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# Self-management practices for preventing complications of type II diabetes mellitus in low and middle-income countries: A scoping review

Pauline Muthoni Maina<sup>\*</sup>, Melanie Pienaar, Marianne Reid

University of the Free State, South Africa, Faculty of Health Science, School of Nursing

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## ABSTRACT

**Introduction:** The projected increase in the prevalence of diabetes mellitus globally is expected to hit the low and middle income countries the hardest. The majority of the day to day disease management activities needed to achieve glycaemic control and improve the quality of life among patients with diabetes mellitus falls on the patient and/or their families. Determining the self-management practices by patients with diabetes mellitus can help develop interventions that can enhance these practices and help prevent complications.

**Objective:** The current study aimed to explore the self-management practices of patients with type II diabetes mellitus in low and middle-income countries to prevent complications.

**Design:** A scoping review was conducted using the Joanna Briggs Institute approach to conducting scoping reviews. The context of the review was low and middle income countries with the core concept being self-management practices for prevention of complications.

**Methods:** Articles in Scopus databases and on the EBSCOHost platform were searched, as were their reference lists. If abstracts met inclusion criteria, full articles were downloaded and data extracted. The review included original research studies, published in the English language. The research studies included in the review were conducted between the year 2000 to 2022 among patients diagnosed with type II diabetes mellitus.

**Results:** This search yielded 823 articles; after deduplication, twelve studies were included in the final list. Four categories of self-management practices for preventing complications of type II diabetes mellitus were identified. The categories are i) acquisition of diabetes-related knowledge, ii) essential skills to manage diabetes mellitus, iii) lifestyle modification, and iv) availability of psychological support and follow-up.

**Conclusions:** Most diabetes care is dependent on patients' self-management levels. The studies reviewed in this article show that patients are capable of adequate self-management when practices are tailored to their needs.

**Registration:** The scoping review protocol was registered in the Fig Share platform on 17th January 2022 under the digital object identifier <https://doi.org/10.38140/ufs.17206751>

## What is already known

<sup>\*</sup> Corresponding author at: Pauline Muthoni Maina P. O Box10544-00200. Nairobi

E-mail addresses: [muthonipauline015@gmail.com](mailto:muthonipauline015@gmail.com) (P.M. Maina), [pienaarma@ufs.ac.za](mailto:pienaarma@ufs.ac.za) (M. Pienaar), [reidm@ufs.ac.za](mailto:reidm@ufs.ac.za) (M. Reid).

- a) Self-management practices are essential for managing diabetes.
- b) Low levels of self-management practices occur among patients diagnosed with type II diabetes.
- c) Improved health outcomes occur when patients with type II diabetes practice self-management.

### What this paper adds

- a) Tailored self-management practices lead to positive behaviour change.
- b) Self-management practices within low- and middle-income countries focus on acquiring basic diabetes-related knowledge, essential skills to manage diabetes, adoption of lifestyle modifications, and the availability of psychological support and follow-up.
- c) Self-management practices for preventing diabetes complications within low- and middle-income countries focus mainly on foot care and hypo/hyperglycemia.

## 1. Introduction

The management of diabetes is a dynamic and ongoing process. In diabetes management, there is an almost constant flow of new knowledge, changes in treatment strategies, and changes in health care environments, which require the active participation of patients, and contribute to the complexity of diabetes management (Gharaibeh and Tawalbeh, 2018). Diabetes is one of the non-communicable diseases of which the prevalence is steadily increasing globally. The trend is expected to continue, with a projected increase of 55%, from 425 million in 2019 to 700 million in 2045 (Saeedi et al., 2019). In 2019, the global prevalence of diabetes mellitus was 9.3%, with type II diabetes accounting for more than 90% of all diabetes mellitus cases, while type I diabetes and gestational diabetes accounted for less than 10% of all cases (Khunti et al., 2021).

Interventions for type II diabetes target key biomarkers such as blood pressure, glycated haemoglobin, fasting plasma glucose, and body weight within target levels to prevent complications or delay disease progression. The most prevalent complications of type II diabetes include microvascular events, including neuropathy, nephropathy, and retinopathy, or macrovascular events such as atherosclerosis, aneurysm, embolism, peripheral vascular diseases, cerebrovascular disease, or coronary artery disease (Denicolò et al., 2021; Kahkoska and Dabelea, 2021). Half of people diagnosed with type II diabetes present microvascular complications, and 27% have macrovascular complications (Davies et al., 2018). Chronic kidney disease is one the most common and devastating complications of diabetes, with 20% - 40 % of all persons diagnosed with type II diabetes developing kidney disease (Davies et al., 2018; Denicolò et al., 2021). Diabetic foot is another well-known complication of uncontrolled diabetes affecting 4%- 10% of people diagnosed with type II diabetes (Pourkazemi et al., 2020). Other complications include diabetic retinopathy, cataracts, erectile dysfunction, and non-alcoholic fatty liver disease (Oluma et al., 2021; World Health Organization, 2019). More isolated complications of type II diabetes include ketoacidosis, typically associated with the stress of another illness, and hyperosmolar coma, which may occur in older adults (World Health Organization, 2019).

