**The Effectiveness of Diabetes Management Methods in Africa: A Systematic Review**

**ABSTRACT**

A chronic illness that has spread like an epidemic around the world is diabetes mellitus. It has also grown to be a significant public health issue in Africa, a continent beset by underdeveloped healthcare systems that are unable to manage the combined consequences of infectious and chronic diseases. This study aimed to explore the effectiveness of public health programs targeted towards controlling and reducing the prevalence of diabetes mellitus in Africa. A systematic review approach was used for the study. For pertinent keywords that encapsulate ideas related to "Diabetes," "Intervention," and "Africa," searches were conducted across four scientific databases: PubMed, Cochrane, CINAHL, and Web of Science between January 2023 and October 2023. COVIDENCE was used to combine resources from several databases, and then deduplication and screening were carried out. Following a full text screening procedure, 13 papers were selected from the remaining 92 articles. An extra search of references produced two (2) more articles. A total of fifteen (15) papers met the inclusion criteria. The review's conclusions showed that couple-focused person-based interventions, hospital-based patient education programs, community-based patient education programs, mobile communication/ICT-based patient education programs, and nutritional education programs are the most often utilised diabetes management interventions in Africa. The results of this analysis demonstrated that despite significant obstacles and difficulties, these interventions have been successful in helping persons with diabetes achieve glycemic control and boost their sense of self-efficacy. Socioeconomic position, cultural sensitivity, and limited access to technology are a few of the issues noted.Despite the fact that these interventions were successful in controlling diabetes, it is still necessary to increase access to intervention programs by focusing on the communities that are most disadvantaged. Additionally, the nation's technological disparity must be closed by making sufficient infrastructural investments. To ensure effectiveness, the cultural dynamics of individual communication must also be taken into account while creating an intervention.

**Keywords:** *Africa, diabetes management, diabetes mellitus, public health.*

**Introduction**

One of the most prevalent non-communicable diseases that has reached epidemic proportions globally is diabetes, which has overwhelmed the healthcare system worldwide (Mirahmadizadeh et al., 2023). Studies based on projections from 2019 have reported that 1.1 million children and 463 million adults (aged 20 to 79) are estimated to have diabetes globally, and this number is projected to rise to 700 million by 2045 (Mirahmadizadeh et al., 2023). Individuals with type 2 diabetes mellitus (T2DM) require ongoing medical treatment to avoid micro- and macro-vascular problems, as is the case with many chronic disorders (Mirahmadizadeh et al., 2019).

Obesity, central adiposity and body mass index (BMI) play a pivotal role in the pathophysiology of T2DM, a chronic metabolic disease characterised by hyperglycaemia and associated with insulin resistance and/or insufficient pancreatic insulin production (Cunningham et al., 2021; Affi et al., 2018). The global obesity epidemic, ageing population, and population expansion are all contributing factors to the rise in type 2 diabetes mellitus (T2DM) incidence and prevalence (Karachaliou et al., 2020). The long-term nature of diabetes and its associated macrovascular and microvascular problems makes it an expensive disease that places significant financial strain on both the individuals who have it and the health care systems that serve them, especially in low- and middle-income countries (LMICs) (Karachaliou et al., 2020). When compared to upper-middle income nations (51%) and high-income countries (28%), the prevalence of T2DM is expected to climb to 108% in poor- and middle-income countries, where over 70% of those with the disease currently reside (Karachaliou et al., 2020). Pharmacotherapy in T2DM typically starts with non-insulin medications, primarily as oral therapeutics, such as metformin, sodium–glucose cotransporter 2 inhibitors (SGLT2i), dipeptidyl peptidase 4 inhibitors and injectable glucagon-like peptide 1 receptor agonists (GLP1RAs). These medications are initially utilised as monotherapy, then combination therapies, before moving to basal insulin for daily glucose control and subsequently progressing to multiple daily injections (MDI) if necessary (Ajjan et al., 2024).

In addition to medical treatments catered to each patient's unique social and living circumstances, managing type 2 diabetes involves the consistent availability of medications, laboratory facilities, data gathering instruments, skilled medical personnel, and informed and empowered patients (Correia et al., 2019). Endocrinology specialists, the health care of related subspecialties, the ability to pay for drugs and glucose monitors, and the resources to support diabetes research and public health campaigns are all present in high-income countries, helping to lower the incidence of these diseases (Karachaliou et al., 2020). However, a lot of LMICs face challenges such as inadequate laboratory facilities, a paucity of endocrinology specialists and clinical staff, and restricted access to diabetes supplies and treatments (Shoge et al., 2021). The general public's ignorance of diabetes and related co-morbidities has an impact on patients' use of healthcare services and compliance with treatment recommendations (Shoge et al., 2021). Patients' results in low- and middle-income countries (LMICs) are also impacted by economic hardships and the challenge of many patients' inability to buy prescription drugs and medical supplies (Karachaliou et al., 2020).

