



A systematic review of factors influencing Type 2 Diabetes Mellitus management in Nigerian public hospitals



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ABSTRACT

Introduction: Type 2 Diabetes Mellitus (T2DM) is often a preventable type of Diabetes Mellitus (DM). However, if developed, can be managed effectively, even at a low-or-no cost. A critical evaluation of the literature on T2DM management in Nigeria reveals sparse evidence-base surrounding external and internal context-specific factors influencing T2DM management in public hospitals across Nigeria. Identification of these factors is crucial to health policy, research, and patient management. This review provides holistic evidence about the influencing factors in public hospitals across Nigeria.

Methods: We synthesised quantitative studies on T2DM management, published between 2006 and 2016 in Nigerian public hospitals. Searches of PsycINFO, EMBASE, and Google Scholar databases were undertaken, alongside the African Journals Online (AJOL) and the Cochrane Library resources. The websites of the World Health Organisation African Region (WHO, AFR) and International Diabetes Federation African Region (IDF, AFR) were also searched. The Critical Appraisal Skills Programme (CASP) and Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) checklists were used for quality appraisal and report.

Results: This review revealed factors such as non-adherence/non-compliance (20 studies), self-care related (9 studies), psychological-related (6 studies), social-related (6 studies), cost-related (6 studies) and drug-related (3 studies). Impacts of these factors on patient health outcome were elevated glycaemic levels, poor self-management skills, early development of DM complications, and loss of trust in clinical management as well as high mortality rate.

Conclusion: The outcome of this review offers practical recommendations for policy review and suggestions for potential change implementation to improve T2DM patient management in the context of clinical practice.

Operational definition

Operationally defined, non-adherence and non-compliance are the same as most researchers used them interchangeably. These words were used to describe the failure of the patients to act by the regime prescribed by their health care providers.

AFR	Africa Region
BMI	Body Mass Index. A value derived from the mass and height of an individual. It is defined as the body mass divided by the square of the body height. Universally, it is expressed in units of kg/m ²
EMBASE	Excerpta Medical Database. It is a biomedical and pharmacological database of published literature
Glycaemic Index (GI)	It is a measure of how quickly carbohydrate (CHO) is digested and absorbed into the bloodstream after ingestion
HbA1c	Refers to Glycated Haemoglobin. It is your average blood glucose levels in the blood for the last two to three months.

ASMMT	Adherence and Self-Management Monitoring Tool intended to help patients to reach or exceed a target adherence rate
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	It measures the beta-N-1-deoxy fructosyl component of haemoglobin
IDF	International Diabetes Federation
NCDs	Non-Communicable Diseases. Non-transmissible directly from one person to another
PRISMA	The Preferred Reporting Items for Systematic Review and Meta-analysis
Postprandial hyperglycaemia	An exaggerated increase in blood sugar after ingesting a meal
PsycINFO	A database of abstracts of literature in the field of psychology produced by the American Psychological Association
QoL	Quality of Life. The general well-being of individuals
Self-Monitoring of Blood Glucose	(SMBG – An important component of modern therapy for Diabetes mellitus
WHO	The World Health Organisation. A specialized agency of the United Nations concerned with international public health. It was founded on 7 April 1948, and its headquarters is in Geneva, Switzerland

1. Introduction

Diabetes mellitus (DM) is a metabolic disorder characterized by chronic hyperglycemia that results from disturbances of carbohydrates, fat and protein metabolism due to defects in insulin secretion, insulin action, or both (WHO, 2014). DM is of three types; Type 1 Diabetes mellitus (T1DM), Type 2 Diabetes Mellitus (T2DM) and Gestational Diabetes mellitus (GDM). In Nigeria, DM is one of the lethal Non-Communicable Diseases (NCDs) estimated to account for 29% of all deaths in 2016 (WHO, 2018).

