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REVIEW

Impact of Self-Care Practices on the Prognosis of Type-2 Diabetes Mellitus in Developing Countries: A Narrative Review

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Abstract

Introduction: Type-2 diabetes mellitus (T2DM) is a type of diabetes with increasing prevalence in lower- and middle-income countries. Diabetes self-care practices (SCPs) are non-pharmacological treatments essential in maintaining health and well-being and improving the quality of life among DM patients.
Objective: To highlight the diabetes SCPs and their impact on diabetes prognosis in developing countries.
Methods: A comprehensive literature search on Africa Journals Online, PubMed, Google Scholar, and Cochrane Library, from year 2000 to 2023, using relevant keywords.
Results: The review highlighted the self-care practices for adequate DM care, including physical activity, diet (healthy eating), self-monitoring of blood glucose, medication adherence, foot care, general body care, and follow-up. The review documented from previous studies that adequate SCPs positively correlated with good glycaemic control, reduction of complications, and improved quality of life among DM patients.
Conclusion: Healthcare systems and policy-makers in developing countries must prioritise and support the integration of SCPs into diabetes management strategies. This will improve DM prognosis and overall well-being for individuals living with diabetes.

Keywords: Medication adherence, Physical activity, Self-care practices, Type-2 Diabetes mellitus.

Introduction

Type 2 Diabetes mellitus (T2DM) is a chronic disease with serious public health implications, with low- and middle-income nations bearing the brunt of the burden due to its significant adverse effects on human life and healthcare costs.[1] The majority of diabetes mellitus (DM) cases worldwide (87.5%) occur in low- and middle-income countries, with low-income countries also having the highest rate of undiagnosed cases (50.5%). The regions with the largest percentages were South-East Asia (51.3%), Africa (53.6%), and the Western Pacific (52.8%). [2,3] An estimated 537 million persons (aged 20–79 years) worldwide are thought to have diabetes mellitus (DM), with

the projected number of people living with the disease rising from 108 million in 1980 to 476 million in 2017 [4] based on the International Diabetes Federation,[5] with a forecasted increase to 783.2 million by 2045. [6,7]

One of the top ten leading causes of death worldwide is diabetes; more than 80% of non-communicable diseases (NCD) mortality is attributed to DM, which is also the second leading cause of Disability Adjusted Life Years (DALYs), with 7.2 million years of lives lost per 100,000 people.[8] While incidence has begun to decline in some nations, its prevalence has climbed recently, primarily in developing countries.[9] The United Nations has classified Diabetes mellitus (DM) as an epidemic of the twenty-first century, and worldwide statistics indicate that the disease is becoming commonplace at an incidence rate of roughly 2.5%/year.[10]

Despite mounting evidence of the effects of DM and other Non-Communicable Diseases (NCDs) in Nigeria and other developing nations, communicable diseases are still prioritised over NCDs. With a total pooled prevalence of 5.77% as of 2019, 8.2 million people were estimated to have impaired glucose tolerance.[11] Diabetes Mellitus can cause both acute and persistent issues, which are primarily responsible for morbidity and death. Even with recent significant advances in DM management, many patients continue not to feel or attain optimal results, as they suffer from devastating complications as a result of insufficient self-care practices. [12-14]

Objective of the review

The objective was to highlight the diabetes self-care practices and their impact on diabetes mellitus prognosis in developing countries.

Methods (Data sourcing/ Information gathering)

A collation of published articles on DM self-care practices in developing countries from 2000 to 2023 was retrieved between February and July 2023 to develop an all-inclusive distribution of articles in the review. In all, 40 articles were accessed after excluding articles not aligned with the study objectives and eligibility criteria. Search themes were developed from the study objectives to guide extracting relevant information. The authors searched online bibliographic archives such as African Journals Online, Google Scholar, Pubmed, Science Direct, and Cochrane Library. Using MesH headings, the terms "diabetes mellitus", "Type-2 Diabetes mellitus", "self-care practices", and "self-care practices in developing countries", as well as variations thereof, were searched for. The literature search results were screened for compliance with the eligibility or inclusion criteria, including original studies (mainly cross-sectional or prospective studies, cohort, and case-control) and reporting findings on DM self-care practices in developing countries in the English Language. Studies not within the review period, those not reporting on DM self-care practices, and studies reporting in other languages were excluded from the study. Data extraction from the eligible articles was carried out independently by two authors (OOA and DHO) in line with the study's objective, highlighting diabetes self-care practices and their impact on diabetes prognosis in developing countries.

Overview of self-care practices

A fundamental element of diabetes care is non-pharmacological treatment, which includes self-management, healthy diet, medication adherence, smoking cessation, self-monitoring of blood glucose, engaging in physical exercise, and receiving psychosocial support. [15-17] Self-care, according to Orem, is the practice of behaviours that people, with or without risk of disease, engage in to maintain their lives, health, and well-being. These behaviours are essential for promoting health, preventing illness, delaying

complications, and empowering patients to handle the complex nature of diabetes with or without medical assistance. [18] Diabetic self-care practices (SCPs) are the actions that persons with diabetes, or at risk of developing the illness, take to effectively treat the ailment on their own.[19] These practices include a combination of six different activities: a healthy diet, regular physical activity, self-monitoring of blood glucose (SMBG), adherence to medication as prescribed, foot care, general body care and follow-up care.[20] These SCPs in patients with diabetes may give better economic and therapeutic outcomes [21] as they all collaborate to enhance cardio-respiratory and cardio-metabolic functions, [22] and ultimately improve overall blood glucose levels and quality of life.