**Problem Statement**

Predictions indicate a concerning perspective of the progressively rising prevalence of T2DM in sub-Saharan Africa. In 2010, it was estimated that 12.1 million people had type 2 diabetes and 26.9 million had impaired glucose tolerance. By 2030, these numbers were expected to rise to 23.9 million and 47.3 million, respectively (Ojuka and Goyaram, 2014). The rising incidence of type 2 diabetes has been primarily linked to a more sedentary lifestyle, altered eating habits with elevated intake of added sugar, salt, and total and saturated fat, and systemic elements including urbanisation, industrialisation, and growing food globalisation (Debussche et al., 2018).

Diabetes has a significant impact on the health system and people in Africa, although this issue is rarely addressed in medical research (Shoge et al., 2021). This is made worse by insufficient health systems that cannot handle the combined effects of chronic and infectious illnesses (Debussche et al., 2018). Consequently, it is discernible to envisage that diabetes has a profound social and economic impact on the area, having an influence on employers and national economies through the loss of productivity (Nuche-Berenguer and Kupfer, 2018).

The combination of factors that accounts for the lack of necessary epidemiological data complicates patient tracking, and makes it difficult to forecast future pharmaceutical and human resource needs, including the availability of diagnostic facilities, access to diabetes treatment, seasoned medical workers, and limited emergency management response (Nuche-Berenguer and Kupfer, 2018; Abdullateef et al., 2021). The management of the disease and the reduction of its prevalence and incidence in many areas of the world have been found to benefit from interventions like task alteration and rotation of medical personnel, lowering expenses for access to care, guaranteeing a consistent supply of medication, increasing diagnostic capacity, developing, releasing, and refining practical clinical recommendations; incorporating diabetes modules into EMR systems; and educating both patients and healthcare providers, with a focus on disadvantaged populations (Nuche-Berenguer and Kupfer, 2018).

Therefore, this research aimed to know how effective non-clinical interventions are in improving the health and well-being of adults with T2DM in Africa.

**Research Design**

The current investigation entails a thorough examination of the available body of literature, using a systematic review approach. The study employs the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

**Research Questions**

As shown in the Table, this study’s research questions were formulated with the use of the PICO guidelines, which stand for Population, Intervention, Comparison, and Outcome. Researchers use this framework to organise their queries and develop search strategies that align with the study's pertinent notions (Page et al., 2020). Essential pieces of scientific evidence relevant to the inquiry were extracted using the aforementioned approach.

**Table 1**: PICO research framework

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | POPULATION | INTERVENTION | COMPARISON | OUTCOME |
| 1. | Adult T2DM patients in Africa | Non-clinical T2DM management intervention |  | Prevalence, treatment outcomes |
| 2. | Adult T2DM patients in Africa | Non-clinical T2DM management interventions | No T2DM intervention | Efficacy, Hospitalisation rate, mortality rate, treatment outcomes |
| 3. | Adult T2DM patients in Africa | Non-clinical T2DM management interventions | Barriers and Facilitators | Prevalence, treatment outcomes, hospitalisation rate, mortality rate |

**Literature Search**

**Databases used**

The literature for this research was obtained using an extensive search in four academic journal databases: CINAHL, PubMed, Web of Science, and Cochrane. The databases that were chosen had a significant correlation to the research problems that were being studied.

In addition, a secondary search was carried out to find any papers or articles that may have been missed in the first electronic database search. This was done to make sure that all relevant material was covered. Specifically, this included looking for relevant systematic reviews that weren't part of this study and all of the references used in the research found in the databases.

**Search terms**

In order to begin the research process, an initial investigation was conducted on Google Scholar to get insights into relevant subjects and conversations within the area of study that required additional investigation in this study. To include a broad spectrum of pertinent material, keywords such as "Diabetes", "intervention", "effectiveness", "efficacy", and "Africa" were used, as shown in Table 2.

The investigation was adjusted as required by the use of Boolean operators ('OR', 'AND', 'NOT') to either widen or limit the range. The use of the Boolean operator 'AND' enabled the combination of several concepts, resulting in a more focused search that included only relevant resources addressing all the investigated topics. In contrast, the 'OR' operator merged MeSH words inside each concept specified in the PICO framework. This allowed for a thorough evaluation of every conceivable manifestation or representation of the concept being investigated. Database-specific terminology and filtering choices were used as necessary. The utilisation of MeSH keywords from the database was used to identify the pertinent categories of publications, if appropriate, effectively.

