

**FACTORS INFLUENCING SELF-MANAGEMENT AMONG GHANAIAN ADULTS WITH
TYPE 2 DIABETES MELLITUS AND A REVIEW OF INTERVENTIONS FROM SUB-
SAHARAN AFRICAN COUNTRIES TO IMPROVE ADHERENCE TO SELF-MANAGEMENT
PRACTISES IN GHANA**

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Factors influencing self-management among Ghanaian adults with type 2 diabetes mellitus and a review of interventions from Sub-Saharan African countries to improve adherence to self-management practises in Ghana

A thesis submitted in partial fulfillment of the requirement for the degree of

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By:

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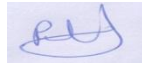
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Declaration:

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Signature:



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LIST OF ABBREVIATION

| | |
|----------|--|
| AADE | American Association of Diabetes Educators |
| BMI | Body mass index |
| BoP | Base of the Pyramid Project |
| BP | Blood pressure |
| CHPS | Community-based Health Planning and Services |
| CHW | Community Health Workers |
| DBP | Diastolic blood pressure |
| DSMES | Diabetes self-management education and support |
| FBG | Fasting blood glucose |
| FDB | Food and Drugs Board |
| GDP | Gross Domestic Product |
| GHS | Ghana health service |
| HbA1c | Glycated hemoglobin |
| HCPs | Healthcare providers |
| HDL | High-density lipoprotein |
| HIV/AIDS | Human Immunodeficiency Syndrome/ Acquired Immunodeficiency Virus |
| LDL | Low-density lipoprotein |
| LMICs | Low and Middle Income Countries |
| MOH | Ministry of Health |
| NCDs | Non-communicable diseases |
| NGOs | Non-governmental organizations |
| NHIS | National Health Insurance Scheme |
| NSTG | National Standard Treatment Guidelines |
| RCT | Randomized Controlled Trial |
| SBP | Systolic blood pressure |
| SMBG | Self- monitoring blood glucose |

| | |
|------|---------------------------|
| SSA | Sub-Saharan Africa |
| T2DM | Type 2 diabetes mellitus |
| TDS | Tamale Diabetes Study |
| VU | Vrije Universiteit |
| WHO | World Health Organization |

GLOSSARY

Self-management: Is an active continuous process adopted by the individuals with support from significant others to manage their health condition for better health outcomes (1,2).

Diabetes mellitus : Is a chronic disease characterised by collection of disorders, hyperglycemia and glucose intolerance as a result of either insulin deficiency or impaired effectiveness of insulin' action or both conditions (3).The three major forms of diabetes mellitus are type 1, type 2 and gestational diabetes (4).

Diabetes self-management education and support (DSMES): is a continuous process of providing self-management education and support to equip people living with T2DM with knowledge and skills to adopt and sustain self-care behaviors in managing their disease for better health outcomes (5).

Social Support: Is assistance from families, friends and significant others that influences health outcomes (6).

Diabetes self-management practices or self-care behaviors: Are the seven essential self-care behaviors or practices performed by people living with diabetes mellitus which yields good health outcomes. These seven essential self-care behaviors or practices are healthy diet or dietary guidelines, being physically active or exercise, self-monitoring of blood glucose, taking medication, problem solving skills, healthy coping skills, and reducing risks i.e. foot care and smoking cessation (7,8). In this thesis, the following terms were used interchangeably in the study analysis: self management practices and self-care behaviors, healthy diet/ eating and dietary guidelines or diabetic diet, being physically active and exercise.

Exercise: "Is physical activity that is planned, structured and repetitive for the purpose of conditioning any part of the body"(9)

Self-monitoring of blood glucose (SMBG): "Provides information regarding an individual's dynamic blood glucose" (10).

Foot care: Is the avoidance of injuries and daily inspection of the feet by a diabetes patient (11)

Diabetic diet:"A dietary adjustment for patients with diabetes mellitus intended to decrease the need for insulin or oral diabetic agents and control weight by adjusting caloric and carbohydrate intake"(12).

General Diet: is the general eating or dietary plan for a diabetic patient (13) .

Specific Diet: Is the recommended fruits, vegetables and fat to be consumed by a diabetic patient (13).

Healthy diet: Is a diet consisting of different food groups in their right amount and quality.It also entails high amount of fruits and vegetables with less amount of fats and refined sugars (14)

Intervention: "Is an act performed for, with or on behalf of a person or population whose purpose is to assess, improve, maintain, promote or modify health, functioning or health

conditions”(15). In this thesis only interventions on type 2 diabetes mellitus self-management were focused.

Gender: means the societal constructed dynamic roles, norms and behaviours that determine being a male or female (16).

Glycated hemoglobin (HbA1c): “Is indicator of long-term glycemic control with the ability to reflect the cumulative glycemic history of the preceding two to three months” (17).

Fasting blood glucose: “A laboratory test that determines the level of glucose in the blood after an overnight fast, used especially to diagnose diabetes and prediabetes” (18)

Total cholesterol: “Is a measure of LDL cholesterol, HDL cholesterol, and other lipids components. Low-density lipoprotein (LDL) is also called “bad” cholesterol and high-density lipoprotein (HDL) is also called “good” cholesterol. Triglycerides are fats carried into the blood from the food we eat” (19).

Blood pressure: “The force of circulating blood on the walls of the arteries. Blood pressure is taken using two measurements: Systolic blood pressure (SBP) is measured when the heart beats, when blood pressure is at its highest. Diastolic blood pressure (DSP) measured between heart beats, when blood pressure is at its lowest”(20).

Body mass index: “A person’s weight in kilogram divided by the square of the person’s height in meters (kg/m^2)” (21). This measure is used for assessing the nutritional status of an individual adult (21)

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is a public health threat in Ghana contributing to mortality rate of 3% in 2016. Self-management is recommended to prevent co-morbidities and mortalities among T2DM patients. Nevertheless, self-management practises are poor among T2DM patients in Ghana.

Objective: The study explores factors influencing self-management practises among Ghanaian adults with T2DM and review interventions from SSA countries in order to make context-specific recommendations to policymakers and stakeholders in Ghana to improve adherence to T2DM self-management practises in Ghana.

Methodology: The study type is a literature review. The adapted Anasri et al., 2017 conceptual framework of self-management of T2DM was used for the analysis of the study.

Results: The key factors influencing T2DM self-management practises were dietary preference, cultural belief, family support, diabetes peer support group, emotional distress, financial status, diabetes knowledge, provider-patient communication and diabetes self-management education and support. Three evidence-based interventions which improve adherence to T2DM self-management practises were found among Sub-Saharan Africa studies reviewed. These interventions are; diabetes self-management education, social support programme, and exercise programme.

Conclusion and Recommendations: Self-management among T2DM Ghanaian adults has received little attention and this is reflected in the limited evidence base studies available. The three evidenced-based interventions from SSA are likely complementary to each other. Adopting a single intervention in Ghana may not be effective to improve adherence to T2DM self-management practises, while a combined approach will likely yield positive outcomes.

Key words: Factors, self-management practices, type 2 diabetes mellitus, interventions, Ghana, Sub-Saharan Africa

Word count: 12,805

INTRODUCTION

Globally the prevalence of diabetes mellitus among adults above 18 years has increased, including in low-and middle income countries (22). In 2017, the global prevalence of type 2 diabetes mellitus was 8.4% and is expected to increase to 9.9% in 2045 especially in developing countries (23). Low and middle income countries (LMICs) recorded 80% of mortality associated with diabetes(24). In Africa more than 15.9 million people have diabetes and this is expected to increase by 162% in 2045 (25). Seventy-three percent of mortality associated with type 2 diabetes mellitus affects people aged below 60years who constitute the work force (25). Globally, the prevention and management of non-communicable diseases (NCDs) is advocated by the World Health Organization (WHO) in conformity with WHO's Global Non-communicable Disease Action plan 2013-2020 (26) and as part of the Sustainable Development Agenda 2030 where member states are to ensure the reduction of premature morbidity and mortality due to NCDs including diabetes mellitus by one third (27). Furthermore, all member states are encouraged to prioritize NCD interventions which include type 2 diabetes mellitus (T2DM) management in their national health plan to ensure a healthy population (26). This includes much focus on the proper management of T2DM once people are diagnosed. Ensuring effective management of T2DM patients does not rely only on action within the health system, but involves continuous responses from different government sectors, civil society, family and the people living with T2DM themselves (27). To achieve effectiveness in management of chronic diseases like T2DM, self-management practices cannot be overlooked (2). Having worked as a district nutrition officer for the past 10 years in the Ghana health service, the author made the following observations regarding the management of T2DM. Healthcare providers mostly focus on giving information on diabetes medication adherence with less focus on other self-management practices, i.e. diet, exercise, self-monitoring of blood glucose (SMBG) and foot care. Also, T2DM patients do not adhere to self-management practices which help to prevent complications and premature deaths. These identified challenges have motivated me to study this topic to explore the factors influencing self-management among Ghanaian adults with type 2 diabetes mellitus and review self-management interventions from Sub-Saharan African countries (SSA) to be implemented and improve adherences of T2DM self-management practices in the disease management for better health outcomes in Ghana.

Structure of the Thesis

This study is a literature review to explore the factors influencing self-management among T2DM Ghanaian adults and review interventions from SSA. The study is structured into five main chapters. The first chapter looks at background information of Ghana, disease burden as well as diabetes mellitus management. The second chapter presents problem statement, justification, objectives, methodology, analytic framework, and study limitation. The third chapter presents the study findings which include the factors influencing self-management practises among T2DM Ghanaian adults using the adapted Anasri et al., 2017 conceptual framework of self-management of T2DM and a review of self-management interventions from SSA countries. The fourth chapter presents discussions on the study findings in the context of Ghana. The fifth chapter looks at the study conclusions, evidence-based information summarized for recommendations to stakeholders in Ghana.

CHAPTER 1.0 BACKGROUND INFORMATION, DISEASE BURDEN AND DIABETES MANAGEMENT

1.1 Background Information

1.1.1 Geography and Demography

Ghana is an Anglophone and a West African country located within the boundaries of three francophone countries and the Gulf of Guinea (Togo, Cote d'Ivoire and Burkina Faso to the east, west and north respectively). The country had a population of 28,102,471 in 2018, a growth rate of 2.16% with a sex proportion of 49.83% and 50.41% of males and females respectively (28–30).

Ghana has a fertility rate of approximately 4 children born per women and life expectancy of 67.4 years with females recording the highest at 70 years in comparison to males at 64.9 years (28,30). The country has 57% of the population aged below 25 years. However, 4.3% of the population are above 65 years and this proportion is among the highest in Sub-Saharan Africa (28). The urban population account for 55.4% of the total population with a rapid annual urbanization rate of 3.4% (28,31).

1.1.2 Economic Situation

Ghana a Low Middle Income Country (LMIC) has experienced an improvement in its economy in the past years (32). However, the estimated Gross Domestic Product (GDP) for 2018 was \$65,556 with a decline growth rate of 6.3% in comparison to 8.1% in 2017 (33,34). The service sector continued to be the largest contributor to the GDP with an increased share from 46% in 2017 to 46.3% in 2018. Also, industry and agriculture sectors recorded GDP shares of 34.0% and 19.7% respectively. The estimated per capita GDP was \$2,214 in 2018 however, 12% of the population are living below the poverty line (31,34).

1.1.3 Education

Education is an indicator for the socio-economic development of every country. The literacy rate among Ghanaians aged above 14 years is 71.5% (31,35). With the aim of improving education in the country the Free Compulsory Basic Education Program (FCUBE) was introduced in 1996 by the government to create access for both males and females education. This program is evident of the increase in literacy rate from 63 % and 77% in 2008 to 67% and 82% in 2014 among females and males respectively (35).

There is gender gap in schooling system in Ghana as 19% of women and 9% of men age 15-49 years have never attended school (35). Also, there is greater disparity of education level between the rural and urban population. A proportion of 10% males in the urban areas have no education in comparison to 25% in the rural areas. Similarly, 18% of females in the urban areas have no education compared to 35% in the rural areas (35).