T2DM is a potentially preventable type of DM, yet the past decade has seen an increasing prevalence of T2DM and more management challenges (WHO, 2016a, 2016b). The prevalence of metabolic disorder T2DM has increased more rapidly in low and middle-income countries than in high-income nations due to urbanization and lifestyle factors (IDF, 2017). The complications of T2DM progression, due to uncontrolled hyperglycaemia, have caused a significant number of health-limiting and potentially life-threatening conditions [22]. International Diabetes Federation (IDF, 2017).

In Nigeria, the prevalence of T2DM varies from 0.65% in rural Mangu (North), 6.8% in Port Harcourt city (Niger Delta) to 11.0% in urban Lagos (Chinenye & Ogbera, 2013), 5.3% of men and 14.3% of women are obese in Nigeria (WHO, 2016a, 2016b). This explains the outcome of the study conducted by Chinenye and Young (2011) that T2DM is commoner in Nigerian women than in men. The increased prevalence in women has been linked to lifestyle, diet, and cultural factors-in some tribes in Nigeria, obese women are often respected and regarded as wealthy (Enang, 2009). T2DM is more prevalent in middle-aged adults than the younger adults in Nigeria (Iloh, Amadi, & Ebirim, 2015). Rapid urbanization contributes to increased incidence of T2DM in Nigeria in that, most people ignore their local healthy foods and choose to eat processed foods instead (Anakwue, Arodiwe, Ofoegbu, 2012).

The complications of T2DM progression, due to uncontrolled hyperglycemia have caused a significant number of health-limiting and potentially life-threatening conditions (IDFA, 2015; Mandal, 2017). Its microvascular complications entail persistent high blood-glucose levels, which can damage the eye (retinopathy) leading to blindness, damage the kidneys (nephropathy) causing kidney failure, damage the nerves (neuropathy) leading to impotence and DM foot disorder (WHO, 2018).

Table 1
The Patient Exposure Outcome (PEO) showing the components of the research question.

Patient	Exposure	Outcome
Adult patients diagnosed with T2DM in public hospitals across Nigeria.	All levels of T2DM management such as counselling, clinical support, and Oral Hypoglycaemic Agents (OHAs).	BMI, HbA1c, medication adherence, blood pressure, self- management skills, waist circumference as well as the onset of complications and mortality pattern.

DM foot disorder often leads to amputation. Macrovascular complications of T2DM include Cardiovascular Accident (CVA) and Myocardial Infarction (MI).

Affluent people can affordably access good healthcare that enables them to manage their illness well. Poor people, however, struggle to gain access to effective treatment. It has been noted that many health settings lack effective policies that can facilitate the empowerment of individuals diagnosed with the condition, especially for people with limited income (Chan, 2016). In Africa, the International Diabetes Federation African region warned that optimal management was not being delivered to most patients diagnosed with T2DM in clinical practice (IDF, 2017).

Previous studies conducted in Nigeria have shown sparse evidence about the factors influencing T2DM management in public hospitals across Nigeria. Identification of these factors is crucial to health policy, research and can offer evidence-based guidance to patient management. This review is required to provide holistic evidence about the factors influencing T2DM management in public hospitals across Nigeria.

1.1. Research questions

- What factors influence T2DM management in public hospitals across Nigeria?
- How do the identified factors impact patients' health outcome?

2. Research design and methods

2.1. Search strategy and selection criteria

After identifying the synonyms relating to the components of the research question, as shown in Table 1, we used Boolean operators, OR and AND as a strategy to search for relevant literature. The keywords used were factors, influencing, Type 2 Diabetes Mellitus, management and Nigeria. We searched PsycINFO, EMBASE, and Google Scholar databases as well as the African Journals Online (AJOL) and Cochrane libraries. The websites of the WHO AFR and IDF AFR were searched for relevant quantitative studies on T2DM management published between 2006 and 2016. We hand searched unpublished conference papers, reports, and abstracts from the International Diabetes Federation (IDF). This was to limit selection bias, obtain robust data as well as add valuable information to this review, as agreed by (Bettany-Saltikov, 2012).