**Table 2:** Search terms

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Concept 1: Population** | **Concept 2: issue** | **Concept 3: intervention** | **Concept 4: Outcome** | **Context** |
|  | Adult\* OR middle-age\* OR older adult\* | Diabetes OR Diabetes mellitus OR type 2 Diabetes OR type II diabetes OR T2DM | Intervention OR health intervention OR program\* OR programme\* OR initiative OR promotion OR health promotion OR behavioural OR lifestyle OR behavioural intervention\* OR lifestyle modification | Remission OR weight OR Weight management OR incidence OR Hospitalisation | Africa OR African OR African Countries |

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**Eligibility criteria**

The selection process for publications used for this research was sufficiently flexible to accommodate various study techniques, while still being appropriately rigorous in determining their relevance and disposition, as shown in Table 3. All publications identified from the primary database searches satisfied the inclusion standards outlined below:

**Table 3: Eligibility Criteria**

|  |  |  |
| --- | --- | --- |
|  | **Inclusion criteria** | **Exclusion criteria** |
|  | Quantitative, Qualitative and mixed-method research | Review articles and meta-analyses |
|  | Articles published in the English language | Conference papers |
|  | Only full-text article | Book chapters |
|  | Articles published in the last 10 years (2014 -2023) | Articles not published in English |
|  | Articles relevant to research objectives, i.e. those that address Diabetes treatment practices |  |
|  | Only research conducted in Africa |  |

**Screening and selection of papers**

The investigation results underwent deduplication using COVIDENCE and a two-stage screening technique to refine the preference to the most relevant articles. The use of this screening strategy was implemented to ensure that the chosen articles sufficiently addressed the main research question. The procedure of screening and selecting articles was facilitated by the use of COVIDENCE, a screening and data extraction programme formulated for performing systematic analyses. The use of this technology enables the process of screening to become more efficient and readily traceable.

The first stage was the screening of topics and abstracts. The papers underwent an initial evaluation procedure in which their topics and abstracts were scanned to get a thorough understanding of the content and determine their relevance. The screening questions used in this study were as follows:

1. What are the prevailing diabetes management services and interventions in Africa?
2. How effective are the diabetes management interventions in addressing T2DM among adults in Africa
3. What are the impediments and facilitators to diabetes management among adults in Africa?

The second stage included a comprehensive examination of the texts, with the purpose of evaluating the extent to which they conformed with the specified expectations and objectives of the current study. After the fulfilment of the selection procedure, information gathering and the examination of its quality were initiated (Arksey and O'Malley, 2005; Okpalauwaekwe et al., 2017).

**Quality Appraisal**

According to Page et al. (2020), chosen articles for a systematic review must adhere to certain quality indicators. Evaluating the academic value of publications used as foundational support in determining the final results is quite important. According to Okoli and Schabram (2010), using a uniformised format is the most optimal method for evaluating the standard of a research publication.

This study employed the Critical Appraisal Skill Programme (CASP) for Randomised Control Trials (refer to Appendix A), the CASP review checklist for Qualitative studies (Appendix B), and the JBI Appraisal tool for Quasi-experimental studies (refer to Appendix C) to assess the methodologies and findings of the selected publications.

A checklist was used in this research to assess the methodological aspects of the selected articles. The articles were allocated a score of 1 on the checklist if they provided a favourable answer to the assessment questions, whilst a score of 0 was given if the response was unfavourable or if there was inadequate information to draw a judgement. The cumulative scores were gathered and communicated as percentages. Articles scoring 70% or above were classified as high quality, while those scoring between 40% and 69% were classified as fair. Publications with a score below 40% were considered to be of inferior quality.

**Data Extraction**

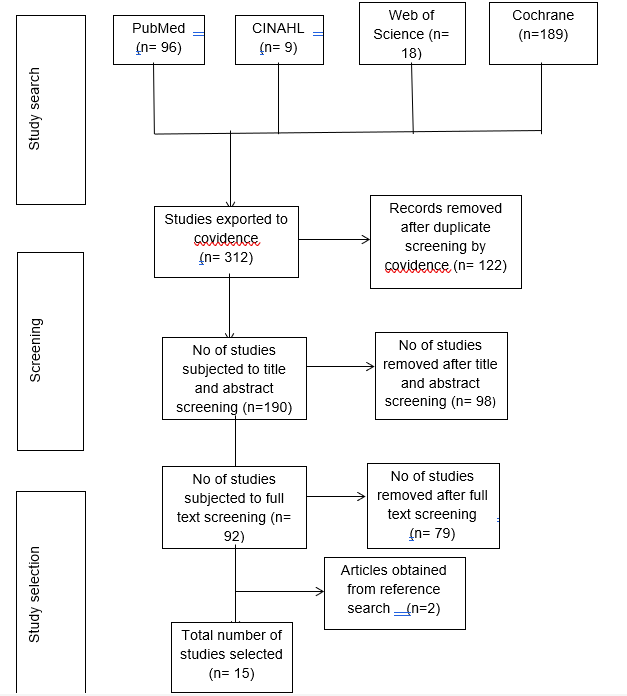
After conducting an in-depth investigation and achieving a sufficient representation of each document, a summarised articulation of the retrieved data was produced using Microsoft Excel. The data extraction approach adhered to the methodology described by Braun and Clarke (2006) and Retat et al. (2019). The data was extracted and organised into several categories, such as Author (Year), Title, Aim, Study Design, Sample Size, and Key Findings (including Identified Themes).