According to Karthik *et al*., [20] SCPs are a collection of the actions that people take to live a healthy lifestyle, as the efficiency of diabetic control is dependent on the SCP measures implemented by individuals and their family members. The components of diabetes SCPs are six different activities such as dietary modification, physical activity and exercise, medication adherence, self-monitoring of blood glucose (SMBG), foot care, general body care and follow-up care, [6,17,23] which are essential to achieving optimal glycaemic control. In order to guarantee that patients stick to their SCPs, family support is crucial. For people with diabetes, self-management skills are considered essential to effectively avoid, control effectively, and limit complications connected with the condition, as they spend less time with healthcare providers. [17,19]

The American Association of Diabetes Educators (AADE) model recommends that SCPs include a continuous set of activities such as healthy eating habits, [24] regular physical activity, [25,26] regular self-monitoring of blood glucose (SMBG) and blood pressure level, medication adherence, [27] risk reduction, problem-solving for the best health outcomes, and quality of life.[12] The activities include a healthy lifestyle, such as physical exercise, reduced tobacco consumption, maintaining healthy weights [16], stress management, [28] and regular foot-care practices, which offer relative protection against diabetic foot ulcers and amputation.[29]

According to Athira *et al*.[16] a study was conducted in Kannada, Bangalore, India on the assessment of SCPs among T2DM patients, which showed a greater degree of commitment to self-care practices in terms of taking medicine and self-monitoring blood glucose but a lower degree of adherence to other self-care activities, such as taking care of one's feet. Enikuomehin *et al.* [19] discovered less than satisfactory adherence to suggested SCP components, particularly SMBG, physical activity, and nutritional regimen, in a study among T2DM patients in Southwest Nigeria.

Diabetes knowledge is essential for successfully conducting SCPs appropriately and effectively, as previous research has reported that a substantial decrease in DM complications and good SCPs are closely correlated with education and knowledge. [17] According to Wamucii *et al*. [30] and Famakinwa *et al*. [31], knowledge not only enables diabetes patients to adhere to their treatment plan effectively but also enhances dedication to SCPs among patients with DM. A study conducted in Karnataka on knowledge and SCPs regarding diabetes among 400 T2DM patients revealed that only one-fourth of the study population had good knowledge of DM, and government policies may help create guidelines on DM management and funding community programmes for public awareness.[32] Giriappa *et al.* [33] further reported in a study conducted in Bengaluru on SCPs among T2DM patients that SCPs among study respondents were poor despite exhibiting a high level of awareness of the disease and its complications. Patient commitment to SCPs is crucial to meeting

their desired treatment goals and properly managing the disease.[34] Type 2 Diabetes mellitus patients' optimal and positive health outcomes are related to their knowledge about their condition and how to manage it. These are attained through health education, self-management, proper attention, and commitment to SCPs using the available health resources. [17] The cornerstone of managing T2DM is adhering to optimum SCPs.[28,35] Patients with diabetes improve their quality of life and reduce their risk of complications to their neurological system, eyes, kidneys, blood vessels, heart, and nervous systems by engaging in active SCPs.[28] The primary objective in the management of diabetes, as shown in Figure 1, is to avert or minimise chronic complications, which include diabetic retinopathy, nephropathy, peripheral neuropathy, cardiovascular diseases, diabetic foot, and peripheral artery disease.[16]