The health-related Sustainable Development Goals are committed to reducing premature mortality from non-communicable diseases such as diabetes by 30% by 2030. It is estimated that up to 4.2 million deaths in the 20 – 70 age groups are attributable to diabetes, contributing to about 11.3% of all deaths globally. In Africa, the proportion of diabetes-attributable deaths mainly occurs in persons under the age of 60 years (Saeedi et al., 2020). In addition, millions of people in low-income regions experience diabetes complications and an accompanying reduction in general well-being (Gammeltoft et al., 2022), which creates a ripple effect through multiple sectors of the economy (Awah, 2019). As such, the prevention of diabetes and associated complications is crucial to the achievement of Sustainable Development Goals, especially in low and middle-income countries.

The prevalence of type II diabetes is comparable in high-income and low and middle-income countries. Still, the projected increase in prevalence is expected to hit low and middle-income countries the hardest (Khunti et al., 2021). The populations in low and middle-income countries face challenges related to treatment inaccessibility and cost barriers, which make it difficult to obtain or sustain lifelong treatment for chronic conditions (Lemos Macedo et al., 2021). As a result, cases of patients going undiagnosed, defaulting on treatment, or not receiving adequate care abound in low and middle-income countries. In addition, health care financing in most low and middle-income countries is heavily reliant on external funding, which is primarily allocated to infectious disease control programmes, such as those for human immunodeficiency virus, malaria, and tuberculosis, with minimal allocations to non-communicable diseases (Kostova et al., 2021).

The majority of the day-to-day disease management practices for diabetes falls on the patient and their families. Self-management refers to a person's ability to adequately handle or cope with the symptoms, treatment, physical and psychosocial consequences, and lifestyle modifications involved in daily living with a chronic condition (Almutairi et al., 2020). Therefore, self-management is vital for achieving glycaemic control, improving quality of life, and lowering the cost of treatment (Edraki et al., 2020; Karthik et al., 2020). Studies have shown that persons living with type II diabetes with good self-management practices can reach and sustain glycaemic control and prevent frequent complications, while those that are lax in self-care often develop complications (Karthik et al., 2020; Oluma et al., 2021). Self-management support in persons diagnosed with type II diabetes could also improve clinical outcomes, such as fasting plasma glucose, lipid profiles, and blood pressure (Hisni et al., 2019). The leading self-management practices include a healthy diet, physical activity, self-monitoring of blood glucose, adherence to medicine, problem-solving, healthy coping mechanisms, and reducing risk behaviors (Almutairi et al., 2020; Karthik et al., 2020). Other documented self-care practices include weight/body mass index monitoring, regular foot care, and ophthalmic examination (Almutairi et al., 2020; Oluma et al., 2021).

Despite an abundance of literature on diabetes self-management, at the time of the current study, the author could not find

comprehensive information for the period starting in 2000 related to the specific self-management practices that patients diagnosed with type II diabetes in low and middle-income countries engage in to prevent complications. The current study explored the self-management practices that patients with type II diabetes in low and middle-income countries applied to prevent diabetes-related complications. This information may assist in developing tailored interventions to promote self-management practices by these patients.

### 1.1. Theoretical framework

The theoretical framework for this study was adopted from the integrative model for behavioural prediction (Glanz et al., 2008). The integrative behavioral prediction model guides predicting and understanding human behaviour through a reasoned action approach. According to the integrative model for behavioural prediction, any behaviour is highly likely to be performed if the individual has a strong intention to perform that behaviour. In addition, having the knowledge and skills needed to perform a behaviour, combined with the absence of environmental constraints that prevent a behaviour, and a strong intention to perform the given behaviour, result in a high probability of the behaviour being performed (Glanz et al., 2008). The current study focused on knowledge and skills as determinants of patients' intention to perform self-management practices. Therefore, not all determinants of the theoretical framework were applied in this study.

The integrative model for behavioural prediction proposes three determinants of intention – also referred to as perception – namely attitude to engaging in health behaviour (outcome beliefs), perceived norms concerning the behaviour (normative beliefs), and self-efficacy beliefs (Yzer, 2012). The intention to engage in a behaviour, in this case, 'self-management practices' by a patient diagnosed with type II diabetes, is likely influenced by the patient's attitudes, perceived norms, and self-efficacy. The patient's intention to engage in self-management practices, together with the patient's knowledge and skills, as well as social support, will ultimately influence the patient's level of performance in self-management practices.

## 2. Methods

A scoping review aims to map the key concepts in a research area and identify the primary resources and available evidence (Arksey and O'Malley, 2005). Scoping reviews enable researchers to identify relevant literature, regardless of the study design involved. In the current study, the Joanna Briggs Institute approach to conducting scoping reviews was applied (Peters et al., 2020).

### 2.1. Protocol and registration

When conducting a scoping review, the population, concept, and context approach is recommended to guide the development of a clear and meaningful review question. Population, concept, and context ensure that the scoping review question provides potential readers with important information on the review's focus, scope, and applicability (Peters et al., 2020). Concerning the prevention of complications, the review question of this study is, what are the self-management practices (concept) of patients with type II diabetes (population) living in low and middle-income countries (context)? The scoping review protocol was registered in the Fig Share platform under the Digital Object Identifier <https://doi.org/10.38140/ufs.17206751>

### 2.2. Eligibility criteria

The eligibility criteria stipulate the basis for considering whether data sources will be included in the scoping review (Yzer, 2012). The included articles had to be original research studies published in English and conducted between January 2000 and June 2022 among patients diagnosed with type II diabetes. This specific time period was chosen because of the focus of the World Health Organization on non-communicable diseases as a topic of global concern, based on the release of global health estimates about years lost through disability from non-communicable diseases (Mathers, 2020). The context was studies conducted in low and middle-income countries, and the core concept was self-management practices for preventing type II diabetes complications. Reasons for exclusion were related to content and type of study. *Content-related* reasons included that studies were not specific to patients with type II diabetes, referenced no specific self-management practices, that studies had been conducted in high-income countries, or articles were not published in English. Reasons related to *type of study* included were non-interventional studies. Non interventional studies were excluded since the link between self-management practice and preventing complications could not be verified. Additional exclusion criteria included studies on self-management practice development, reviews of practices, study protocols, practice guidelines, or letters to the editor.