1.1.4 Health System

The health system of Ghana is guided by regulatory institutions, policies and standards to offer quality healthcare to the population (32). The health sector is structured into three administrative levels: national, regional and district levels which integrates curative, preventive and promotional service of health programmes (36). The health system is administrated by the Ministry of Health (MOH) which has its agencies such as Ghana Health Services (GHS), Food and Drugs Board (FDB) and National Health Insurance Scheme (NHIS). Among the responsibilities of the MOH are formulation of health policies, generation and allocation of resources, monitoring and evaluation of the health sector. And the GHS exist to implement health policies and ensure health service delivery to the population (32,37,38). The health service delivery in Ghana is categorized into three-tiers which are:

primary, secondary and tertiary levels and this ensure the gate keeping system in health service delivery (37).

The primary level covers the provision of health care through Community-based Health Planning and Service (CHPS) and health centers which serves as the first point of contact to the individual seeking for health care (37). The primary level is mainly manned by clinical nurse, Community Health Officer (CHO) and Community health Volunteer (CHV) (37,39). The secondary level covers the district and regional hospitals and teaching hospitals including specialized hospitals also form the Tertiary level. Ghana has employed 68% of the required health work force for service delivery (40). As a result of low social amenities in the rural part of the country, health workers distribution is highly concentrated in the urban compared to the rural areas (32).

The private health care providers offers 55% healthcare service out of the total health services delivery in the country (41). Private health facilities such as hospitals, clinics, pharmacies and chemical shops provide the most accessible health services to the rural and urban poor (32).

The National Health Insurance Scheme (NHIS) was instituted by government with the aim of protecting the individual from catastrophic cost of ill health, yet out-of-pocket expenditure stands at 38% of the total household income which mostly affects the poor (32,42,43). The NHIS covers curative cost of about 90% of both communicable and non-communicable diseases which affects the population (42,44).

1.2 Disease burden

Over the past two decades in Ghana, there has been a significant shift from primarily communicable diseases to a double disease burden of infectious and non-communicable diseases as major causes of mortality and disability (45). The mortality rate of disease burden in the country is estimated as 47% for communicable diseases, 43% for non-communicable diseases and 10% for injuries in 2016 (46) (See figure 1).

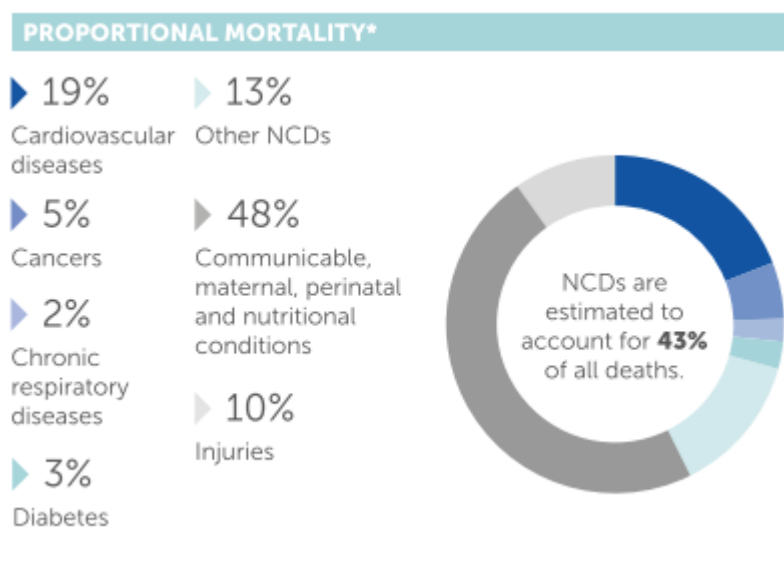


Figure 1: Ghana Country Profile on Non-communicable Diseases Proportional Mortality, 2016
Source: WHO Non-Communicable Disease Country Profiles, 2016 (46)

In Ghana, the top five diseases that caused mortality among the population in 2017 were malaria, lower respiratory, neonatal disorders, ischemic heart disease and stroke (47). Furthermore, dietary iron deficiency, headache disorders, low back pain, depression disorders and diabetes were also ranked as the top five diseases that led to disabilities among Ghanaians (47). However, there has been an improvement in the health indicators of some communicable diseases such as HIV(AIDS) which has recorded a decreased mortality rate of 39.6% between 2007 and 2017 (47). NCDs mortality rate is expected to exceed that of communicable diseases by 2030 (48). Obesity, physical inactivity, alcohol use and raised blood pressure are the exposure risk factors for the development of NCDs in Ghana (49).

1.3 Diabetes management

Diabetes is among the prioritised NCDs in Ghana which affects both the young and older population (45). The country prevalence of diabetes among adults aged 20-79 years was 3.6% in 2017 and it is expected to increase to 5.1% by 2045 (see table 1). Diabetes is one of the chronic diseases in the country which recorded 49.7% undiagnosed cases in 2017. However, these undiagnosed cases are likely to be poorly controlled which lead to premature death (50).

In Ghana, type 2 diabetes mellitus (T2DM) accounts for 90% of all diabetes cases which mostly affects adults above 40 years living in both urban and rural areas (51,52). Nonetheless, diabetes prevalence among rural men and women is low (3.6% and 5.5% respectively) as compared to urban men and women (10.35% and 9.2% respectively) (53). Again, a study conducted in the country showed that there is insignificant gender difference in diabetes prevalence as female recorded 2.16% and 1.73% for males (54). Poorly managed diabetes leads to complications such as kidney failure, cardiovascular diseases (CVDs), amputation, stroke and premature death (4). In Ghana, disability and mortality rates associated with diabetes has increased by 52.8% and 20% respectively in 2017 (47). However, 35% of diabetes mortality in 2017 affected people below 60 years who are the working force of the country (50).

Table 1: Ghana Country Report on Diabetes 2017 and 2045

| Ghana At a Glance | 2017 | 2045 |
|--|----------------------------------|----------------------------|
| Diabetes estimates (20-79 years) | | |
| | Confidence intervals in brackets | |
| Country prevalence, % | 3.6 (1.0-5.7) | 5.1 (1.2-7.3) |
| Age-adjusted comparative prevalence, % | 5.0 (1.3-7.3) | 5.0 (1.3-7.1) |
| Number of people with diabetes, in 1,000s | 518.4 (140.5-830.3) | 1,426.3 (339.8-2,026.5) |
| Number of people with undiagnosed diabetes, in 1,000s | 257.6 (69.8-412.6) | 708.8 (168.9-1,007.1) |
| Proportion of undiagnosed cases, % | 49.7 | 49.7 |
| Number of deaths due to diabetes, in 1,000s | 9.8 (2.4-14.9) | |
| Proportion of deaths due to diabetes in people under 60 years, % | 35.0 | |
| Healthcare expenditure due to diabetes (20-79 years) | | |
| Total health expenditures, million USD* | 55.2 | 132.9 |
| Health expenditures per person with diabetes, USD* | 106.5 | 93.2 |

Source: *The IDF Diabetes Atlas, 8th Edition* (11)

The total healthcare expenditure due to diabetes management for adults 20-79 years was \$55.2 million with a cost of \$106.5 per person in 2017 (see table 1).

As part of efforts to strengthen the management of diabetes in Ghana, the Ministry of Health has implemented some interventions which include the Buddy Doctor Initiative (BDI), Base of the Pyramid Project (BoP), provision of essential diabetic drugs at primary care facilities and developing of National Standard Treatment Guidelines (NSTG) which has some aspect tailored towards general diabetes management (4,55,56). With reference to the NSTG, management of diabetes in Ghana has been categorized into pharmacological and non-pharmacological management. The pharmacological management of type 2 diabetes mellitus is concentrated on medication therapy. Diet therapy and exercise are the two non-pharmacological management components of diabetes with emphasis on diet therapy as the first line of management for a newly diagnosed T2DM (4). One of the core components of the base of the Pyramid Project (BoP) is to achieve and improve self management through patient education a pre-requisite for diabetes management (55).

Despite the implications of diabetes in Ghana (see table 1), the country has limited number of trained diabetes healthcare providers, two Diabetes registries and has no evidence-based national diabetes protocol and standards and blood glucose measuring machines at most primary care facilities which serves majority of the rural population (56,57). These evidence-based diabetes protocol and standards are components for effective diabetes management and prevention (56).

CHAPTER 2.0 STATEMENT OF THE PROBLEM, JUSTIFICATION, METHODOLOGY, CONCEPTUAL FRAMEWORK AND STUDY LIMITATIONS

2.1 Problem Statement

There has been an increase in diabetes prevalence in Ghana from 2% in 2016 to 3.6% in 2017 which is above the African regional prevalence of 3.1% in 2017 (50,56,58). In 2016, diabetes recorded 3% mortality rate in Ghana (46). The major risk factors associated with developing diabetes mellitus in Ghana are family history, physical inactivity, ageing, obesity, unhealthy diet and increase in urbanisation (52,54,59). The Ghanaian government provides basic medical care to all Ghanaians. However, compared to other countries, the provision of health care services for diabetic patients is still limited (60).

In Ghana, the identified challenges in the management of NCDs which includes type 2 diabetes mellitus (T2DM) are: high cost of essential drugs, limited funds and less political commitment has resulted to limited access of health care (61). These limited health care services, coupled with poor self-management practises of diabetes may be responsible for complications and premature deaths among people living with diabetes mellitus in Ghana (62). Evidence indicates that, seven out of ten diabetes patients in Ghana poorly manage their conditions leading to negative health outcomes (63). Poorly controlled diabetes leads to complications such as nerve damage, kidney failure, amputation, CVDs, stroke and vision loss which reduce the quality-adjusted life years (QALYs) of diabetes patients and eventually resulting in premature deaths (4,22,27). In Ghana, individuals with uncontrolled diabetes which is characterised by severe weight loss are stigmatized as HIV/AIDS patients within the community especially among women (64). The economic consequences cannot be underestimated as high financial burden and time lost is experienced by individuals, family, society and government in managing diabetes complications and productive individuals are lost to the national economy due to largely preventable causes (27,64).

Due to the public health threat of NCDs such as type 2 diabetes mellitus (T2DM), the global community has agreed as part of the 2030 Agenda for Sustainable Development to ensure the reduction of premature deaths due to NCDs (27). Furthermore, the WHO Global NCD Action plan for the period 2013-2020 encourage all member states to prioritize NCDs interventions which includes T2DM management in their national health plans to ensure healthy population (26). In view of this, Ghana developed the National Policy on Non-communicable diseases in 2012 with the goal to reducing the burden of the four major NCDs (cancers, diabetes, cardiovascular diseases and sickle cell diseases) contributing to avoidable morbidity, complications and premature deaths in Ghana (64).

Resources for managing diabetes are limited in general. There are not enough qualified health workers to provide health services to meet the increasing health needs of people suffering from chronic conditions such as diabetes patients (65). Therefore, self-management practises has been suggested as necessary to encourage people living with chronic diseases like T2DM to adopt for improvement in their health outcome (7). According to the America Diabetes Educators Association (AADE) and Shrivastava et al. recommended that the seven core self-management practises or self-care behaviours are: healthy diet, being physical active, self-monitoring blood glucose, taking medications, good problem-solving skills, healthy coping skills and reducing risk i.e. foot care (7,8). These seven core recommended self-management practises have positive relationship with good glycermic control¹, decrease in complications and better quality of life among people living with T2DM when practiced effectively (7,8)

¹ Glycermic control are measures taken to achieve a normal blood plasma glucose level (fasting blood glucose < 7.0mmol/l or random blood glucose < 11.1mmol/l) (116,117).

Self-management is regarded as cost effective way of managing T2DM management to prevent complications and deterioration of co-morbidities (27). According to World Health Organisation (WHO) self-management practices such as healthy diet and exercise by T2DM patients has led to good control of blood glucose level and positive health outcomes (27). Even though, diabetes is a chronic and progressive disease, patient life expectancy could be extended as a results of supportive self-management and periodic follow-ups by an organised health system (27,66).