2.2. Inclusion criteria

To achieve the research aims and objectives of this review, we considered the below-listed criteria;

- Quantitative studies conducted in a public hospital across all geographical regions in Nigeria.
- Considered studies that targeted adults (over 18yrs), diagnosed with T2DM.
- Patients exposed to all levels of T2DM management such as; pharmacological and non-pharmacological interventions.
- Studies that used direct anthropometric tool to measure at least one health outcome. Outcomes such as Body Mass Index (BMI), HbA1c

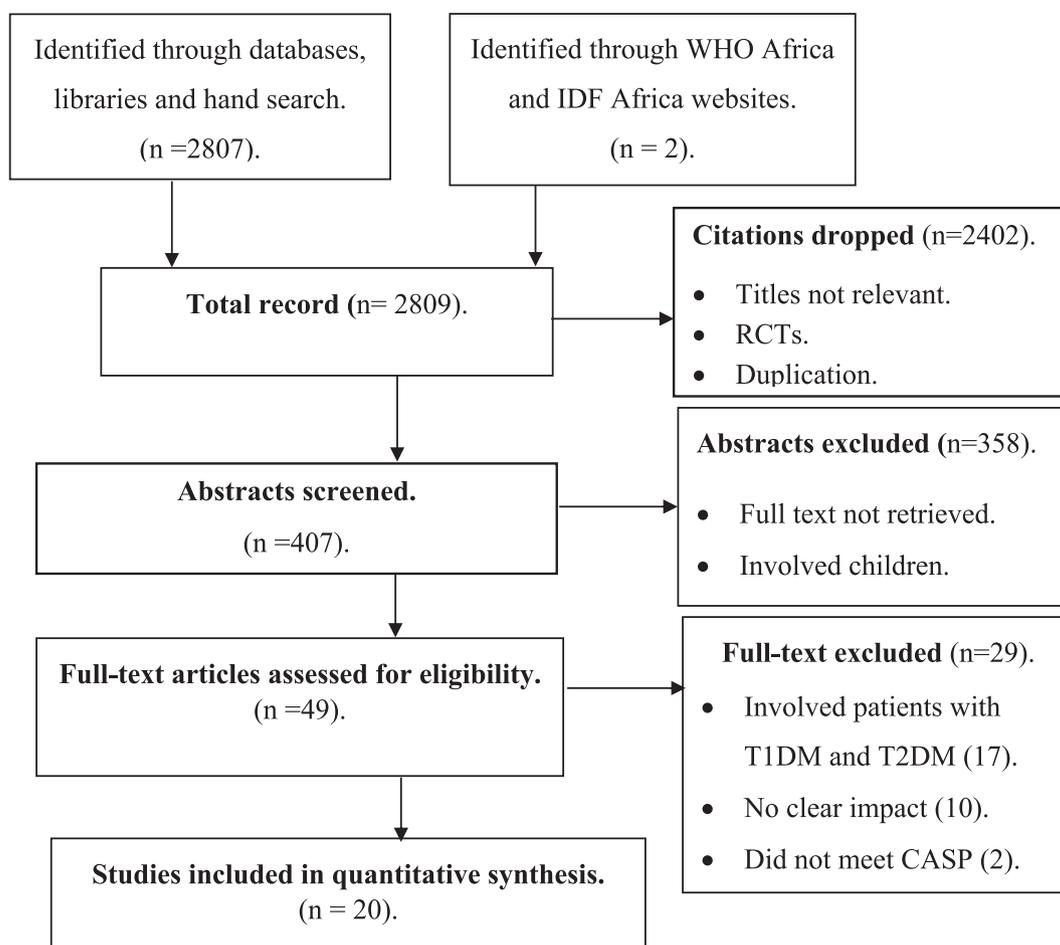


Fig. 1. The Preferred Reporting Items for Systematic Review and Meta-analysis (PRISMA) flow chart of the review.

