive measures. The p value was 0.07. Thus, there was a failure to reject the null hypothesis. This finding is probably due to the low frequency of participants willing to take measures to prevent type 2 diabetes.

Table 6.

Logistic Regression on Relationship between Knowledge and Willingness to Prevent Diabetes.

Standardized coefficients (Variable scores)						
Source	Value	Standard error	Wald Chi-Square	Pr>Chi ²	Wald Lower bound (95%)	Wald Upper bound (95%)
SCORES	27.76808	15.5152	3.203147	0.073497	-2.64116	58.17732

Table 7.

Logistic Regression on Willingness to Take Measures to Prevent Diabetes

Standardized coefficients (Variable scores)						
Source	Value	Standard error	Wald Chi-Square	Pr>Chi ²	Wald Lower bound (95%)	Wald Upper bound (95%)
Age	-0.02731	0.015445	3.126847	0.077013	-0.05758	0.00296
Education	3.16E-05	0.035117	8.08E-07	0.999283	-0.0688	0.06886

Summary

In summation, some useful findings emerged from this study on the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their level of

Chapter 5

Discussion, Conclusions, and Recommendations

Introduction

Diabetes mellitus was previously rare in rural Africa; however, in recent times it has emerged in epidemic populations and become a chronic, non-communicable disease of huge public health concern with severe socioeconomic challenges in Africa (Mbanya et al., 2010). The increasing incidence and prevalence of type 2 diabetes mellitus in Nigeria is largely attributable to the recent urbanization and westernization Nigeria is experiencing, which has resulted in behavioral and lifestyle changes such as sedentary lifestyles, overly rich nutrition, reduction in physical activities, and obesity (Zimmet et al., 2001). The risk of developing type 2 diabetes increases in Nigerian women at about the age of menopause (Ogbera et al., 2011). More so because obesity, an important risk factor for type 2 diabetes, is viewed amongst Nigerian women as a social indicator of affluence (Mbanya et al., 2010). The purpose of this study was to assess the level of knowledge on type 2 diabetes, the means of preventing it, and the attitude towards preventing type 2 diabetes mellitus amongst middle-aged Nigerian women using a self-designed survey. The intent of this study was to assess the knowledge level and attitude towards taking measures to prevent this chronic, non-communicable disease in middle-aged Nigerian women since they are at an increased risk of developing it. It is believed that this knowledge will act as a guide in developing public health programs to prevent

this disease in this population and promote the health of the middle-aged Nigerian woman.

Discussion

The researcher-designed survey “*Survey on the Level of Knowledge on Diabetes, the Methods for Preventing it, and Attitudes Towards Preventing Type 2 Diabetes*” was designed to assess middle-aged Nigerian women’s level of knowledge on type 2 diabetes, the means of preventing it, and their attitude towards preventing type 2 diabetes. The average age of respondents was 49.73years, the majority of respondents (70%) were from the Yoruba ethnic group and 92.22% were Nigerians. This is attributable to the location and geographical setting in which this study was conducted. Most immigrants (non-Nigerians) in Nigeria settle in urban Nigerian communities. This study was conducted in Lagos State, Nigeria. The indigenous settlers and dwellers in Lagos state are the Yoruba ethnic group. Hence, the majority of the members of this ethnic group still dominate both the rural and semi-urban communities in Lagos State, Nigeria.

Most of the respondents (64.44%) had an education of primary school and above and 42.22% were employed full-time. In the Nigerian community (especially rural and semi-urban communities), there is little or no emphasis on educating the girl child; however, in order to make ends meet most Nigerian women empower themselves by trading or doing menial jobs full-time. In addition, this study was conducted in communities where polygamy is the standard. Women in polygamous marriages, whether educated or not educated, are left to fend for themselves and their children. As a result, the Nigerian woman needs to be employed full-time to care for herself and her children.

Approximately 63% of the survey questions on knowledge of type 2 diabetes were left unanswered by the participants. The magnitude of unanswered survey questions on knowledge of type 2 diabetes suggests that there is a dearth of knowledge of type 2 diabetes amongst middle-aged Nigerian women.

On the knowledge portion of the survey, most (75%) participants missed the question, “*Can diabetes be cured?*” On the knowledge portion of the survey, only 2.78% correctly answered in the negative the *true* or *false* statement, “*Diabetes is caused by being inflicted by witchcraft,*” and 82.78% did not know the answer to the question “*Diabetes can be treated using insulin.*”

These responses show an education deficit on the type of disease diabetes is, the treatment of diabetes, and the cause of type 2 diabetes. Nigerian women do not know that diabetes is a chronic, non-communicable, incurable, but manageable disease; they spiritualize the cause of diabetes, thinking it can be inflicted by witchcraft and they do not know what “*insulin*” is. As a result, education efforts targeted towards generally improving the knowledge on type 2 diabetes and methods of preventing it will need to focus on the causes and treatment of diabetes, and the type of disease type 2 diabetes is.

