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REVIEW

Culturally Tailored Education Interventions to Enhance Diabetes Self-Management: A Systematic Review of Randomised Controlled Trials

Linda Widiastuti[1], Tuti Pahria[2], Hartiah Haroen[3], Yulia Sofiatin[4]

[1]Doctoral Program in Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, Indonesia; [2]Department of Medical Surgical Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, Indonesia; [3]Department of Community Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, Indonesia; [4]Department of Epidemiology, Faculty of Medicine, Universitas Padjadjaran, Sumedang, West Java, Indonesia

Correspondence: Linda Widiastuti, Doctoral Program in Nursing, Faculty of Nursing, Universitas Padjadjaran, Sumedang, West Java, Indonesia, Fax +62227795596, Email linda24001@mail.unpad.ac.id

Background: Cultural disparities in type 2 diabetes mellitus (T2DM) care contribute to suboptimal self-management and poor glycemic outcomes among ethnic minority populations. Culturally tailored diabetes self-management education and support (DSMES) interventions have emerged as a strategy to improve disease outcomes by aligning educational content with patients' beliefs, language, and traditional practices. This systematic review evaluates the effectiveness and core cultural components of culturally adapted DSMES interventions.

Methods: A systematic search was conducted in PubMed, Scopus, EBSCOhost, and Taylor & Francis using PRISMA 2020 guidelines. Randomized controlled trials (RCTs) involving culturally tailored DSMES for adults with T2DM were included. Study quality was appraised using the Joanna Briggs Institute (JBI) checklist. Data were extracted and synthesized narratively.

Results: A total of 14 high-quality RCTs met the inclusion criteria, representing diverse cultural groups including Latino, Black-British, Chinese, Pakistani immigrant, Iranian, and Korean American populations. Interventions incorporated culture through native-language delivery, traditional dietary guidance, family and community engagement, and culturally aligned behavioral support delivered via (I) traditional face-to-face or (II) technology-based interventions. Across the included studies, culturally tailored interventions were associated with statistically significant improvements in several diabetes self-management outcomes, including self-management behaviors, self-efficacy, diabetes knowledge, and psychosocial well-being, in many intervention groups compared with controls. Clinical outcomes also improved in several trials, most notably through significant reductions in HbA1c levels.

Conclusion: Culturally tailored DSMES effectively enhances both behavioural and clinical outcomes in ethnically diverse populations with T2DM. Integrating cultural values, traditional diet, language, and community support strengthens patient engagement and optimizes the intervention's impact. Future studies should emphasise long-term follow-up, cost-effectiveness evaluation, and standardized reporting of cultural adaptation components to support wider implementation and scalability.

Keywords: type 2 diabetes mellitus, culturally tailored intervention, diabetes self-management education, health disparities, randomized controlled trials

Introduction

Diabetes mellitus (DM) is a global health challenge that has continued to increase in recent decades. The 2021 Global Burden of Disease (GBD) study reported that approximately 529 million people worldwide live with DM, with a prevalence of 6.1%.[1] The number of people with diabetes has increased sharply from around 200 million people in 1990 to 830 million in 2022.[2] This burden is particularly concentrated in low- and middle-income countries, which face limited health resources, access to education, and ongoing support for diabetes self-management.[3] In this context, improving the quality and effectiveness of educational interventions to support diabetes self-management is a global priority agenda.

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Diabetes self-management education and support (DSMES) is recognized as an essential component of quality diabetes care.[4–6] The consensus report of the American Diabetes Association and related professional organizations confirms that DSMES contributes to lowering HbA1c, preventing or delaying complications, improving quality of life, and strengthening patients' coping and decision-making abilities in daily self-care practices.[7] However, in developing countries, DSME has also been shown to improve glycemic control, but evidence is still limited and shows heterogeneity in design, intensity, and intervention components.[6] Therefore, there is a need to develop and evaluate educational interventions that are more sensitive to cultural context.[8,9]

Previous studies have shown that ethnic minority groups and migrant populations have a higher prevalence of type 2 diabetes, poorer glycemic control, and a higher burden of complications than the majority population in high-income countries.[8] Barriers, such as language differences, low health literacy, different models of illness explanation, culturally specific eating habits, and the role of the family in health decision-making, can limit the effectiveness of standard education.[7,10–12] Culturally tailored educational interventions attempt to address these barriers by adapting content (eg, dietary advice, metaphors, narratives), format (group vs. individual sessions, role of community health workers), language, and learning strategies to align with the values, beliefs, and everyday practices of the target group.[7,13,14] Culturally tailored education interventions are highly effective in enhancing diabetes self-management, primarily when they are co-created with communities, address specific cultural needs, and involve family or peer support.[13,15–17] These programs lead to better clinical, behavioural, and psychosocial outcomes, making them essential for reducing disparities in diabetes care.