Domain of diabetes self-care practices

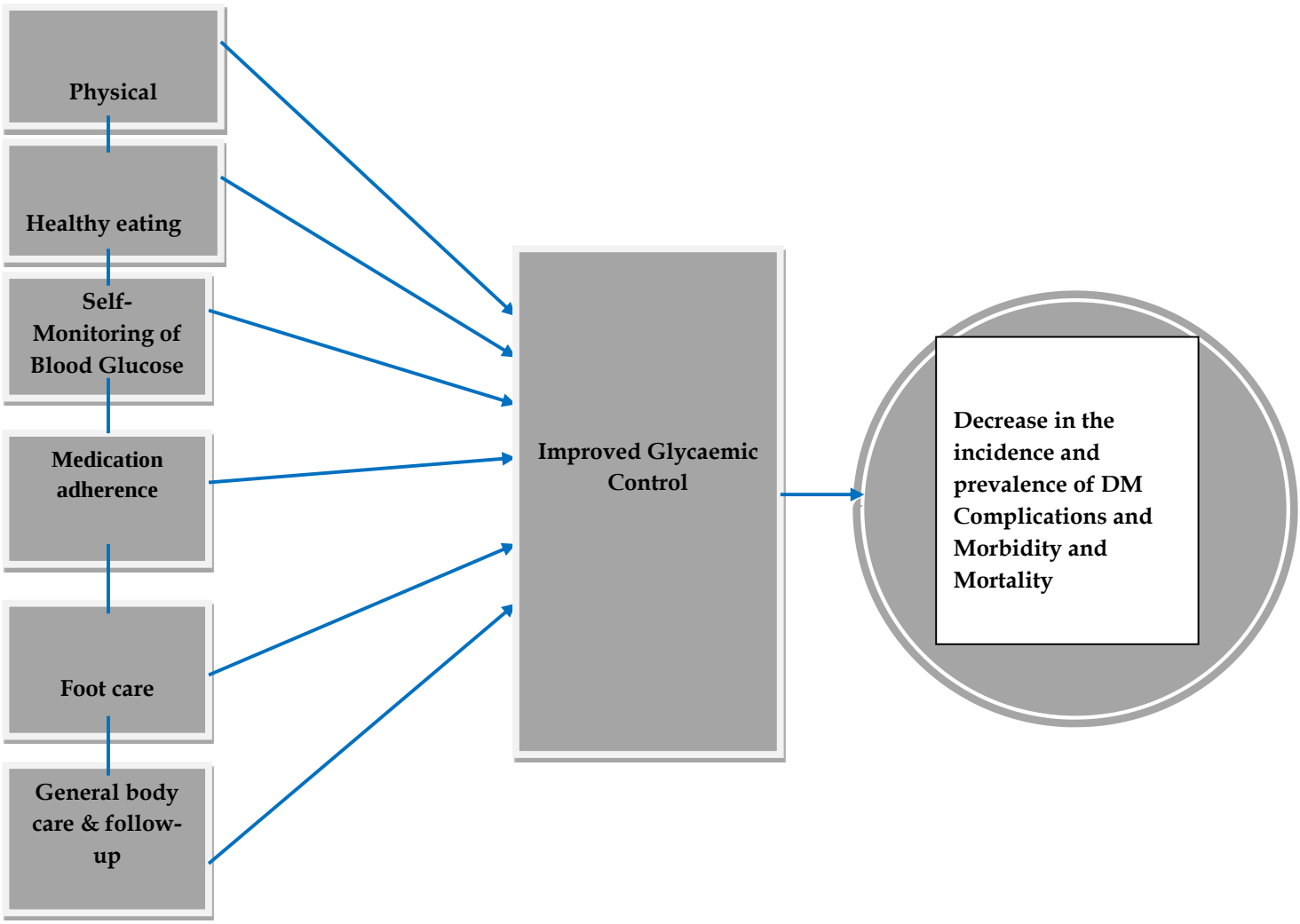

Figure 1: Conceptual framework for DM SCPs and its impact on DM prognosis

Analysis of the Literature Review

Impact of Self-Care Practices on the Prognosis of Diabetes Mellitus

The rising prevalence of DM that necessitates life-long treatments could have a large financial impact on the healthcare system, especially in developing nations where the immediate and long-term effects of DM place a heavy load on healthcare facilities.[36] Sub-standard SCPs in people with diabetes are a paramount issue that healthcare professionals deal with regularly, especially in a developing nation like Nigeria.[37] According to numerous research studies, effective self-care management techniques and reasonable metabolic control can prevent diabetes complications.[38-41] Although having T2DM alters all aspects of the patient's life, it is still possible for the patient to lead a normal life if they take self-care management measures to regulate their manifestations seriously.[37]

All self-care activities are positively correlated with good glycaemic control, reduction of complications, and improvement in quality of life.[42,43] Ultimately, when diabetes self-care is successfully integrated into everyday life, a patient is more likely to achieve adequate glycaemic control, reducing and delaying the onset of complications that are identified to increase the morbidity and mortality of DM.[38] Effective self-management is essential to improve goal achievement during management. Nonadherence to treatment hinders the regulation of blood glucose levels, leading to poor glucose control, a negative impact on the quality of life and increased complications.[41]

Self-care in diabetes management has improved with the introduction of self-monitoring of blood glucose (SMBG) and the widespread use of glycosylated haemoglobin as a marker of metabolic control, which has shifted more responsibility to the patient.[44] Adequate SMBG usually results in a favourable prognosis in the management of DM.[45] Self-monitoring of Blood Glucose gives information about the patient's present glycaemic status.[45] Additionally, SMBG includes patients in their care, boosts patient education and engagement, and improves glycaemic control.[46] Furthermore, SMBG encompasses all other SCPs of patients by providing real-time feedback on how their diet, physical activity, and medications affect their glucose levels. Regular monitoring helps make immediate adjustments to treatment plans, leading to better glycaemic control and better prognosis. Improved control reduces the risk of both short-term complications, such as hypoglycaemia and hyperglycaemia, and long-term complications, like neuropathy, retinopathy, and nephropathy. In addition, SMBG helps patients identify patterns and trends in blood glucose levels that might not be evident from occasional testing. Recognising these patterns enables more precise adjustments to treatment plans, which, in both the short and long term, improve the prognosis of the disease. (See Table I).

Adherence to prescribed medication is highly associated with better metabolic control, better quality of life, lower hospitalisation rates and improved DM prognosis. [47] Conversely, nonadherence to medication regimen is detrimental to the disease prognosis by contributing to treatment failure, risk of hospitalisation, morbidity and mortality in patients with long-term medication therapy. [48] Numerous studies have demonstrated that individuals with high levels of medication adherence were less likely to have poor glycaemic control than patients with low levels of medication adherence. [49-52] Furthermore, adhering to prescribed medications helps to maintain blood glucose levels within target ranges. This consistent control reduces the risk of both hyperglycaemia and hypoglycaemia,

leading to an overall better diabetes prognosis. In addition, effective glycaemic control through medication adherence improves DM prognosis and lowers the risk of long-term complications such as cardiovascular disease, nephropathy, retinopathy, and neuropathy. Medication adherence can help manage diabetes symptoms and improve overall DM prognosis and well-being. Patients who follow their medication regimen are likely to experience fewer symptoms and have a better quality of life. See Table II.

Table I: Summary of the studies on self-monitoring of blood glucose

Authors	Location	Objective	Study Design
	SELF-MONITORING OF BLOOD GLUCOSE		
Aschalew et al. [44]	Ethiopia	Assessment of DM self-care practices	Cross-sectional study
Zewdie et al. [45]	Ethiopia	Assessment of DM self-care practices	Parallel Mixed Methods
Manoch et al. [81]	Pakistan	Determine the frequency of SMBG to glycaemic control	Cross-sectional study
Li et al. [82]	China	SMBG in primary healthcare	Cross-sectional study
Nayeem et al. [84]	Bangladesh	Proportion of SMBG users	Cross-sectional study
Mamo et al. [85]	Ethiopia	Identify the determinants of poor glycaemic control	Case-Control Study
Enikuomehin et al. [19]	Nigeria	Assessment of SCPs and their determinants	Descriptive cross-sectional
Eze et al. [86]	Nigeria	Assessment of drug therapy & glycaemic control	Cross-sectional study
Sindhu et al. [87]	India	Estimate the proportion of people with Type-2 Diabetes practising SMBG & factors influencing practice.	Cross-sectional study
Malky et al. [64]	Saudi Arabia	To identify the barriers to self-care practices in patients with diabetes	Systematic Review
Sia et al. [88]	Taiwan	Examine the association between SMBG and glycaemic control among patients	Retrospective longitudinal study
Pamungkas & Chamroonsawasdi [89]	Indonesia	This review explains the psychological problems of capillary blood glucose testing and insulin injection.	A review

Healthy dietary practice is a fundamental determinant of diabetes self-care, as it relates to obesity-induced diabetes and the importance of nutrition in the management of DM.[53] Prevention of Type 2 diabetes through weight and metabolic control is clear.[54] However, nutrition is one of the most contentious and challenging components of managing T2DM, which is heavily influenced by cultural backgrounds.[55] Adherence to a dietary plan is viewed as a cornerstone of diabetes treatment and is linked to better disease prognosis.[56] A well-balanced diet helps maintain stable blood glucose levels. A diet low in refined glucoses and unhealthy fats can improve insulin sensitivity, crucial for effective DM prognosis. However, in each dimension of dietary practices, the patient's knowledge, a salient factor related to dietary behavioural control, is crucial. A study conducted on dietary indices and relation to metabolic markers found that knowledgeable patients performed self-management activities better than those with little insight into the condition. [55,57] (See Table III).