**Data Synthesis and Analysis**

The objective of this step, as per the proposals made by Arksey and O'Malley (2005), is to incorporate numerical overviews with theme analysis to formulate a coherent framework based on the findings of the systematic review. The information was organised in a data-charting manner to simplify comparison and guarantee consistency in the methodology (Arksey and O'Malley, 2005). The data was classified into themes by synthesising the results and evaluating studies that presented pertinent findings. The results were thereafter deliberated and further assessed using a comparative analysis with the current body of research (Owoade et al., 2019). Using these data, a thematic analysis was conducted to provide suggestions that might enhance investigators' and decision-makers' comprehension of the likelihood of future policy and practice.

**Overview of Included Studies**

The four databases/search engines that were used to compile the materials were PubMed, CINAHL, Web of Science, and Cochrane. 312 articles in all were found using the databases and search engine; these were sent to Covidence so that duplicate articles could be removed. There were 122 duplicate items removed in total. Following a thorough examination of the 190 papers that were still present, 98 papers were found to be unnecessary based on the inclusion and exclusion criteria. Following a full text screening procedure, 13 papers were selected from the remaining 92 articles. An extra search of references produced two (2) more articles, making the total number of papers included in this review fifteen (15). The PRISMA flow diagram that is given below highlights the procedures that were followed in article selection.



**Figure 1:** PRISMA flow diagram of selection process

**Study Characteristics**

This review included fifteen articles that all fulfilled the study's aim and objectives (see Appendix D). All of Africa's areas were studied, with the exception of North Africa. Five publications, four from South Africa (Mash et al., 2015; Muchiri et al., 2016; Smith et al., 2023; Whittington et al., 2023) and one from a joint publication between Malawi and South Africa (Leon et al., 2021), made up the largest publishing count for Southern Africa. Four publications were produced in West Africa (two from Nigeria (Essien et al., 2017; Okafor et al., 2023), one from Mali (Debussche et al., 2018), and one from Senegal (Wargny et al., 2018)). Three publications from East Africa were contributed (two from Kenya (Githinji et al., 2022; Theuri et al., 2023) and one from Rwanda (Amendezo et al., 2017)). There were two publications from Cameroon (Assah et al., 2015) and Congo (Takenga et al., 2014) in Central Africa. One publication was produced in a partnership between South Africa and Uganda (Guwatudde et al., 2022), two countries in Southern and East Africa.

The review's source publications used a variety of study designs. Eleven of the articles used the randomized control trial in different forms of adaptation; open-label randomized control trial (Debussche et al., 2018), parallel-group individual randomized control trial (Essien et al., 2017), cluster randomized control trial (Githinji et al., 2022; Guwatudde et al., 2022; Mash et al., 2015; Whittington et al., 2023), open controlled clinical trials with randomized time allocation (Wargny et al., 2018), and the regular randomized control trial (Amendezo et al., 2017; Muchiri et al., 2016; Takenga et al., 2014; Theuri et al., 2023) study designs. A quasi-experimental study was utilised in one publication (Okafor et al., 2023), a qualitative research study was carried out in two papers (Leon et al., 2021; Smith et al., 2023), and a non-randomised control trial study design was used in one publication (Assah et al., 2015). A variety of statistical techniques were used by the various studies to gather and analyse their data, including Fisher's exact test, the student t-test, Pearson chi-square, inductive and deductive analysis, modified Poisson regression modelling analysis of co-variance (ANOVA), multivariate linear regression, Markov micro simulation model, and descriptive statistics.

**Quality Appraisal of Selected Papers**

A critical appraisal of the selected papers revealed scores ranging between 46.1% and 90%. Eight of the selected papers (Essien et al., 2017; Mash et al., 2015; Debussche et al., 2018; Muchiri et al., 2016; Githinji et al., 2022; Whittington et al., 2023; Takenga et al., 2014; Amendezo et al., 2017) were considered of moderate (fair) quality, scoring between 46.1% and 69.2% while 7 papers (Guwatudde et al., 2022; Theuri et al., 2023; Wargny et al., 2018; Okafor et al., 2023; Assah et al., 2015; Smith et al., 2023; Leon et al., 2021) were of high (good) quality, scoring between 76.9% and 90%.

A total of 11 papers (Debussche et al., 2018; Whittington et al., 2023; Guwatudde et al., 2022; Muchiri et al., 2016; Essien et al., 2017; Mash et al., 2015; Githinji et al., 2022; Theuri et al., 2023; Wargny et al., 2018; Takenga et al., 2014; Amendezo et al., 2017) selected for this review used the randomized control trial method. The studies uniformly demonstrated a clear focus on well-defined research questions and employed random assignment of participants to interventions. This adherence to fundamental principles of RCT design contributes to the internal validity of the studies, ensuring a robust foundation for investigating the effects of the interventions. Furthermore, the proper accounting for all participants at the study's conclusion reflects a commitment to data integrity and strengthens the reliability of the reported outcomes.