To effectively bridge the gap in diabetes care for ethnic minorities, educational interventions must move beyond simple translation and adopt a formal theoretical framework for cultural adaptation. A pivotal model in this context is Leininger's Culture Care Diversity and Universality theory,[18] which emphasizes that health and illness behaviors are deeply embedded in the social structure, language, and spiritual beliefs of a community. According to this framework, for nursing and health interventions to be therapeutic and meaningful, they must be culturally congruent. A previous systematic review of culturally tailored interventions for South Asians with type 2 diabetes, guided by Leininger's Sunrise Model, revealed a significant gap in current research.[19] While linguistic and educational adaptations were common, most studies failed to address broader sociocultural determinants—including religious, political, economic, and kinship factors. These omissions underscore the critical need for integrating "culturally congruent care" as a foundational element when designing future diabetes self-management education (DSME) programs.[19]

Several systematic reviews and a Cochrane Review have summarised the evidence on culturally appropriate diabetes education. Hawthorne et al[9] and updates by Attridge et al and Creamer et al showed that "culturally appropriate" education was more effective than standard education in improving glycemic control and diabetes knowledge among ethnic minority groups. However, most of the measured effects remained limited to the short- to medium-term, and the available studies were highly heterogeneous.[20] Limitations highlighted include a lack of standardization of intervention components, limited data on cost-effectiveness, insufficient long-term data, and unclear specific mechanisms by which cultural adaptation improves self-management.[20] On the other hand, the primary literature continues to grow with the emergence of new RCTs that integrate cultural adaptation into various educational models.[7,21,22]

To date, there has been no recent synthesis that explicitly focuses on RCTs of culturally tailored educational interventions aimed at improving diabetes self-management and systematically describes the characteristics of cultural adaptation and educational components associated with improved clinical and patient-reported outcomes. Based on these gaps, this systematic review aims to (1) identify and summarise all randomised clinical trials of culturally tailored educational interventions to improve diabetes self-management, (2) evaluate the effects of these interventions on glycemic and other patient outcomes, and (3) characterise the culturally tailored strategies and educational components used in these interventions. Thus, this review is expected to provide a stronger empirical basis for designing and implementing more effective DSMES programs for populations with diverse cultural backgrounds.

Materials and Methods

Study Design

This study utilized a systematic review approach, adhering to the Cochrane Handbook for Systematic Reviews of Interventions and to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Eligibility Criteria

Three independent reviewers systematically selected relevant articles following the PRISMA guidelines (see Figure 1). The development of research questions and eligibility criteria was based on the PICOT framework. The Population (P) of interest consisted of adults with type 2 diabetes. The Intervention (I) studied was a culturally based diabetes self-management education intervention, encompassing various culturally relevant educational methods. The Comparator (C) was standard care (usual care). The Outcome (O) focused on self-management and secondary outcomes, including glycemic control, quality of life, diabetes knowledge, depression, anxiety, and self-efficacy. The Study Type (T) included randomized controlled trials (RCTs) (including pilot and feasibility RCTs).