Despite evidence supporting the practise, poor self-management practises among T2DM patients in Africa remain the norm (7,67). This is corroborated by a limited body of evidence which for Ghana equally indicates that, many T2DM patients do not adhere to the recommended self-management practices (68–70). One of the studies conducted in Ghana indicated that, 2.7%, 26%, 0.5% and 9.6% of T2DM patients adhered to the diet, exercise, self-monitoring blood glucose (SMBG) and foot care respectively (68). In another study, it was found that 50.1% of people living with T2DM in Ghana perform SMBG (69). Also, one study recorded 38.5% of T2DM patients who adhered to medication (70). Evidence shows that the factors influencing poor T2DM self-management practises include inadequate capacity to prepare recommended diet, irregular access to fresh fruits and vegetables and limited variety of non-starchy foods, social and peer-influence on choice of unhealthy diet (27). Also health illiteracy, gender and education level influences the self-management practises of people with T2DM in Ghana (70–73). Self-management places significant responsibilities on patients with T2DM (74). Furthermore, frequent use of traditional medicine in addition to biomedical medication in Africa is a barrier to T2DM self-management which often result in poor health outcomes (67). People with T2DM should be involved in managing their diseases which should be strongly supported by response of the family, society, health system and different nongovernmental and governmental sectors (45,63,75,76). Therefore, this thesis seeks to answer the question: what are the factors influencing self-management practises among Ghanaian adults with T2DM and review interventions from SSA and provide recommendations for policy and implementation to improve adherence of T2DM self- management practises in Ghana.

2.2 Justification

There are limited studies that have been conducted on T2DM self-management in Ghana and they identified low levels of adherence to self-management practises (68–70). These studies highlighted mostly on levels of adherence to T2DM self-management practises in Ghana with little focus on factors influencing T2DM self-management practises. Also, all the studies were conducted in health facilities and the results covered only diabetes patients who had access to these hospitals excluding those in the community. Furthermore, the findings of these studies did not suggest any evidenced-based self-management interventions which are context-specific to Ghana to help improve adherence to T2DM self-management practises.

A study conducted in Ghana also recommended that there should be a multidisciplinary interventions which target lifestyle modification an inclusion of self-management practices which can contribute in averting premature deaths among diabetics patients in Ghana (63). Furthermore, a commentary paper on NCDs proposed a new direction of research, practices and policy on collective engagement of patients in chronic disease management along with health care professionals, researchers, policy makers and civil society in Ghana (45).

Diabetes education and health providers support for self-management practises regarding NCDs such as 2TDM management is not prioritized in the delivery of health services in Ghana (77). This challenge of not prioritizing self-management for NCDs such as T2DM is evident in the National Policy on NCDs and National Strategy for the Management, Prevention and Control of Chronic Non-communicable diseases (48,64). Hence, a gap in

identified factors influencing self-management practises and recommended self-management interventions for T2DM patients in Ghana. Given the paucity of evidence within the Ghanaian context, this thesis seek to address this gap by exploring factors influencing self-management practises among T2DM Ghanaian adults and review interventions from Sub-Saharan Africa region and provide recommendations for policy and implementation to improve adherence of T2DM self- management practises in Ghana.

2.3 General Objective

To explore factors influencing self-management practises among Ghanaian adults with T2DM and review interventions from SSA countries in order to make context-specific recommendations to policymakers and stakeholders in Ghana to improve adherence to T2DM self-management practises in Ghana.

2.4 Specific Objectives

1. To identify and examine the factors influencing self-management practises among T2DM Ghanaian adults.
2. To review evidence-based T2DM self-management interventions from Ghana and SSA countries.
3. To recommend evidence-based and context-specific self- management interventions for adults living with type 2 diabetes mellitus to policy makers and stakeholders in Ghana to improve adherence to T2DM self-management practises.

2.5 Methodology

The study was based on literature review on published and grey literature. Literature search for published scientific articles was done using Google scholar, PubMed, Google and Vrije University electronic-library. Additionally, relevant documents from official websites of World Health Organization, International Federation of Diabetes (IFD), Ministry of Health (MOH) and its agency i.e., Ghana Health Service (GHS) and National Health Insurance Authority (NHIA) were sourced. Furthermore, 'Expert opinion' through emails and personal contact on phone were made to verify current and relevant information from colleagues and experts in Ghana to aid in developing the thesis. For the purpose of this dissertation, five of the seven self-management practices of the individual would be focused which are: adherence to diabetic diet or dietary guidelines, exercise, SMBG, medications and foot hygiene or care (7,8). These five self-management practises were focused due to limited literature and time.

In order to achieved the objective one: To identify and examine the factors influencing self-management practises among T2DM Ghanaian adults, peer-reviewed articles with titles on T2DM self-management practises were reviewed by reading the abstract. There is limited literature in Ghana on factors influencing T2DM self-management practises with the guide of the adapted Ansari et al., 2017 Conceptual framework of T2DM self-management (see figure 2). Hence, articles from other SSA countries with similar context like Ghana have been included (78). In addition, reference list of selected articles were screened to find any potential missing literature not found during literature search. Also, relevant documents from official websites of Ministry of Health and its agency i.e. National Health Insurance Authority (NHIA) were sourced. The Boolean operators 'AND' or 'OR' were used in combination with some key words 'self-management practises', 'type 2 diabetes mellitus', 'factors', 'Ghana', 'Sub-Saharan Africa' (refer to table 2.0) for details of search terms.

In order to achieved the objective two: To review evidence-based intervention T2DM self-management interventions form Ghana and SSA countries, peer-reviewed articles on T2DM self-management interventions focused on the five self-management practises (dietary guidelines, exercise, SMBG, medication and foot care) were reviewed by reading the abstract. Also, reference list of selected articles were screened for potential missing literature not found during literature search. The details of the studies were extracted (see

table 4 and annex 2). The Boolean operators 'AND' or 'OR' were used in combination with some key words 'self-management intervention', 'type 2 diabetes mellitus', 'Ghana', 'Sub-Saharan Africa countries' (see table 2.0) for details of search teams.

The search was limited to published and grey literature in English language within (2002-2019). English language is what the author understands and paucity of information in Ghana and SSA necessitated extension of years to 2002. Only articles with access to full text were included. Articles that do not meet the above criteria were excluded.

Table 2: Key Words for Search Strategy

| Objective | Source | Key words |
|--|---|--|
| <p>1. To identify and examine the factors influencing self-management practices among T2DM Ghanaian adults</p> | <p>Google scholar, PubMed, Vrije University electronic-Library, Google</p> <p>Official websites: Ministry of Health and its agency i.e. National Health Insurance Authority (NHIA)</p> | <p>"Self-management OR self-care practices OR (diet, healthy diet, physical activity exercise, SMBG, medication, foot care) AND factors AND type 2 diabetes mellitus AND Ghana OR SSA countries", "Self-management OR self-care practices AND social support OR family support AND type 2 diabetes mellitus AND Ghana OR SSA countries", "Self-management OR self-care practices AND psychological OR emotional distress AND type 2 diabetes mellitus AND Ghana OR SSA countries", "Self-management OR self-care practices AND self-management education and support OR diabetes knowledge AND type 2 diabetes mellitus AND Ghana OR SSA countries", " self-management OR self-care practices AND demographic factor AND Ghana OR SSA", "Self-management OR self-care practices AND cultural AND type 2 diabetes mellitus AND Ghana OR SSA countries",</p> |
| <p>2. To review evidence-based T2DM self-management interventions form Ghana and SSA countries</p> | <p>Google scholar, PubMed, Vrije University electronic-Library,</p> | <p>" Type 2 diabetes mellitus AND evidence-based self-management OR self-care intervention OR program in Ghana OR SSA countries", "Effective type 2 diabetes mellitus AND self-management education and support program OR</p> |

| | | |
|--|--|--|
| | | intervention in Ghana OR SSA countries", "Diabetes self-management education AND intervention in SSA", exercise program AND type 2 diabetes mellitus in SSA", "type 2 diabetes mellitus dietary therapy OR diet intervention OR recommendation OR guidelines AND in SSA", "self-monitoring blood glucose AND intervention Or program in Ghana OR SSA", |
|--|--|--|

2.6 Description of conceptual framework

There are various conceptual frameworks for self-management of chronic diseases such as Grey et al., 2006 and Zimbudzi et al., 2015. These two conceptual frameworks focus on testing self- and family management interventions for people with chronic or at risk for their development and facilitating effective self-management of diabetes respectively (79,80). To identify the factors influencing self- management practices of T2DM among adults in Ghana, Ansari et al., 2017 conceptual framework of self-management of T2DM was chosen and adapted to guide the literature review (81) (see annex 1) .The following were the reasons why the conceptual model was chosen and adapted:

1. The framework was developed on the basis of identifying factors that can influence T2DM self-management for Adults, which is an objective for this study with the similar target group (Adults).
2. The study population for the development of the framework was from Pakistan a LMIC like Ghana (82).
3. The framework provides a central position for the individual patient and all other factors that can influence self-management of T2DM are directed towards the individual. Thus, recognizes the patient involvement in managing chronic disease such as T2DM which yield positive health outcomes (75).

From a critical observation on Ansari et al., 2017 conceptual framework of self-management of T2DM, the self- management practises performed by the individual such as SMBG, healthy eating/diet and physical activity (7,8) are captured under the psychological characteristics which is one of the influential factors of the individual SMPs (83,84).Therefore, all these self-management practices have been captured under the self-management of the individual where all other characteristics are directed to have influence towards it. Furthermore, it is observed that the framework has only three self-management practices as stated above, therefore additional two self-management practises i.e. medication and foot care has been captured (7). Emotional distress have been incorporated as psychological factors (83,84).

In the framework, family support has been repeated in two different main factors namely: social support and barriers to self-management, hence it has been captured under socio-economic factors. Also, the sub-factors (i.e. financial status and diabetes knowledge) under the barriers to self-management of the framework have been captured as socio-economic and demographic factors respectively. In addition, health service factors also have influence on self-management (84), but were not included in the framework. Therefore it has been

added as a separate factor in the adapted model. Based on the above reasons, the Ansari et al., 2017 framework has been adapted, modified and incorporated with these identified areas for organized and in-depth analysis of the objective one (see figure 2).

The adapted Ansari et al., 2017 framework consists of five factors that can influence T2DM self-management: demographic factor comprise of gender, age, education level and knowledge on diabetes; psychological factors consist of illness perception and emotional distress. Cultural factors entail cultural beliefs and dietary preferences. Socio-economic factors consist of financial status, support group, family and friends support. Health service factors comprise access to Diabetes self-management education and support and provider-patient communication. This model indicates that all the five aforementioned factors can influence self-management practises which encompass dietary guidelines, exercise, SMBG, foot care and medication of the individual which can predict health outcomes.

