

An Analytical Exploration of Various Non-Pharmacological Approaches Utilized in Managing Diabetes Among Patients in Malaysia

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Abstract

Pharmacotherapy plays an important role in diabetes treatment, effectively managing the condition and reducing the risk of complications. Achieving optimal glycaemic control can help ease the strain on healthcare resources. However, one of the major challenges in diabetes management is poor adherence to prescribed medications. In Malaysia, reported adherence rates vary between 36% and 87% for oral antidiabetic drugs and between 54% and 81% for insulin therapy. To improve glycaemic regulation and reduce the incidence of complications, additional intervention methods beyond pharmacological therapies should be explored. These approaches include non-pharmacological and patient-driven strategies, which can function as independent methods or as supportive therapies alongside standard medication regimens. This study aimed to identify and consolidate key themes related to non-pharmacological strategies used in diabetes management within Malaysia. A comprehensive electronic search for English-language studies was conducted in four major databases (PubMed, Scopus, Web of Science, and OVID) using relevant search terms. A final selection of 22 studies was analyzed, revealing six major themes: diabetes education initiatives, patient empowerment efforts, adherence enhancement strategies, lifestyle modification programs, psychological support interventions, and shared decision-making processes. Further studies are needed to confirm these findings and to explore how these themes can be practically integrated into real-world healthcare environments to enhance patient outcomes.

Keywords: Patient management, Diabetes mellitus, Non-pharmacological, Interventions, Thematic analysis

Introduction

In 2003, an estimated 194 million people worldwide were diagnosed with diabetes, with 75% of cases occurring in developing nations [1]. By 2030, diabetes prevalence in these countries is projected to surge by 170%, whereas developed nations are expected to experience only a 42% increase. South East Asia has been identified as one of the regions most affected by diabetes and its associated complications [2]. Moreover, the significant public health burden posed by undiagnosed diabetes within Asian populations is frequently underestimated [3]. Many individuals in this region receive a diagnosis at an

advanced stage of the disease, increasing their risk of severe acute and chronic complications.

Malaysia, as part of Southeast Asia, faces a growing diabetes crisis, with patient numbers rising annually. In 2011, 20.8% of Malaysians were diagnosed with diabetes, a substantial increase from 14.9% in 2006 [4]. Among ethnic groups, the highest prevalence was recorded among Indians at 24.9%, followed by Malays at 16.9%, and Chinese at 13.8% [5]. Additionally, poor glycemic control remains a persistent issue among Malaysian diabetic patients. The mean glycosylated hemoglobin (HbA1C) level increased from 8.0% in 2003 to 8.66% in 2008 [5], with only 22% of patients achieving the recommended HbA1C target of 7% or lower. One contributing factor to the high diabetes prevalence in Malaysia is the rising incidence of overweight and obesity. Between 1996 and 2015, the proportion of overweight individuals increased from 16.6% to 30.0%, while obesity rates surged from 4.4% to 17.7%, reflecting an alarming rise of 80.7% and 302%, respectively [6].

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Pharmacotherapy remains one of the most effective strategies for attaining glycemic control and minimizing diabetes-related complications. However, treatment efficacy is often compromised due to poor adherence to prescribed medications. To improve diabetes management and reduce complication rates, the incorporation of non-pharmacological intervention strategies alongside conventional drug therapy has gained increasing attention. These strategies, which include patient-mediated approaches that enhance healthcare delivery through direct interaction with patients or through information exchange, are designed to support better disease control [7]. As highlighted in prior research, these interventions may encompass counseling, psychological and social support, patient empowerment initiatives, patient-centered education, adverse event awareness, nutritional guidance, exercise programs, and health coaching [8]. The implementation of these strategies typically varies based on local healthcare capacity and needs, and they may be delivered individually or in combination by professionals, healthcare organizations, or both.