Physical exercise is a key component of the therapeutic approach for T2DM patients [58] and refers to all repetitive, planned and structured motions explicitly intended to enhance fitness and health. Several T2DM patients are affected by obesity, which is a leading cause of insulin resistance. The recommended physical activity for DM are aerobic and resistance training, resistance training improves blood pressure and

increases muscle mass and strength, which may positively impact insulin responsiveness, metabolic control and DM prognosis.[59] Regular exercise causes the body to experience physiological stress, which can result in adaptations like activating antioxidant defence mechanisms linked to the prevention and minimisation of weight gain.[60] Furthermore, there is an improvement in insulin sensitivity and glucose control, which can be used as a tool to help regulate blood glucose and improve the prognosis of the disease.[61] The decreased exercise capacity in people with T2DM is associated with the development of future cardiovascular events.[62] Tai, Chi and Yoga are examples of balance, flexibility, and resistance exercises. While yoga helps with metabolic control, Tai and Chi help T2DM patients with neuropathy to improve neurologic symptoms and maintain balance. [58,59] Due to the contribution of exercise to weight management and insulin sensitivity, it has been acknowledged that it holds a great prognostic value for people with diabetes and total glycaemic control. (See Table IV).

Table II: Summary of the studies on medication adherence

Authors	*Location*	*Objective*	*Study Design*
		MEDICATION ADHERENCE	
Huang et al. [49]	China	The prevalence of medication adherence and the factors associated with medication adherence in patients with T2D	A cross-sectional study
Aflakpui et al. [50]	Ghana	Assessment factors influencing adherence to medication regimen among outpatients with T2DM at a diabetes clinic, Tema General Hospital, Ghana	A cross-sectional study
Ayele et al. [52]	Ethiopia	To evaluate medication regimen complexity and to assess its impact on medication adherence and glycaemic control among patients with Type 2 diabetes Mellitus (T2DM)	A hospital-based cross-sectional design
Kassahun et al. [90]	Ethiopia	To assess nonadherence and factors affecting adherence of diabetic patients to anti-diabetic medication in Assela General Hospital (AGH), Oromia Region, Ethiopia.	A descriptive cross-sectional study
Baral & Baral et al. [91]	Nepal	The study aims to investigate self-care practices and predictors of self-care management activities among Type 2 diabetes mellitus patients in the Tanahun district of Nepal.	Descriptive cross-sectional study
Chittooru et al. [21]	India	To describe the self-care practice and the determinants of poor self-care practice	A community-based cross-sectional study
Alhaiti et al. [28]	Saudi Arabia	To analyse the prevalence of self-care practices in T2D patients in KSA.	Not Stated
Basu et al. [29]	India	To assess the adherence to self-care practices, glycaemic status, and influencing factors in diabetes patients	A cross-sectional observational analysis of baseline data from a quasi-experimental study
Anene-Okeke et al. [93]	Nigeria	This study aims to assess knowledge, practice, and barriers to self-monitoring of blood glucose (SMBG) among patients with Type 2 diabetes mellitus (T2DM) in Enugu State, Nigeria.	This study was a cross-sectional survey.

Domains of diabetes self-care practices

Physical Activity/Exercise

Physical activity is a fundamental therapeutic aid in the management of T2DM, for which regular engagement elicits a plethora of adaptations that improve the prognosis and overall health outcomes.[63] The World Health Organization,[65] defined physical activity as any contraction of skeletal muscles that results in energy expenditure, including actions taken when playing, working, completing household chores, engaging in leisure activities, and travelling,[66] While there are some enabling factors for engaging in physical activities, barriers that negatively influence commitment to them are many.[64] Lack of motivation to exercise, regular reinforcement of the need to exercise, living in undesirable areas such as urban slums, where there are no parks or open spaces for recreation, and ignorance of the kinds of activities to participate in, are some of the factors that discourage physical activity. [67]

Table III: Summary of the studies on dietary practice

Authors	*Location*	*Objective*	*Study Design*
		DIETARY PRACTICE	
Sami et al. [72]	Global	This review aims to examine various studies to explore the relationship of T2DM with different dietary habits/patterns and practices and its complications.	A review
Opoku-Addai et al. [73]	Ghana	This study aimed to explore and describe the practices and skills in the nutritional management of diabetes mellitus among patients living with diabetes attending a Ghanaian hospital.	Exploratory, descriptive qualitative research design.
Malky et al. [64]	Global	To identify the barriers to self-care practices in patients with diabetes from a global perspective	A systematic review
Ogbera & Ekpebegh et al. [78]	Nigeria	Assessed the past, present, and future of DM in Nigeria	A review
Rajasekharan et al. [68]	India	Determine the practice of self-care activities among people with diabetes	Cross-sectional study
Thojampa et al. [69]	Thailand	Knowledge and self-care management of uncontrolled diabetes patients	This qualitative research design
Nwose et al. [80]	Nigeria	To develop food choices for DM peer education	A purposive research design

The World Health Organization advises engaging in 150-300 minutes of moderate-intensity aerobic exercise, 75-150 minutes of vigorous-intensity aerobic exercise, or an equivalent combination of both–per week. [67] Since exercise reduces limb and muscle stiffness, improves blood flow, and increases the effectiveness of the hormone insulin, boosting the release of insulin; hence it is imperative to promote exercise among patients with diabetes, as these practices help minimise or delay the complications of diabetes. [16]

Exercise and being physically active have been proven helpful in T2DM management and prognosis, and both have been recommended. Some of the advantages are better control of blood pressure levels, reduction in insulin resistance, better blood glucose control, and protection of the heart.[68] Exercise also makes the body utilise more energy and improves the function of the lungs.[69] In Nigeria, some studies have shown that exercise significantly influences metabolic parameters like waist circumference, triglycerides, systolic blood pressure in males, fasting blood glucose, and reduced

cardiovascular risk in T2DM patients.[70] In addition, another study (in Nigeria) showed the association between activities of daily living (ADL) among DM patients and its effect on body mass index (BMI). In that cross-sectional assessment, 74% of participants were in physically demanding ADL occupations but affirmed inactivity in 98% on leisure exercise. Further, 47% had a BMI >25 kg/m ^{2} and were consistently less active on all leisure ADLs relative to those with BMI <25 kg/m ^{2} ($p < 0.02$).[71] This shows increasing ADL is directly associated with decreasing BMI.

