

A Thematic Analysis of Non-Pharmacological Intervention Strategies in the Management of Diabetic Patients in Malaysia

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Abstract

Pharmacotherapy is one of the most effective treatments for the control of diabetes and the prevention of its complications. Optimal glycaemic control can reduce the healthcare burden. Nonetheless, the efficacy of diabetes management is often limited by poor medication adherence among patients. The level of medication adherence among diabetic patients in Malaysia has been reported to be 36%-87% for oral medication and 54%-81% for insulin injection. In order to increase the proportion of diabetic patients with good glycaemic control and low disease complications, other intervention strategies that are complementary to drug treatment should be considered. These strategies include all the non-pharmacological interventions and patient-mediated strategies that can be implemented either as standalone or adjunct therapy to promote better diabetic control among patients who are already prescribed with conventional pharmacotherapy. This study aimed to provide a synthesis of the themes for all the non-pharmacological intervention strategies applied in the management of diabetic patients in Malaysia. An electronic literature search for English articles in four databases (PubMed, SCOPUS, Web of Science, and OVID) was conducted using relevant search strings. Twenty-two articles were included in the final analysis. Six themes were identified, namely diabetes education programmes, patient empowerment programmes, adherence support programmes, lifestyle adjustment programmes, psychological intervention programmes, and shared decision-making. Further research is warranted to empirically validate these results and to obtain a better understanding of the themes that are most meaningful for patients as well as their practical application in real-life settings.

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

INTRODUCTION

In 2003, a total of 194 million of the world's population was estimated to be diabetic, with 75 percent being from developing countries [1]. The prevalence of diabetes in developing countries is expected to increase by 170% by 2030, compared with an increment of only 42% in developed countries. It is reported that South East Asia is among the regions with the highest prevalence of diabetes and complications globally [2]. Furthermore, the public health impact of undiagnosed diabetes mellitus in Asian population is often overlooked [3]. In this region, diabetic patients are commonly diagnosed at an advanced stage, thus leading to a higher number of acute and chronic diabetic complications.

Malaysia is one of the countries in South-East Asia that is highly affected by diabetes. Every year the number of diabetic patients continues to increase. In 2011, 20.8% of Malaysians were diagnosed as diabetics compared to only 14.9% in 2006 [4]. In Malaysia, Indians recorded the highest prevalence of DM at 24.9%, followed by the Malays (16.9%) and Chinese (13.8%) [5]. Additionally, Malaysian diabetic patients were also associated with poor glycaemic control. The mean glycosylated hemoglobin (HbA1C) levels among Malaysians were reported to increase from 8.0 % in 2003 to

8.66% in 2008 [5], with only 22% achieving the recommended HbA1C target of 7% and below. One of the possible reasons for the high prevalence of diabetes in this country is the increasing prevalence of overweight and obesity among Malaysians. The population of overweight and obese Malaysians rose from 16.6% and 4.4% in 1996 to 30.0% and 17.7% in 2015 [6], representing a dramatic increase of 80.7% and 302%, respectively.

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How to cite this article: Hassan F, Hatah E. A Thematic Analysis of Non-Pharmacological Intervention Strategies in the Management of Diabetic Patients in Malaysia. Arch Pharm Pract. 2022;13(3):62-9. <https://doi.org/10.51847/KkiibdIlok>

Pharmacotherapy is one of the most effective treatment modalities for achieving optimal glycaemic control and preventing the development of diabetes complications. Nonetheless, the efficacy of pharmacotherapy is often limited by poor medication adherence among diabetic patients. In order to increase the proportion of diabetic patients with good glycaemic control and low complication rates, non-pharmacological intervention strategies that are complementary to drug treatment were also increasingly used in diabetes management. Non-pharmacological strategies, including patient-mediated strategies that improve healthcare delivery through interactions with patients or via the information provided by or to patients, are aimed at promoting better control of the disease for diabetic patients [7]. As defined in a previous study, these strategies may include counseling, psychological and social interventions, patient empowerment, patient-centered training, explanation of possible adverse events, nutritional therapy, physical activity, and health coaching [8]. Such intervention strategies are usually introduced based on the capacity and needs at the local level. They can be provided in combination or as single strategies, and either by professionals, organizations, or both.