While blinding of participants was generally reported across the studies, there were instances where this information was not provided ('Can't Tell') (Debussche et al., 2018; Whittington et al., 2023; Essien et al., 2017; Mash et al., 2015; Githinji et al., 2022; Theuri et al., 2023; Wargny et al., 2018; Takenga et al., 2014; Amendezo et al., 2017). This lack of transparency raises concerns about potential bias introduced by participant expectations. Additionally, the variability in blinding of investigators and outcome assessors underscores the importance of methodological rigour in minimising the risk of bias. The reported baseline similarity of study groups is a positive aspect, although the absence of this information in some studies ('Can't Tell') necessitates cautious interpretation of results. Notably, the equal treatment of study groups is an area where several studies fell short, potentially introducing confounding variables and compromising internal validity (Debussche et al., 2018; Whittington et al., 2023; Essien et al., 2017; Mash et al., 2015; Githinji et al., 2022; Takenga et al., 2014).

Comprehensive reporting of intervention effects was a strength across the studies (Debussche et al., 2018; Whittington et al., 2023; Guwatudde et al., 2022; Muchiri et al., 2016; Essien et al., 2017; Mash et al., 2015; Githinji et al., 2022; Theuri et al., 2023; Wargny et al., 2018; Takenga et al., 2014; Amendezo et al., 2017). This contributes to the transparency and interpretability of the findings. However, the inconsistent reporting of the precision of intervention effects and the balance between benefits, harms, and costs raises concerns about the completeness of information (Debussche et al., 2018; Whittington et al., 2023; Essien et al., 2017; Mash et al., 2015; Githinji et al., 2022; Theuri et al., 2023). Precision is crucial for understanding the reliability of reported results, and the absence of this information can limit the ability to gauge the clinical significance of interventions.

The majority of studies were deemed applicable to local populations or contexts, suggesting potential generalizability (Debussche et al., 2018; Whittington et al., 2023; Guwatudde et al., 2022; Muchiri et al., 2016; Essien et al., 2017; Mash et al., 2015; Theuri et al., 2023; Wargny et al., 2018; Takenga et al., 2014; Amendezo et al., 2017). However, the 'Can't Tell' designations in some cases indicate a lack of sufficient information for a definitive judgment on local applicability (Githinji et al., 2022). Assessing the value of the experimental interventions compared to existing practices is crucial for informed decision-making, and the positive evaluations across most studies suggest a perceived benefit in patient care (Debussche et al., 2018; Whittington et al., 2023; Guwatudde et al., 2022; Muchiri et al., 2016; Essien et al., 2017; Githinji et al., 2022; Theuri et al., 2023; Wargny et al., 2018; Takenga et al., 2014; Amendezo et al., 2017).

In general, the critical appraisal highlights both strengths and weaknesses across the evaluated RCTs. Adherence to fundamental RCT principles, comprehensive reporting, and perceived value in patient care are positive aspects. However, inconsistencies in blinding, potential confounding variables, and gaps in reporting precision emphasise the need for careful interpretation.

Furthermore, qualitative research methods were employed by 2 of the selected papers (Smith et al., 2023 and Leon et al., 2021). Both studies excel in providing a clear statement of their research aims, aligning them with their respective qualitative methodologies and research designs. The appropriateness of data collection methods in addressing the research issues is evident in both studies. However, concerns arise regarding the researcher-participant relationship in Smith et al. (2023) and the recruitment strategy in both studies. The lack of clarity in the assessment of the recruitment strategy for Smith et al. (2023) and the researcher-participant relationship in Leon et al. (2021) calls for a nuanced interpretation of these aspects.

While both studies share similarities in their methodological strengths, differences in the consideration of the researcher-participant relationship and recruitment strategy emerge. The lack of clarity in the recruitment strategy in Smith et al. (2023) and the unaddressed relationship dynamics in Leon et al. (2021) indicate areas for improvement. These variations highlight the need for a nuanced interpretation of the results and suggest potential avenues for refining future qualitative research methodologies.

Finally, two papers (Assah et al., 2015 and Okafor et al., 2023) used the quasi-experimental research method. One strength of the research is that participants included in comparisons are similar. This minimises potential confounding variables, bolstering internal validity and instilling confidence in the study's findings. Participants included in comparisons are reported to receive similar treatment/care, aside from the intervention of interest. This further fortifies internal validity by isolating the impact of the intervention from other external influences. The inclusion of a control group also marks a significant strength in quasi-experimental design. This aspect allows for more robust comparisons, enhancing the internal validity and reliability of the study. A limitation arises from the absence of multiple measurements of the outcome pre- and post-intervention. This limitation diminishes the study's ability to capture changes over time comprehensively, highlighting an area for improvement in future research.