(Glycated Haemoglobin) level, medication adherence, blood pressure, self-management skills, waist circumference as well as the onset of complications and mortality pattern.

These outcomes are required to measure the impact of the factors identified on patients' health. The details on the PEO on Table 1 was useful for the extraction of significant characteristics of the population such as sample size, age, gender, and diagnosis. The PRISMA flow chart (see Fig. 1 below shows the flow chart of the articles included).

2.3. Exclusion criteria

Research conducted in private hospitals across Nigeria was excluded from this review given this review did not seek to compare the management of T2DM between private and public sectors across Nigeria. This review excluded studies that included children- this is because there are few documented data about children with T2DM in Nigeria. Overall, given the aim and objectives of the research questions posed in this review, other African countries other than Nigeria, Randomised Controlled Trials (RCTs) and qualitative studies were excluded. RCTs were excluded given that this review did not aim at evaluating the effectiveness of an intervention. Qualitative studies were excluded from the review as we wanted to explore those factors that had been widely reported in previous work. Qualitative studies are often exploratory in nature and so to include these would have meant including work that had not been replicated elsewhere.

2.4. Appraisal of studies included

The 10 questions on the CASP checklist was used for the systematic quality assessment of the articles extracted and reviewed. The checklist was then used to evaluate the reliability and validity of the quantitative studies reviewed. However, from a realist perspective, studies that had clear research aim, adopted appropriate research methodology, recruitment strategy, and data collection methods as well as gave consideration to ethical issues, the rigour of data analysis, clarity of findings and the research significance were selected.

In quantitative studies, the issue of generalisability is crucial in determining the degree to which the result findings are representative of the target population. Therefore, studies that did not clearly provide a report on sample size were excluded. Twenty studies that passed the assessment were considered in this review (see Fig. 1).

3. Results

The data extracted from the twenty studies included in this review were all quantitative- studies- fifteen cross-sectional studies, and five cohort studies were included (see Table 2). These studies were conducted in rural (1) and urban regions (19) in public hospitals across Nigeria. This review covered all the geopolitical regions in the country except the north-eastern region because no study from this region met the inclusion criteria. Previous studies conducted within the north-eastern regions appeared to have included patients diagnosed with DM and did not single out those diagnosed with T2DM. The highest number of the studies reviewed were conducted in the south-western region of Nigeria (11), south-eastern (4), south-south (2), north-central (2) and

Table 2
Synthesis of the reviewed articles.