Several systematic reviews have assessed the impact of non-pharmacological interventions on diabetes management [9, 10]. These evaluations have considered factors such as weight reduction, medication adherence, clinical outcomes, glycaemic control, and psychological well-being. Findings indicate that the effectiveness of these interventions varies depending on the approach used and the targeted outcome. Although studies have

documented the application of non-pharmacological strategies for diabetes patients in Malaysia, a comprehensive investigation into how these interventions are integrated into healthcare services remains lacking. Given that diabetes management in Malaysia involves a multidisciplinary team of professionals, including physicians, pharmacists, nurses, dietitians, and counselors, a wide range of non-pharmacological interventions may be in place. Therefore, a systematic review of these strategies is essential to better understand their implementation within healthcare settings and the coordination of services among healthcare professionals.

Materials and Methods

Search method

A comprehensive literature search was conducted across four electronic databases—PubMed, SCOPUS, Web of Science, and OVID—covering studies from their inception until May 30, 2020. Additionally, a manual review of reference lists from all identified articles was performed to capture any potentially relevant studies. To ensure inclusivity, related and synonymous terms were incorporated into the search process using dictionaries, thesauri, and previously established keywords. Boolean operators such as “AND” and “OR” were employed in constructing search strings once all relevant keywords had been identified (Table 1).

Table 1. Literature search strings for the review used in various

Database	Date assessed	Search string	Results
Pubmed	6 October 2020	((diabetes OR “type 2” OR “diabetes mellitus”) AND (MTAC OR (medication AND adherence) OR (medication AND review) OR compliance OR concordance OR adherence OR education* OR intervention OR (medication AND therapy) OR (clinical AND review) OR nutrition OR diet* OR behavior OR psych*) AND (Malaysia OR johor* OR Melaka OR malacca OR Sembilan OR selangor* OR wilayah OR “kuala lumpur” OR perak OR kedah OR penang OR pinang OR perlis OR Terengganu OR kelantan OR Pahang OR labuan OR sabah OR sarawak OR borneo))	2449
Scopus	6 October 2020	TITLE-ABS-KEY((diabetes OR “type 2” OR “diabetes mellitus”) AND (MTAC OR (medication AND adherence) OR (medication AND review) OR compliance OR concordance OR adherence OR education* OR intervention OR (medication AND therapy) OR (clinical AND review) OR nutrition OR diet* OR behavior OR psych*) AND (Malaysia OR johor* OR Melaka OR malacca OR Sembilan OR selangor* OR wilayah OR “kuala lumpur” OR perak OR kedah OR penang OR pinang OR perlis OR Terengganu OR kelantan OR Pahang OR labuan OR sabah OR sarawak OR borneo))	857
Web of Science	6 October 2020	TS=(diabetes OR “type 2” OR “diabetes mellitus”) AND (MTAC OR (medication AND adherence) OR (medication AND review) OR compliance OR concordance OR adherence OR education* OR intervention OR (medication AND therapy) OR (clinical AND review) OR nutrition OR diet* OR behavior OR psych*) AND (Malaysia OR johor* OR Melaka OR malacca	717

		OR Sembilan OR selangor* OR wilayah OR “kuala lumpur” OR perak OR kedah OR penang OR pinang OR perlis OR Terengganu OR kelantan OR Pahang OR labuan OR sabah OR sarawak OR borneo))	
OVID	6 October 2020	((diabetes or “type 2” or “diabetes mellitus”) and (MTAC or (medication and adherence) or (medication and review) or compliance or concordance or adherence or education* or intervention or (medication and therapy) or (clinical and review) or nutrition or diet* or behavior or psych*) and (Malaysia or johor* or Melaka or malacca or Sembilan or Selangor* or wilayah or “kuala lumpur” or perak or kedah or Penang or pinang or perlis or Terengganu or Kelantan or Pahang or Labuan or Sabah or Sarawak or Borneo)) ab, kf, ti	347

Data collection

The selected articles were transferred to the Mendeley reference manager for the organization, and any duplicate entries were removed. Studies were included if they examined non-pharmacological and patient-mediated approaches for managing diabetic patients, as outlined in prior research. These approaches could be utilized alone or alongside pharmacotherapy for type 2 diabetes mellitus (T2DM). Exclusions applied to systematic reviews, reviews, meta-analyses, meta-syntheses, books, book series, book chapters, and studies published in languages other than English, as well as those reporting services outside Malaysia. Article screening was conducted by FH, starting with an evaluation of titles and abstracts. Studies were excluded only when they met the exclusion criteria. If the eligibility of an article remained uncertain or if exclusion reasons were unclear, a full-text review was performed. FH and EMH independently assessed the full-text articles to determine inclusion. Any disagreements in article selection were resolved through discussion.