**Research Findings**

**Community-Based Patient Education**

Of the fifteen studies analyzed for this study, seven discuss how well community-based patient education works for managing diabetes mellitus. (Amendezo et al., 2017; Assah et al., 2015; Debussche et al., 2018; Githinji et al., 2022; Guwatudde et al., 2022; Mash et al., 2015; Whittington et al., 2023) all provided evidence that community-based patient education was beneficial in raising glycemic control, lowering HbA1C, and enhancing quality-adjusted life years and retention in treatment for individuals with diabetes mellitus. These programs, which were tailored to each country's unique circumstances, became vital resources for tackling the widespread problem of diabetes mellitus and its treatment in a resource-constrained African setting. The programs are intended to inform, educate, and increase awareness about various lifestyle strategies that can be used in the management or prevention of diabetes mellitus among individuals with the disease as well as groups at risk. The core of these initiatives is the accurate dissemination of information regarding the role that physical activity, a healthy diet, and routine hospital check-ups have in the prevention and treatment of diabetes mellitus. Participants receive education on controlling blood sugar and insulin, managing their diet, exercising, and reducing their risk of cardiovascular disease. Additionally, the participants' understanding of hypo-hyperglycemia, diabetes complications, anti-diabetic medication, exercise, food, and foot care is affected. These programs use interactive teaching techniques to get participants actively involved. To guarantee ongoing involvement and follow-up, this frequently entails peer-led instruction, the utilisation of educational resources, and mobile communication. Certain programs include peer-led activities, making use of peer influence. Trained community mentors provide a supportive network of people with comparable experiences and obstacles by educating their peers about diabetes mellitus.

According to (Amendezo et al., 2017; Assah et al., 2015; Debussche et al., 2018), patients with diabetes or those at risk for the disease showed improvements in both anthropometric parameters and diabetic management when they received community-based patient education that included peer support. (Mash et al., 2015; Whittington et al., 2023) also pointed out that diabetes education provided by community health workers was efficient and economical in terms of raising quality-adjusted life years and glycemic control, respectively. (Githinji et al., 2022) claims that when a community-based intervention is tailored to participants' cultural sensitivity, it can enhance diabetes awareness and improve health attitudes in those who have the disease or are at risk for it.

**Hospital-Based Patient Education**

This intervention entails hospital staff members (nurses or doctors) educating people in a medical context. Peer support is not a part of it, which sets it apart from community-based patient education. In actuality, individuals may receive separate care at times in order to reduce bias and participant comparison of results (Abdullateef et al., 2021). Along with general diabetes management, which includes foot care, regular blood pressure monitoring, identifying the symptoms of hypo- and hyperglycemia, eye exams, and stress management, it also entails educating patients and those who are at risk about daily physical activity, adherence to diet therapy, daily glucose monitoring, and more. To guarantee adherence and reduce follow-up loss, educational resources and mobile communication are also used.

The significance of hospital-based patient education in the management of diabetes mellitus is highlighted in two of the studies (Essien et al., 2017; Okafor et al., 2023) for this review. (Essien et al., 2017) conducted a comparative analysis of two patient education approaches: intensive patient education, which was an adaptation of the highly successful United Kingdom's Health Educator Desk Guide of the COMDIS-HSD group to the Nigerian setting, and conventional patient education. Twelve two-hour structured training sessions, including topics such as diet and nutrition, exercise, foot care, glucose monitoring, medication compliance, and mechanism of action, were part of the intensive patient education program. The participants' regular hospital appointments do not coincide with the instructional sessions, which take place outside of the endocrinology department. In the endocrinology department, the conventional patient education was given in addition to routine hospital visits. (Essien et al., 2017) subsequently found that the intense patient education greatly enhanced the glycemic management of diabetics. In addition, Okafor et al. (2023) showed how a hospital-based patient education program enhanced participants' self-efficacy as lifestyle modifications were noted. Participants also showed greater awareness of hypo- and hyperglycemia symptoms, as well as improved stress and depression management skills.

**Mobile Phone Communication/ICT-Based Intervention**

The usefulness of ICT-based mobile communication interventions in the treatment of diabetes mellitus was demonstrated in four of the publications included in this review (Leon et al., 2021; Takenga et al., 2014; Theuri et al., 2023; Wargny et al., 2018). According to research by (Theuri et al., 2023), patients with diabetes who would not typically think to stick to a certain diet plan and meal times showed better adherence to prescribed dietary practices when they used mobile phone communication, particularly when it came to meal planning and frequency of meals. (Wargny et al., 2018) discovered that the use of SMS improved glycemic control in people living with diabetes, a benefit that persisted three months after the program's end. The SMS reminded participants of their dietary restrictions, meal schedules, and medications, as well as to be alert for any potential complications' symptoms. Though brief messaging is useful for raising awareness and serving as a reminder to follow certain guidelines, (Leon et al., 2021) pointed out that brief text messaging may not have been enough to improve health outcomes due to the complex context in which patients take their diabetes medication, which includes a variety of routinized, partial diabetes care adherence behaviors shaped by complex and interacting individual, social, and health service factors. The extent of the need for health services support and self-management indicates that digital communication interventions should be used in conjunction with other types of self-management assistance and a strengthened health system. (Takenga et al., 2014) claims that the Mobil Diab system, an ICT-based intervention, improved clinical results by reducing blood glucose and improving HbA1C. It accomplishes this by using a completely integrated provider-patient system. It allows patients to move about freely and assists with routine data entry, which makes it simpler for medical professionals to use the imputed data for individualised treatment and reduces errors.