N	Authors and type of study.	Size.	Region	Variables	Impact	Summary
1.	Awodele and Osulale (2016) Cross-sectional	150	South-Western	Emotional distress and poor self-care	Poor glycaemic control and DM self-care habits	People with poor glycaemic control had significantly higher mean (± SD) total PAID scores
2.	Adisa et al. (2009) Cross-sectional	121	South-Western	Omission, forgetfulness, being fed up of daily ingestion of OHAs and high cost of medication	Poor self-monitoring of the glycaemic level	Non-adherence was unintentional
3.	Odume et al. (2015) Cross-sectional	145	North-Central	Dysfunctional family and social support	Poor glycaemic control	There was a significant relationship between family characteristics and glycaemic control
4.	Pascal et al. (2012) Cross-sectional	120	South-Eastern	Financial constraints	Fasting blood glucose was 70–130 mg/dL for at least three months	Good medication adherence rate is possible with active intervention
5.	Emmanuel and Otovwe (2015) Quantitative	350	South-South	Use of alternative traditional medicine	Poor adherence to dietary treatment	Regular counselling on adherence to medication and dietary regimen
6.	Jackson et al. (2014) Cross-sectional	303	South-South	Low literacy level, high cost of medication, forgetfulness, limited access to care, the complexity of regimen, poor patient-provider communication, lack of trust in the provider and depression	Poor adherence rate	Educational status, monthly income, duration of T2DM and negative attitude toward disease condition predicted knowledge
7.	Awodele and Osulale (2015) Retrospective and prospective	152	South-Western	Age, gender and cost influence compliance	Poor compliance and glycaemic control	Effective health counselling can result in high adherence rate and clinical outcomes
8.	Nwaokoro et al. (2014) Quantitative	30	South-Eastern	Ignorance, fear of hypoglycaemia and poor DM knowledge	Increased morbidity and mortality rates	Explore the precursors of treatment adherence behaviour and adopt effective interventions
9.	Iloh et al. (2015) Cross-sectional	750	South-Eastern	Biosocial factors (Family history of hypertension and unhealthy eating)	The high incidence rate of T2DM	Early screening of adults with a family history of hypertension
10.	Onakpoya et al. (2010) Cross-sectional	83	South-Western	Inadequate knowledge and low referral rate	Early development of diabetic retinopathy	Health education on diabetic retinopathy
11.	Ogboma et al. (2014) Retrospective analysis	399	South-Eastern	Drug therapy problems such as nonadherence and polypharmacy	Hypo-Glycaemia	There is a need for a comprehensive medication management approach
12.	Ajayi, Ajayi and Olalekan (2010) Retrospective study	308	South-Western	Inadequate guideline	Poor control of blood glucose, blood pressure, and BMI	Current practices are not aggressive enough to manage a substantial proportion of T2DM patients
13.	Iwuala et al. (2015) Cross-sectional study	100	South-Western	Financial constraint limits patients' Self-Monitoring of Blood Glucose (SMBG).	Poor self-monitoring of blood glucose and high HbA1c	SMBG was performed frequently by persons with a tertiary level of education yet, no statistically significant output on HbA1c
14.	Olamoyegun et al. (2015) Quantitative	90	South-Western	Increasing age, duration of DM hypertension and dyslipidemia	Early development of a complication	Poor glycaemic control were factors associated with early presentation of microvascular complications
15.	Chijioke, Adamu, and Makusidi (2010) Retrospective study	785	North-Central	Ignorance, poor hygiene, infections, lack of foot care and inadequate glycaemic and blood pressure control	The overall mortality rate was 32.5%	The mortality rate was high in those that presented with hypoglycaemia, stroke and diabetic keto-acidosis and foot syndrome
16.	Adeniyi et al. (2012) Cross-sectional Quantitative	122	South-Western	Low social support	Low self-efficacy for physical exercise	Psychosocial constructs should be considered by giving priority to social support when prescribing physical activity
17.	Adeniyi et al. (2010) Cross-sectional	58	North-Western	Older age and adiposity	Low exercise capacity	Prescription of physical exercise to patients.
18.	Yusuff et al. (2008) Quantitative	200	South-Western	Lack of finance, side effects of medications, perceived inefficacy of prescribed OHAs	Self-medication with local herbs, poor self-management	Poor adherence with the prescribed drug regimen, inadequate knowledge, and poor self-management
19.	Ekore et al. (2010) Cross-sectional	137	South-western	Poor attitude to foot care and reduced awareness	Lack of foot care education	Lack of education of the patients by their health care providers
20.	Adeniyi et al. (2015) Quantitative	227	South-Western	Low level of physical activity	Low-level quality of life	Patients with moderate-to-high physical activity were likely to reduce the risk of poor QoL by half

north-western (1).

The most salient factors reported as influencing factors to T2DM management were; nonadherence/non-compliance related (20), self-care related (9), psychological-related (6), biosocial related (6), cost-related (6) and drug-related (3). The impacts of these factors on patient health outcome were detrimental. The impact ranged from high glycaemic output to poor self-management skills to early development of microvascular and macrovascular complications as well as high mortality rate.