Analysis

A thematic approach was used to examine non-pharmacological strategies for diabetes management in Malaysia. The qualitative data analysis software ATLAS.ti facilitated the coding process, ensuring systematic identification of key themes. The selected articles were uploaded as primary documents, and data extraction was conducted without concealing author names or journal sources. Extracted details encompassed publication specifics, participant demographics, selection criteria, intervention methods, and study

outcomes. A second author cross-verified all extracted data, and any discrepancies were addressed through discussion. Initial codes were created following a detailed review of the articles, and related codes were grouped into broader themes. Each theme underwent a rigorous evaluation to confirm alignment with the coded extracts and the entire dataset. Ultimately, themes were refined, clearly defined, and labeled with specific names to ensure consistency in interpretation.

Results and Discussion

Study description

A total of 4,370 references were initially identified through the search process. After eliminating 2,081 duplicate entries, 2,289 articles remained for further screening. Following a review of the titles and abstracts, 2,149 studies were excluded, leaving 140 articles for full-text evaluation. From these, 22 articles met the inclusion and exclusion criteria and were incorporated into the final analysis. The process is visually represented in **Figure 1**, according to the PRISMA guidelines.

The key details of the selected studies are summarized in Supplementary **Table 2**. Among the 22 included studies, fourteen were randomized controlled trials (RCTs), 2 were cross-sectional studies, 1 was a non-randomized trial, 2 were quasi-experimental, 1 was a longitudinal intervention study, one used a pre and post-intervention design, and 1 was qualitative. These studies focused on various non-pharmacological patient-centered interventions. The studies ranged in publication from 2010 to 2020, with the earliest published in 2010 and the latest in 2020.

Table 2. Characteristics of included studies

Authors and year	Design	Setting	Providers	Intervention strategies	Duration/sessions	Outcomes measured
Lim and Lim, 2010	Cross-sectional	Outpatient clinic	Pharmacists	Adherence support Diabetes education	Eight sessions	Glycaemic control, lipid profile

Tan <i>et al.</i>, 2011	Randomized controlled trial	Outpatient clinic	Physicians	Patient empowerment	twelve weeks	Glycaemic control, diabetes knowledge, medication adherence, physical activity
Wong <i>et al.</i>, 2012	Randomized controlled trial	Outpatient clinic	Not mentioned	Patient empowerment	Six months	Glycaemic control, diabetes knowledge
Ismail <i>et al.</i>, 2013	Randomized controlled trial	Outpatient clinic	Multiple HCW	Patient empowerment	six months	Glycaemic control, blood pressure, lipid profile, body weight
Ahmad <i>et al.</i>, 2014	Pre and post-intervention	Community	Not mentioned	Diabetes education Patient empowerment	One session	Perceived benefit
Alvani <i>et al.</i>, 2015	Non-randomized controlled trial	Outpatient clinic	Therapists	Psychological intervention	twelve weeks	Glycaemic control, psychological wellbeing
Chow <i>et al.</i>, 2015	Randomized controlled trial	Outpatient clinic	Pharmacists	Adherence support Diabetes education Lifestyle adjustment Patient empowerment	two sessions	Diabetes knowledge, medication adherence
Sazlina <i>et al.</i>, 2015	Randomized controlled trial	Outpatient clinic	Physicians	Lifestyle adjustment Psychological intervention	twelve weeks	Physical activity
Bakar <i>et al.</i>, 2016	Cross-sectional	Outpatient clinic	Pharmacists	Adherence support Diabetes education Patient empowerment	Eight sessions	Medication adherence, patient's satisfaction
Butt <i>et al.</i>, 2016	Randomized controlled trial	Outpatient clinic	Pharmacists	Adherence support Diabetes education Lifestyle adjustment Patient empowerment	Six months	Glycaemic control, lipid profile, quality of life, body weight, medication adherence
Ibrahim <i>et al.</i>, 2016	Quasi-experimental	Community	Multiple HCW	Diabetes education Lifestyle adjustment Patient empowerment Psychological intervention	One year	Glycaemic control, blood pressure, lipid profile, quality of life, body weight, physical activity
Lee <i>et al.</i>, 2016	Randomized controlled trial	Outpatient clinic	Physicians	Patient empowerment Diabetes education Psychological intervention	One year	Glycaemic control, blood pressure, lipid profile, quality of life, self-efficacy, cost analysis
Lim <i>et al.</i>, 2016	Randomized controlled trial	Outpatient clinic	Pharmacists	Adherence support Diabetes education	Eight sessions	Glycaemic control, lipid profile
Ramli <i>et al.</i>, 2016	Randomized controlled trial	Outpatient clinic	Multiple HCW	Diabetes education Patient empowerment	One year	Glycaemic control, blood pressure, lipid profile, body weight
Wasif Gillani, 2016	Longitudinal interventional study	Outpatient clinic	Pharmacists	Diabetes education Patient empowerment	Six months	Glycaemic control
Ahmad <i>et al.</i>, 2017	Randomized controlled trial	Outpatient clinic	Physicians	Patient empowerment Diabetes education	Eighteen months	Glycaemic control, diabetes knowledge, retention rate
Sharoni <i>et al.</i>, 2017	Quasi-experimental	Long-term care institution	Nurses	Diabetes education Patient empowerment	Twelve weeks	Glycaemic control, diabetes knowledge, quality of life, self-efficacy, foot condition