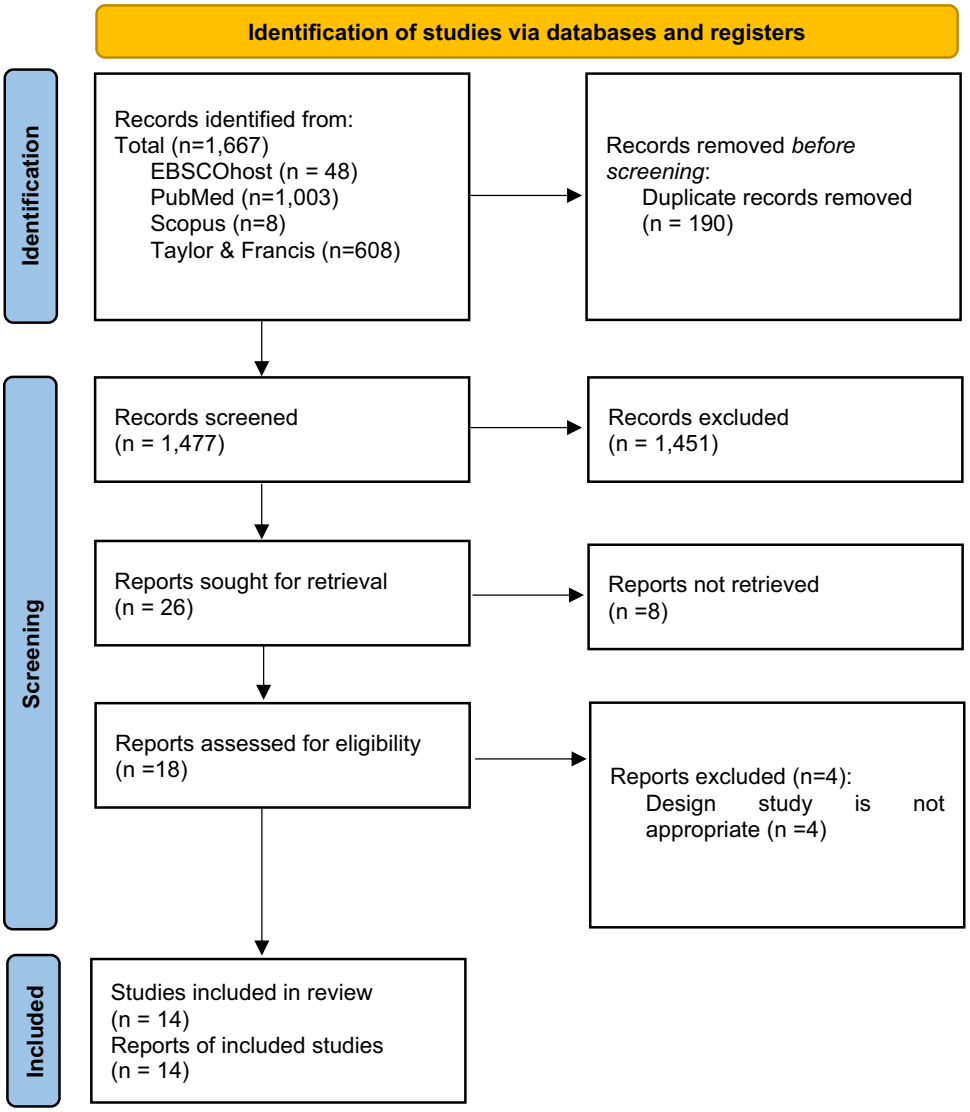

Figure 1 PRISMA Flow Diagram adapted from Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71. Creative Commons.[23]

Studies were eligible if they were full-text articles published in English and employed an experimental design to evaluate the effectiveness of culturally tailored education interventions for type 2 diabetes management. Publications were excluded if they lacked full text, were in a language other than English, or were secondary research. There were no publication year restrictions to ensure a comprehensive exploration of relevant studies. Quasi-experimental studies without randomization, observational studies, qualitative studies, reviews, and protocols were excluded.

Search Strategy

Identification of articles was conducted systematically across four major databases: EBSCOhost, PubMed, Scopus, and Taylor & Francis. The final search was conducted on 19 August 2025 with no restriction on publication year. The search included keywords such as:

((((diabetes mellitus[MeSH Terms]) OR (type 2 diabetes mellitus[MeSH Terms]))) OR (T2DM)) AND (((Cultural intervention) OR (culturally based education)) OR (culturally adapted education)) AND ((self management[MeSH Terms]) OR (self care[MeSH Terms])).

Boolean operators "AND" and "OR" were used to refine or broaden search results, capturing relevant literature from across various databases. In addition to database searching, a manual search was conducted. Hand searching involved reviewing the reference lists of relevant articles, journals, or conference proceedings to identify additional studies that may not have been retrieved through electronic databases. This approach ensured a more comprehensive identification of eligible studies for inclusion in the review.

Study Selection and Quality Appraisal

The authors (LW and HH) independently screened studies according to the predefined eligibility criteria. In the initial selection phase, duplicates were identified and removed using Mendeley Reference Manager. Then, the titles, abstracts, and full texts of articles were assessed for relevance to the research topic, applying the inclusion and exclusion criteria. In the final phase, all authors conducted a detailed review of each selected article using the Joanna Briggs Institute (JBI) critical appraisal checklist to assess the quality of the studies.[24] This tool was chosen due to its global recognition as a standardized framework for evaluating RCTs, ensuring consistency and enhancing transparency in the appraisal process. Discrepancies in assessment results were discussed among the authors. However, no disagreements arose regarding the suitability of the selected studies for inclusion.

Data Extraction and Analysis

Data from the selected studies were extracted and analyzed using thematic analysis within an exploratory, descriptive framework. Data extraction was performed by two reviewers (LW, HHM, TP), and the resulting data were reviewed by a third reviewer (YS). The extraction table included important study characteristics, intervention details, and outcomes, which were then analyzed thematically to identify common patterns across the studies. Each finding was carefully examined, described, and analyzed according to the extracted data. To ensure accuracy and minimize errors, the authors conducted a final review of all included studies. During data synthesis, we inductively grouped interventions into two categories based on primary delivery mode: (1) traditional, face-to-face, culturally tailored and (2) technology-enhanced, culturally tailored DSMES (eg, telemonitoring, mHealth, digital platforms).

Results

Study Selection

The initial search across four databases identified 1,667 records: EBSCOhost (n = 48), PubMed (n = 1003), Scopus (n = 8), and Taylor & Francis (n = 608). After removing 190 duplicate records, 1477 articles proceeded to the screening phase. Based on title and abstract screening, 1451 records were excluded for not meeting eligibility criteria. As a result, 26 articles were selected for full-text retrieval; however, eight articles were not successfully retrieved.

A total of 18 full-text articles were assessed for eligibility. Following critical appraisal, four articles were excluded because their study designs did not meet the predetermined inclusion criteria. Ultimately, 14 studies were deemed eligible and included in the final systematic review (see Figure 1).

Quality Appraisal Results

All the studies in Table 1 achieved relatively high JBI scores, most ranging from 11/13 to 13/13, reflecting strong methodologies and research design. While most studies used RCTs, which are effective at reducing bias by blinding participants (and sometimes investigators) to group assignments, the details about whether outcome assessors were blinded are not always precise. Intervention strategies varied, from general lifestyle education to more specialized treatments. However, the consistency of these interventions and the potential for provider bias—especially if the providers were not blinded remain important factors to consider. Overall, despite differences in study design, blinding, and intervention delivery, the studies maintain a high level of methodological quality.