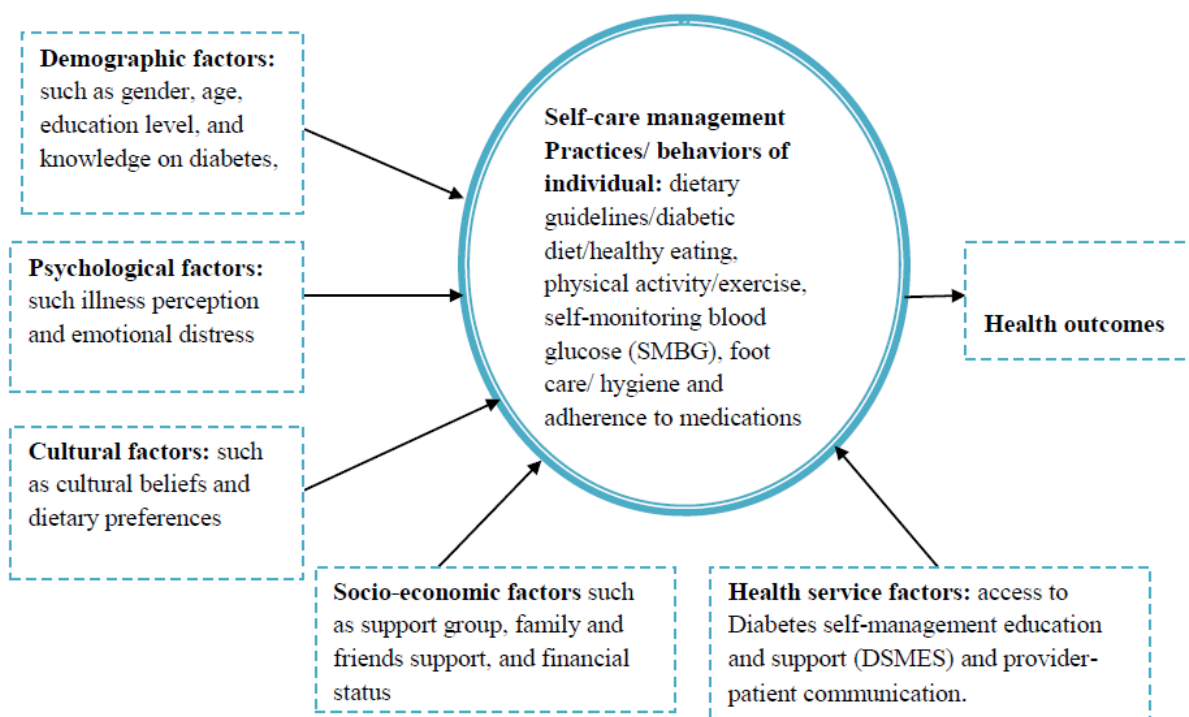


Figure 2: Adapted Ansari et al., 2017 conceptual framework of self-management of type 2 diabetes mellitus (Adapted by author)

Source: Ansari et al., 2017 (81)

2.7 Study limitation

Few studies on T2DM self-management practises have been done in Ghana which limits triangulation of data in Ghanaian context. With respect to literature search approach, articles written in only English language, and the four search engines as mentioned above used, coupled with limited time for reviewing of literature may limited the number of articles used for the study analysis.

2.8 Operational definition of Terms

For the purpose of this thesis, operational definition of terms has been done to assist in the study analysis (see table 3).

Table 3: Operational definition of Terms

| No. | Terms | Definitions |
|------------|--|--|
| 1. | Dietary guidelines | Are specific or general recommended diets and portions for type 2 diabetes mellitus patients |
| 2. | Technology Assisted Self-management practices | Is the use of text messages and glucose-meter to enable T2DM patients perform self-care behaviours |

CHAPTER 3.0 FACTORS INFLUENCING SELF MANAGEMENT PRACTISES AMONG T2DM GHANAIAN ADULTS AND EVIDENCE-BASED T2DM SELF-MANAGEMENT INTERVENTIONS IN GHANA AND SUB-SAHARAN AFRICAN COUNTRIES

This section presents findings on the factors influencing self-management practices among adult living with T2DM in Ghana and evidence-based T2DM self-management interventions in Ghana and SSA.

3.1 Factors influencing self management practises among T2DM Ghanaian Adults

In the adapted Ansari et al., 2017 conceptual framework of T2DM self-management, the factors that influence T2DM self-management practises are demographic, psychological, cultural, socio-economic, and health service factors and these are highlighted in this section. Findings are presented based on the following self-management practises exercise ,self-monitoring blood glucose (SMBG), dietary guidelines, medications and foot care (7,8). As stated in the study limitations, there are limited literatures on T2DM self-management practises in Ghana, hence findings from Sub-Saharan African countries are used to link in context of Ghana.

3.1.1 Demographic factors

With regards to demographic factors such as age, gender, education, and diabetes knowledge were examined in this section.

3.1.1.1 Age

Age influences individuals ability to effectively involve one's self in disease management (85,86). A cross-sectional study conducted in Ghana among (n= 201) participants showed no association between age and SMPs of T2DM patients (69). However, a recent qualitative study conducted in Ghana among T2DM reported that old age hinders T2DM patients to practice self-management practises like exercises (86). This was a small qualitative study and the result may not be generalisable. With limited literature to establish the relationship between age and self-management practises among T2DM patients in Ghana, a study with (419 participants) conducted in Ethiopia showed participants aged (40-49 years old) were 11 times (95% CI= 1.03–13.6; $p < 0.05$) more likely to adhere to medication in comparison to those aged (60- 76 years old) (85). The variation in the findings from the above mentioned studies may be due to the difference in study populations and sample sizes.

3.1.1.2 Gender

Gender plays a significant role in diseases management by the individual (72). A cross-sectional study conducted (n= 201) among T2DM patients in Ghana revealed no association between sex and self-management practises (69). A similar study conducted among T2DM patients in the northern part of Ghana revealed that males in comparison to females frequently practise SMBG ($r=0.198$, $p=0.007$) (68). Another findings from the Tamale Diabetes Study (TDS) conducted among (n=222) T2DM patients in Ghana showed that more women (57.7%) reported to perform weight management compared to their men (45.5%) counterparts (72). The two aforementioned studies may infer that gender influences the frequency of self management practises. However, all the studies were conducted in the northern parts of Ghana without a representation from other parts of the country and may not be representative.

3.1.1.3 Education level

In a cross-sectional study conducted among T2DM patients at a teaching hospital in Ghana showed that there was an association (OR)= 1.508; $p=0.019$ between educational level and self-management practises like adherence to diabetic drug (70). The study further indicated that T2DM patients with primary education level do not adhere to medication. Another study carried out among T2DM patients in three public hospitals in Ghana revealed that an increase in number of years in school by participants was associated with the increase in the

frequency of self-management practises such as adhering to exercise ($r= 0.168$; $p=0.022$), foot care ($r= 0.153$; $p=0.037$) and dietary guidelines ($r= 0.223$; $p=0.002$) (68).

Another study conducted in Ethiopian among T2DM patients found an association for primary level of education compared to tertiary. The patients with primary level of school were 70% less likely (95% CI= 0.1-0.9; $p<0.05$) to practice SMBG compared to those with higher education (tertiary level).The above findings may suggest that education assist individuals to participate in self-management practises.

3.1.1.4 Knowledge on diabetes

In Ghana evidence show that less knowledge concerning individuals own chronic illness affect its management (87). A study conducted in Ghana among T2DM patients indicated that 60% ($n=630$) of the respondents have limited knowledge on diabetes complications (73). Also a cross-sectional study conducted at a teaching hospital in Ashanti region among ($n=543$) T2DM patients showed that 4.2% and 98.6% of participants had knowledge on ideal body weight and ways of assessing body weight, respectively (88). Furthermore, the TDS study conducted in Ghana indicated that 50% ($n=222$) and 40% of the participants were not aware of their weight status and had no knowledge about weight management respectively (72). The study populations of the aforementioned studies were specifically overweight, obese and newly diagnosed T2DM patients and the findings may not be representative.

A cross-sectional study conducted at the largest primary health facility in Accra among T2DM patients found out that adequate diabetes knowledge is associated with frequent practice of T2DM self-management practices which are adherence to diet guidelines ($r= 0.46$; $p<0.001$), foot hygiene ($r=0.18$, $p<0.05$), and SMBG ($r =0.43$, $p<0.001$) (89). In a qualitative study conducted among T2DM in Ghana revealed that participants who have glucometer and strips are not aware about the recommended blood glucose level coupled with challenges to operate the machine hence affecting adherence to SMBG (86). The above mentioned study is qualitative with small sample sizes and may not be generalisable.

3.1.2 Psychological factors

Psychological factors such as emotional distress and illness perception are presented in this section.

3.1.2.1 Emotional distress

Evidence in Ghana suggests that emotional distress as such depression affect T2DM patients which prevent them from effectively managing their condition (62). A qualitative study conducted in Ghana among T2DM patients revealed that emotional distress such as fear and pain of pricking one's own finger affects self-management practises like SMBG (86). This was a small study and findings may not be generalisable.

Though evidence on emotional distress and self-management practises in Ghana are limited, in a similar context like Ghana a cross-sectional study from Rwanda among T2DM patients found that emotional distress like depression has a negative influence on self-management practises among participant as 20% of variance in self-management practises was defined by depression ($R^2=0.20$; $p=0.000$) (90). Nonetheless, the sample size was small ($n=86$) and this may have affected the correlation. The findings of the aforementioned study is unionism with a study conducted in Nigeria that indicated emotional distress among T2DM negatively associated with self-management practices ($r= -0.18$; $p=0.02$) (91). This means that high emotional distress leads to low self-management practises. The similarities in results of all the three studies may infer that emotional stress may influence T2DM self-management practise.

3.1.2.2 Illness perception

A cross-sectional study conducted among (n=160) T2DM patients in Ghana revealed that illness perception negatively influences self-management practises ($r = -0.33$, $p < 0.001$) (89). Even though, there are limited literatures to establish the influence of illness perception on T2DM self-management in Ghana, a study conducted in Rwanda among T2DM patients indicated that illness perception has an association with self-management practices ($r = 0.14$; $p < 0.05$) (90). This was a quantitative study with small sample size (n=86) hence it may not be generalisable. However, the aforementioned studies were quantitative which measured the association between illness perception and self-management practises, a mixed method with qualitative study could have given reasons for the findings.

3.1.3 Cultural Factors

Culture is an important factor that underpins the health behavior of people which can influence self-management of T2DM (92). Under this section, cultural belief and dietary preference shall be examined.

3.1.3.1 Cultural Belief

In Ghana individuals with uncontrolled T2DM which is characterized by severe weight loss are culturally stigmatized as been HIV/AIDS patients (64). A qualitative study conducted among T2DM patients at three hospitals in Ghana revealed that, participants do not exercise as a result of the accompanied weight reduction which is culturally seen as a chronically ill person (86). The cultural belief of plumpness of individual as a sign of good living in Ghana hinders people living with T2DM from performing exercise as a self-management practise (86).

In Ghana evidence shows that cultural belief underpins the use of traditional medicine for managing diseases (93). As a result of limited literatures on association between cultural belief and T2DM self-management practises in Ghana, in a similar context in Senegal, a west Africa country have been conducted (92). The qualitative study was carried out among T2DM patients and the findings revealed that some participants culturally believe and are experienced in the use of traditional medicine for T2DM management. The study further stated that, some T2DM patients use both the western and traditional medicine which influences adherence to diabetic medication.

Another similar qualitative study was conducted at the coastal area of Kenya among T2DM patients revealed that participants have the belief that herbal medicine is effective and hence use it for the management of diabetes which influence medication adherence (94). However, these abovementioned studies were small qualitative studies with small sample size which may not be generalisable. Cultural belief may influence diabetes medication adherence, as in the context of Ghana traditional medicine is used for curative, rehabilitation and preventive purpose of disease management which includes T2DM (93). Furthermore, a systematic review of self-management of diabetes in SSA indicated that there is combined usage of traditional and western medicine among T2DM patients which is a barrier to self-management practises (67).

3.1.3.2 Dietary preference

In Ghana there is high diversity of vegetables, less consumption of fruits and dairy products at the household level and food preference is influenced by culture (95). A qualitative study conducted among T2DM patients in Southern part of Ghana found that, participants preferred food prepared at home in comparison to pre-packed food (96). However, participants complained about the influence of food preparation for the whole family as against recommended diabetic diet for an individual hence preference for home-made food hinders adherence to dietary guidelines (96).

Another qualitative study conducted at the Northern part of Ghana among T2DM patients revealed that, participants felt their dietary guidelines given by healthcare providers are restrictive and limited in food varieties therefore, they have less opinions of foods which affects their adherence to dietary guidelines (86). As evidence to establish the influence of dietary preference on T2DM self-management practises in Ghana is limited, the result of a similar qualitative study conducted in Senegal a West Africa country like Ghana is unionism with the aforementioned two studies (92). The study reports that, participants are disturbed about the continual adherence to diabetic diet which does not fit within their locally preferred foods and this limit adherence to dietary guidelines (92). Though the above studies were conducted at two distant study areas of Ghana and Senegal, yet the findings are similar with respect to dietary preference influencing diabetic diet adherence. These were however small qualitative studies with small sample sizes which could not quantify the strength of the correlation for the findings.