Table IV: Summary of the studies on physical activity

Authors	*Location*	*Objective*	*Study Design*
		PHYSICAL ACTIVITY	
Mphasha et al. [58]	South Africa	To assess diabetes dietary knowledge and intake of patients	A convergent mixed-methods parallel study design
Naeini et al. [59]	Iran	To evaluate the interaction between diet quality indices and BDNF Val66Mat (rs6265) on cardiometabolic markers among diabetic patients.	A cross-sectional study
Cannata et al. [60]	Not Applicable	To explain the contribution of physical activity and its beneficial effects on patients affected by type 1 (T1D) and Type 2 diabetes (T2D)	A review
Kirwan et al. [61]	Not Applicable	The essential role of exercise in the management of type-2 diabetes	A review
Tofas et al. [62]	Not Applicable	This paper aims to provide a thorough review of the available literature investigating the effects of acute and chronic exercise training and detraining on redox regulation in the context of CVDs.	A review
Harrington & Henson [63]	Not Applicable	Physical activity and exercise in the management of Type 2 diabetes: where to start	A review
Athira et al. [16]	India	The study assessed the self-care activities of diabetic patients using the summary of the diabetes self-care activities scale (SDSCA) and the variables associated with them (Age, gender, educational level, socioeconomic status (SES)).	A cross-sectional descriptive study
Rajasekharan et al. [68]	India	Determine the practice of self-care activities among people with diabetes	Cross-sectional study
Thojampa et al. [69]	Thailand	Knowledge and self-care management of uncontrolled diabetes patients	This qualitative research design
Glezeva et al. [70]	Sub-Saharan Africa	This review outlines the burden of Type 2 diabetes mellitus in Sub-Saharan Africa. It highlights the need for improved community health care and regulations to reduce its epidemiological spread and devastating impact on health.	A review
Nwose et al. [71]	Nigeria	This study aimed to assess the extent to which ADL and BMI are evaluated in hospital practice among diabetes patients.	This was a clinical observational baseline study.

Diet (Healthy Eating)

Diet modification is a crucial part of self-care strategies [72] as it alters the course of the illness by reducing the risk of morbidity and mortality associated with DM and the cost of care for diabetes. [73] Regarding dietary behaviour, some

factors play a significant role, such as environmental factors, workplace-related factors (working hours), and social functions (weddings, etc.), which can negatively or positively influence adherence to the dietary regimen.[74] Some patients with diabetes lack awareness of healthy nutritional options that they should adopt and awareness about the harmful effects and the health consequences that occur as a result of poor compliance with a healthy diet.[37]

Table IV: Summary of the studies on foot care practices

Authors	*Location*	*Objective*	*Study Design*
		FOOT CARE PRACTICES	
Woo & Cui [95]	Not Applicable	The study aimed to examine factors influencing diabetic foot care behaviours (DFCBs) among patients with diabetes.	An Integrative review using the Whittemore & Knafl five-stage framework
Paton et al. [96]	Not Applicable	To identify self-management actions and risky behaviour avoidance strategies within interventions	A scoping review
Chin et al. [97]	Taiwan	To determine pre-hospitalised diabetes-related foot ulcer (DFU) self-management behaviours and explore the factors associated with these behaviours.	Cross-sectional design
Wazqar et al. [98]	Saudi Arabia	This study aimed to assess the level of patients' knowledge and practices regarding self-care of diabetic foot among diabetic patients.	A cross-sectional analytical study
Desalu et al. [99]	Nigeria	This study aimed to determine the knowledge and practice of foot care among diabetes patients attending three tertiary hospitals in Nigeria.	Cross-sectional study
Mbisi et al. [100]	Kenya	Foot Care Practices among Type 2 Diabetics Mellitus Patients Attending Diabetes Clinics in Embu County, Kenya	A descriptive survey
Jing et al. [101]	Malaysia	This study aims to identify the level of foot care knowledge and self-care practices among diabetic patients in the primary care setting.	A cross-sectional study
Hirpha et al. [102]	Ethiopia	To describe the patterns of foot self-care practice among diabetic patients attending an ambulatory clinic	A descriptive cross-sectional study
Bekele et al. [103]	Ethiopia	To identify the diabetic foot self-care practices among diabetic patients in southwestern Ethiopian hospitals	A cross-sectional study

Dietary management is crucial to maintaining optimal glycaemic control, and the foundation for successful nutritional management is the requirement for individuals with diabetes to possess the necessary skills and abilities to engage in healthy eating.[64] The American Diabetes Association [74] recommends weight loss and monitoring the intake of carbohydrates, fibre-containing foods, cholesterol, saturated fats, trans fats and sodium, which are integral parts of DM treatment.[75] The best possible glycaemic control and improved quality of life for patients with diabetes are dependent on optimal dietary management.[74] While good nutritional management of diabetes is seen to be the most challenging component of managing the condition, the majority of patients with diabetes do not practice it [75] due to additional behaviour, including following good eating habits, reading and utilising food labels to their benefit, as well as organising suitable meals for themselves.[74]

The overall health objective is to improve glycaemic control, decrease the need for anti-diabetes, and lower cardiovascular risks. [22] Thus, the recommended dietary regimen should include a variety of healthy foods drawn from all food groups [67] such as a diet high in fibre and low in carbohydrates, trans-fats, saturated fats, refined grains, and glucose beverages.[76] One of the key components in managing T2DM is adherence to dietary recommendations, which lowers blood pressure, normalises lipid abnormalities, and improves glucose levels and DM prognosis, all of which are linked to a reduced risk of diabetes complications.[77]