Characteristics of Studies and Participants

Table 1 presents an overview of various studies (n=14) focused on type 2 diabetes mellitus (T2DM) conducted in different locations and populations. These studies utilized a range of designs, including RCTs, feasibility studies of RCTs, and pilot RCTs, with sample sizes varying from small groups of about 24 participants to larger studies involving over 400 individuals. The mean ages of participants ranged from 41 years in a study conducted in Pakistan or Norway by Telle-Hjellset et al,[29] to 67.58 years in the study by Liang et al[21] in China.

The gender distribution in these studies varied significantly, with some studies focusing on predominantly female populations, such as Mikhael et al[25] in Iraq, where only 25% of participants were male, and others, Osborn et al[31] in the USA, involving a higher proportion of females (79%). The studies also covered diverse ethnic and cultural groups,

Table 1 Characteristics of Studies and Participants

Study	Location	Design	Sample	Mean Age	Female (%)	JBI
Amoozadeh et al (2023)[13]	Iran	RCT	80 patients with T2DM	54.38	50	11/13
Sinclair et al (2020)[17]	USA	RCT	48 patients with T2DM	53	N/I	12/13
Talavera et al (2021)[14]	USA	RCT	456 Latino adults with T2DM	55.72	63.7	13/13
Mikhael et al (2023)[25]	Iraq	RCT	78 patients with T2DM	55.03	35.8	13/13
Mohamed et al (2013)[16]	Qatar	RCT	430 Arab adults with T2DM	52	N/I	13/13
Goff et al (2021)[26]	UK	Feasibility RCT	55 patients with T2DM	55-64	69	12/13
Liu et al (2023)[7]	USA	Pilot RCT	60 patients with T2DM	54.3	38	13/13
Abu-Saad et al (2024)[27]	Israel	RCT	50 patients with T2DM	53.0	58	13/13
Liang et al (2024)[21]	China	RCT	24 patients with T2DM	67.58	58.3	13/13
Rosal et al (2011)[28]	USA	RCT	252 patients with T2DM	55-64	76.6	11/13
Telle-Hjellset et al (2013)[29]	Norway	RCT	198 patients with T2DM	41	N/I	11/13
Philis-Tsimikas. (2011) et al[30]	USA	RCT	207 patients with T2DM	52.2	66.2	11/13
Osborn et al (2010)[31]	USA	RCT	118 patients with T2DM	56.9	79	11/13
Kim et al (2009)[32]	Baltimore–Washington area, USA (community setting and Korean Resource Center)	RCT	79 patients with T2DM	56.2	37.5	12/13

Abbreviations: N/I, No Information; RCT, Randomized controlled trial; T2DM, Type 2 Diabetes Mellitus.

including Latino adults in the USA, Arab adults in Qatar, and Pakistani immigrants in Norway, reflecting the international scope of diabetes research.

Characteristics of Intervention

Across the included randomized controlled trials, culturally tailored DSMES interventions showed considerable variation in content, delivery mode, and intensity (see Table 2). To better understand how these programs achieved their effects, we synthesized the core characteristics of the interventions, with particular attention to how cultural elements were embedded into education and support strategies. For clarity, the interventions were grouped into two broad categories based on their primary delivery approach: culturally based programs using traditional methods and technology-based programs.

Category 1: Culture-Based Using Traditional Methods

Culturally based diabetes education interventions are emerging as an important strategy to improve self-management in patients with type 2 diabetes, particularly in minority communities with language barriers, differing health beliefs, and unique dietary habits. All studies in this category emphasize cultural adaptation through local language, traditional foods, community values, and educational practices aligned with community norms. This approach aims to enhance knowledge, motivation, and self-care skills, thereby improving glycemic control and quality of life.

Culture-based diabetes education interventions delivered through traditional, face-to-face approaches consistently integrate language, food practices, social values, and health beliefs to strengthen diabetes self-management. In Iran, the Culturally Self-Care Intervention consisted of six 30–40-minute sessions (twice per week) focusing on disease knowledge, self-monitoring, stress management skills, and demonstrations of a healthy diet using traditional Iranian foods, all delivered in Persian to align with local health beliefs.[13] The Partners in Care program used a 12-week peer-led structure for Native Hawaiians and Pacific Islanders, integrating community-based educators, storytelling, and cultural analogies to address glucose balance, nutrition, physical activity, and psychosocial wellness.[17] Meanwhile, among low-income Latinos in the US, LUNA-D provided 6-month integrated medical and behavioural same-day visits with classes emphasizing traditional Latino dietary preferences, physical activity, and coping strategies to reduce diabetes distress.[14]

In Qatar, the Culturally Sensitive Diabetes Education Program included four 3–4-hour group sessions using Arabic-language booklets, culturally familiar food examples, and empowerment-based counselling to develop goal-setting and responsibility in disease care.[16] HEAL-D program delivered seven group-based sessions (14 hours total) using games, culturally relevant visual materials, African-Caribbean meal adaptations, and supervised activity sessions with emphasis on peer learning.[33] The Latinos en Control intervention applied a literacy-sensitive curriculum via 12 weekly + 8 monthly sessions, utilizing food bingo, cooking lessons, and a culturally relevant soap-opera storyline to build practical skills and sustain behavioural change.[28]