Ayadurai <i>et al.</i>, 2018	Randomized controlled trial	Outpatient clinic	Pharmacists	Adherence support Diabetes education Lifestyle adjustment	Six months	Glycaemic control, blood pressure, lipid profile
Ramadas <i>et al.</i>, 2018	Randomized controlled trial		Not mentioned	Lifestyle adjustment Psychological intervention	Six months	Glycaemic control, dietary knowledge
Lee <i>et al.</i>, 2018	Qualitative		Not mentioned	Shared decision making Diabetes education	One session	Usability and utility
Chew <i>et al.</i>, 2019	Randomized controlled trial		Multiple HCW	Psychological intervention Diabetes education	eighteen weeks	Glycaemic control, blood pressure, lipid profile, quality of life, self-efficacy, diabetes distress
Lee <i>et al.</i>, 2020	Randomized controlled trial		Multiple HCW	Adherence support Patient empowerment	One year	Glycaemic control, blood pressure, lipid profile, quality of life, self-efficacy

The intervention durations in the studies ranged from 3 to 18 months, with follow-up sessions occurring between one and eight times. These interventions were carried out by various healthcare providers, including pharmacists, physicians, nurses, therapists, or teams comprising multiple professionals. Five studies utilized interventions delivered by a combination of two or more healthcare providers [11-15], while four did not specify the providers involved [16-19]. A large portion of the studies ($n = 20$) focused on examining the effects of non-pharmacological interventions across a wide range of

outcomes. Glycaemic control was the most commonly measured outcome, reported in 17 studies as either a primary or secondary measure. Other outcomes assessed included blood pressure, lipid profiles, body weight, psychological factors, knowledge retention, self-care practices, foot condition, and quality of life. 2 pilot studies [17, 18] evaluated the feasibility and practicality of the proposed interventions. Additionally, one study [20] outlined a protocol for an RCT on diabetes education and support strategies.