Table V: Summary of the studies on general body care practices

Authors	*Location*	*Objective*	*Study Design*
		GENERAL BODY CARE	
Kirwan et al. [61]	Not Applicable	To assess the essential role of exercise in the management of type-2 diabetes	A review
Ukai et al. [107]	Japan	This study investigated whether the follow-up interval can be extended by comparing the clinical outcomes and cost for monthly versus bimonthly follow-up of patients with well-controlled diabetes mellitus	A retrospective cohort study
Zhao et al. [108]	China	To determine whether the follow-up frequency for Type 2 diabetes mellitus (T2DM) patients in the National Metabolic Management Centers (MMCs) leads to different clinical outcomes	A prospective, observational, real-world study
Nyong'a et al. [109]	Kenya	To assess the effect of the health-seeking behaviour on glycaemic control among Type 2 diabetes mellitus female patients aged 35-60 years in Taveta sub-County Hospital	A descriptive cross-sectional design
Afroz et al. [110]	Bangladesh	To identify the determinants of glycaemic control among people with Type 2 diabetes mellitus in Bangladesh	A cross-sectional study
Sekimoto & Li [111]	Japan	To analyse patient data to investigate the presence of SID in the treatment of chronic diseases at the regional level in Japan	A comparative study
Animaw & Seyoum [36]	Ethiopia	This study aimed to assess the prevalence of diabetes mellitus in urban and rural dwellers in a low-income country from both younger and older populations and to identify related factors.	This is a community-based comparative cross-sectional study
Li et al. [82]	China	Examine the regularity of follow-up attendance and blood glucose monitoring in a primary care sample of Type 2 diabetic patients at moderate-to-high CV risk and explore factors associated with poor engagement.	Cross-sectional study

Healthy eating is essential to achieve good glycaemic control in DM care; it aims to improve overall health by achieving and sustaining the best nutritional status, attaining good glycaemic control, and preventing both short and long-term complications of DM.[78] The World Health Organization [79] and Rajasekharan *et al.* [68] recommended a minimum of 400 grams of fruits and vegetables daily because adequate intake of fruits and vegetables is better in controlling blood glucose levels, they keep complications such as gastrointestinal tumours, cardiovascular and cerebrovascular diseases at bay. Better awareness in this direction is essential for patients with

T2DM; therefore, this component should be given more attention.[79] Diet has been found to help reduce blood glucose levels of T2DM patients by 58 per cent.[69]

As shown in Figure 2, most foods (carbohydrate, proteins, fruits and vegetables) are available in a typical Nigerian market. This means that food accessibility among DM patients might not be an issue; however, affordability will be a factor that influences the quantity and quality of food consumed. For example, a study among DM patients in Nigeria that assessed the development of frameworks for DM peer education on food choices found that despite the availability of fruits and vegetables in the local markets, the majority consumed less than three servings of fruits (68%), vegetables (53%) and fruit and vegetables (68%).[80]

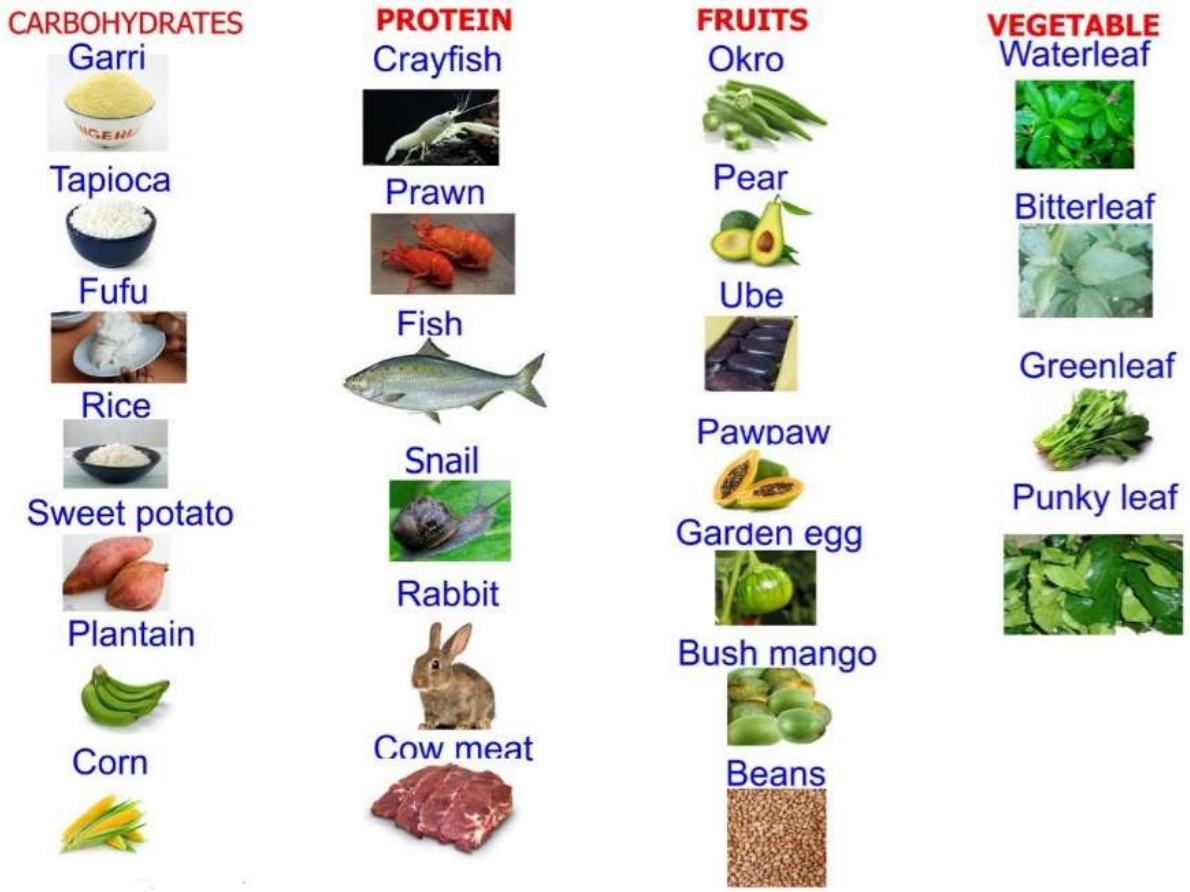

Figure 2: Pictograph of Common Foods in Local Markets in Nigeria
Source: Nwose *et al.* [80]

Self-monitoring of Blood Glucose (SMBG)