The InnvaDiab-DE-PLAN trial in Norway targeted Pakistani immigrant women. It delivered six sessions of culturally adapted lifestyle education using South Asian foods and language, while addressing barriers such as low literacy and gender-specific social norms by creating safe, women-only learning spaces.[29] The Project Dulce peer-education model for Mexican Americans used promotoras, trusted community health workers, to lead structured group diabetes self-management sessions, reinforcing family involvement and shared cultural identity.[30] Finally, among Puerto Rican adults, a brief IMB-theory-guided intervention provided tailored coaching on food label reading, low-cost healthy foods, and modifying physical activity to match neighbourhood conditions, targeting information, motivation, and behavioural skills simultaneously.[31]

Across all nine studies, interventions were intentionally adapted to cultural context by utilizing native languages, traditional dietary practices, community-trusted facilitators, and culturally congruent education formats. These strategies consistently improved self-efficacy, dietary behaviour, self-monitoring, diabetes knowledge, and clinical outcomes, particularly reductions in HbA1c and, in some cases, blood pressure, BMI, and lipid profiles. Collectively, this evidence demonstrates that holistic cultural tailoring enhances intervention acceptability, relevance, and ultimately, diabetes self-management effectiveness in diverse minority communities.

Table 2 Characteristics of Intervention

Intervention	Delivery Method and Duration	Component of Education	Cultural Integration	Outcomes
Category 1: Cultural-Based using Traditional Methods (n=9)				
Culturally Self-Care Intervention[13]	Face to face 6 sessions, delivered twice a week, 30–40 minutes each	• Understanding diseases and complication • Culture and health belief. • Demonstrate healthy diet and food choice • Nutritional status • Self monitoring and self care • Demonstrate skills of stress management	• Language: Persian. Food and Dietary • Habits: Traditional Iranian meals included in dietary advice. • Health Beliefs: Cultural understanding of diabetes and self-care practices	The intervention showed significant differences between the 2 groups immediately regarding glycemic control (HbA1c), ($p<0.001$), quality of life ($p=0.01$), and health literacy ($p=0.007$) compared control group.
Partners in Care[17]	Face to face Peer-led, 12-week program, 12 Lesson	• Glucose balance, nutrition/food, cholesterol • Physical activity • Healthy health • Psychosocial (stress and depression) • Preventing complication	• Language: Hawaiian and English. • Cultural Integration: Use of local analogies, community-based health workers.	Participants feedback was highly positive: 97% were satisfied with the class content, 98% found the materials useful, 94% considered them applicable, and 93% reported cultural appropriateness.
LUNA-D[14]	Face to face 6 months, same-day visits for medical and behavioral health integration	• Diabetes pathophysiology and self-management (with emphasis on knowledge, cultural beliefs, and barriers) • Healthy eating (two classes; with special emphasis on the traditional Latino diet); • Physical activity (knowledge, exercise, incorporating activity into everyday life); • Psychosocial well-being (prevention and coping with depression, anxiety, diabetes distress, stress management, problem solving); and • Medication adherence	• Food and Dietary Habits: Latino dietary preferences. • Health Beliefs: Understanding Latino health practices, family involvement in health. • Cultural-tailoring included discussion of activities, foods and food preparation common in the Latino community	Significant improvement in HbA1c level over 6 months ($p<0.001$), total cholesterol and diastolic blood pressure ($p <0.05$) compared control group.
Culturally Sensitive Diabetes Education Program[16]	Face to face Booklet 6 months, group education, 4 sessions	• Etiology of DM, energy balance, sign and symptom, complication • Healthy diet, Idaho plate method, hazards of fastfood goal setting • Role of exercise, types, energy of expenditure, benefit and goal setting • Exploring health beliefs, developing coping skills, changing attitudes and practices, accepting responsibility for one's disease, goal via counselling.	• Language: Arabic. • Food and Dietary Habits: Focus on culturally appropriate meals. • Health belief	Improvement in HbA1c ($p=0.012$), body mass index ($p=0.001$), albumin/creatinine ratio ($p<0.001$), diabetes knowledge, attitudes, and practice ($p=0.001$) compared control group.
HEAL-D: Healthy Eating and Active Lifestyles for Diabetes[26]	Face to face 7 sessions, 14 hours total, group-based education. Booklets, games and videos	• Carbohydrates: limit portion sizes. • Physical activity: participate in 30 minutes of moderate to vigorous physical activity daily and strength training twice a week. • Body weight: lose 5%–10% if overweight/obese, or maintain a healthy weight. • Cardiovascular risk: limit saturated fat and salt intake	• Language: English. • Cultural Integration: Culturally relevant materials, use of games, peer learning, and dietary habits specific to Black British communities.	Intervention attendance was high; 85% completed the program (attendance at ≥5 sessions), and 74% attended ≥6 sessions. Improvement in diabetes knowledge ($p<0.05$), dietary competence, and quality of life ($p<0.05$) compared control group.

(*Continued*)

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Table 2 (Continued).