### 2.3. Information sources

The current study sourced data from electronic databases, checked reference lists and contacted authors. Data were searched from Academic Search Ultimate, Africa-Wide Information, APA PsycArticles, APA PsycInfo, CAB Abstracts, CINAHL with Full Text, Communication & Mass Media Complete, Health Source – Consumer Edition, Health Source: Nursing/Academic Edition, Humanities Source Ultimate, MEDLINE, Open Dissertations, and Sociology Source Ultimate. Four authors were contacted via email after the initial search of electronic databases to request additional information on specific self-management practices reported in their articles; only one author responded. The reference lists of the included articles were searched for additional sources, and this search yielded ten

additional articles. Articles written in non-English were excluded due to a lack of budget to access translation services.

## 2.4. Search strategy

The development and revision of the search string were undertaken by the three authors and a subject librarian. An initial search was conducted across the Scopus databases and the EBSCOHost platform, followed by a brief analysis of the retrieved search records to assess the search string's effectiveness. The string was revised, and appropriate database filters were used to focus the search on patients with type II diabetes and complications of diabetes. The search string used in the current scoping review is presented in Table 1.

### 2.4.1. Source of evidence selection

The current study employed a two-step search strategy. During the first step, electronic databases were identified with the assistance of a subject librarian. This search yielded 1208 abstracts, reduced to 823 after automatic system and manual deduplication. The authors independently screened the abstracts against the inclusion and exclusion criteria. A review of the full-text articles followed this step to identify articles that met the inclusion criteria fully. The authors resolved disagreements arising from the independent reviews through discussion and consensus. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension flow chart in Fig. 1 shows screening and selecting evidence sources.

### 2.5. Data charting process

Data extraction in scoping reviews is also called data charting (Yzer, 2012). The authors developed an initial draft data extraction table in the current study and recorded key information from the articles in the initial draft table. The three authors continuously refined the draft to form the final data extraction table outlined in Appendix 1.

### 2.6. Data Items

The study extracted data on article characteristics such as the country of origin, participants' engagement characteristics, and contextual factors such as type of engagement activity, frequency, and intensity of engagement. The specific data items collected for the scoping review varied according to the review's focus, as outlined in Appendix 1.

## 3. Results

The results of the current review are presented through a discussion of the characteristics of the articles included in the review, a summary of identified practices and the self-management practices for preventing complications of type II diabetes, as shown in Table 2.

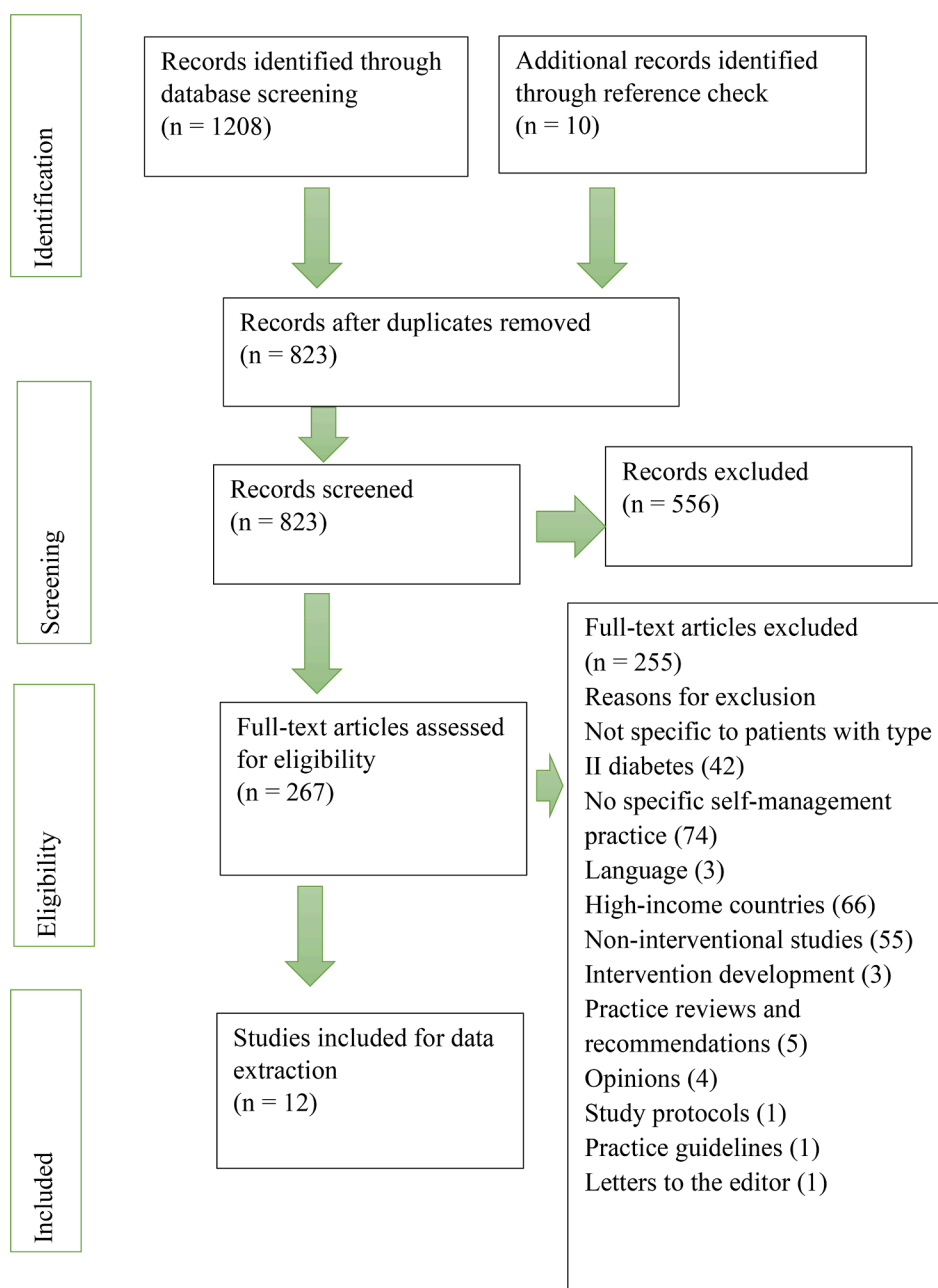
### 3.1. Characteristics of included studies