Several systematic reviews have been carried out to measure the benefits of non-pharmacological intervention strategies in managing diabetic patients [9, 10]. Those strategies were evaluated based on outcomes such as body weight reduction, medication compliance, clinical outcomes, glycaemic control, and psychological distress. The findings highlighted

that different intervention strategies might show a different level of effectiveness in achieving the main outcome of the intervention. Although there are reports on the non-pharmacological intervention provided for diabetic patients in Malaysia, a study is yet to systematically investigate the provision of such intervention in health care structure services. Since diabetic patients in Malaysia are jointly managed by a team of multi-disciplinary healthcare professionals, including physicians, pharmacists, nurses, dieticians, and counselors, numerous non-pharmacological intervention strategies could have been applied to the patients. Hence, it is important to review the reported non-pharmacological intervention strategies systemically in Malaysia and to evaluate how the services provided within and between health care professionals.

MATERIALS AND METHODS

Search Method

Article search was conducted in four electronic databases, namely PubMed, SCOPUS, Web of Science, and OVID, from inception to 30th May 2020. A manual search was also done on the reference lists of all identified articles to obtain all possibly relevant studies. Related and similar terms were included in the search using dictionaries, thesaurus, and relevant keywords listed in previous research. The search strings with Boolean operators such as "AND" and "OR" were created after all keywords were determined (**Supplementary 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 behaviour 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 behaviour 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 behaviour 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))	717
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 behaviour 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 final articles' list was exported to a reference database management software (Mendeley Reference Manager). Any duplicates were removed. The inclusion criteria for articles were reports on non-pharmacological and patient-mediated strategies in managing diabetic patients as defined in the previous studies. The strategies could be applied as standalone or as an addition to type 2 diabetes mellitus (T2DM) pharmacotherapy. Publications in the form of systematic review, review, meta-analysis, meta-synthesis, book series, book, chapter in a book and articles published in languages other than English and reported services, not in Malaysia were excluded from the study. FH screened the articles using titles and abstracts. Only articles with clear exclusion criteria were excluded from the study. The articles with the potential to be included or unclear reasons for exclusion will be screened using the full texts. The full-text articles were appraised independently by FH and EMH to identify their eligibility. Discrepancies in the included articles were resolved by discussion.

Analysis

The thematic analysis reviewed the non-pharmacological strategies used in managing diabetic patients in Malaysia. Qualitative data analysis software (ATLAS.ti) was used to code the relevant information before the themes were created. The articles were uploaded as primary documents in the software. Data from the included studies were extracted without blinding the authors or journals. These data included publication information, participant characteristics, selection processes, intervention strategies, and outcomes. All extracted data were checked and verified by the second

author. Discussions between the authors resolved inconsistencies in the extracted data. Initial codes were generated through the familiarisation of data in the articles. Similar or related codes were then grouped into possible themes. Each theme was reviewed closely to ensure that all the coded extracts and the entire data set were represented. Finally, the themes were refined and defined by assigning them clear definitions and names.

RESULTS AND DISCUSSION

Study Description

A total of 4370 references were located using the search strategies. Of this, a total of 2081 were found to be duplicates and hence removed, leaving 2289 articles that were fit for screening. Following title and abstract screening, a further 2149 references were excluded, and only 140 were included for the full-text screening. Of this, 22 articles fulfilled the inclusion and exclusion criteria and were included in the final analysis. Following the PRISMA guideline, **Figure 1** shows the flowchart of the search result.

The characteristics of the included studies were summarised in Supplementary **Table 2**. Of the total included studies, 14 were randomized controlled trials (RCT), two were cross-sectional studies, one was a non-randomized trial, two were quasi-experimental studies, one was a longitudinal intervention study, and one was a pre-and post-intervention study design, and one was a qualitative study. The non-pharmacological intervention strategies used in the study included a variety of patient-oriented intervention strategies. The earliest study was conducted in 2010, while the latest was in 2020.