Intervention	Delivery Method and Duration	Component of Education	Cultural Integration	Outcomes
Literacy-Sensitive, Culturally Tailored Diabetes Self-Management Intervention[28]	Face to face 12 weekly sessions, eight monthly follow-up sessions	Diabetes knowledge, attitudes, and self-management behaviours	Culturally relevant activities, such as a soap opera, food bingo, and cooking lessons	The intervention resulted in significant change differences in diabetes knowledge at 12 months (p =0.001), self-efficacy (p = 0.001), blood glucose self-monitoring (p = 0.02), and diet, including dietary quality (p=0.01) compared control group.
InnvaDiab-DE-PLAN study[29]	Face to face 6 educational sessions, each 2 hours long, over 7 months ± 1 month. Small group sessions (10–12 people) for discussion and support among participants.	• Knowledge of blood glucose physiology and its regulation through diet and physical activity. • Teaching how to influence blood glucose in every-day life.	• Language and Communication: The program was delivered in Urdu, Punjabi, or English • The educational material was culturally adapted. • Cultural adaptation focused on understanding and respecting dietary preferences and lifestyle choices. • Education relevant to the traditional Pakistani diet, emphasizing replacing refined carbohydrates with whole grains and consuming more vegetables, nuts, and fatty fish.	Significant improvement in fasting blood glucose (p=0.022) and fasting insulin (p=0.036) compared control group.
Project Dulce peer-led promotora education.[30]	Face to face Eight weekly 2-hour group diabetes self-management classes delivered at community health centres by trained promotoras (lay community health workers), followed by monthly peer-led support groups up to 10 months; usual clinic care continued in both groups.	Curriculum "Diabetes Among Friends" covering basics of diabetes and complications, diet, exercise, medications, blood glucose monitoring, and cultural beliefs that interfere with self-management (eg, fear of insulin, reliance on traditional remedies); interactive classes with group discussion, review of home glucose logs, and reinforcement of ADA standards of care.	Conducted in Spanish by promotoras drawn from the same Mexican-American community; addressed myths and cultural remedies (eg, nopales), used culturally familiar examples, and functioned as a cultural bridge between patients, community resources, and the healthcare system.	Significant improvements in absolute levels of HbA1c (p=0.001), HDL cholesterol and total cholesterol (p=0.01). No significant changes were noted in the control group
Brief IMB-based culturally tailored intervention[31]	Face to face Single 90-minute, one-to-one counselling session delivered within 5 days of baseline by a bilingual medical assistant of Puerto Rican heritage, using a flipchart and individualized culturally tailored meal-plan booklet; usual care.	Information on diabetes and complications, local prevalence, carbohydrate monitoring, portion control, spacing meals, and role of lifestyle activity; motivational interviewing (personalized risk feedback, exploration of beliefs, affirmation, goal setting); behavioural skills training on reading food labels, counting carbohydrates, controlling portion sizes, and integrating low-cost physical activity, with teach-back and role-play.	Culturally tailored for low-income Puerto Ricans: session and materials in Spanish (Puerto Rican dialect); educator and dietitian of Puerto Rican heritage; use of culturally familiar foods and examples; individualized meal-plan booklet reflecting typical Puerto Rican diet; explicit discussion of local prevalence and community-specific barriers (unsafe neighbourhoods, affordability, cultural expectations).	The mean HbA1c values decreased in both groups (Intervention: 0.48% vs. Control: 0.27% absolute decrease), only the intervention group showed a significant improvement from baseline to follow-up (p <0.008) corroborating improvements in self-care behaviors

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Category 2: Culture-Based using Technological Methods (n=5)				
Culturally Adapted Lifestyle Counselling Tool[27]	Face to face 6 months, 4 dietitian-delivered counseling sessions for 30 to 45 min.	Modifiable lifestyle educational content based on the published standards of care for medical nutrition therapy for patients with T2DM	• Language: language congruence through its multi-language capacity • Food and Dietary Habits: Arabic dietary habits considered. • Health Beliefs: Culturally sensitive to Arabic community health practices.	DM-related lifestyle knowledge improved faster in the I-ACE arm than in the SLA arm (P=0.02), with reduced added sugar intake (−2.6%, P=0.03) and increased dietary fiber intake (+2.7 g/1000 kcal, P=0.003) at 12 months.
Culturally adapted, evidence-based and theory-driven DSMP[21]	Face to face and phone call for consultation Booklet and teleconsultation via phone 6 months, 1 individual interview, 3 group sessions 60 minutes, and phone call support 30 minutes. Telephone-based consultations lasted 30 min.	• Motivational interviewing process • Goal setting • Action planning • Self-monitoring of behavioral change	• Language: Chinese booklet for intervention. • Food and Dietary Habits: Traditional Chinese diets included. • Health Beliefs: Focus on Chinese cultural practices and family roles • The booklet and logbook were designed with participants' cultural needs in mind.	The intervention significantly improved self-efficacy and self-management behaviours and reduced diabetes-related distress compared with the control group (all $p < 0.05$).
CARE Program[7]	Online via WeChat 2 culturally and linguistically tailored DSMES videos per week for 12 weeks (3 months)	• Self-care topics, including diabetes basics, healthy eating, physical activity, medication adherence, glucose monitoring, and behavioral techniques such as goal-setting and problem-solving. • Support calls from trained community	• Language: Mandarin. • Food and Dietary Habits: Tailored to Chinese American preferences. • Health Beliefs: Consideration of Chinese health practices, traditional medicine.	Intervention participants showed significant improvements in self-efficacy at 3 months (P=0.02), reduced diabetes distress at 6 months (P=0.009), and better adherence to a healthy diet at both 3 and 6 months (both P=0.02).
Culturally Adapted Diabetes Self-Management Education[25]	Face to face and phone call for additional education 6 months of in-person counselling Educational book	• Dietary education • Blood sugar management • Physical activity • Psychosocial support	• Language: Arabic. • Food and Dietary Habits: Iraqi food culture and dietary practices. • Health Beliefs: Culturally adapted to Iraqi perceptions of diabetes.	The effectiveness of most outcomes was better in the intervention group compared with the control group. The ICER per unit improvement in HbA1c, SBP, DBP, serum TC, and TG levels was <1 of the minimum CET compared with the control group,
SHIP-DM structured self-help program[32]	Combination Teletransmission via telephone Community-based program at Korean Resource Centre; 2-hour weekly group sessions for 6 weeks led by bilingual nurses and a nutritionist, followed by 24 weeks of home glucose and blood pressure telemonitoring plus monthly bilingual nurse telephone counselling.	Psychobehavioral diabetes education (overview of T2D, complications, healthy eating, reading food labels, exercise, medications and food–drug interactions, problem solving, communication with physicians), self-monitoring of glucose/BP via teletransmission, and protocolized counselling to reinforce knowledge, troubleshoot problems, and support self-care.	• Sessions and materials delivered in Korean by bilingual nurses; • Community partnership with the Korean Resource Centre • Content linked to traditional Korean diet and activity patterns; • Counselling considered patients' use of traditional herbal medicine and cultural beliefs about illness, with emphasis on restoring self-confidence and reducing isolation.	The intervention significants improved in knowledge (p=0.001), self-care (p=0.001), self-efficacy (p=0.01), attitudes (p=0.04), and quality of life (p=0.03) after 30 weeks compared control group.