3.1.4 Socio-economic factors

Socio-economic factors play a role in adherence to T2DM self-management practises, peer group support, family and friend support and financial status shall be focus in this section.

3.1.4.1 Support group

Self-support groups are important factors that promote adherence to self-management practises according to the adapted Ansari model (see figure 2). A literature review study in support of this theory reports that T2DM patients support groups in Ghana provide psychosocial support and fundamental diabetes knowledge to members (57). Though there are limited evidence on support group (peer or patients) influence on T2DM self-management practises in Ghana, in a quasi-experimental study conducted in Uganda among (n=46) T2DM patients found that peer support group (patients) helps increase adherence of dietary guidelines from (mean (SD)=11.55 (3.87) to 22.4(2.9) ; $p<0.005$) after six months post intervention period (97). Another non-randomised controlled trial (RCT) study conducted among (96 intervention and 96 controls) T2DM patients in Cameroon reported that diabetic peer support increases adherence to general diet (from mean: 3.76 to 5.86; $p<0.01$), exercise (from mean: 2.23 to 4.65; $p<0.01$), SMBG (from mean:1.18 to 4.03; $p<0.01$) and foot care (from mean: 4.24 to 6.97; $p<0.001$) (98).With the similarities of results from the two studies may infer that peer support group improve self-management practices of T2DM.

3.1.4.2 Family and Friends support

A qualitative study conducted among T2DM patients in Ghana found that less family support had a negative influence on self-management practises especially adherence to medication and dietary recommendations (86). Though there is limited literature on family support and its influence on T2DM self-management practises in Ghana, in a similar context like Nigeria, a West Africa neighbour country have been conducted. This was a cross-sectional study conducted among (n= 197) T2DM diabetes patients which, reported difference in adherence to self management practises between those with good perception and those with bad perception, and the mean was higher in people with good perception (mean difference = 2.6; $p<0.007$) (99).

In another context, a study conducted among T2DM patients in Ethiopia found that participants who are supported by their relatives and friends were 2.72 times (CI 1.66, 4.47) more likely to practise good T2DM self-management practises in comparison to those without family support (100). The similarities of results in the three studies which used qualitative method in the Ghana study and quantitative in the two different countries may suggest that, family support positively influence self-management practises among T2DM patients.

3.1.4.3 Financial status

In Ghana, the package of National health insurance scheme (NHIS) covers health facility based management of NCDs including T2DM for insured patients (42,44). However, diabetes drugs supplies within the NHIS are at time erratic and the cost of glucometer and strips for SMBG is not covered and needs to be purchased privately by patients (42,44,57). Nevertheless, T2DM patients who are financially handicapped to pay for the NHIS premium bear their own cost of disease management such as purchase of diabetic drugs and glucose-meter (57). Two separate qualitative studies conducted in the Greater Accra and Northern region among T2DM patients revealed that financial constraints prevent T2DM patients from adherence to medication and SMBG which are a self-management practises (70,86). A T2DM patient in a qualitative study in Ghana said this (86):

'If not because of the price I would be checking everyday but the test strips are expensive for one to be self-testing every day'. (Participant 15, Patient)

In addition, a qualitative study conducted among people living with T2DM in three urban poor communities of Greater Accra region showed that, one out of twenty respondents had a glucometer for SMBG as a result of financial constraint (101). Similarly in a qualitative study conducted in Ashanti region among (n=30) T2DM patients reported that 60% of urban and 33% of rural participants ability to adherence to dietary guidelines is hindered by high cost of fruits and vegetables (96). This was a small qualitative study and may not be representative.

3.1.5 Health service factors

The health service plays significant contribution towards the self-management of T2DM patients. Patient-provider communication and diabetes self-management education and support (DSMES) are presented in the section below.

3.1.5.1 Access to Diabetes Self-Management Education and support (DSMES)

In Ghana, the National Strategy for the Management, Prevention and Control of NCDs does not address self-management for NCDs which includes 2TDM (48,64). Also there is no national diabetes protocol and standards for the management of 2TDM (57). This has led to less attention by healthcare providers (HCPs) on diabetes self-management education and support (DSMES) for 2TDM. And this is an evident of a qualitative study conducted among healthcare providers in Ghana which revealed that participants apparently provide information on diabetes but does not support T2DM patients to adopt self-care behaviours (77). The study further stated that participants perceived themselves as not adequately equipped to offer effective DSMES to diabetes patients. In a cross-sectional study conducted among (n=200) nurses in Ghana indicated that, 90% of the participants had poor knowledge on dietary guidelines for diabetic patients (102).

Evidence to establish the association between DSMES and self-management practises in Ghana is unavailable. However, in a similar context like South Africa, Randomised Controlled Trial (RCT) study was conducted in two health centers among (intervention=41 and controls=41) T2DM patients found out that diabetes nutrition education and support programme had a positive effect on specific dietary practices such as a reduction of median energy intake food (5988 v. 6946 kJ/d) ($p=0.017$) (103).

Another intervention study was conducted among (n= 82) T2DM patients in six different health clinics in South Africa which measured the impact of a diabetes group education and support program (13). The study findings indicated that diabetes group education program is positively associated with adherence to self-management practises like specific diet (mean: from 4.6 to 5.1 CI= 4.8-5.4; $p=0.01$), exercise (mean: from 3.0 to 4.5 CI= 4.0-

4.9; $p < 0.001$) and foot care (mean: from 4.5 to 5.8 $CI = 5.4-6.2$; $p < 0.001$) among T2DM patients. This study though used mixed methods (qualitative and quantitative) but with small sample size ($n = 84$) and might not be generalisable.

In addition, a cross-sectional study conducted in Nigeria among T2DM patients indicated that participants who had been introduced to diabetes management education frequently performed good self-management practises ($p < 0.05$) compared to those whom had not been exposed to diabetes management education (99).

3.1.5.2 Patient- provider communication

Patient-provider communication has influence on the outcome of disease management in Ghana (104). A qualitative study conducted among people living with T2DM in three urban communities in Ghana revealed that there is inconsistency of information on diabetes management among respondents receiving care at the same health facility especially in the aspect of self-management practises like dietary guidelines (101). The study further stated that, the greatest source of such inconsistent diabetes information was from healthcare providers i.e. physicians (101). In view of this, effective self-management practises may be hindered.

Another qualitative study carried among T2DM patients at three hospitals in Ghana showed that healthcare providers do not communicate and teach participants how to conduct SMBG and hence such self-management practise is not adhered (86). A T2DM patient in a qualitative study in Ghana said this (86);

'They have never told me anything like that but the lowest I have ever had is 5.6. I have never had lower than 5'. (Participant 5, Patient)

Furthermore, a cross-sectional study conducted in the northern region of Ghana among ($n = 222$) T2DM patients found that 60.4% of the respondents had received weight management counseling from a healthcare provider (72). Similarly in a cross-sectional study conducted among ($n = 378$) T2DM patients in two hospitals in Ghana indicated 51.3% of participants had been counseled on weight management by a health provider (71). The study further revealed that participants who had received counseling on weight management from a healthcare provider reported ever trying to adhere to dietary guidelines (89.7 vs. 27.2%; $p < 0.001$) and exercise (85.1 vs. 48.0 %; $p = 0.003$) to lose weight compared to those who have not received any weight management counseling. The findings from the above mentioned study may infer that patient-provider communication influences adherence to self-management practises.

3.1.6 Summary of findings

With the use of the adapted Ansari et al., 2017 conceptual framework on T2DM self-management as a guide (see figure 2), the study identified the factors influencing T2DM self-management practises in Ghana. The key findings that emerged include dietary preference, cultural belief, family support, diabetes peer support group, emotional distress, financial status, diabetes knowledge, provider-patient communication and diabetes self-management education and support and these factors have negative or positive influence on adherence to T2DM self-management practises. The key self-management practises influenced by the aforementioned factors are adherence to dietary guidelines, medication, exercise, foot care and SMBG. The information gathered above were used to guide in the review of evidence-based T2DM self-management interventions in Ghana and SSA which is the next section.

3.2 Evidence-based T2DM self-management interventions in Ghana and Sub-Saharan African Countries

Self-management is a recommended component of the chronic care model for chronic diseases like T2DM (105). In this section, description of evidenced-based T2DM self-management interventions from Ghana and other SSA countries have been made. The section of the finding is categorised into: Diabetes self-management education support, social support programmes, exercise programmes, dietary guidelines and technology assisted self-management practises based on the findings and the focused self-management practises for the thesis as mentioned in the methodology.

A total of 10 intervention studies on T2DM self-management interventions grouped into the above mentioned categorizations which were conducted in five different SSA countries were identified (13,97,98,103,106–111). South Africa had four studies (13,103,107,110), Nigeria had three studies (106,108,109) and a study each from Uganda, Cameroon, and Kenya (97,98,111). There were none from Ghana. Three articles each reported on only diabetes self-management education (DSME) (13,103,111) and two each focused only on social support (97,98) and dietary guidelines (108,109). One article focused on exercise program (107) and another one reported on assisted technology on self-management practises (106). Also, one article reported on both social support program and technology assisted self-management practices (110). All the studies reported on one or more self-management practices or self-care behavioral and/ or clinical outcomes which include: general and specific diet, healthy eating, energy intake, starchy foods, exercise or physical activity, foot care, SMBG, medication adherence, walking distance, glycated hemoglobin (HbA1c), Blood pressure (BP), diastolic blood pressure (DBP), systolic blood pressure (SBP), fasting blood glucose (FBG), total cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), blood viscosity, triglycerides, fibrinogen haematocrit, body mass index (BMI) and waist circumference. (See to table 3)

3.2.1 Diabetes self-management education and support (DSMES)

Diabetes self-management education and support (DSMES) is a continuous process of providing self-management education and support to equip people living with T2DM with knowledge and skills to adopt and sustain self-care behaviors in managing their disease for better health outcomes (5). DSMES is a core component of T2DM management which limits early development of complications and also improve health outcomes among people living with T2DM (111,112).

In South Africa, a RCT study conducted among (41 controls and 41 intervention group) T2DM adults on DSMES established an improvement in self-care behaviours especially dietary adherence among intervention group in comparison to control group (103). The intervention focused on diabetes nutrition education and vegetable gardening. It also included the demonstration on performing vegetable gardening and distribution of educational materials. This intervention was led by three dieticians and a horticulture officer. All participants (intervention and control group) had their usual medical care during the intervention period. This study was carried out in a low resource setting where majority of both intervention and control groups were unemployed (80%) and they depend on pension income (>45%) and other forms grants (>14%). After twelve months intervention, there was a significant improvement in decreased Starchy-food intake and median energy intake among the intervention group in comparison to control group (see table 4) This showed an improvement in adherence to dietary guidelines by intervention group. The diabetes nutrition education and the vegetable gardening may have influenced the findings.

Another RCT study on DSMES was conducted in Kenya among (70 intervention and 70 controls) T2DM patients (111). This study was conducted at a private health facility which

serves mostly T2DM patients with middle or high socio-economic status. During the intervention period, all participants had access to their usual medical care and a concise unstructured patient-tailored diabetes education with the use of audio-visual, prints and online patient education materials. The intervention group received individualized structured DSME training from a certified diabetes educator with the use of the health facility standard clinical sheet as a guide during the education. The education was based on self-care behaviours: healthy eating, exercise, SMBG, and medications). The intervention group had access to a hotline number, received patient guide, diabetes booklet, graphic material and a phone call reminder for review visits. Results from the study indicated that, there were no significant clinical outcomes between both groups at the end of the intervention and no self-management practices outcomes were measured. The short intervention duration (six months) may have influenced the findings.

Evidence from a diabetes group education intervention program (called "Take five school") at six rural primary clinics in South Africa showed that structured group education program for T2DM improved adherence to self-care practices (13). The intervention focused on education and motivation for (n= 84) T2DM patients (single group) on adherence to self-care behaviors. The group education session was conducted by health promoter, dietician and physician where available. The intervention was carried out among a low socio-economic group T2DM people who are medically uninsured at a primary care level. The study indicated self-reported significant improvement in mean of adherence to general diet, specific diet, exercise, foot care and ability to teach other on self-management practices (see table 3). However, medication adherence did not improve significantly. The study further indicated that poor healthcare provider attitude and communication hinder some patients from full participation of the education sessions (13). Study findings were based on self-reporting by participants and this might influence the results. Also this was a single group study with small sample size and may not be representative.