Table 2. Characteristics of included studies

Author & Year	Design	Setting	Providers	Intervention strategies	Duration/Sessions	Outcomes Measured
Phei ching lim & lim, 2010	Cross sectional	Outpatient clinic	Pharmacists	Adherence support Diabetes education	8 sessions	Glycaemic control, lipid profile
Tan <i>et al.</i> , 2011	Randomised controlled trial	Outpatient clinic	Physicians	Patient empowerment	12 weeks	Glycaemic control, diabetes knowledge, medication adherence, physical activity
Wong <i>et al.</i> , 2012	Randomised controlled trial	Outpatient clinic	Not mentioned	Patient empowerment	6 months	Glycaemic control, diabetes knowledge
Ismail <i>et al.</i> , 2013	Randomised controlled trial	Outpatient clinic	Multiple HCW	Patient empowerment	6 months	Glycaemic control, blood pressure, lipid profile, body weight
Ahmad <i>et al.</i> , 2014	Pre & post intervention	Community	Not mentioned	Diabetes education Patient empowerment	1 session	Perceived benefit
Alvani <i>et al.</i> , 2015	Non-randomised controlled trial	Outpatient clinic	Therapists	Psychological intervention	12 weeks	Glycaemic control, psychological wellbeing
Chow <i>et al.</i> , 2015	Randomised controlled trial	Outpatient clinic	Pharmacists	Adherence support Diabetes education Lifestyle adjustment Patient empowerment	2 sessions	Diabetes knowledge, medication adherence
Sazlina <i>et al.</i> , 2015	Randomised controlled trial	Outpatient clinic	Physicians	Lifestyle adjustment Psychological intervention	12 weeks	Physical activity
Bakar <i>et al.</i> , 2016	Cross sectional	Outpatient clinic	Pharmacists	Adherence support Diabetes education Patient empowerment	8 sessions	Medication adherence, patient's satisfaction

Butt et al., 2016	Randomised controlled trial	Outpatient clinic	Pharmacists	Adherence support Diabetes education Lifestyle adjustment Patient empowerment	6 months	Glycaemic control, lipid profile, quality of life, body weight, medication adherence
Ibrahim et al., 2016	Quasi-experimental	Community	Multiple HCW	Diabetes education Lifestyle adjustment Patient empowerment Psychological intervention	1 year	Glycaemic control, blood pressure, lipid profile, quality of life, body weight, physical activity
J. Y. Lee et al., 2016	Randomised controlled trial	Outpatient clinic	Physicians	Patient empowerment Diabetes education Psychological intervention	1 year	Glycaemic control, blood pressure, lipid profile, quality of life, self-efficacy, cost analysis
P c lim et al., 2016	Randomised controlled trial	Outpatient clinic	Pharmacists	Adherence support Diabetes education	8 sessions	Glycaemic control, lipid profile
Ramli et al., 2016	Randomised controlled trial	Outpatient clinic	Multiple HCW	Diabetes education Patient empowerment	1 year	Glycaemic control, blood pressure, lipid profile, body weight
Wasif gillani & gillani, 2016	Longitudinal interventional study	Outpatient clinic	Pharmacists	Diabetes education Patient empowerment	6 months	Glycaemic control
Ahmad et al., 2017	Randomised controlled trial	Outpatient clinic	Physicians	Patient empowerment Diabetes education	18 months	Glycaemic control, diabetes knowledge, retention rate
Sharoni et al., 2017	Quasi-experimental	Long-term care institution	Nurses	Diabetes education Patient empowerment	12 weeks	Glycaemic control, diabetes knowledge, quality of life, self-efficacy, foot condition
Ayadurai et al., 2018	Randomised controlled trial	Outpatient clinic	Pharmacists	Adherence support Diabetes education Lifestyle adjustment	6 months	Glycaemic control, blood pressure, lipid profile
Ramadas et al., 2018	Randomised controlled trial		Not mentioned	Lifestyle adjustment Psychological intervention	6 months	Glycaemic control, dietary knowledge
Y. K. Lee et al., 2018	Qualitative		Not mentioned	Shared decision making Diabetes education	1 session	Usability and utility
Chew et al., 2019	Randomised controlled trial		Multiple HCW	Psychological intervention Diabetes education	18 weeks	Glycaemic control, blood pressure, lipid profile, quality of life, self-efficacy, diabetes distress
J. Y. Lee et al., 2020	Randomised controlled trial		Multiple HCW	Adherence support Patient empowerment	1 year	Glycaemic control, blood pressure, lipid profile, quality of life, self-efficacy