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Category 2: Culture-Based Using Technological Methods

This category includes five studies that implemented culturally adapted interventions incorporating technological methods to improve diabetes self-management among ethnic minority populations with type 2 diabetes. Technology enhancements varied across interventions, including digital software, telemonitoring systems, mobile health platforms, remote telephone counselling, and online multimedia education. Despite different delivery modes, all studies emphasized cultural tailoring based on language, traditional dietary practices, and community health beliefs, promoting both acceptability and sustained engagement in self-management behaviours.

Abu-Saad et al integrated the I-ACE clinical software into dietitian-led counselling, enabling personalized dietary assessment, interactive graphics, and real-time goal setting that aligned with Arabic language and cultural food norms.[27] Kim et al utilized teletransmission and bilingual nurse counselling within a community setting, addressing social isolation while incorporating traditional Korean perspectives on food and herbal medicine.[32] Mikhael et al implemented culturally adapted DSME(S) supported with phone follow-ups and locally relevant educational materials, demonstrating high cost-effectiveness in improving metabolic outcomes among Iraqi patients.[25]

Additionally, two studies focusing on Chinese populations implemented digitally based DSMES delivery. Liang et al blended face-to-face group education with telephonic maintenance sessions grounded in behavioural theory, integrating traditional dietary practices and the supportive role of families in diabetes control.[21] Meanwhile, Liu et al leveraged the WeChat platform to deliver Mandarin video modules and bi-weekly community health worker support, successfully reducing diabetes distress and enhancing self-efficacy among Chinese Americans.[7]

Across all studies, significant improvements were reported in self-efficacy, diabetes knowledge, dietary adherence, and glycemic control, with additional psychosocial benefits, including reduced depression and diabetes-related distress. These findings highlight that culturally aligned technology-based interventions can effectively reduce healthcare disparities, improve patient empowerment, and enhance long-term diabetes self-management among underserved ethnic minority groups.

Discussion

This systematic review aimed to evaluate the effectiveness of culturally tailored diabetes self-management education interventions (DSMES) on clinical and behavioural outcomes in patients with T2DM. Most included trials were conducted in middle- or high-income settings and among specific ethnic minority groups (eg, Latinos in the USA, Arab adults in Qatar, Pakistani immigrants in Norway). Evidence from low-income countries and Southeast Asian or sub-Saharan African populations remains scarce, limiting the generalizability of our findings to these regions. Of the 14 RCTs, this review divided interventions into two broad categories: (1) culturally based using traditional methods and (2) culturally based using technological methods. Primary outcomes assessed included glycemic control (HbA1c), self-management behaviours (diet, activity, medication adherence), and psychosocial outcomes (self-efficacy, diabetes distress, and quality of life). These findings align with a meta-analysis in Latino populations that reported a −0.24% reduction in HbA1c through culturally tailored DSMES.[34]

Cultural tailoring may enhance patients' skills in diabetes management by increasing the relevance, motivation, and sustainability of health behaviours within social contexts and values that are meaningful to the individual. Education tailored to local language, food, and customs makes health messages easier to understand and apply in everyday life.[33] A culture-based approach also strengthens intrinsic motivation by involving families and communities, which has been shown to improve adherence and glycemic control significantly.[14,21,27] In addition, cultural similarities between patients and educators increase trust and comfort in interactions, thereby strengthening self-efficacy and openness to education.[35] Therefore, culturally tailored self-management educational interventions serve not only as a means of conveying health information, but also as a social and psychological mechanism that changes patients' perceptions of their illness.