According to the correlation matrices from the logistic regression test run on data obtained in this study there is no correlation between age or education is correlated and the women’s knowledge on type 2 diabetes. In addition, there is no relationship between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their willingness to take preventive measures. Both hypotheses of the study were not proven. There are no previous studies specifically on the variables and outcome of this study on

Nigerian women. However, other studies on the average person's level of knowledge on the diabetes in other places reported little knowledge on diabetes. The low level of knowledge on diabetes was also attributed to a poor attitude towards preventing diabetes and or its complications.

A study by Pace, Ochoa-Vigo, Caliri, & Fernandes (2006) was conducted in the interior of São Paulo amongst diabetic patients. The purpose of the article by Pace et al. (2006) was to “verify” diabetic patients' knowledge about diabetes and highlight the importance of diabetes knowledge in self care. The average age of participants was 53.3 ± 13 years most did not finish basic education. According to the Pace et al., only 28.6% of participants responded correctly to the causes of diabetes and the type of disease diabetes is. They concluded that little knowledge on diabetes, causes, and symptoms of diabetes affect the prevention and early diagnosis of diabetes, and, in addition, predispose one towards complications (Pace et al., 2006).

An article by Desalu, Salawau, Jimoh, Busari, & Olokoba (2011) reported that the majority (78.4%) of its participants with poor practice of diabetic foot care also had poor knowledge of foot care. This cross-sectional study involving 352 diabetes patients attending three tertiary hospitals in Nigeria surveyed respondents on their knowledge of type 2 diabetes, knowledge of diabetic foot care, and their practice of diabetic foot care. The majority (78.4%) of respondents with poor practice had poor knowledge of foot care. Many respondents (33%) Poor knowledge on foot care was associated with illiteracy and low socioeconomic conditions in this study (Desalu et al., 2011).

Desalu et al. (2011) attributed the low level of knowledge of diabetes foot care amongst women in his study to the generally low level of education of women in some third world countries. Desalu et al. (2011) concluded there is a need for an urgent, patient-friendly educational intervention and regular physician reinforcement to reduce the risk of diabetic foot ulcers and amputations.

The findings from this study can help guide the development of curricula for diabetes prevention programs, health care provider education courses, and diabetes prevention efforts; as well as strategies that will improve middle-aged women's attitudes towards preventing type 2 diabetes.

Theoretical basis for this study

According to Estabrooks, Thompson, Lovely, & Hofmeyer (2006), for knowledge-translation initiatives to succeed, it is essential to find a fit between context and theory. It is of use to understand and use different theories because one theory will not fit all contexts. This study reported a poor level of knowledge on diabetes. No one participating in the study demonstrated being knowledgeable on Type 2 diabetes, defined as scoring more than 75% on a 22-question exam on its cause, symptoms, prevention, treatment, and cure.

The Socio-Ecological Model and the Social Cognitive Theory support this study's first hypothesis. The Socio-Ecological Approach contributes to behavior, using each of its environmental levels. Individual health behavior, which is influenced by knowledge and attitude, is largely influenced by each level of the Socio-Ecological Model from the innermost level to the outermost level (the individual, the family, relations, peers and the

community, and the society and culture) (DiClemente et al., 2013). Certainly middle-aged Nigerian women are not learning about diabetes from their environment. Currently, the levels of the Socio-Ecological Model in Nigeria neither contribute to, nor influence, the knowledge of middle-aged Nigerian women.

The Social Cognitive Theory explains knowledge as a precondition for behavior change (DiClemente et al., 2013). According to eSource (n.d.), “the principles of Social Ecological Models are consistent with Social Cognitive Theory concepts which suggest that creating an environment conducive to change is important in making it easier to adopt healthy behaviors.” With the data reported from this study, within the context of both the Socio-Ecological and Social Cognitive Theories, Nigerian public health system needs to be advised to direct its public health and health promotion efforts at improving the knowledge of middle-aged Nigerian women, while focusing on the environment and creating and implementing interventions that apply both the Socio-Ecological Model and the Social Cognitive Theories. This will enhance the ability of all the environmental levels of the ecological approach to contribute positively to the middle-aged Nigerian women’s socialization process by improving their level of knowledge on diabetes (DiClemente et al., 2013). This will also enable the personal factors, environmental influences, and behavior of middle-aged Nigerian women, to continue to interact with each other in a manner that will allow them to improve their level of knowledge on diabetes, as well as their attitude towards preventing type 2 diabetes (e Source, n.d.).