3.2.2 Social support programmes

Continuous social support for people living with T2DM facilitate and sustain self-management practices for improved health outcomes (113). Evidence in a quasi-experimental study conducted in Uganda showed that peer support led to increased in social and emotional support among T2DM patients which resulted in significant clinical outcomes and adherence to self-care behavior or practices (see table 3) (97). This study involved 46 participants (single group) categorised into partners and champions who were trained separately on self-care behaviors. However, champions were further trained on communication skills to equip them in assisting their paired partners. Participants make phone calls or personal contact with each other at home to provide emotional and social support to peers in their day-to-day diabetes management. Participants also had access to contact a nurse on phone for assistance. The study provided prepaid telephone connected to an electronic recording system to monitor participant progress of interaction with peers. After the four months intervention, the study recorded a significant improvement in healthy eating (mean (SD): from 11.55(3.87) to 22.42(2.09); $p < 0.005$), DBP decreased from (mean: 85.39(12.3) to 76.27(14.63) mmHg; $p < 0.001$) and HbA1c values from (mean (SD): 11.10(4.3) to 8.31(2.12); $p < 0.005$). Nonetheless, the study was a single group without any comparison group with small size and may not be representative.

Additionally, a non-RCT study conducted in Cameroon among T2DM patients (96 intervention and 96 controls) revealed that, peer support significantly improved adherence to self-management practices and clinical outcomes among participants (98). Both intervention and control group received the usual medical care. The intervention group consists of peer supporters who were paired with eight to ten group members. The intervention focused on training peer supporters on self-care behaviors and effective group

communication skills to equip them in supporting their group members. Peer supporters were selected based on their good clinical profile, compliant to clinic reviews and their basic knowledge in diabetes. However, groups were formed on the basis of similarities in culture, residential location and socio-professional background of patients. Peer supporter and group members had contacts through telephone calls, home visiting and group meetings which were held within a desirable location for all members. After the six months study, results showed significant decreased in HbA1c of intervention group (-33mmol/mol (-3.0%); $p < 0.001$) compared with controls (-14mmol/mol (-1.3%); $P < 0.001$). Furthermore, effects of peer support group were accessed only in the intervention group which includes the following significant outcomes: decreased in average FBS, BMI, BP and improvement in adherence to self-care behaviors (general diet, exercise, SMBG, foot care) (see table 4) and four previous smokers quit smoking. The study was a non-randomized control trial and thus, selection of study participants may be biased which may have influenced the findings.

Another intervention study called "diabetes buddies" was conducted in South Africa among ($n = 22$) women living with 2TDM (110). This was a single group intervention which focused on weekly meeting among the peer group to discuss self-care practices, negative emotional management and assessment of successful support to peers. Participants were paired with each other as buddies to provide an exchange emotional support. There was no significant self-care behavioral and clinical outcomes after the 6 months post intervention. However, an improvement in social support was recorded between baseline and three months (see table 4). This was, however a single group study with small sample size and may not be representative.

3.2.3 Exercise programmes

Evidence suggest that education on exercise can improve HbA1c of T2DM when diet education is inclusive (114). Nonetheless, only structured exercise training (aerobic, resistance) solely improves HbA1c among T2DM (114). In South Africa, a RCT study on supervised exercise and relaxation program was implemented among females living with T2DM. The study had a control (supervised relaxation group) and intervention (supervised exercise group) in duration of 12 weeks (107). All groups received education on diabetes, diet and exercise and had the usual diabetes care in the hospital. The control group had two weekly supervised relaxation exercises. The intervention group performs two weekly supervised aerobic exercises at the hospital and a home-based self exercise on daily brisk walking. Participants were given physical activity log book with illustrations for reference on types of exercises to perform and record the number of exercise done at home. At the end of the study, there was significant improvement in HbA1c within the two groups (supervised relaxation and exercise) (see table 3) (107). For the intervention group it was reported that, participants could not fully complete their physical activity log book which showed a sign of noncompliance to home exercise. However, the exercise group had a significant increase in the walking distance (adherence to exercise) 46.76m (95%CI 36.20–57.32) compared to the relaxation group 22.7m (95%CI 12.07–33.33) ($p < 0.001$). The supervised exercise and relaxation by healthcare provider may have influenced the findings. The population for this study was only females and findings may not be representative.

3.2.4 Dietary guidelines

As defined in the methodology, dietary guidelines consist of general and specific dietary portions recommended for diabetes patients. A qualitative study in Ghana suggest that T2DM patients are uncertain about the various food portions they need to consume (96). An experimental study conducted in Nigeria on provision of calculated amount of fruits and vegetables for T2DM patients showed improved clinical outcomes (108). This was a single group ($n = 30$) and participants had their usual medication and normal food intake. The intervention constituted calculation on portions of fruits and vegetables: daily consumption

of 100 grams of green leafy vegetables (fluted pumpkin leaf, spinach and water leaf), 200grams of fruit salad (pawpaw, orange, grapes, pineapple and tangerine) and two fingers of banana by participant for a duration of eight weeks. At the end of the study, there were significant improvements in clinical outcomes which include fibrinogen, blood viscosity and haematocrit level (see table 4) and these haemorrhological parameter reduce the risk of cardiovascular complication of T2DM patients (108). No self-care behaviours outcomes were reported. Nonetheless, this was a study with small sample size and without any control group for comparison of results.

Another interventional longitudinal study was conducted in Nigeria among (intervention=35 and controls=17) T2DM patients (109). Dietary guidelines for TD2M patient were calculated based on their physical activity (exercise) and BMI. All participants were on oral diabetic medication and a diet prepared with local food ingredients (60% as complex carbohydrate, 20% as protein, 15% as polyunsaturated fat, and 5% as saturated fat). The invention group consumed additional 40grams of fiber foods daily and their total caloric content was also calculated for each individual. After the eight weeks intervention, there was a decrease in HbA1c in both groups and an improvement in total cholesterol, HDL, LDL and triglyceride only intervention group (see table 4). However, no self-care behavioral outcomes were measured. The study used a small sample size and only newly diagnosed T2DM participants were recruited as the study participants and this might have influenced the result and may not be generalised.

3.2.5 Technology assisted self-management practises

As stated in the methodology, technology assisted self-management practises entails the use of glucose meter and text messages to enable diabetes patient to perform self-care behaviours. RCT study conducted in Nigeria revealed that using glucose meter to perform SMBG by T2DM patients did not yield any significant differences of clinical outcomes like. FBG and HbA1c between intervention (n=55) as compared to controls group (n=52) (106). Evidence suggest that SMBG assist diabetes patients for prompt management and adjustment of therapy (diet and medication) but does not directly improve clinical outcomes (115). In the RCT study, both groups received structured education on diabetes and had access to usual medical care (106). The intervention group was given glucose meters, strips and they were educated on how and when to use it to perform the SMBG at home. The post- intervention results showed that, both groups had significant improvement in HbA1c and fasting blood glucose (see table 4). The significant result of the comparison group may be attributed to other factors: adherence to medication or diet. No self-care behavioural outcomes were measured. The duration of the study (eight months) may have influence the findings.

Evidence in the previous reported study on social support program that was conducted among (n=22) women living with T2DM in South Africa showed that the use of mobile phone to assist self-management practices yielded an improvement in social support between baseline and three months (see table 3) (110). The intervention involved sending text messages as reminder on adherence to healthy eating and exercise to participants. Participants (diabetes buddies) exchange text messages among themselves to provide emotional support to assist in adherence to self-management practices. In six months post-intervention, no significant self-care behavioural or clinical outcomes were reported in the reviewed literature. An average of 123 text messages weekly was recorded. This was a study with small sample size and may not be generalisable.

3.2.6 Summary of findings

There is one or more self-care behavioral and clinical significant outcomes associated with review evidence-based T2DM self-management interventions in SSA countries. These interventions are diabetes self-management education and support, social support

programmes, dietary guidelines, and exercise programme. The significant behavioral outcomes improve adherence to T2DM self-management practices and significant clinical outcomes are potential outcomes from enhanced self-management practices. Technology assisted self-management practices interventions: use of glucose-meter to perform SMBG and text messages on healthy behaviours were found to have weak influence on study participants. There were no literature to establish the relationship between the behavioral outcomes (adherence to T2DM self-management practices) of T2DM self-management interventions like T2DM dietary guidelines, and technology assisted self-management practices (i.e. SMBG) in SSA region.

Table 4: Characteristics and Outcomes of Intervention Studies on T2DM Self-Management

| No | Author | Country | Study Design | Sample Size | Intervention Duration | Intervention | Intervention | Significant behavioral and clinical outcomes |
|----|--------------------|--------------|----------------------|--|-------------------------------|---|---|---|
| 1. | Muchiri et al | South Africa | RCT | Intervention : 41 and control group:41 | June 2010 to November 2011 | Education on nutrition, vegetable garden including garden and cooking demonstration. Distribution of educational materials | Diabetes self-management education and support (DSMES) facilitated by dieticians and horticulture officer | Intervention group had decreased starchy-food intake and median energy intake in comparison to control group (9.9 v. 11.9 serving /d) (p = 0.05) and (5988 v. 6946 kJ/d) (P=0.017) respectively |
| 2. | Gathu et al | Kenya | RCT | Intervention : 70 and control group:70 | April 2015 and September 2015 | Empowerment and individualised education on self-care behaviours of (healthy eating, exercise, SMBG, and medications) Distribution of educational materials | DSMES on self-care behaviours by diabetes educator | No significant clinical outcomes between both groups and no measure of self-care behaviour or self-management practices |
| 3. | Van der Does et al | South Africa | Intervention studies | 84 | 4 weeks | Group education on self-care behaviors and general information on | DSMES on self-care behaviours by health promoter or physician | Self-reported improvement in self-care behaviours: adherence to general diet from mean: 4.8 (CI= 4.4-5.1) to 5.9 (CI=5.6-6.1); p<0.001, specific diet form mean:4.6 (CI= 4.3-4.9) to 5.1(CI= |

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|-----------|--------------|----------|--------------------------|--|----------|--|--|---|
| | | | | | | diabetes. Motivation and application on new knowledge | and dietician | 4.8-5.4);p= 0.01, exercise form mean: 3.0 (CI= 2.6-3.5) to 4.5(CI= 4.0-4.9);p<0.001, foot care from mean: 4.5 (CI= 4.0-5.0) to 5.8 (CI=5.4-6.2) ; p<0.001,ability to teach others from mean: 5.4 (CI= 4.6-6.1) to 8.8 (CI=8.4-9.2); p<0.001 |
| 4. | Bauman et al | Uganda | Quasi-experimental Study | 46 | 4 months | Training of champions to provide social and emotional support on self-care behaviours and provide linkage between HCPs and patients Provision of prepaid telephone, call logbook and educational materials | Social support programme (peer-led support) | Improvement in healthy eating from mean (SD): 11.55(3.87) to 22.4 (2.09); p<0.005), diastolic blood pressure decreased from (mean (SD): 85.39 (12.34) to 76.27 (14.63) mmHg; p<0.001) and average HbA1c values from (mean (SD): 11.10 (4.30) to 8.31 (2.12) (p<0.005) |
| 5. | Assah et al | Cameroon | Non-RCT | 1 92 (96 intervention and 96 controls) | 6 months | Training of peer supporters to provide social and emotional support Group meeting on self-care behaviours, phone calls and home visit among peers | Social support programme (community -based level peer support) | Decreased in HbA1c of intervention group (-33 mmol/mol (-3.0%]) compared with controls [-14 mmol/mol (-1.3%]); P < 0.001). Intervention group peer support resulted into decrease in fasting blood glucose (-0.83 g/l; P< 0.001), cholesterol (-0.54 g/l; P < 0.001), HDL (-0.09 g/l; P < 0.001), BMI (-2.71 kg/m ² ; P < 0.001) and Systolic blood pressure (-6.77 mmHg; P < 0.001) |

| | | | | | | | | |
|----|----------------------|--------------|--------------------|-----------------------|----------|--|---|--|
| | | | | | | | | Increase adherence to self-care behaviors among intervention group: general diet from (mean (SD): 3.76 (2.43) to 5.86 (1.01); p<0.001), exercise (mean (SD): 2.23 (1.68) to 4.65 (0.98); p<0.001), Self-monitoring blood glucose (mean (SD): 1.18 (1.52) to 4.03 (1.63); p<0.001) and foot care (mean (SD): 4.26 2.57) to 6.97 (0.21); p<0.001). |
| | | | | | | | | |
| 6. | Rotheram-Borus et al | South Africa | Intervention study | 22 | 6 months | Group education on self-care behaviours Diabetes buddies (paired patients) for support through text messages Daily text message reminder on healthy behaviours, distribution of pedometers to women who arrived on-time for meetings | Social support (Diabetes buddies) and Technology assisted self-management practises | Improvement in social support from mean (SD): 13.2 (2.8) to 16.5 (3.2); p<0.01 from baseline to three months |
| | | | | | | | | |
| | | | | | | | | |
| 7. | van Rooijen et al | South Africa | RCT | 157 (80 intervention: | 12 weeks | Home exercise, supervised | Supervised exercise | Decrease in glycated hemoglobin (HbA1c) within both groups: [exercise group from mean |