3.1. Non-adherence/non-compliance related

In the context of this review, the words non-adherence and non-compliance are operationally defined as being the same since all the authors of the reviewed articles used them interchangeably. Non-adherence was the most influencing factor in patient management, reported across the studies. Thirteen articles from the twenty articles reviewed used these words to describe the failure of the patients to act by the regime and activities prescribed by their health care providers. As well, seven articles used the same words to describe the failure of the support system to act in favor of the patients. The support-system described entails; the use of guideline for pharmacological intensification of glycaemic control (Ajayi & Olalekan, 2010), patient referral (Onakpoya, Adeoye, & Kolawole, 2010), family support (Odume, Ofoegbu, Aniwada, & Okechukwu, 2015), education and access to care (Jackson, Adibe, Okonta, & Ukwe, 2014) and financial support (Pascal, Ofoedu, Uchenna, Nkwa, & Uchamma, 2012).

3.2. Self-care related

Self-care related factor was reported as the second most influencing factor in patient management across the studies. About half of the total studies reviewed (9 studies) reported defective patients' self-care related factors had a deterring effect on T2DM management. The nine studies were conducted in four geo-political regions in Nigeria (North West, North Central, South West, and South East). There was a vast similarity in the measurement tool that the nine studies used to evaluate patients' self-care related factors as an influencing factor on the management of adults diagnosed with T2DM in public hospitals.

A cohort study described the prescription pattern of Hypoglycaemic Agents (HAs), patients' adherence to the prescribed HAs, patients' glycaemic control and self-management practices among 200 adult patients diagnosed with T2DM (Yusuff, Obe, & Joseph, 2008). A cohort had OHAs and the other cohort had both OHAs and insulin. A pre-tested Adherence and Self-Management Monitoring Tool (ASMMT) was used to measure patient adherence in both cohorts. Over half of the patients (59%) were not adherent to treatment ($p < 0.05$).

Low knowledge and practice of critical components of DM self-management behaviors were revealed among the cohort studied. Similarly, poor-self monitoring of glycaemic control (Diabetes Association of Nigeria, 2013; Iwuala, Olamoyegun, Sabir, & Fasanmade, 2015), ignorance (Chijioko, Adamu, & Makusidi, 2010), poor attitude to foot care (Ekore, Ajayi, Arije, & Ekore, 2010), poor self-care habits (Ogbera & Adeyemi-Doro, 2011), low level of physical activity (Adeniyi, Ogwumike, Oguntola, & Adeleye, 2015), low-exercise capacity (Adeniyi, Uloko, & Sani-Suleiman, 2010) and low self-efficacy for physical exercise (Adeniyi, Idowu, Ogwumike, & Adeniyi, 2012) were identified as inhibiting factors to effective management. All these studies reported a statistically significant relationship between patients' self-care and their glycaemic control.

3.3. Psychological-related

Out of all the articles reviewed, six studies reported psychological-related factors as influencing factors to patient management. Clinical and psychosocial variables that influence self-care management of 150

adult patients with T2DM were evaluated (Adeniyi et al., 2010). The outcome of their study reported that emotional distress directly influenced the patients' glycaemic control and self-care habits ($P = 0.012$). The study disregarded the association of distress with a duration of T2DM, patients' ages and anthropometric indices. Additionally, omission and forgetfulness (Adisa, Alutundu, & Fakeye, 2009; Jackson et al., 2014), fear of hypoglycemia (Nwaokoro et al., 2014), low self-efficacy and depression (Adeniyi et al., 2012) and low level of Quality of Life (QoL) (Adeniyi et al., 2015), were regarded as psychological factors impacting of effective management of T2DM.

3.4. Biosocial-related

Six studies reported biosocial factors such as increasing age and duration of DM (Olamoyegun, Ibraheem, Iwuala, Audu, & Kolawole, 2015) age-and adiposity (Adeniyi et al., 2010) age and gender (Awodele & Osulale, 2015) as well as educational status and monthly income (Jackson et al., 2014; Odume et al., 2015) reported dysfunctional family relationship and social system as a hindering factor to glycaemic control. The use of alternative medicine was identified as a deterring factor to effective management (Emmanuel & Otovwe, 2015).