Twelve studies conducted among patients with type II diabetes were included in the review. The studies were from the following low and middle-income countries: one each from South Africa, Turkey, Vietnam, Palestine, Thailand, Mexico, Pakistan, and Brazil, and two each from Indonesia and Iran. The studies varied in research design used: Quasi-experimental (Herrera et al., 2015; Hisni et al., 2019; Iunes et al., 2014; Moradi et al., 2019; Nguyen et al., 2019), randomised controlled trials (Ahrary et al., 2020; Doğan and Enç, 2022; Pienaar and Reid, 2020; Shahid et al., 2015; Suryani et al., 2021; Wichit et al., 2017) and an observational study with pre- and post-test design (Rashed et al., 2016) were identified.

The delivery mode of the majority of the practices in the studies was a combination of group educational sessions and written material (Ahrary et al., 2020; Doğan and Enç, 2022; Herrera et al., 2015; Hisni et al., 2019; Iunes et al., 2014; Moradi et al., 2019; Nguyen et al., 2019; Rashed et al., 2016; Shahid et al., 2015; Wichit et al., 2017). Pienaar and Reid (2020) applied a peer support intervention combining face-to-face group sessions and home visits. Suryani et al. (2021) used a combination of modules and videos

**Table 1**  
Comprehensive search strings.

Comprehensive search string
(self-care or self-manag* or "self care" or "self manag*") and (diabet* or T2DM or DMT2) and (prevent* n3 (complication* or Cardiovascular or heart or "Nerve damage" or neuropath* or "Kidney damage" or nephropath* or "eye damage" or retinopath* or "Foot damage" or "diabet* foot")) and ti (diabet* or T2DM or DMT2)



**Fig. 1.** The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension flowchart illustrating the screening and selection process.

with home follow-up. Several articles developed the practices based on theories, such as self-efficacy theory (Nguyen et al., 2019; Wicht et al., 2017), Orem self-care (Ahrary et al., 2020), and motivational interviewing (Pienaar and Reid, 2020).

### 3.2. Identified practices in the reviewed studies

#### 3.2.1. Education

While all studies reviewed had an education/knowledge enhancement as a component, six studies had education/knowledge enhancement as the primary focus (Ahrary et al., 2020; Herrera et al., 2015; Hisni et al., 2019; Moradi et al., 2019; Nguyen et al., 2019; Rashed et al., 2016). The studies targeted improvement in metabolic control (Herrera et al., 2015; Moradi et al., 2019; Rashed et al., 2016), diabetic neuropathy (Ahrary et al., 2020), cardiovascular complications (Hisni et al., 2019), and foot care knowledge and practices (Moradi et al., 2019; Nguyen et al., 2019).

**Table 2**

Self-management practices identified in the studies.

Characteristics  (Author, date, country, study design)	Acquisition of basic diabetes-related knowledge					Acquisition of essential skills to manage diabetes					Adoption of lifestyle modification					Availability of psychological support and follow-up										
	General information on diabetes	Cardiovascular disease prevention	Diet selection	Metabolic control	Smoking cessation	Self-monitoring of blood glucose	Foot care	Lower limb home exercises	Developing action plans to prevent cardiovascular complications	Calorie estimation	Skills to cope with complications	Insulin use	Diet modification	Physical exercise	Smoking cessation	Weight reduction	Blood pressure control	Stress control	Getting adequate rest and sleep	Follow-up phone calls	Short message service (SMS) reminder	Involving family members	Follow-up examinations and photographs	Peer support	Alarms for reminders	Home visits
Nguyen et al., 2019, Vietnam, Controlled, observer-blinded, pre-test/post-test quasi-experimental study	*					*	*							*						*						