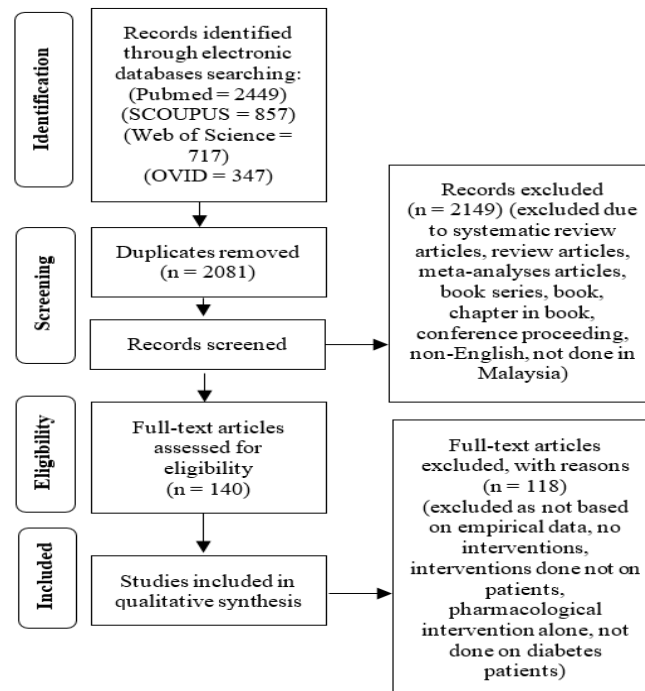


Figure 1. Article selection process.

Themes of interventions

The studies included in this review differed in terms of the intervention types, duration, and healthcare providers involved. A significant focus was placed on improving patients' knowledge and self-efficacy across most of the interventions. Six main intervention strategies were identified: diabetes education [12-14, 17, 18, 20-29], patient empowerment [11-13, 15-17, 20-23, 25, 26, 29,

30], adherence support [15, 23-28], lifestyle modification [12, 19, 23, 25, 27, 31], psychological interventions [12, 19, 20, 31-33], and shared decision-making [18]. Many studies integrated multiple strategies into their interventions. A diagram in **Figure 2** presents a network view of the various non-pharmacological approaches used in diabetes care.