3.5. Cost and drug-related

Six studies reported cost-related factors as influencing factors to patient management. Financial constraint (Yusuff et al., 2008; Adisa et al., 2009; Pascal et al., 2012; Jackson et al., 2014; Iwuala et al., 2015; Awodele & Osulale, 2015). Three studies presented cost-related factors as influencing factors to patient management. A side effect of medication and perceived inefficacy of prescribed OHAs (Yusuff et al., 2008) polypharmacy (Ogbonna, Ezenduka, Opara, & Ahara, 2014) and poor therapy intensification (Ajayi & Olalekan, 2010).

3.6. Impact of the identified factors on patient health outcome

Poor glycaemic control poorly controlled blood pressure and increased BMI, poor foot care, low level of physical activity, early development of complication (Olamoyegun et al., 2015; Onakpoya et al., 2010) and high mortality rate (Chijioko et al., 2010).

4. Discussion

Given the vast cultural diversity, religious, socio-economic disparities and complex political issues that exist in Nigeria, T2DM management standard across the nation, is incomparable to what can be achieved in developed nations. DM subjects in Nigeria often experience prolonged hospital stay, unaffordable medical bills and early onset of microvascular and macrovascular complications (Ogbera, Fasanmade, Ohwovoriole, & Adediran, 2006; Arogundade, 2013).

Jackson et al. (2014) demonstrated that the availability of quality T2DM management can improve patients' adherence to treatment and improve patients' self-care knowledge about their T2DM. Non-adherence is considered one of the major challenges associated with the management of T2DM across Nigeria (Yusuff et al., 2008; Adisa et al., 2009; Nwaokoro et al., 2014). Patients' educational status and monthly income, and the duration of DM can impact on patient's adherence to treatments (Olamoyegun et al., 2015). However, a study by Pascal et al. (2012) suggested that logical intervention can help improve patients' adherence rate. Negative patient attitude toward T2DM was tied-up with the knowledge deficit in relation to the management of their condition (Ekore et al., 2010).

On the contrary, Awodele and Osulale (2015) negated an association between a patient's low educational level and noncompliance to T2DM treatment. The study argued that insufficient health setting, low levels of health education and inadequate counseling by the health providers might be the cause of low adherence rate amongst the

patients in Nigeria. Similarly, the outcomes of other studies connected poor DM knowledge of patients in Nigeria to the limited or deficient? DM education they received from their health providers and inadequate health resources in Nigeria (Ekore et al., 2010). Patient-related factors, health provider factors, and organizational factors were considered as inter-related factors that can collectively influence patient management of T2DM in a clinical setting (Henriksen, Dayton, Keyes, Carayon, & Hughes, 2008).

Essentially, the *Diabetes Association of Nigeria* (2013) recognizes that management of T2DM in a clinical setting should at least focus on an essential evaluation of the condition and treatment. An initial evaluation should ideally include a detailed medical evaluation to classify the DM and review previous treatments, to prevent complications and potentially prolong the patient's Quality of Life.

Furthermore, T2DM management should focus on glycaemic control in diagnosed individuals, and management plan should be collaborative for adequate care. Although laboratory tests are vital to diagnose and assess the condition, DSME remains a cornerstone for effective glycaemic control in patients because it facilitates the patient's direct involvement in his/her care (Weinger & Carver, 2008; Nicolucci et al., 2013). Most individuals diagnosed with T2DM present with a feeling of guilt, shock, anger, fear, and depression (Nash, 2013). Therefore, to understand the psychosocial consequences of the condition on the patients in Nigeria. It is useful to consider the psychosocial-cultural and economic background of individuals diagnosed with T2DM (Chinenye & Young, 2011).