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Table 2 (continued)

Characteristics  (Author, date, country, study design)	Acquisition of basic diabetes-related knowledge					Acquisition of essential skills to manage diabetes					Adoption of lifestyle modification					Availability of psychological support and follow-up										
	General information on diabetes	Cardiovascular disease prevention	Diet selection	Metabolic control	Smoking cessation	Self-monitoring of blood glucose	Foot care	Lower limb home exercises	Developing action plans to prevent cardiovascular complications	Calorie estimation	Skills to cope with complications	Insulin use	Diet modification	Physical exercise	Smoking cessation	Weight reduction	Blood pressure control	Stress control	Getting adequate rest and sleep	Follow-up phone calls	Short message service (SMS) reminder	Involving family members	Follow-up examinations and photographs	Peer support	Alarms for reminders	Home visits
Osama et al., 2016, Palestine, observational study with pre and post-tests	*					*	*						*	*	*	*	*									
Wichit et al., 2016, Thailand, randomised controlled trial	*					*	*				*		*	*								*				
Moradi et al., 2019, Iran, quasi-	*						*														*					

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Table 2 (continued)

Characteristics  (Author, date, country, study design)	Acquisition of basic diabetes-related knowledge					Acquisition of essential skills to manage diabetes					Adoption of lifestyle modification					Availability of psychological support and follow-up										
	General information on diabetes	Cardiovascular disease prevention	Diet selection	Metabolic control	Smoking cessation	Self-monitoring of blood glucose	Foot care	Lower limb home exercises	Developing action plans to prevent cardiovascular complications	Calorie estimation	Skills to cope with complications	Insulin use	Diet modification	Physical exercise	Smoking cessation	Weight reduction	Blood pressure control	Stress control	Getting adequate rest and sleep	Follow-up phone calls	Short message service (SMS) reminder	Involving family members	Follow-up examinations and photographs	Peer support	Alarms for reminders	Home visits
experimental study																										
Hisni et al., 2019, Indonesia, quasi-experimental with pre- and post-tests	*	*							*					*	*					*		*				
Ahrary et al., 2020, Iran, randomised controlled trial	*			*		*						*	*	*	*			*	*	*		*		*		

(continued on next page)



Table 2 (continued)

Characteristics  (Author, date, country, study design)	Acquisition of basic diabetes-related knowledge					Acquisition of essential skills to manage diabetes					Adoption of lifestyle modification					Availability of psychological support and follow-up										
	General information on diabetes	Cardiovascular disease prevention	Diet selection	Metabolic control	Smoking cessation	Self-monitoring of blood glucose	Foot care	Lower limb home exercises	Developing action plans to prevent cardiovascular complications	Calorie estimation	Skills to cope with complications	Insulin use	Diet modification	Physical exercise	Smoking cessation	Weight reduction	Blood pressure control	Stress control	Getting adequate rest and sleep	Follow-up phone calls	Short message service (SMS) reminder	Involving family members	Follow-up examinations and photographs	Peer support	Alarms for reminders	Home visits
Herrera et al., 2015, Mexico, quasi-experimental	*		*	*	*	*				*			*	*												
Iunes et al., 2014, Brazil, prospective and quasi-experimental study	*							*														*				
Shahid et al., 2015, Pakistan,	*					*							*	*						*						

(continued on next page)

Table 2 (continued)

Characteristics  (Author, date, country, study design)	Acquisition of basic diabetes-related knowledge					Acquisition of essential skills to manage diabetes					Adoption of lifestyle modification					Availability of psychological support and follow-up										
	General information on diabetes	Cardiovascular disease prevention	Diet selection	Metabolic control	Smoking cessation	Self-monitoring of blood glucose	Foot cure	Lower limb home exercises	Developing action plans to prevent cardiovascular complications	Calorie estimation	Skills to cope with complications	Insulin use	Diet modification	Physical exercise	Smoking cessation	Weight reduction	Blood pressure control	Stress control	Getting adequate rest and sleep	Follow-up phone calls	Short message service (SMS) reminder	Involving family members	Follow-up examinations and photographs	Peer support	Alarms for reminders	Home visits
randomised controlled trial																										
Pienaar et al., 2021, South Africa, randomised controlled trial	*					*							*											*		*
Suryani et al., 2021, Indonesia, Double-blind randomised	*							*						*												*

(continued on next page)

Table 2 (continued)

Characteristics  (Author, date, country, study design)	Acquisition of basic diabetes-related knowledge					Acquisition of essential skills to manage diabetes					Adoption of lifestyle modification					Availability of psychological support and follow-up										
	General information on diabetes	Cardiovascular disease prevention	Diet selection	Metabolic control	Smoking cessation	Self-monitoring of blood glucose	Foot care	Lower limb home exercises	Developing action plans to prevent cardiovascular complications	Calorie estimation	Skills to cope with complications	Insulin use	Diet modification	Physical exercise	Smoking cessation	Weight reduction	Blood pressure control	Stress control	Getting adequate rest and sleep	Follow-up phone calls	Short message service (SMS) reminder	Involving family members	Follow-up examinations and photographs	Peer support	Alarms for reminders	Home visits
clinical trial																										
Doğan et al., 2021, Turkey, Randomised controlled experimental study	*																								*	