This study also demonstrated that middle-aged Nigerian women have a poor knowledge of diabetes and a poor attitude towards preventing it; however, it also reported

that 100% of the participants had a desire to learn about diabetes. Perhaps more importantly, 61.88% expressed a willingness to change their habits if they knew more about diabetes. It concluded that there is a need for the Nigerian public health system to focus on promoting the health of middle-aged Nigerian women. The knowledge deficits identified in this research, which would provide a good focus for education programs, were on the type of disease diabetes is; the causes, symptoms, treatment, prevention, and complications of diabetes.

This author postulates that the knowledge translation initiative the Nigerian public health system is advised to embark on, can be understood and implemented using the health behavior change theories used as a basis for this study (the Theory of Reasoned Action and the Theory of Planned Behavior). Using the Theory of Reasoned Action and the Theory of Planned Behavior, the logic flow is that if middle-aged Nigerian women had a greater knowledge on diabetes, she would have a better attitude towards preventing type 2 diabetes. Also, the study's data reports 61.88% of participants expressed they would be more willing to take measures to prevent type 2 diabetes if they were more knowledgeable on diabetes and 100% of the participants expressed a desire to learn more about diabetes. This further buttresses the fact that both the Theory of Reasoned Action and the Theory of Planned Behavior are not only appropriate for this study, but can both be used to test this study's second hypothesis.

According to the Theory of Reasoned Action, attitudes towards the health behavior and subjective norms both contribute to the behavioral intent and the level of intent one has, which contributes to one's behavior (DiClemente et al., 2013). According

to the Theory of Reasoned Action, public health efforts to increase the level of knowledge on type 2 diabetes amongst middle-aged Nigerian women through different means such as the social media and public health efforts to enable positive social influences that encourage the adoption of healthy lifestyles, will shape the behavioral intent of middle-aged Nigerian women to take measures to prevent type 2 diabetes (Diclemente et al., 2013). Also, improved level of knowledge on diabetes amongst middle-aged Nigerian women will help the middle-aged Nigerian women develop a positive attitude towards preventing type 2 diabetes by, evaluating their behavior and beliefs relative to “good versus bad,” and encouraging themselves to adopt measures to prevent type 2 diabetes (Diclemente et al., 2013).

According to The Theory of Planned Behavior, improving the level of knowledge middle-aged Nigerian women have on diabetes will improve the personal perception of middle-aged Nigerian women on preventing type 2 diabetes, enhance their facilitating factors towards preventing type 2 diabetes, repress their inhibiting factors towards preventing type 2 diabetes, enhance the perceived power of these facilitating factors, and improve their perception of their ability to take measures to prevent type 2 diabetes (Diclemente et al., 2013). These theories enable one to better generalize the findings of this study to a larger population.

Recommendations for Action

The results from this study emphasizes the deficit of knowledge on type 2 diabetes amongst middle-aged Nigerian women and the need for the Nigerian public health system to develop and implement diabetes education programs tailored at

preventing type 2 diabetes in middle-aged Nigerian women. The Nigeria public health system should strengthen its diabetes prevention efforts. This can be achieved by developing and implementing nation-wide diabetes prevention programs and a health care provider education courses on diabetes prevention. The objective of the health care provider education courses should be to teach health care providers what to discuss with their patients or clients that are at risk of developing type 2 diabetes, how to counsel these at risk population, and educate middle-aged Nigerian women during clinic visits. The objective of the nation-wide diabetes prevention programs should be to focus on improving the level of knowledge on type 2 diabetes and means of preventing it amongst middle-aged Nigerian. The Nigerian public health system should maximize its time and effort by ensuring funding towards these nation-wide diabetes prevention programs and focusing on the deficits in knowledge of diabetes identified in this study, specifically including the causes and treatment of diabetes and the type of disease diabetes is.

Limitations

Although this study yielded some useful information, there were some limitations to consider. The first limitation was related to the sample size. The self-designed survey used in this study was administered concurrently to women between the ages of 45 and 60 at Epe and Ibeju-lekki, AkodoGeneral Hospitals for four hours daily over five working days. This totaled 40hours of survey administration time. With a greater administration period or more administration sites, the size of the sample could be expanded. A second limitation was response bias. Some respondents could have being influenced by a wide range of cognitive biases that prevent respondents from providing truthful and thoughtful

responses. Clinic personnel who administered the survey read out the questionnaires to illiterate participants, and this introduced the possibility that some participants may have completed their questionnaires without fully understanding them. In addition, some of the participants were accompanied to the clinics by their relatives. The responses of participants whose relatives accompanied them to the clinic could have been influenced by their relatives. Researcher(s) repeating this study in the future should consider politely excusing relatives who are accompanying participants to the clinic away from the participants for the brief period during the survey administration. The third limitation was the geographical setting in which the study was conducted. This study was conducted at Epe and Ibeju-lekki General Hospitals, Akodo. Both hospitals are located in suburban and rural Nigerian communities. As a result, the level of knowledge of type 2 diabetes, means of preventing it, and the attitude towards preventing type 2 diabetes amongst middle-aged women was only assessed in rural and sub-urban Nigerian communities, inadvertently excluding urban Nigerian communities.