The huge economic problems faced by many Nigerians often prompt them to consume high-calorie diets. This is because high-calorie diets are affordable and readily available (Chinenye & Ogbera, 2013). High-calorie diets have been proven to have a high Glycaemic Index (GI). GI is measured on a scale of 1–100, 70 is considered high and 56–69, medium. Foods with medium-high indices can induce more hunger and increase postprandial hyperglycemia thereby, fuelling the occurrence of obesity- a precursor of T2DM (Umeadi & Chinenye, 2014). Postprandial hyperglycaemia is an exaggerated increase in blood sugar after ingesting a meal.

Added to this, some cultures in Nigeria consider being marginally overweight as a sign of affluence and beauty. In certain Nigerian cultures, women are kept in fattening rooms, where they are continually fed large portions of food before their weddings to achieve a higher weight, which is interpreted as 'beautiful' for womanhood (Enang, 2009). This type of culture also highlights that health providers in Nigeria ought to recognize that traditional leaders, religious leaders, family and community leaders play a strong role in people's decision-making, especially concerning health matters (Chinenye & Ogbera, 2013).

T2DM is rapidly increasing among the populations of Nigeria (WHO, 2016a, 2016b). It was reported that the management of T2DM in Nigerian public health sectors was lagging. Despite this report, most previous research in Nigeria often focuses on social-economic, lifestyle and psychological factors (patient-related factors) that influence the management of T2DM, ignoring the contribution of health-professionals and clinical sectors in determining management pathway for the condition.

In the context of management of NCDs in Nigeria, health policy agenda occurs on three levels, macro, meso, and micro. Macro-level entails legislation, funding, national policy and national programme (Federal Government agenda) that are in place. Meso level entails programme and organizational infrastructures that are in existence for management at a state level and micro level (health practitioners, including nurses who provide DM management in hospitals).

According to the deliberative policy analysis framework, there is a need for collaboration between these three levels to promote and maintain population health in a participatory and inclusive manner (Hajer et al. 2003). Integration and interface of top-bottom and bottom-top interaction among the macro, meso and micro levels in health

policymaking are critical to health planning (Uneke, Ezeoha, Ndukwe, Oyibo, & Onwe, 2010; Langlois et al., 2016). The outcome of this review supports the relevance of bottom-top interactions that can contribute to effective T2DM management in Nigeria.

5. Limitations

It is acknowledged that this review has limitations in relation to its inclusion and exclusion criteria. Firstly, only quantitative studies that focused on adult patients diagnosed with T2DM were included. Secondly, only studies that involved public hospitals in Nigeria were considered. Therefore, the outcome of this review may not represent the situation of people diagnosed across Nigeria.

6. Recommendations

Health providers who utilize the empowerment model, the biopsychosocial model and the health promotion model can potentially and positively impact patients' lifestyle options for the optimization of patients' self-management. It is recommended that strategic plans for T2DM management ought to consider the potential impact of social class, social capital, and organizational operations for minimal-cost approaches to the management of T2DM across public hospitals in Nigeria. There is currently sparse evidence on clinical, organizational factors influencing T2DM management in Nigeria. Future research is recommended for an exploration of organizational factors influencing T2DM management in public health settings in Nigeria.

7. Conclusion

The outcome of the review provides holistic evidence of the factors influencing T2DM management across Nigeria and presents the impact of the factors on patients' outcomes. However, all the identified factors in the review appeared to be one-directional as they focused on patient-related factors, and unfairly blamed the individuals for unhealthy lifestyle choices, and ignored the relevance of clinical providers in preventing progression of T2DM. The review outcome summarises non-adherence as an indicator of ineffective management rather than a mere and intentional deterring factor to effective management.

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Ethical approval details

Not applicable.

Declaration of Competing Interest

There are no conflicts of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijans.2019.100151>.

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