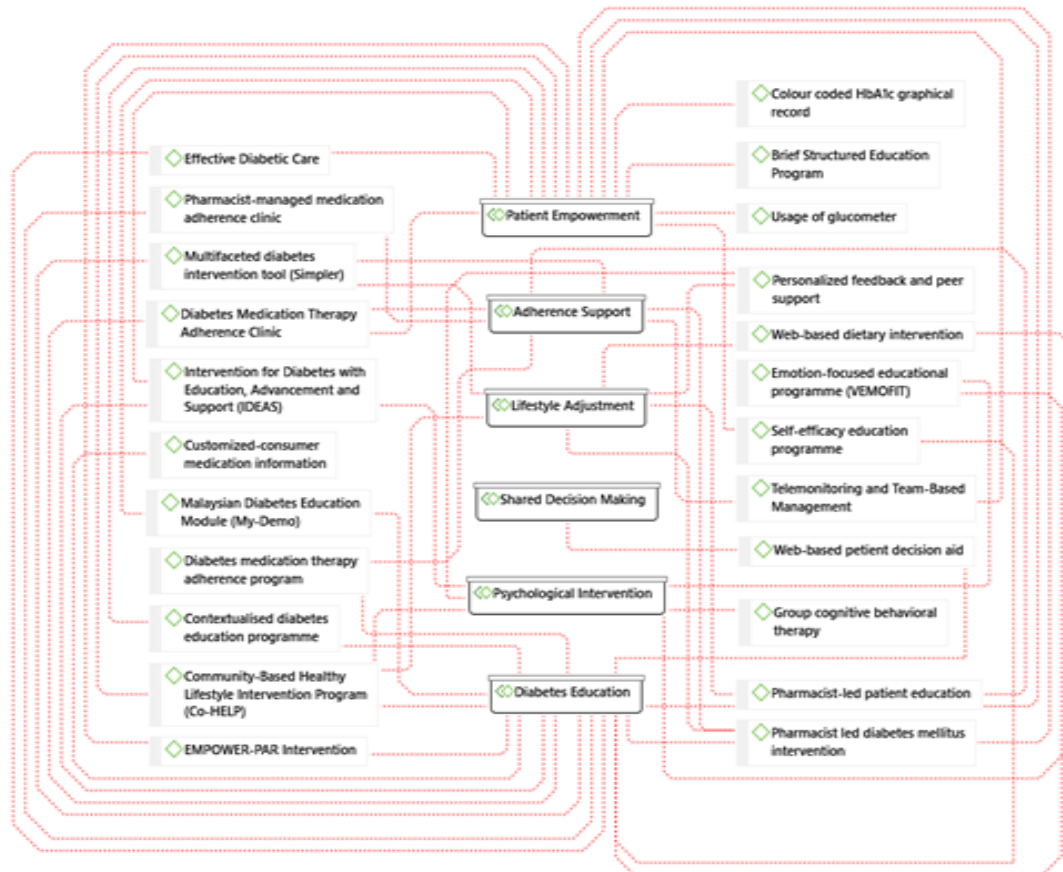


Figure 1. Network view on the themes of non-pharmacological interventions applied in the management of diabetic patients.

Diabetes education strategies

This review focused on identifying the various intervention strategies utilized in the management of diabetes in Malaysia. Among the strategies commonly implemented were diabetes education programs and patient empowerment. Other approaches, such as support for adherence, lifestyle modifications, psychological interventions, and shared decision-making, were also applied to varying extents. These interventions were carried out in outpatient settings, community environments, and patients' homes.

Out of the 22 studies reviewed, 16 incorporated diabetes education programs, either as stand-alone interventions or in combination with other strategies. The content of these programs varied depending on the study objectives and the healthcare provider delivering the program. For instance, dietitians primarily focused on dietary information, while pharmacists concentrated on promoting medication adherence. However, all programs included a fundamental diabetes education component, covering key topics such as diet, exercise, medication, complications, and self-care, in alignment with national

clinical guidelines [34]. Structured diabetes education programs are considered a significant advancement in managing diabetes without pharmacological treatment [35].

Recent research in Malaysia has shown that patients' diabetes knowledge tends to be lower among individuals with lower educational attainment and certain ethnic groups [36, 37]. This suggests the need for diabetes education programs to be specifically designed to address the needs of different population groups. The success of these multi-faceted education programs relies on collaboration among various healthcare professionals [38]. As diabetic patients frequently visit different healthcare providers, they may lose interest in education programs due to repetitive information. It is essential, therefore, to create a unified educational program, developed through the collaboration of multidisciplinary teams, to ensure the program's effectiveness.

Patient empowerment initiatives

Self-management has been a key focus in diabetes care since the 1970s, and systematic reviews have demonstrated its effectiveness in improving glycaemic control for both type 1 [39] and type 2 diabetes [40, 41]. Patient empowerment, which involves equipping individuals with the tools and knowledge to manage their diabetes, has become an essential aspect of diabetes management. In the studies reviewed, 14 used patient empowerment as part of their intervention, either alone or alongside other strategies. Six of these interventions were delivered through group activities [12, 14, 17, 20, 21, 32], where small groups of patients participated in interactive sessions and received guidance from trained facilitators. Group activities provide valuable emotional support, especially for individuals with chronic conditions, as they connect with others in similar situations. Evidence suggests that group-based patient empowerment activities can significantly improve metabolic control [42].

In addition to traditional methods, patient empowerment activities are also increasingly offered through digital platforms, such as mobile apps and online systems. However, only one study in Malaysia utilized technology-enabled self-management, incorporating a feedback loop that connected patients with their healthcare team. The study by Chow *et al.* [23] provides an example of how future diabetes self-management programs in Malaysia could incorporate multiple

components of self-care with technology-based feedback and personalized support.

Adherence support initiatives

Seven studies incorporated adherence support activities as a key part of their non-pharmacological diabetes management approach. These activities were typically led by pharmacists, either independently or as part of a team of healthcare professionals. The core components of these activities included reviewing patients' medication-taking behaviors, identifying instances of non-adherence, and uncovering the underlying causes of such non-compliance [43]. The goal was to implement appropriate interventions aimed at enhancing medication adherence. In Malaysia, the primary platform for delivering such services is the medication therapy adherence clinic (MTAC), introduced in 2006 by the Ministry of Health. Most interventions were carried out in outpatient environments, such as pharmacies or doctor's clinics, although Lee *et al.* [15] utilized telehealth as the mode of delivery. However, telehealth showed limited effectiveness compared to in-person consultations, as the interaction between patients and healthcare providers was insufficient to guide further treatment decisions. Future programs might benefit from creating more interactive telehealth solutions to overcome these challenges.