### 3.2.2. Follow-up

Four studies employed follow-up strategies to improve outcomes and/or prevent complications (Doğan and Enç, 2022; Nguyen et al., 2019; Shahid et al., 2015; Wichit et al., 2017). Dogan and Enc, (2022) used a reminder and diabetic foot mirror to improve feet-checking practices and reported a significant increase in the experiment group. Shahid et al. (2015) used mobile phone follow-up about self-care practices, including monitoring blood glucose, diet, and exercise. The study reported a significant positive association with the normalisation of HbA1c levels in the intervention group. Nguyen et al. (2019) combined educational intervention with regular booster follow-up phone calls over six months. The intervention group showed improved preventive foot care practices and decreased prevalence of foot risk factors for ulceration. Wichit et al. (2017) applied telephone calls as a follow-up strategy. A theoretically derived family-oriented intervention enhanced self-efficacy, self-management, glycemic control, and quality of life.

### 3.2.3. Exercises

Two studies evaluated home-based foot exercises' efficacy in preventing plantar diabetic ulcers (Iunes et al., 2014; Suryani et al., 2021). Suryani et al. (2021) assessed the effect of foot-ankle flexibility and resistance exercises in preventing the recurrence of plantar diabetic ulcers, HbA1c, and diabetic neuropathy in persons with a history of plantar ulcers. The study concluded that foot-ankle flexibility and resistance exercises could reduce the recurrence of plantar foot diabetic ulcer incidence and improve diabetic neuropathy and walking speed. On the other hand, Iunes et al. (2014) combined self-management guidelines with home exercises for improving ankle and foot plantar pressure and alignment among patients with type II diabetes. The study reported significant positive changes in forefoot alignment, mediolateral stability, body balance, and preventing complications.

### 3.2.4. Peer support

Only Pienaar and Reid (2020) utilized face-to-face peer support as self-management practice reporting a significant improvement in diastolic blood pressure in the intervention group but no significant difference in other outcomes, including HbA1c.

## 3.3. Self-management practices for preventing complications of type II diabetes

The authors identified four broad categories of self-management practices in the studies: acquisition of basic diabetes-related knowledge, acquisition of essential skills to manage diabetes, adoption of lifestyle modification, availability of psychological support, and follow-up.

### 3.3.1. Acquisition of basic diabetes-related knowledge

All twelve studies included a diabetes knowledge enhancement component in the practices. The general diabetes information consisted of definitions, symptoms, risk factors, types, pathophysiology, treatment, and complications of diabetes. Studies also refer to patients' education components relating to follow-up, physical exercise, medication adherence, weight management, diet selection, metabolic control, and smoking cessation (Ahrary et al., 2020; Doğan and Enç, 2022; Herrera et al., 2015; Hisni et al., 2019; Iunes et al., 2014; Moradi et al., 2019; Nguyen et al., 2019; Pienaar and Reid, 2020; Rashed et al., 2016; Shahid et al., 2015; Suryani et al., 2021; Wichit et al., 2017).

### 3.3.2. Acquisition of essential skills to manage diabetes

All the studies reviewed noted the need to address essential skills for enhancing self-management. The skill mentioned most was self-monitoring of blood glucose (Ahrary et al., 2020; Herrera et al., 2015; Nguyen et al., 2019; Pienaar and Reid, 2020; Rashed et al., 2016; Shahid et al., 2015; Wichit et al., 2017) followed by foot care to prevent ulcers (Moradi et al., 2019; Nguyen et al., 2019; Rashed et al., 2016; Wichit et al., 2017). Lower limb home exercises were also highlighted to improve ankle and foot plantar pressure, foot alignment, and flexibility or stretching and resistance exercises (Iunes et al., 2014; Suryani et al., 2021). Hisni et al. (2019) highlighted the importance of developing personal action plans to prevent behaviours that lead to cardiovascular complications and maintaining a medication logbook, while Herrera et al. (2015) included estimating calories and selecting foods from the different food groups. Additionally, the acquisition of skills needed to cope with diabetes-related complications and emphasis on self-administration of insulin were highlighted (Wichit et al., 2017; Ahrary et al., 2020).

### 3.3.3. Adoption of lifestyle modification

Some of the reviewed studies included a lifestyle modification component. The specific aspects highlighted include diet modification, physical exercise, smoking cessation, weight reduction, blood pressure control, stress control, and getting adequate rest and sleep (Ahrary et al., 2020; Herrera et al., 2015; Hisni et al., 2019; Nguyen et al., 2019; Pienaar and Reid, 2020; Rashed et al., 2016; Shahid et al., 2015; Suryani et al., 2021; Wichit et al., 2017).

### 3.3.4. Availability of psychological support and follow-up

Some of the interventions in the studies reviewed had psychological support and follow-up components. These components included: follow-up phone calls (Ahrary et al., 2020; Hisni et al., 2019; Nguyen et al., 2019; Shahid et al., 2015), short message service reminders (Moradi et al., 2019), family members' involvement (Ahrary et al., 2020; Hisni et al., 2019; Wichit et al., 2017), follow-up examinations and photographs (Iunes et al., 2014), peer support (Ahrary et al., 2020; Pienaar and Reid, 2020), setting alarms as reminders (Doğan and Enç, 2022), as well as home visits (Pienaar and Reid, 2020; Suryani et al., 2021).