The length of intervention strategies reported in the included studies ranged between 3 and 18 months. The interventions included as low as one and up to eight follow-up sessions. The interventions could be delivered by pharmacists, physicians, nurses, psychological therapists, or a multi-disciplinary team. Five interventions were provided by a team of two healthcare providers or more [11-15], whereas four studies did not mention the healthcare provider delivering the interventions [16-19]. Most studies (n=20) reported the effects of non-pharmacological intervention strategies on multifaceted outcomes. Most studies (n = 17) reported glycaemic control as the primary or secondary outcome. In addition, the studies also measured other outcomes such as blood pressure, lipids profile, body weight, psychological measures, knowledge, retention rate, self-care, foot condition, and quality of life. Two pilot studies [17, 18] aimed to determine their proposed interventions' applicability and utility. Lastly, one was a protocol for an RCT of education and support on managing diabetic patients [20].

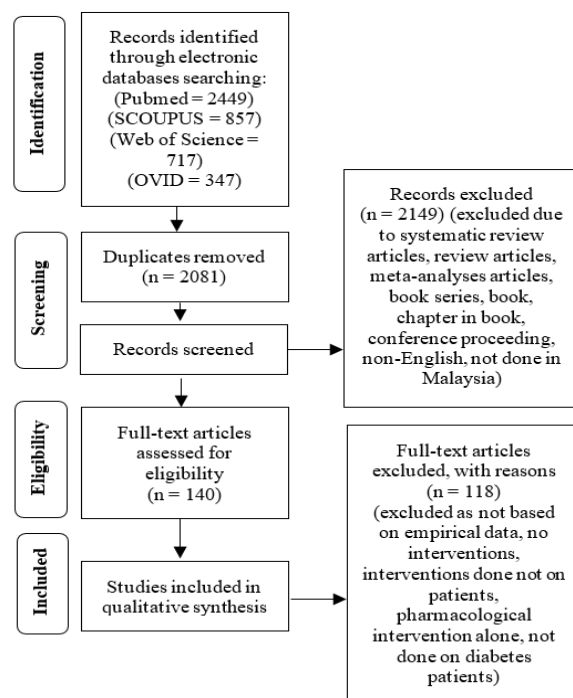


Figure 1. Article selection process.

Themes of Interventions

The included studies varied regarding the intervention strategy, duration, and providers based on the results. Most intervention strategies focus on increasing patients' knowledge and self-efficacy. Six intervention strategies were found, namely 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 adjustment [12, 19, 23, 25, 27, 31], psychological intervention [12, 19, 20, 31-33], and shared decision-making [18]. Most of the studies combined different intervention strategies in their services. **Figure 2** shows a network view on the themes of non-pharmacological interventions applied in managing diabetic patients.

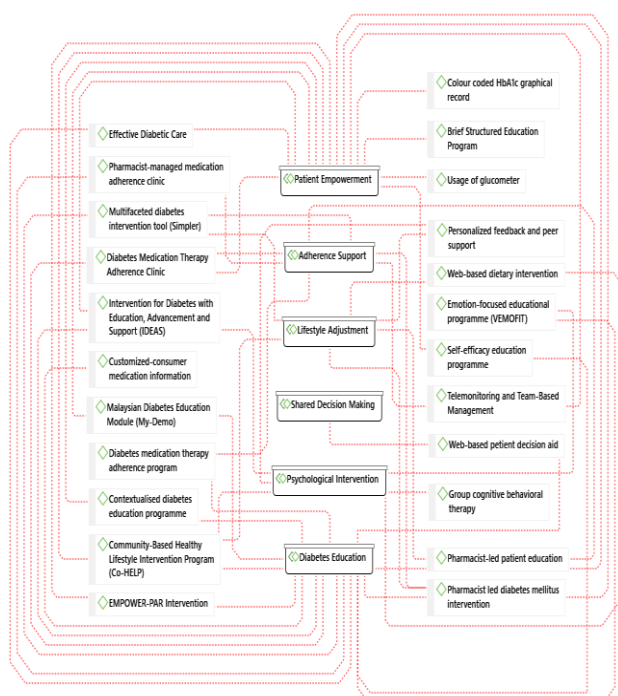


Figure 2. Network view on the themes of non-pharmacological interventions applied in the management of diabetic patients

Diabetes Education Activities

This review aimed to identify the intervention strategies applied in managing diabetic patients in Malaysia. The most commonly provided intervention strategies included diabetes education modules and patient empowerment. Other strategies used to a certain degree included adherence support, lifestyle adjustment activities, psychological interventions, and shared decision-making. The interventions were carried out in outpatient settings, in the community or patient's home.