Lifestyle modification programs

Only one study incorporated lifestyle modification as part of the diabetes management strategy [31]. Interventions focused on changing lifestyle behaviors like diet and physical activity are crucial in diabetes care. The study involved providing personalized feedback with peer support to improve physical activity levels. Combining exercise, diet therapy, and pharmacological treatment has been proven to significantly benefit diabetic patients' glucose and lipid metabolism [44, 45]. Patients who received peer support in addition to personalized feedback demonstrated improved glycemic control compared to those receiving feedback alone. Since sustaining lifestyle changes in diet and exercise can be challenging, support from family and close social networks can provide vital encouragement [46]. Furthermore, lifestyle interventions seemed to yield better results when they were customized based on the patient's stage of readiness to change. Programs utilizing the stages-of-change framework led to more noticeable

improvements in physical activity and healthy eating [47]. One study within this review proposed that dietary changes should be promoted primarily for patients in the pre-contemplation and contemplation stages [19]. This targeted approach ensures that interventions focus on those most in need of assistance. Further exploration into using the stages-of-change model for other types of interventions would be beneficial.

Psychological support initiatives

Five studies examined the use of psychological interventions, such as motivational interviewing, cognitive-behavioral techniques, and behavioral modification strategies. These were designed to foster changes in behavior that would reduce stress and help prevent dropouts from the programs [12, 19, 20, 31, 32]. Diabetes patients face many psychological challenges in managing their condition, from following dietary restrictions to maintaining physical activity, performing regular blood glucose checks, taking medications, and adhering to foot care routines. Psychological interventions aim to help alleviate these pressures and encourage ongoing participation in the program. Combining psychological support with pharmacological treatment has been shown to improve diabetes management outcomes [48]. Establishing a strong relationship between the patient and the therapist is key to making lasting emotional, cognitive, and behavioral changes that promote adherence. However, more research is needed to identify the most effective psychological intervention techniques and the patient groups that would benefit the most from them.

Shared decision-making

Only one study incorporated shared decision-making as part of the management strategy for diabetes [18]. This approach involves a collaborative process where clinicians and patients jointly review the best available evidence before making healthcare decisions. During this process, both the patient's preferences and the clinical evidence regarding treatment options are shared. Patients are actively involved in the decision-making process, empowering them to take a more proactive role in their healthcare choices [49]. Previous research has highlighted that shared decision-making enhances patients' understanding of clinical evidence, which leads to more informed treatment decisions [50]. Furthermore, it has been shown to improve healthcare outcomes by

increasing patients' commitment to managing their health, including improving medication adherence.

This review marks, to the best of our knowledge, the first comprehensive integration of both theoretical and empirical literature on non-pharmacological interventions for managing diabetes in Malaysia. The six identified themes reveal a broad range of intervention strategies and demonstrate their relevance and applicability within the Malaysian healthcare context. These findings could inform the development of a more cohesive and comprehensive management model for diabetic patients. This review contributes to a deeper understanding of how healthcare providers in Malaysia can implement diverse intervention strategies to improve diabetes management. However, further research—both theoretical and empirical—is required to refine and support the proposed themes.

This study is not without limitations. First, the potential absence of relevant articles and unpublished content might limit the comprehensiveness of the review. However, significant efforts were made to ensure thoroughness in the literature search. The search approach was tailored to various databases and developed in collaboration with field experts. Second, although not the focus of this paper, assessing the effectiveness of various interventions would provide additional value and should be explored in future research.

Conclusion

The current article presents a thematic review of non-pharmacological approaches to managing diabetes in Malaysia. The analysis identified six key themes: diabetes education, patient empowerment, adherence support, lifestyle changes, psychological interventions, and shared decision-making. Future studies are needed to further confirm these themes through empirical research and to assess their practical relevance and effectiveness in real-world diabetes care settings.

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