#### 4. Discussion

The study aimed to review self-management practices for preventing complications of type II diabetes in low and middle-income countries. The review identified four broad categories of self-management practices for preventing type II diabetes complications: the acquisition of basic diabetes-related knowledge, the acquisition of essential skills to manage diabetes, the adoption of lifestyle modifications, and the availability of psychological support and follow-up.

Patients' knowledge and skills are highlighted as key components influencing the intention to engage in a behaviour in the integrative model for behavioural prediction. Knowledge and skills refer to the extent to which someone possesses the necessary information and ability to perform an activity. In the current study, knowledge and skills were defined as relating to the correct information regarding preventive self-management practices and the know-how to perform the preventive self-management practices. Additionally, perceived norms, which constitute the social and psychological support that patients with type II diabetes received from their families and health care providers through follow-up, were noted to enhance self-management practices. Perceived norms comprise injunctive norms. Perceived norms refer to support expected from one's social network for performing a behaviour. Descriptive norms refer to the extent to which one's social network performs the behaviour, with perceived norms being essential in determining someone's motivation to comply with a behaviour (Yzer, 2012).

Concerning the acquisition of essential diabetes-related knowledge, all studies reviewed had a component of diabetes-related knowledge enhancement. This reflects the importance of education in improving diabetes knowledge, self-management behaviour, and clinical outcomes, as well as reducing the occurrence or severity of diabetes complications. Diabetes education builds patients' knowledge and skills, enabling them to understand their condition and actively participate in their treatment plan. Understanding diabetes's pathophysiology, treatment/management, risk factors, and complications improves self-efficacy and self-management behaviour (Amer et al., 2018). This improvement could be because increased knowledge improves patients' perception of diabetes severity and susceptibility to its effects and improves their perceived ability to manage the disease.

Studies have found that diabetes self-management education programmes and interventions that include a diabetes self-management education component are effective in achieving clinically significant improvements in metabolic control (Chrvala et al., 2016; Muchiri et al., 2021) and in promoting positive health behaviours, including performing self-management activities (Edraki et al., 2020).

Several studies on the impact of educational interventions emphasise the central role of diabetes education in managing diabetes and improving clinical outcomes. A systematic review and meta-analysis by Kim and Hur (2021) regarding the effects of dietary education interventions on individuals with type II diabetes report improvements in HbA1c levels in the intervention groups after interventions, compared to control group members. This review was, however, not specific to low and middle-income countries. Similarly, a study conducted by Manickum et al. (2022) in South Africa reports that patients randomly assigned to educational intervention groups showed a significant improvement in foot care knowledge and practices after the intervention compared to patients who received instructional handouts and control groups.

Selecting a method for delivery of diabetes education is dependent on the local context, intended reach, cost-effectiveness, duration, educators, and intensity (Chrvala et al., 2016). A group-based approach is the most common approach to diabetes self-management education, probably because it is easier to implement, less resource intensive, and allows patients to share experiences (Odgers-Jewell et al., 2017). In low and middle-income countries, the in-person group-based approach to diabetes education is mainly due to the lack of resources to run more individualised programmes; sessions primarily consist of instructional sessions for groups of patients during clinic days (Muhoma et al., 2020).

Another practice highlighted in the reviewed studies is acquiring essential skills to manage type II diabetes. Self-monitoring blood glucose is the most commonly addressed skill, followed by foot care. The relative skewing of interventions towards self-monitoring blood glucose and foot care activities may be attributed to poor self-management practices observed concerning glucose monitoring and foot care. In low and middle-income countries, self-monitoring of blood glucose is one of the least practiced self-care activities among patients with diabetes (Habebo et al., 2020). Some of the most often cited reasons for low self-monitoring of blood glucose practice levels are financial barriers, such as the high cost of self-monitoring of blood glucose equipment and ignorance/low awareness of the importance of self-monitoring of blood glucose (Farhan et al., 2017).

However, some studies report moderate to high scores for self-monitoring blood glucose. For example, a study in India reports adherence to blood glucose monitoring once every three months at 75% (Karthik et al., 2020), while another study in Pakistan reports a 59% usage of home glucometers, with a mean use frequency of three times per week (Farhan et al., 2017). Higher adherence to self-monitoring of blood glucose could be due to the higher socioeconomic status of the study population, which means they can afford glucometers (Farhan et al., 2017; Karthik et al., 2020) and have higher education levels and awareness of self-monitoring of blood glucose (Farhan et al., 2017).

Concerning foot-care practices, overall foot care among patients with diabetes is low, and the levels of compliance for specific activities vary. For example, adherence to instructions to not walk barefoot and to wash/dry the feet regularly recorded high levels of practice (Durai et al., 2021), probably because these activities are practiced as part of safety and general personal hygiene, respectively. In contrast, practices such as foot inspection, wearing specialised shoes, moisturising, and nail care are reported to be largely neglected (Durai et al., 2021).

However, other studies found a moderate level of foot care practice. For example, a meta-analysis of foot care studies in Ethiopia reported a level of foot care practice at 64% (Dagnew et al., 2021). Furthermore, higher levels of foot care are reported in countries such as Sri Lanka, and the Middle East, where Islam is the predominant religion and foot hygiene is part of the religious rituals (Kaluarachchi et al., 2020). Common barriers to foot care practices for patients with diabetes include inadequate education on foot

care, general neglect (Pourkazemi et al., 2020), and the high cost of specialised footwear (Kaluvarachchi et al., 2020).