Among the 22 included studies, diabetes education programs were conducted in 16 of them either as a single intervention or in combination with other non-pharmacological intervention strategies. However, the specific contents of the modules differ from one study to another based on the

objectives and the providers of the studies. For example, an education module provided by dietitians focused more on diet-related information while those by pharmacists emphasized medication adherence. However, all the modules incorporated a basic diabetes education module that included information on diet, exercise, medication, complications, and self-care as recommended by the local clinical practice guideline [34]. As the latest innovation in diabetes structured education programs, the diabetes education model was the most commonly incorporated intervention strategy in non-pharmacological diabetes management [35].

Recently, a few studies in Malaysia showed that the low level of diabetes knowledge among diabetic patients could be correlated with their education level and ethnicity [36, 37]. Therefore, diabetes education programs should be tailored to the population's specific needs. The effectiveness of multi-component diabetes education programs is highly dependent on the multi-professional team involved in the service provision [38]. In the Malaysian public setting, diabetic patients visit several health professionals throughout their treatment and follow-up. As a result, the patient may lose interest in the program when they are repeatedly fed with redundant information. Thus, it is vital to design and implement a single education program via the collaboration of multi-disciplinary professionals to ensure the program's success.

Patient Empowerment Activities

In diabetes, self-management is a concept that has been long discussed since 1970. Systematic reviews showed that diabetes self-management education could improve glycaemic control in type 1 [39] and type 2 diabetes [40, 41]. Patient empowerment can be developed by providing proper self-management education and activities to help patients manage their disease effectively. In the current review, 14 studies used patient empowerment as one of the interventions, either alone or in combination with other strategies. Six studies provided the intervention through group activities [12, 14, 17, 20, 21, 32] in which patients underwent interactive sessions and received lectures by trained facilitators in small groups. Patients with chronic diseases tend to have difficulties coping with their conditions, and group activities offer them the opportunity to receive emotional support from others who experience similar conditions. The delivery of patient empowerment activities through group activities is associated with great potential to improve metabolic control [42].

Apart from that, patient empowerment activities can also be provided via computer and mobile applications. However, only one study in Malaysia reported on the utilization of self-management activities that incorporated a technology-enabled self-management feedback loop to connect diabetic patients with their healthcare team. The study by Chow Ee Pin (2015) may serve as a reference for future self-management programs in Malaysia that incorporate multiple

self-management components with technology-enabled interventions and individualized feedback [23].

Adherence Support Activities

Seven of the included studies provided adherence support activities as part of the non-pharmacological management. The pharmacist delivered these activities alone or as part of a multi-disciplinary healthcare team effort. They involved the review of patients' medication-taking behavior and the identification of any non-adherence and reasons for it [43]. The ultimate aim of the activities was to provide the necessary intervention or support to improve patients' adherence to medicines. In Malaysia, such activities were mostly provided through the Medication Therapy Adherence Clinic (MTAC) that the Ministry of Health introduced in 2006. Most of the interventions utilized face-to-face interventions in outpatient settings, for example, at the pharmacy or doctor's clinics. However, the exception was the study by Lee *et al.* (2020) that applied telehealth as the main mode of service delivery [15]. Nevertheless, telehealth was found to be of limited benefit as a replacement for face-to-face consultation due to the lack of engagement between patients and providers, which is crucial for interpreting the results and decision-making for further management. In the future, a more interactive telehealth module can be designed to address this limitation.