**Couple-Focused Intervention**

In a particular intervention, couples with one member having diabetes were given a couple-focused intervention. This relationship-focused solution views the disease as a shared problem, which encourages communal coping. In this type of coping, partners share expectations about each other's health and work together to achieve desired results. For improved comprehension and communication necessary for efficient treatment, both spouses attend diabetes education training. According to the study, this intervention was successful in controlling meal timings, eating habits, exercise routines, medication use, and awareness in the event of difficulties (Smith et al., 2023).

**Nutritional Education Intervention**

This review included a study that looked at the intervention of nutritional education. In order to manage diabetes, this intervention uses diet education and nutrition. In order to help the patients better comprehend the disease and make healthier dietary choices, it entails educating and training them. In-depth instruction on the disease's aetiology, risk factors, symptoms, and complications is part of it, along with a demonstration of vegetable gardening. This intervention's main focus is on healthy eating practices, which emphasise diversity and a balanced diet. This intervention's other nutrition-related focal areas include meal planning on a tight budget and increasing vegetable supply through gardening. It was discovered that the intervention was successful in enhancing dietary habits and awareness of diabetes (Muchiri et al., 2016).

**Facilitators to the Success of Interventions**

Numerous interventions reviewed in this research were shown to be highly effective in managing diabetes, particularly when they involved changing one's lifestyle, adhering to medication schedules, and scheduling hospital visits. Psychosocial characteristics, cultural adaptability, and accessibility are a few of the elements linked to the effectiveness of these interventions.

**Psychosocial Characteristics**

Group therapy and peer-led interventions have been shown to be useful in managing a variety of diseases, including diabetes mellitus. This has been seen in numerous instances. The review incorporated three studies that highlighted the significance of psychosocial characteristics in the effectiveness of diabetes treatment regimens (Debussche et al., 2018; Githinji et al., 2022; Mash et al., 2015). A major contributor to the success of its structured peer-led diabetes self-management and support intervention, according to (Debussche et al., 2018), is the learning next approach, which combines peer education and interaction with the capacity to corporately monitor and modify behavioural strategies like exercise, diet, and medication adherence. (Mash et al., 2015) also mentioned how crucial and affordable community group support may be for individuals with diabetes in enhancing their quality-adjusted life years during a community-based intervention. (Githinji et al., 2022) asserts that the intervention's success was greatly attributed to the participants' ability to establish trust with the community health care providers, whose accessibility within the community allowed the program to be both scalable and sustainable.

**Adaptation to Culture**

Certain interventions' success has been linked to their ability to adapt culturally to the context and culture of the nation and region. In this review, three studies emphasised how crucial an intervention's capacity for cultural adaptation is to its effectiveness (Amendezo et al., 2017; Debussche et al., 2018; Githinji et al., 2022). (Debussche et al., 2018; Soori et al., 2025) pointed out that a key element in the success of the ST2EP intervention is the way it was customised to the cultural context of the community through the joint efforts of patients, medical professionals, and local peer educators. (Amendezo et al., 2017) added that a key factor in the program's success was training and educating the facilitators of its lifestyle education initiative to meet the cultural needs of the participants. (Githinji et al., 2022) added that participants' self-efficacy and nutritional intake improved, and their awareness of perceived susceptibility rose as a result of the intervention's cultural adaptation.

**Barriers and Challenges to Successful Diabetes Interventions in Africa**

The degree of progress made on the continent in terms of diabetes treatment shows that, despite the numerous successes reported in many of these interventions, there are still certain obstacles or difficulties that prevent the full success of some of these interventions.

**Socio-economic Barriers**

The socioeconomic barrier is one element that has posed a significant obstacle to the effectiveness of diabetic therapies. Four studies in this review (Githinji et al., 2022; Mash et al., 2015; Smith et al., 2023; Theuri et al., 2023) emphasised the difficulty that socioeconomic barriers present for treatments to be successful. (Theuri et al., 2023) pointed out that the low consumption of fruits and vegetables and poor meal variety that some participants reported can be linked to economic constraints, which also make it difficult to follow basic dietary guidelines for the management of diabetes. According to couples using a couple-based approach intervention (Smith et al., 2023) also found that one of the main obstacles to the success of diabetes management interventions is poverty and unemployment. (Mash et al., 2015) also mentioned this socioeconomic barrier, citing reports that many study participants were too poor to have functioning cell phones, making it impossible to follow up with them. (Githinji et al., 2022) also stated that obstacles to the effectiveness of diabetes control interventions include financial constraints, social influences from friends and family, poverty, and insecurity.