Some of the studies reviewed also included lifestyle modification components: physical exercise, diet modification, smoking cessation, weight reduction, blood pressure control, stress control, and getting adequate rest and sleep. This finding is consistent with a systematic review reported by Cotterez et al. (2014) that found a wide variation in the targeted aspects of lifestyle modification, which included diet, physical activity, coping skills, and reducing risks. These variations may be due to contextual differences that call for various practices depending on the most prevalent lifestyle-related issues affecting diabetes patients in the study areas. Including lifestyle modification components in diabetes management interventions could result from growing evidence that lifestyle changes are effective in managing diabetes and reducing the risks posed by type II diabetes. A systematic review by Bekele et al. (2020) concludes that lifestyle and dietary interventions for type II diabetes management in Africa are vital to preventing and managing type II diabetes.

Many lifestyle modification interventions focus on physical activity and diet management, either as stand-alone programmes or as components of weight management programmes. This may be because most patients with diabetes struggle to adhere to a diabetes diet (Hwalla et al., 2021; Muchiri et al., 2021), and most lack a good understanding of what a diet that is suitable for a person with diabetes entails (Karthik et al., 2020). Studies on adherence to dietary recommendations report varied results ranging from poor to moderate levels of adherence, depending on context. For example, a systematic review in Ethiopia reports a pooled adherence to dietary management by people with diabetes of 49% (Habebo et al., 2020), and a meta-analysis of self-care studies in the same country reports a 50% adherence to diet recommendations (Dagnew et al., 2021). Some key factors affecting adherence to a diabetes diet include high cost, social-cultural factors, lack of knowledge or motivation, and experiencing a feeling of deprivation (Hwalla et al., 2021; Muchiri et al., 2021). Addressing the need for diet management plans in resource-poor settings such as low and middle-income countries is necessary. The main challenge the patients and health care providers encounter is no one-size-fits-all diet plan (Evert et al., 2019).

Most studies in the current review emphasised physical activity as a critical component in self-management. Studies done in rural India reported low levels of engagement in physical activity, with no more than 50% of diabetes patients complying with the recommended practice (Durai et al., 2021; Karthik et al., 2020). In addition, for most people diagnosed with type II diabetes, physical activity has been found to decrease as diabetes progresses, mainly due to the development of complications, such as diabetes-related foot ulcers, painful joints, and fatigue, that make the performance of even simple physical activities difficult and painful or due to hesitance by patients who have experienced cardiovascular disease events to exert themselves (Puffelen et al., 2020).

The current review found that psychological support and follow-up was important component of interventions for preventing and managing diabetes complications. Psychological issues are common in persons with type II diabetes, who are 2–3 times more likely to be depressed than the general population (Berhe et al., 2020). The development of depression, in turn, negatively affects the ability of the patients to seek care promptly and perform self-management activities (Hapunda et al., 2017).

Increased social support improves psychological health, healthy behaviours, and adherence to prescribed management regimes. Consequently, enhancing social support at all levels of patient care is necessary to promote self-management practices in patients with type II diabetes (Huang et al., 2021). Two reviews of random controlled trials that implemented psychological interventions for patients with diabetes found that members of the intervention groups had slightly better levels of glycosylated haemoglobin than the controls (Chew et al., 2017; Winkley et al., 2020), as well as somewhat higher self-efficacy (Chew et al., 2017).

The studies in this review recognised the need for psychological support and follow-up. However, significant variability was noted in the modes of providing support. The modes included follow-up phone calls, short message service reminders, involving family members, providing peer support, and doing home visits. These variations result from sociocultural/contextual differences in different study areas, differences regarding the available resources, and demographic characteristics of the study populations, which determine what is logistically feasible and acceptable. This finding is consistent with a narrative review by Harvey (2015) which report a variety of psychosocial support intervention modes/forms, such as cognitive and behavioural therapy, family interventions, motivational interviewing/therapy counselling, interpersonal psychotherapy and the use of technology, such as text messaging, phone calls, and videoconferencing.

## 5. Limitations

Despite vigorously searching for relevant studies in various databases, some studies might have been missed or exempted due to publication bias; this may have led to underreporting of specific aspects of the results leading to the studies being exempted.

Despite these limitations, the current review identified areas of further research, such as self-care practices to address other complications of diabetes outside of metabolism-related complications and diabetes foot, as well as variations in diabetes self-care between patients in low- and high-income countries.

## 6. Conclusions

The majority of diabetes care is dependent on patients' self-management practices. The studies reviewed in this article show that patients can have adequate self-management when practices are tailored to address and enhance specific self-care activities. In addition, the review noted that diabetes self-management helps prevent complications and improve patients' quality of life.

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## Data availability

All the data reviewed in the current study are available in the published cited articles under the references section.

## CRediT authorship contribution statement

**Pauline Muthoni Maina:** Conceptualization, Data curation, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing. **Melanie Pienaar:** Conceptualization, Methodology, Supervision, Visualization, Writing – review & editing. **Marianne Reid:** Conceptualization, Methodology, Supervision, Visualization, Writing – review & editing.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Pauline Muthoni Maina

Dr. Melanie Pienaar

Prof. Marianne Reid

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## Supplementary materials

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