All of these limitations affected the external validity of this study. It is preferable to have conducted this study with a larger sample and in all three of Nigeria's geographical settings. This study's sample size and geographical settings may affect the generalizability of the results. The possibility of having a response bias amongst respondents could have been prevented with a larger sample.

Were this study to be replicated, the sample size could be increased through continuous administration of the survey. Having more respondents would eliminate two

of the limitations to this study, and, in turn, improve the external validity, thereby increasing the generalizability of the findings.

Recommendations for Further Study

Based on the results of this study, future researchers should assess the exact same variables of this study in an urban Nigerian community (the third Nigerian geographical setting). This will go a long way in increasing the generalizability of the study's findings.

Future researchers should also conduct an experimental study as a secondary effect to assess middle-aged Nigerian women's attitudes towards preventing type 2 diabetes after a diabetes education program (an intervention effect). The program should be tailored towards improving middle-aged women's knowledge on the causes, symptoms, prevention methods, and complications of type 2 diabetes, and bridge the gap in the knowledge deficits identified in this study (the type of disease diabetes is, and its causes and treatment). It is hoped that this intervention effect will improve middle-aged women's knowledge on type 2 diabetes and enhance their willingness to prevent it. Eventually, this will reduce the incidence and prevalence of type 2 diabetes in middle-aged Nigerian women and improve the overall health and quality of life of them. This will also contribute in no small manner to improve Nigeria's health indices across the board and reduce health care costs.

Conclusion

Three main conclusions were drawn from this study. The first conclusion is there is a poor knowledge of type 2 diabetes, the means of preventing it, and attitudes towards preventing it amongst middle-aged Nigerian women. This is most likely middle-aged

because there is a dearth of public health professionals in Nigeria and Nigeria is a poor country, where 70.8% of the Nigerian population lives on less than one dollar a day (United Nations Children's Fund, n.d.). Resources are scarce and infectious diseases such as HIV/AIDS, tuberculosis, poliomyelitis, and malaria compete with chronic, non-communicable diseases such as type 2 diabetes for scarce resources.

The second conclusion is that according to the correlation matrices from the logistic regression test run on data obtained in this study, neither age nor education is correlated with the women's knowledge on type 2 diabetes and there is no correlation between the amount of knowledge middle-aged Nigerian women have on type 2 diabetes and their willingness to take preventive measures. These findings are probably due to the low number of participants knowledgeable on diabetes, as well as the low number of participants willing to take measures to prevent type 2 diabetes.

The third conclusion is that this study reported a poor attitude towards preventing type 2 diabetes amongst middle-aged Nigerian women, most likely due to the paucity of knowledge on type 2 diabetes amongst this population. By bridging the gap on the knowledge of type 2 diabetes amongst middle-aged Nigerian women, the Nigerian public health community will likely have success improving the willingness of middle-aged Nigerian women to take measures to prevent type 2 diabetes.

An implication of this study is that the Nigerian public health system needs to become empowered, improve its personnel, and re-distribute both its resources and personnel to focus on health promotion by effectively preventing both infectious and chronic communicable diseases in the Nigerian society.

First Heading

Criteria	Poor					Excellent				
<p>Chapter 5: Conclusions (Capstone Project Only) NA</p> <p>-The interpretations of the findings include conclusions that address all research questions and relates the findings to a larger body of literature on the topic.</p> <p>-Includes recommendations for action and further research study.</p> <p>-Comments: Dr. A., You did a really good job, especially since you had so many revisions to make. I made as many as I possibly could do for you, so that you would have to do little more than accept changes. Your earned grade was a 47.5, but I'm deducting 2.5 points for not using track changes. Your final grade on week 7 is a 45.</p> <p>Dr A., Why is the highlighting removed from the references I have already checked? If I cannot tell which references I have already checked, and have to recheck those, there will be a significant penalty in the week 8 grade. Perhaps you can find them from a previous version and rehighlight them. They won't necessarily be the first 10 because I did more than that on many papers and as you have added references, the references I checked would have changed their places in the paper.</p>	1	2	3	4	5					

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Appendix: Title of Appendix

Appendix A: Survey on the level of knowledge on diabetes, the methods for preventing it, and attitudes towards prevention

Appendix B: Letter of consent for Ibeju-lekki General Hospital, Akodo

Appendix C: Letter of consent for Epe General Hospital

Appendix D: Informed consent forms

Appendix E: Handout on type 2 diabetes mellitus