**Cultural Perception**

The way a culture views a particular food, disease, or diet can have an impact on how well diabetic interventions work. Another cultural barrier to the efficacy of diabetes management interventions is the inflexibility of some cultural customs and people's resistance to change or adapt to new ways of doing things. (Theuri et al., 2023) discovered that even while fruits were readily available during the study period, many participants showed scepticism about consuming them or did not consume any at all because of the cultural belief that fruits are sweet and hence unhealthy for people with diabetes. (Leon et al., 2021) claims that some of the obstacles to the effectiveness of an SMS-based intervention are adherence to deeply ingrained cultural customs and behaviours. Smith also pointed out that a barrier to the intervention's success is couples using a person-based approach's lack of understanding of the illness and self-management practices.

**Staff Shortage**

A further obstacle to the success of intervention is the lack of healthcare workers. (Guwatudde et al., 2022) noted that the SMART2D pragmatic implementation trial's execution was insufficient. Rapid staff turnover, organisational change, and inadequate supervision of community health workers were linked to this poor implementation. (Essien et al., 2017) further stated that a hindrance to the effectiveness of hospital-based educational intervention is the lack of physicians and nurses. Additionally, it was noted that while many physicians and nurses favour the intervention's implementation, hiring educators and other professionals will come at a cost, which will act as a barrier (Soori et al., 2025).

**Limited Access to Technology**

For intervention programs, navigating Nigeria's technological world offers both a difficulty and an opportunity. Though technology can increase access, there is still a problem with the digital divide. (Takenga et al., 2014) highlights how underprivileged communities are excluded from digital initiatives because they have restricted access to the internet. Initiatives for digital inclusion run by governmental and non-governmental organisations can offer instruction in digital literacy. This gives the underprivileged population the ability to use technology and access online resources for intervention. Interventions can also have an offline-first design, which guarantees accessibility in places with spotty internet access. By utilising the widespread use of mobile phones, telephone counselling can be integrated to provide support to even the most remote areas with limited internet connection.

**Individual Accountability**

A key component of any therapeutic program's success is the patients' individual accountability. Even with education and reminders via text messaging, some people did not take the initiative to put the knowledge they had learned into practice, thus the influence was not observed at all in them, according to Muchiri et al. (2016), who stated that the nutrition education intervention did not produce the necessary outcome.

**CONCLUSION**

The research covered in this review shows the effectiveness of many intervention programs designed to control diabetes mellitus that have been implemented in numerous African nations, as well as the ongoing difficulties they face. This study has revealed a number of significant findings and roadblocks that demonstrate the difficulties or barriers to the effective application of diabetes control treatments.

First off, a number of the effective interventions are community-based, demonstrating that peer instructors leading community education groups can significantly improve members' attitudes and understanding about diabetes. These findings demonstrate the importance of diabetes education in empowering individuals with the disease to make informed decisions about their food and way of life. Second, hospital-based treatments that teach patients how to use medical professionals in a hospital context can also help patients with diabetes manage their diabetes and feel more confident in themselves. A couple-focused person-based strategy that offers a dyadic viewpoint to support and assist couples in setting health objectives and cooperating to achieve them for better outcomes is one of the additional interventions mentioned in this review. Another extremely helpful intervention is mobile communication and ICT-based therapy, which is especially helpful for time-constrained working people since it allows users to maintain their health management without the need for frequent hospital visits.

Socioeconomic disparities continue to be a major obstacle to the effectiveness of diabetes control treatments. Research indicates that a person's access to financial and educational resources may have an impact on their incapacity to follow intervention guidelines or manage their diabetes appropriately. Low socioeconomic position can make it more difficult to access healthcare and educational opportunities, which lowers the effectiveness of therapies. Therefore, closing these inequalities and guaranteeing that everyone has equitable access to resources are crucial components of a comprehensive diabetes treatment plan. The availability of infrastructure and technology has an impact on the effectiveness of interventions. Access to healthcare facilities and technology may be restricted, which could potentially hinder the effectiveness and scope of therapies. Consequently, innovative projects that leverage technology and community-based strategies might be able to overcome these challenges and reach a larger audience. Lastly, cultural factors present unique challenges for diabetes care strategies. Cultural customs, values, and practices may support or undermine efforts to manage diabetes. Interventions need to be culturally aware and respectful of local customs and norms in order to be successful and acceptable within certain communities.

**Recommendations**

1. Multifaceted intervention strategy: Considering the range of challenges the research uncovered, a multifaceted intervention plan is needed. Programs ought to integrate hospital-based education, mobile communication/ICT-based intervention, and community-based empowerment and education. This comprehensive approach may address multiple challenges concurrently and raise the likelihood of success.

2. Cultural Adaptability: It's critical that treatments are customised to the target demographics and cultural contexts. Since cultural factors have a significant impact on behavior and attitudes, it is crucial for the effectiveness of treatments to comprehend and navigate area norms and values.

3. Constant Message Innovation: For prevention of message fatigue, communications provided to individuals with diabetes should be funny, inventive, and updated often in order to maintain their attention.

**COMPETING INTERESTS DISCLAIMER:**

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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