Self-monitoring of blood glucose (SMBG) is a crucial component of the modern treatment protocol for diabetes patients. It helps patients achieve optimal glycaemic control and prevent hyperglycaemia and hypoglycaemia by collecting detailed data on blood glucose concentration at different times.[81] Diabetes becomes apparent when blood glucose concentration exceeds the normal blood glucose level.[82] Self-monitoring allows patients to determine the impact of various diabetes self-

care activities on blood glucose levels, provides real-time feedback, and reveals derangements such as post-prandial hyperglycaemia and acute complications such as hypoglycaemia.[67] Provision of remedial actions such as adjusting dietary intake, physical activity, and insulin dosages to improve glycaemic control daily are all necessary for achieving this.[67,82]

Self-monitoring of blood glucose allows patients to assess their responses to treatments, self-care routines, attainment of glycaemic goals, and adjustment of insulin dosages/oral anti-glycaemic agents, which improve the prognosis of the disease.[83] It includes assessment of capillary glucose concentration (self-measurement), interpretation of readings, and responses to readings (self-regulation).[22] It acts as a crucial mechanism for evaluating and improving DM prognosis, quality of diabetes control and the judicious use of SMBG may greatly help in managing diabetes mellitus and help in preventing the secondary as well as tertiary complications of the disease among patients.[84] A study conducted in Jimma University Medical Centre in Ethiopia reported a lack of SMBG as a determinant of poor glycaemic control.[85] Other studies in Nigeria also reported poor SMBG practices.[19,86] A study conducted on the Frequency of Follow-Up Attendance and Blood Glucose Monitoring in Guangdong province, Southern China, identified that patients' engagement in blood glucose monitoring was sub-optimal and living in rural areas and having poor awareness of diabetes complications act as a significant barrier.[82]

The key component of diabetes therapy is patient participation in disease control, which is improved by SMBG.[87] SMBG can assist in fixing a therapeutic regimen in response to blood glucose values. At the same time, the frequency of SMBG levels has been reported to be associated with clinically and statistically improved glycaemic control regardless of diabetes types or therapies.[81] Continuous blood glucose monitoring makes the titration of drug dosages easier, which is necessary for monitoring blood glucose levels. Patients with diabetes have a lot of difficulties in this area due to a lack of knowledge about normal blood glucose levels; different testing techniques like Random Blood Glucose (RBS) and Glycated Hemoglobin (HbA1c), and tools or equipment are needed to conduct these tests like a glucometer and test strips.[64] Although costly, it is beneficial for achieving and maintaining near-normal blood glucose levels, a fundamental element of diabetes care; it provides feedback for therapeutic effectiveness, helping patients adjust insulin dosages, diet, and exercise regimens.[88] The purpose of SMBG is to gather comprehensive data on blood glucose levels numerous times to enable more precise regimens in order to maintain more stable glucose levels.[89]

Medication Adherence

Medication adherence is another aspect of self-care practices that is very important in achieving optimal glycaemic control. There are oral hypoglycaemic agents (OHA) and injectable medications. Medication adherence is essential because there are strong relationships between adherence to medication, patient outcomes and costs of treatments.[90] Compliance with diabetes treatment regimens may help achieve stable blood glucose and prevent complications, thereby enhancing the quality of life of people living with the disease.[91]

Diabetes patients must follow a specific set of behaviours in order to successfully manage their conditions independently; adherence to medication alone is insufficient for reasonable glycaemic control.[21] The level of education and treatment method the patient uses have been found to impact medication adherence significantly.[19] Other factors, such as older age, longer duration of diabetes, financial hardship, and higher education, have also been found to

have significant impacts on medication adherence.[92] According to a similar study in India, diabetes patients' nonadherence to medication can occur from unintentional factors such as irregular access to health facilities, lack of patient-perceived benefit from taking medication, fear of side effects of drugs, and increasing complexity of regimen.[29] Alhaiti *et al.* [28] in Saudi Arabia conducted a study on the adherence of Type 2 Diabetes patients to self-care activity among 385 respondents with T2DM in a tertiary care setting. The study revealed adherence to medication commitment activities was the most practised of all the domains, while other domains of self-care practices were relatively poor. Adequate and optimum glycaemic control is achievable if patients adhere to their medications as prescribed [93], as studies in Nigeria reported moderate to adequate medication adherence among diabetes patients. [19,86] This shows that patients can adhere to treatment regimens even in a low-resource setting with sufficient knowledge of the benefits of medication adherence. Consequently, it is necessary to continue to assess adherence level to medication and self-care behaviours in patients with T2DM as it will enhance the identification of poor medication adherence and assist in planning appropriate strategies to promote medication and other self-care practices. [75,92]

Foot Care

Diabetic foot care is regarded as activities to prevent foot ulcers, amputation, and maintain optimum health.[94] Diabetic foot care behaviours (DFCBs) entail the patients engaging in practices such as feet inspection, feet hygiene (washing and drying), care of toenails, basic wound management, and selection of appropriate footwear.[95] Clinical recommendations have emphasised the value of diabetes foot care behaviours in conjunction with glucose control in patients' diabetes self-management.[96] Proper footwear, daily inspection, and washing of the feet are crucial. Preventive diabetes foot care practices have been found to promote prompt seeking of medical attention, therefore preventing diabetic foot ulcers (DFUs) and amputations. [97,98]

Proper diabetic foot care is crucial to diabetes treatment for limb preservation.[64] Still, despite having significant effects on preventing foot complications, foot self-care practices are insufficient among diabetes patients in developing countries. For example, a study in Ghana reported poor practice of DM foot care and the relationship between poor knowledge of foot care and poor foot care practices.[99] Also, another study in Kenya documented the association between foot ulcers with walking barefoot in and out of the house, breaking into new shoes, and poor inspection of feet.[100] In addition to the direct costs of foot complications, there are indirect costs related to loss of productivity, individual patients and family costs, and loss of health-related quality of life. Foot self-care practices also reduce common foot issues like callosities, speed up the healing of foot ulcers and improve DM prognosis.[101] Studies have shown that awareness of proper foot care and other self-care techniques, such as daily inspection, hygiene habits, shoe choice, and seeking professional treatment for wounds and ulcers, can reduce the risk of foot complications.[98,102] Many complications are avoidable by thorough annual foot examinations, including closely examining the colour and temperature, paying close attention to the inter-digital spaces where blisters occur, and ambulating in protective shoe gear indoors and outdoors.[94]