Lifestyle Adjustment Activities

Only one study was found to promote lifestyle changes as part of the diabetes non-pharmacological intervention strategies [31]. It is important to incorporate lifestyle adjustment interventions such as diet modification and physical activities in managing diabetes patients. In the study, the personalized feedback strategies focused on utilizing peer support to enhance improvement in physical activity. Pharmacotherapy combined with exercise and diet therapy had been shown to significantly improve the glucose and lipid metabolism of diabetic patients [44, 45]. Patients receiving support from peers and personalized feedback were found to have better glycaemic control than those who received personalized feedback alone. Since modifications in dietary habits and physical activity may be difficult to achieve without social support, motivation from close ones such as family members and friends can be beneficial in encouraging effective lifestyle changes [46].

Additionally, lifestyle adjustment interventions appeared more effective when tailored based on the patient's readiness to change. Improvement of physical activity levels and healthy eating habits were more prominent in interventions based on the stages-of-change approach [47]. Interestingly, in this review, a study suggested that dietary changes should only be promoted among patients in the pre-contemplation and contemplation stages [19]. This way, the efforts can focus on patients who need the intervention. Therefore, the application of the stages of change should be studied more extensively in the future to deliver interventions other than lifestyle adjustments.

Psychological Intervention Activities

A total of five studies were found to implement several types of psychological interventions such as behavioral modification techniques, cognitive behavior techniques, and motivational interviewing. These interventions aimed to promote behavioral changes that reduce stress and dropout rate in the intervention activities [12, 19, 20, 31, 32]. Patients with chronic diseases are often psychologically-challenged in dealing with the strains of the diseases. For diabetic patients, further stressors are present such as the need to adhere to dietary restraints, perform physical activity and self-monitoring blood glucose, not to mention the regular consumption of oral medications or insulin injection and regular foot care. Psychological interventions usually aim to reduce distress among the patients and ensure the retention rate for other interventions that promote behavioral change. The combination of psychological therapy with pharmacological interventions had been shown to improve disease control [48]. A therapeutic alliance must be formed between the patient and the therapist to bring about changes in emotional, cognitive, and behavioral functioning before subsequently improving patients' adherence. However, the most effective psychological intervention approach and the subgroup of patients most likely to benefit from it have not yet been established.

Shared Decision Making

Only one study included shared decision-making activity in the management [18]. Shared decision-making is a model in which clinicians and patients share the best evidence before reaching a healthcare decision. During the session, information and values of treatments are shared between patients and healthcare professionals. Patients are encouraged to play an active role in making their healthcare decisions [49]. Previous studies showed that shared decision-making improved patients' interpretation of clinical evidence before deciding on treatment choices [50]. It also improved the management outcomes by enhancing patients' commitment to managing their condition, such as improving their medication adherence behavior.

To the best of our knowledge, this thematic analysis of the literature is the first attempt to integrate theoretical and empirical literature on non-pharmacological interventions in managing diabetic patients in Malaysia. The six emerging themes showed the diversity and applicability of various intervention strategies in Malaysia. These themes could be combined to develop a more comprehensive module for managing diabetic patients in Malaysia. This review is another step towards achieving a better understanding of how healthcare providers can apply different intervention strategies in the context of diabetes management. However, further theoretical and empirical work is still needed to expand the construction and support the proposed themes. This study is subjected to a few limitations. Firstly, the probable absence of relevant articles and any unpublished content might be an issue in the comprehensiveness of the review. However, we have taken extensive steps to ensure an

exhaustive literature review. The search strategy was adapted for different databases and was developed in collaboration with field experts. Secondly, although it is beyond the scope of this paper, addressing the effectiveness of different types of interventions will broaden the impact of the results and should be considered in future studies.

CONCLUSION

In summary, this article presents a thematic analysis of the literature on non-pharmacological interventions in managing diabetic patients in Malaysia. Six themes were identified, namely diabetes education programs, patient empowerment programs, adherence support programs, lifestyle adjustment programs, psychological intervention programs, and shared decision-making. Further research is needed to empirically validate these results to obtain a better understanding of the most meaningful themes for patients and their applicability in real-life settings.

ACKNOWLEDGMENTS: The authors would like to thank Universiti Kebangsaan Malaysia for funding this project and Ministry of Health Malaysia for providing the PhD scholarship to Fahmi Hassan.

CONFLICT OF INTEREST: None

FINANCIAL SUPPORT: This study received funding from the Research University Grant of Universiti Kebangsaan Malaysia reference number GUP-2021-010.

ETHICS STATEMENT: None

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