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|-----------|-------------|---------|-----------------------------------|---|-------------------------|--|--------------------|--|
| | | | | exercise and 77 controls; relaxation) | | aerobic exercise by HCP and distribution of physical activity log book for intervention group. Supervised relaxation exercise for controls | programmes | (SD) 9.36 (2.42) to 8.99 (2.59) and relaxation group from (SD) 9.25 (2.28) to 8.26 (1.97); 95% CI - 1.16-0.01; P=0.05] Increase in the walking distance in exercise group [46.76m (95%CI 36.20–57.32) compared to the relaxation group 22.7m (95%CI 12.07–33.33) (p<0.001)] |
| 8. | Salau et al | Nigeria | Experimental study | 30 | August to December 2008 | Diet (calculation of daily consumption of 300g of mixed fruits and vegetables) | Dietary guidelines | Reduction in fibrinogen from mean(SD): 262.50 (2.64mgdl ⁻¹) to 250.57 (2.16mgdl ⁻¹); p<0.05, blood viscosity from mean (SD): 5.96(0.21) to 4.82 (0.16); p<0.05 and haematocrit level from mean (SD): 38.80 (1.2%) to 44.7 (1.0%); p<0.05 |
| 9. | Ikem et al | Nigeria | Interventional longitudinal study | 52 (35 intervention and 17 control group) | 8 weeks | Calculation of individualised dietary recommendation (High caloric fiber diet (40grams) per day) | Dietary guidelines | Fasting blood glucose decrease from mean (SD): 10.9 (2.8) to 5.9 (1.3) mmol; p=0.000 in intervention group compared to control 58.2 (8.8) to 25.6 (3.4)mmol; p=0.000 Improvement in the following below outcomes in intervention group compared to no significant outcomes in controls: HDL from mean (SD): 1.1(0.6) to 1.4 (0.8)mmol; p=0.000, LDL from mean (SD): 3.3 (1.2) to 2.4 (0.9)mmol; p=0.000, total Cholesterol from mean (SD): 4.8 (1.1) to 4.2 (1.1)mmol; p=0.000, Triglycerides from mean (SD): 1.2 (0.4) to 0.9 (0.2)mmol; |

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|-----------|--------------|---------|-----|--|------------------------|---|--|---|
| | | | | | | | | p=0.000. |
| | | | | | | | | |
| 10 | Sodipo et al | Nigeria | RCT | 120 (60 intervention and 60 controls) | March 2013 to Nov 2013 | Self-monitoring blood glucose (SMBG), distribution of glucose meters strips and education on diabetes and its complications | Technology assisted self-managemen t practises | Reduction in glycated hemoglobin for intervention group (8.7% to 7.2%; p-value < 0.001) and control group (8.7% to 7.7%; p-value < 0.001 Decrease in fasting blood glucose for intervention group (153 mg/dl to 123 mg/dl; p-value < 0.001) and control group 158 mg/dl vs. 137 mg/dl; p-value= 0.022 (p-value <0.001) |

CHAPTER 4.0: DISCUSSION

This chapter discusses how factors influencing T2DM self-management practices and evidence-informed self-management interventions from SSA countries presented in the previous chapter relate to the context of Ghana.

4.1 Factors influencing self management practices among T2DM Ghanaian adults

4.1.1 Demographic factors

The findings revealed that age influences T2DM self-management practices (85,86). Older people have less capacity to attend to themselves including routine medication and less strength for exercise which sometimes is accompanied by pains which may discourage them from performing such self-management practices. In the Ghanaian community, the aged are mostly indoors and inactive without any enabling environment and support for exercise. Also, middle aged people are more energetic and earn income to afford diabetic drugs and perform outdoor exercises as recommended in T2DM self-management practices. To the contrary, the findings also indicates that aged is not associated with T2DM self-management practices (69). This could be that, the majority of the study population below 49years shows a non-representative sub-sample of the population which may have biased the study findings. There is the need for further research with a larger sample size and diverse study populations to establish this association.

As presented in the findings, gender influences the ability and frequency to perform T2DM self-management practices. Men engage more in SMBG whiles women perform weight management exercise (68,72). In the Ghanaian society, men are regarded as providers of basic needs of the family which include health. Therefore, they have the decision and purchasing power as to what to buy hence men with T2DM may have access to glucose-meter for SMBG in comparison to women hindering their ability to perform such self-management practices. Also, gender expectations may play a role as Ghanaian women are very conscious about their body image aiming to look attractive so they join fitness clubs to exercise which positively improves adherence to self-management practices among T2DM women who participate in terms of physical exercise. Nevertheless, a study reviewed report no association between sex and T2DM self-management practices (69). One reason could be recruitment bias with more women recruited in the study population compared to men.

Based on the findings, education level of patients was seen to influence their adherence to T2DM self-management practices (68,70). Increase in the educational level of the individual leads to a corresponding increasing adherence of T2DM self-management practices such as medication, exercise, foot care, and diet (68). In Ghana individuals who are illiterate usually depend on literate relatives to guide them with routine medication and the absence of such a resource person, medication adherence may be hindered among T2DM patients may have contributed to the findings reported in the thesis.

It was revealed in the findings that diabetes knowledge is a factor that influences adherence to self-management practices (86,89). Individuals with knowledge on their disease are more concerned about all aspect of disease management including personal contributions like healthy diet and exercises which are self-management practices in the case of T2DM patients. With limited number of HCPs to deliver healthcare (40) including provision of diabetes education to patients in Ghana, adherence to T2DM self-management practices is hindered. Nevertheless, community health volunteers at the primary care level in Ghana (39) can assist in providing diabetes knowledge to T2DM patients at the community level if they are trained.

4.1.2 Psychological factors

The findings point to the fact that depression, pain and fear were identified as emotional distress that negatively influence T2DM self-management practices (62,86). People who are depressed have less concentration and personal contribution in managing disease and hence adherence to self-management practices is compromised. In Ghana, individuals with poorly controlled T2DM characterized by severe weight loss are stigmatized by community members as being HIV/AIDS patients which result in depression among individuals thereby affecting their adherence to self-management practices such as exercise (62,64). Furthermore, fear and pains associated with pricking one's own self discourage T2DM patients from adhering to SMBG. As revealed in the findings illness perception was seen as factor that influence T2DM self-management practices (89). T2DM patient having negative illness perception about disease condition as life threatening and incurable perceived that disease management is non-profitable. This perception limits their personal contribution towards the management of the disease which hinders adherence to self-management practices.

4.1.3 Cultural factors

As presented in the findings, cultural belief affects the adherence of T2DM self-management practices (86). In the Ghanaian society, there is a cultural belief about the effectiveness and use of traditional medicine in comparison to biomedical as curative for all diseases (93) including T2DM. This cultural belief negatively influence medication adherence as a self-management practice among people living with T2DM. Furthermore, the cultural belief of plumpness of the individual as a sign of good living within the community prevent T2DM patients from performing exercise which is accompanied by normal body size (86). In my own experience as a district nutrition officer for the past ten years personally observed that obese T2DM patients whom have adhered to dietary and exercise recommendation and have achieved normal body size were culturally seen within the community as poor and chronically ill individuals and this discouraged them from continued adherence to such self-management practices. Thus individual with weight reduction is regarded as a person who cannot afford three square meals as a result of poverty.

Based on the findings dietary preference was also identified as a cultural factor that influences adherence to dietary guidelines (86,96). People living with T2DM in Ghana preferred home-prepared foods with locally available ingredients (96). However, in the Ghanaian community food preparation is mostly done for the consumption of the whole family without any special diet for an individual with T2DM hence adherence to dietary guidelines may be compromised. Furthermore, the literature reviewed indicated that nurses have limited knowledge on diabetes dietary guidelines (102), yet, they continued to offer dietary advice to T2DM patients. This challenge is likely to result to recommendation of diabetic foods which are not context specific in Ghana. Thus T2DM dietary guidelines which are not based on locally and culturally acceptable foods are seen as limiting dietary preference and may hinder adherence to T2DM dietary guidelines.

4.1.4 Socio-economic factors

Based on the findings, family support and diabetes patients support groups were found to influence adherence to self-management practices (57,86). In my observation, diabetes patients support groups are mostly seen at the tertiary and secondary level of healthcare in Ghana which is located in the urban areas and people accessing healthcare at the primary level do not have access to such helpful groups which provides emotional support and diabetes basic knowledge for T2DM patients in adhering to self-management practices. The literature review indicate that family support was necessary for adherence to T2DM self-management practices including diet and medication with adequate support from relatives (86). In Ghana, managing chronic disease like T2DM of individual partly involve the

emotional, financial and physical support from relatives, and significant others within the community. The absence of such social support patients may not adhere to T2DM self-management practices like medication and diet which sometimes goes beyond the capabilities of the individual patients. However, stigmatization from community and family members towards T2DM patients with weight loss as a result of disease management is likely to discourage the adherence to exercise and dietary recommendations (86). Community awareness creation on social support for T2DM patients would assist to improve adherence to self-management practices.

The findings revealed individual financial status influence adherence to T2DM self-management practices like diet, medication and SMBG in Ghana (70,96,101). Though, the NHIS in Ghana covers the cost of diabetic drugs of insured T2DM patients, the direct and indirect cost associated with T2DM self-management like the cost of glucose-meter and strips for SMBG, transportation for review visits, drugs and eating recommended diabetic diet become barrier to T2DM self-management due to low financial status. In addition, stock-out of diabetic drugs in health facilities (57) may necessitate insured T2DM patients to privately purchase drugs. Therefore, medication adherence may be compromised due to the intersection of socio-economic and health service factor to diabetic medication adherence. Uninsured T2DM patients with financial difficulties face limited access to diabetic drugs, SMBG logistics and diabetic foods which hinders engagement in T2DM self-management practices.

4.1.5 Health service factors

As presented in the findings Diabetes self-management education and support (DSMES) was identified as an influential factor that improves the adherence of self-management practices among T2DM patients. When T2DM patients are introduced to DSMES, it equip patients with knowledge and skills to empower them to perform effective self-management practices (5). As a result of non existence of national diabetes protocol and standards in Ghana, which includes T2DM self-management, healthcare providers (HCPs) may have not trained on DSMES. This challenge of limited knowledge on DSMES by HCPs, in addition to inadequate number of trained diabetes HCPs to provide DSMES to T2DM patients is likely to hinder adherence to self-management practices (57,77). Provider-patient communication was revealed in the findings as a key factor that influence adherence to T2DM self-management practices. From my own observation as a district nutrition officer and as it has been previously stated in the introduction, HCPs mostly concentrate on providing diabetes information relating to medication adherence whereas less or no information is given on the other self-management practices like diet, exercise, SMBG and foot care. In addition, conflicting information on dietary recommendations from HCPs to T2DM is noticed to hinder effective self-management practices.