The most complicated DM consequence, diabetes foot ulcers (DFU), are caused by neuropathy, deformity, and ischaemia, all enhancing an area's susceptibility to infection. [22] Poor foot care practices were identified as important risk factors for diabetic foot ulcer patients to develop surgical drainage of the foot, amputations, physical

disability, low quality of life, and high mortality rate. Diabetic foot ulcers often re-occur after healing, so prevention of DFU is essential.[103] Inappropriate footwear is the most common source of trauma, which highlights the value of frequent routine foot examinations.[104] Neuropathy alterations to the body reduce pedal sensations and make diabetic feet more vulnerable to mechanical and pressure injuries.[105] Reduced blood supply to the lower extremity due to microvascular alterations may lead to delay in wound healing.[94]

Furthermore, appropriate footwear, frequent inspection, and foot cleaning are crucial for the early detection and prevention of foot ulcers.[106] Prevention of foot ulcers and prophylactic foot care practices have been championed to minimise patient morbidity and the use of costly resources and reduce the likelihood of amputations.[100] Poverty, lack of sanitation and cleanliness, and walking barefoot frequently exacerbate the effects of diabetes foot damage; thus, to lessen the financial burden of diabetes foot damage, prevention of these ulcers is crucial.[102] Prevention of foot ulcers and infections is important to improve DM prognosis. Regular foot inspections help detect and prevent the development of diabetic foot ulcers, which are a common and serious complication of diabetes. Furthermore, effective management of minor injuries and proper wound care practices help prevent infections and promote healthy DM prognosis. Healthy feet contribute to better mobility and the ability to engage in daily activities, which is crucial for maintaining independence and overall well-being. [103]

General Body-Care and Follow-Up

Total body care and active follow-up are essential components of DM care because they support and reinforce self-care recommendations, improve quality of life and prognosis, and prevent serious consequences.[61,107] Three aspects of diabetes care are the main emphasis of follow-up care: yearly foot inspections, medication or medical therapeutic regimen, and routine testing in patients with well-controlled diabetes.[108] Finding an effective follow-up schedule for managing chronic diabetes helps promote DM prognosis and ease the financial and medical burdens that diabetes has on the population and health care system as a whole. A study revealed that women attending scheduled clinic check-ups had better glycaemic control than women who never attended or missed scheduled check-ups.[109] A similar research aimed at identifying glycaemia regulation determinants among people with T2DM was done in Bangladesh by Afroz *et al.* [110] Their results showed poor glycaemic control was associated with a low level of education, infrequent follow-up, and insulin use. However, there are significant regional variations in the amount of follow-up, and there are no recommendations based on scientific data.[111] There are inconsistent findings from several research studies that have examined the connection between follow-up frequency and metabolic outcomes in T2DM patients.[111]

Although evidence regarding follow-up intervals for patients with DM is sparse and contradictory, frequent follow-up may be acceptable if it results in favourable patient outcomes. [108] Follow-up reminders must be incorporated into diabetes routine care processes because timely follow-up is essential in determining patients' adherence to regimens and encouraging patients to follow optimal treatment plans. [36,82] It also aids in detecting any deviation from normal health, improving DM prognosis and preventing complications.[108]

Implications of SCP Adoption for healthcare and policy

Diabetes is a chronic disease that requires long-term management and care. This often places financial, psychological and social burdens on the healthcare system, patients and their families.

Self-care practices are any human regulatory function under the patient's control, deliberate or self-initiated.[109] Therefore, healthcare professionals' attitudes towards DM patients, especially as it concerns education and counselling towards the adoption of the highlighted SCPs, should be comprehensive and holistic to encourage practice. Family members should be ready to assist and bear the financial cost associated with the management of DM, particularly among older people who might not have the privilege of being occupationally productive. This will go a long way to reduce mental stress as a result of the financial burden on drugs, dietary components, and other expenses associated with the management of the disease.

For the Nigerian government, existing policy and strategic plans, such as the Nigerian multi-sectoral action plan for NCD prevention and control, should be appropriately tailored to the dynamics of DM management in facilities across the country. In addition, the government can redesign existing insurance policies to reduce the burden of out-of-pocket expenses on patients and their families, especially as it concerns the purchase of medications; the cost of medications has gone astronomically too high in the last year due to general inflation on price commodities in Nigeria.

Strengths and limitations of the review

This review provides a broad perspective and understanding of the trends related to self-care practices concerning prognosis in DM, mainly in developing countries. It also highlighted the gaps in existing literature on self-care practices and determinants of self-care practices among DM patients. The review was limited to studies available online during the research. It did not include quantitative synthesis, statistical analysis, or meta-analysis, which could restrict the conclusion about the strength of evidence or the magnitude of the effects presented.

Conclusion

Diabetes mellitus is a common major public health problem due to the mortality and range of morbidities attributed to the disease considerably affecting lower and middle-income countries, especially Nigeria. Self-care practices are the cornerstone of T2DM management, which entails six core components with the overall aim of maintaining glycaemic control and preventing complications. Adherence to prescribed dietary regimens and medication contributes to maintaining optimum health with the end product of optimal glycaemic control. Frequent foot care and foot examination focus mainly on reducing the risk of peripheral neuropathy, thereby preventing lower limb amputations as well as reducing other morbidity and mortality of DM. Moderate or vigorous physical activity contributes to total body care by maintaining the body's metabolism and body mass index through weight management. SMBG, total body care and follow-up care are essential to achieving desirable outcomes in T2DM care.

Recommendations

It can be recommended that promoting education and training by developing and disseminating educational resources that emphasise the importance of self-care practices, including physical activity, healthy eating, blood glucose monitoring, medication adherence, and foot care, are essential.

Strengthening Healthcare Support Systems by establishing or improving support systems facilitates regular follow-up and personalised care plans and encouraging community-based programs are equally germane. Collaborations, advocacies and appropriate policy formulations will promote awareness and practical application of SCPs. Governments should be encouraged to enhance access to needed resources in diabetes care particularly in rural and underserved areas.

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