4.2 Evidence-based T2DM self-management interventions in Ghana and sub-Saharan African countries

Five different categories of evidence-based interventions were identified in this thesis' review of the literature in five SSA countries as presented in the findings. In the literature review, DSMES was found to improve T2DM adherence to self-management practises (exercise, foot care, general and specific diet) in South Africa (13,103). The involvement of multidisciplinary HCPs exposed T2DM patients to wider knowledge and skills in performing self-management practises. DSME can be adopted in Ghana because the various HCPs used for the implementation are available at secondary and tertiary healthcare levels. Additionally, community health workers (CHWs) can also be trained to provide DSMES service at primary healthcare level and within the community since they are already involved with community health education and promotion activities in the health system of Ghana. Thus, CHWs can assist T2DM patients in performing SMBG at the community level

during routine home visiting. Vegetable gardening and cooking demonstrations with locally available food ingredients will be feasible in the Ghanaian context as cooking and farming are culturally valued among Ghanaians. However, poor patient-provider attitude may hinder the full participation of T2DM patients in the DSME. Also, the improvement in adherence of self-management practises did not yield any significant clinical outcomes. However, the results could be influenced by the limited intervention duration.

As pointed in the findings, social support programmes (diabetes peer groups) in Cameroon, and Uganda improved adherence to self-management practices and clinical outcomes among T2DM patients (97,98). Formation of diabetes peer support group can be applicable in Ghana because the group formation based on religion, cultural, socio-professional and resident location are already in existence within the communities hence such categorisations will facilitate the establishment of the support groups. Also, individual home visiting and group meetings among peers as components of the programme will be feasible in the Ghanaian context as community members value visitation and the spirit of togetherness in all aspects of life including health issues. However, the establishment of an effective peer support group may go beyond the capacity of the health system hence other stakeholders like opinion leaders need to be involved.

As revealed in the findings supervised exercise programme were identified to improve both clinical and behavioral outcomes among T2DM patients in South Africa (107). Supervised exercise by HCPs at the health facility in the Ghanaian context may not be effective for T2DM patients as a result of indirect health costs and regular time scheduled visits for such an activity. However supervised exercise can be more acceptable and effective at the community level through diabetes support groups and the emerging social and fitness clubs in the Ghanaian society.

As presented in the findings, provision of individualised dietary guidelines based on the BMI, physical activeness and available local foods was seen as an intervention that measured improvement in only clinical outcomes among T2DM patients in Nigeria. However, self-management practises or behavioural outcome measures were not reported i.e adherence to dietary recommendations (108,109). This intervention can be implemented in Ghana with the already existence of nutrition officers and dieticians though who are few at the various levels of healthcare. The availability nurses and CHWs can be trained on the nutritional assessment and dietary guidelines based on acceptable cultural and locally available foods for T2DM patient to offer such health services. Furthermore, a pilot study can be conducted in Ghana to establish the relationship between provisions of T2DM individualised dietary guidelines and adherence to dietary guidelines (behavioural outcomes).

As noted in the findings technology assisted self-management practises with the use of mobile text messages to remind T2DM patients on daily adherence to self-care behaviours suggest a weak improvement in emotional support among peers in South Africa from baseline to three months (110). The intervention was a small scale study with duration of six months and no comparison group to assess the effectiveness .Hence, a large study could be conducted in Ghana to examine potential effectiveness of text messages in improving adherence to T2DM self-management practises. The literature review indicates that intervention on the use of glucose-meter for SMBG among T2DM patients in Nigeria had weak influence on clinical outcomes like HbA1c and FBS (106). The diabetes education given to both groups may have led to improve dietary and medication adjustment and suggest the equal clinical improvement in the intervention and control group. However, the behavioural outcomes (adherence to SMBG) associated with the use of glucose-meters were not reported in the study. Further research could be done in the Ghanaian context to examine the provision of glucose meter to T2DM patients and adherence to SMBG.

Due to limited literature on factors influencing self-management practises of T2DM in Ghana, the literature search was extended to SSA countries. While, these SSA countries are located in the same region, there may be differences in culture and practices which may affect study outcomes. Most literatures used were qualitative with small sample size therefore, it would be necessary to conduct a study with a large sample size in Ghana. The adapted Ansari et al., 2017 conceptual framework of self-management of T2DM used for the analysis of the thesis reveals factors influencing T2DM self-management practises. The framework was found to be lacking in identifying policy level factors which are equally influential in T2DM self-management. Lastly, due to limited availability of literature in SSA context, only five out of the seven self-management practises were covered as described in the methodology. The current lack in the literature on good problem-solving and healthy coping skills in context of T2DM self-management practises also indicates future areas for research in the Africa context.

CHAPTER 5.0: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Generally issues on T2DM self-management practises regarding factors influencing and interventions to improve adherence to self-management practises among Ghanaian adults have received little attention and this is reflected in the limited evidence, while T2DM self-management practises can reduce and prevent premature morbidity when adhered to. This study revealed the influential factors to T2DM self-management practises and evidence-based interventions to improve adherence to T2DM self-management practises in Ghana. The following factors were identified by the study to influence T2DM self-management practices: dietary preference, diabetes knowledge, cultural belief, family support, diabetes peer support group, emotional distress, financial status, provider-patient communication and diabetes self-management education and support. These factor needs to be taken into consideration when developing and implementing T2DM self-management interventions in Ghana. It is recommended that for future research the adapted Ansari et al., 2017 conceptual framework of T2DM self-management be used with addition of policy level factors which were found missing in the current model.

It is imperative to point out that as a result of limited evidence in Ghana, the search methodology was widened and evidence from the wider SSA context used to inform the factors influencing T2DM self-management in Ghana. Hence the findings and recommendations contained in this thesis should be cautiously taking into account the Ghanaian context.

Some evidence-based interventions to improve T2DM self-management practises adherence and clinical outcomes were identified in SSA countries seem promising for application in the Ghanaian context. DSMES which improved adherence to T2DM self-management practises in South Africa can be implemented in Ghana due to the existence of multidisciplinary teams of HCPs at the levels of healthcare and community health workers at the community level. Social support program which involve peers to educate and provide emotional support among T2DM patients in Cameroon and Uganda were found to improve adherence to self-management practises and clinical outcomes. These interventions can be readily implemented in the Ghanaian context by leveraging existing of social networks for example religious, cultural, socio-professional and residential groups.

The supervised exercise programme in South Africa help improved adherence to self-management practises and clinical outcomes .Implementing this intervention at the health facility level may not be effective in Ghana, but can be effectual when implemented at the community through social support groups. Individualised dietary guidelines based on locally available food ingredients in Nigeria, equally seem promising, demonstrating improved T2DM clinical outcomes. However, as adherence to self-management practises was not measured, study could be conducted in Ghana to examine potential effectiveness. This approach seems feasible in Ghana due to existence of nutrition officers, dieticians and other HCPs who can be trained in this regard. Technology assisted self-management practises in South Africa and Nigeria were found to have weak influence among T2DM patients. It is possible that this intervention may achieve similar results in Ghana which has similar context as Nigeria and South Africa. However, since behavioural outcomes (adherence to self-management practises) were not measured by these interventions, pilot studies could be conducted to assess their effectiveness in the Ghanaian context.

Lastly, it should be mentioned that the benefits of the T2DM self-management evidence-based interventions discussed are likely complementary to each other. Adopting a single intervention may not be effective to improve adherence to T2DM self-management practises, while a combined approach of: DSMES, social support programme, dietary

guidelines, exercise programme will likely yield positive outcomes, which is reflected in the comprehensive recommendations below to the MOH and other stakeholders.

5.2 Recommendations

This section below details recommendations based on the evidence-based interventions and feasibility in the Ghanaian context directed to specific stakeholders where possible for implementation at policy, intervention and research.

5.2.1 Policy

1. The MOH should formulate national diabetes protocol, standards and policy on evidence-based interventions which will include self-management practices as a core component for T2DM management.
2. The MOH should revise the part of standard treatment guidelines on diabetes management to include other recommended self-management practices i.e. SMBG.

5.2.2 Interventions

1. MOH should implement context specific diabetes self-management education and support at all levels of healthcare.
2. MOH should train multidisciplinary teams of healthcare professionals and CHWs to support self-management of T2DM patients at the health facility and community level respectively.
3. MOH should collaborate with civil societies, NGOs, religious bodies and opinion leaders for the formation of diabetes support groups at the community level.
4. Ghana Health Service should organise periodic community durbars and awareness creation campaigns on social support on self-management for people living with T2DM.
5. Healthcare providers at the various healthcare levels must recommend culturally acceptable dietary guidelines based on local available foods for T2DM patients.

5.2.3 Research

1. The national Diabetes Research institutions should conduct a study on assessing the improvement of adherence level in relation to the provision of T2DM individualised dietary guidelines, glucose-meter and text messages on T2DM self-care behaviours.
2. The research institutions should focus on national population representative survey to establish the association between demographic factors i.e. age and gender in relation to T2DM self-management practices.

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ANNEX

Annex 1: Ansari et al., 2017 conceptual framework of self-management of type 2 diabetes mellitus



Source: Ansari et al., 2017 (81)

Annex 2: Characteristics of Patients in Interventions Studies on T2DM Self-Management

| No | Author | country | Study location and Recruitment site | Sample size | comparison group | Age | Women % | Duration of T2DM (years) | Education level | Socio-economic Status |
|----|-------------------|--------------|---|-------------|--|----------------|---------|---|--|---|
| 1. | Muchiri et al | South Africa | Two community health centers in (Moretele sub-district) | 82 | Intervention : 41 and control group:41 | 40-70 years | 86.5 | Mean: intervention : 3-9. Control: 4-10 | No formal education- Intervention: 4.9%. Control:12.2% | Unemployed: 80%. Dependent on pension >45%and other forms of grants : > 14% |
| 2. | Gathu et al | Kenya | Private family medicine clinic (Aga Khan University Hospital) Nairobi | 140 | Intervention : 70 and control group:70 | Mean age:48 | 43.6% | N/R | N/R | Middle or high SES patients |
| 3. | Van der Dos et al | South Africa | Six rural primary care clinics (Western Cape) | 84 | None | Mean age: 51.6 | 81% | Mean: 5.8 | N/R | People of low socio-economic status |
| 4. | Baumann et al | Uganda | Mityana diabetes clinic (Mityana) | 46 | None (champion: 19 and Partners: 27) | Mean: 53 | 60.8% | Champions: 4 and Partners:6 | Primary to tertiary level | N/R |
| 5. | Assah et al | Cameroon | Yaounde Central Hospital. | 1 92 | One intervention and one control | Mean: 57 | 53.1% | N/A | N/R | N/R |
| 6. | Rothera | South | Local health | 22 | None | 21-70 | 100% | More than | N/R | 46% |

| | m-Borus et al | Africa | clinics | | | years | | 1year | | employed |
|--|-------------------|--------------|--|-----|----------------------------------|---|-------|-----------------------------------|-------------------|--------------------------|
| 7. | van Rooijen et al | South Africa | Mamelodi community hospital | 158 | One intervention and one control | Mean: intervention: 54years and control:55 years | 100% | N/R | N/R | N/R |
| 8. | Salau et al | Nigeria | Olabisi Onabanjo University teaching hospital | 30 | None | N/R | N/R | N/R | N/R | N/R |
| 9. | Ikem et al | Nigeria | Obafemi Awolowo University Teaching Hospital | 52 | One intervention and one control | N/R | 50% | N/R | N/R | N/R |
| 10. | Sodipo et al | Nigeria | Family medicine clinic at Lagos University teaching hospital | 120 | One intervention and one control | Intervention: Mean(SD):57.6(6.3) and Control: 58.2(8.8) | 64.1% | 56.6% < 3years and 43.3% > 3years | No education 6.7% | Low monthly income 85.8% |
| N/R: Not reported in article SES: Socio-economic Status | | | | | | | | | | |