The findings of this review suggest that culturally tailored interventions significantly enhance psychosocial determinants of health, which are pivotal for long-term glycemic control. This is consistent with Paulsamy et al,[36] who demonstrated that social support and self-efficacy are robust predictors of self-care behavior in patients with type 2 diabetes, particularly during challenging periods such as the COVID-19 pandemic. By aligning educational content with the patient's cultural and linguistic background, these interventions do more than just transfer knowledge; they foster a supportive

environment that bolsters the patient's confidence in managing their condition. Furthermore, the success of long-term diabetes management also depends heavily on treatment satisfaction as a patient-centered outcome. Alqifari et al (2026) showed that treatment satisfaction is closely related to the patient's understanding of their illness and the flexibility of the therapy provided.[37] By integrating patients' cultural and linguistic values into the education program, this intervention not only facilitates the achievement of HbA1c targets, but also has the potential to increase patient satisfaction with the healthcare services received, which will ultimately support patient adherence and sustainability of self-care.

In the traditional intervention category, cultural adaptations were implemented through local language, traditional foods, family values, and community approaches. The intervention in Iran emphasized education using Persian and demonstrations of traditional Iranian diets, which improved health literacy and reduced HbA1c.[13] Programs like LUNA-D for Latino communities emphasize integrating medical and behavioural services with adjustments to food and family traditions.[14] In the UK, HEAL-D combines educational games and Afro-Caribbean food adaptations, which improve dietary knowledge and physical adherence.[33] All these interventions confirm that cultural adaptation strengthens educational effectiveness by increasing participants' emotional and social engagement.

Comparisons between traditional interventions show variation in outcomes and sustainability of effects. Peer-led programs like Project Dulce in Mexican-American settings and Partners in Care in Hawaii achieve more sustainable outcomes because they are grounded in social support and trust among participants.[17,30] In contrast, programs conducted in Qatar[16] and Pakistan[29] and delivered mainly by professional educators demonstrated substantial reductions in clinical indicators (eg, HbA1c and triglycerides); however, psychosocial improvements were more limited, potentially due to the absence of peer support. Interventions that engage food culture and community narratives tend to be more acceptable and effective in the long term than formal instructional models that are less flexible in local contexts.

In the second category, technology-based interventions adapt cultural elements through digital media, telemonitoring and online applications.[7,21,25,27,32] Programs such as CARE via WeChat for Chinese-American patients using Mandarin-language videos and online community support sessions resulted in significant increases in self-efficacy and decreases in diabetes distress.[7] The SHIP-DM intervention for the Korean-American community utilized teletransmission of glucose data and bilingual counselling that improved glycemic control and decreased depression.[32] Meanwhile, the I-ACE program in Israel uses Arabic-based diet software to customize diets and increase fibre intake and lower HbA1c.[27]

Comparisons between technology interventions show that interactive platforms with visual components and two-way communication (such as I-ACE and SHIP-DM) provide better clinical outcomes than passive video-based approaches.[27,32] Liang et al's program in China, which combined face-to-face meetings and telephone consultations, yielded the most comprehensive results, namely significant improvements in self-efficacy and glycemic control, and decreased distress.[21] This suggests that a combination of traditional and digital methods provides a balance between depth of social relationships and ease of ongoing access. Purely digital interventions are effective in increasing efficiency, but they fall short in creating strong emotional connections between educators and participants.

Comparatively, face-to-face interventions excel at increasing emotional engagement and cultural trust, while digital interventions excel at reach and sustainability.[16,28,30,31] Peer-based approaches in communities produce more stable behavioural changes, while technological approaches excel in cost efficiency and long-term monitoring.[25,35,38] However, the effectiveness of both is highly dependent on the participants' level of health and digital literacy.[35,38] The combination of face-to-face and digital models has been shown to address most of these weaknesses by maintaining social closeness while improving continuity of care.[7,21]

Overall, this review indicates that cultural tailoring, which integrates local values, language, and practices into the DSMES, consistently improves clinical and psychosocial outcomes for patients with T2DM. This integration provides a sustainable model that can be adapted across cultures and global health system contexts. Thus, the combination of in-depth cultural adaptation and technological innovation is key to reducing disparities in diabetes care across diverse populations worldwide.

Strengths and Limitations

This systematic review has several strengths. First, it is among the few comprehensive reviews that focus exclusively on randomized controlled trials (RCTs) evaluating culturally tailored diabetes self-management education and support (DSMES) interventions across diverse global populations. The review followed PRISMA 2020 guidelines and employed

the Joanna Briggs Institute (JBI) critical appraisal tool to ensure methodological rigour, enhancing the validity of its findings. In addition, the included studies span multiple cultural and geographical contexts, enabling meaningful cross-cultural comparisons and synthesis of practical intervention components.

However, several limitations must be acknowledged. The heterogeneity of intervention duration, delivery format, and outcome measures limited the ability to perform a meta-analysis and may have contributed to variability in the reported effects. Moreover, most included studies had relatively short follow-up periods, making it difficult to evaluate the long-term sustainability of behavioural and clinical improvements. The majority of trials were conducted in middle- to high-income countries, with limited representation from low-resource settings where cultural barriers and healthcare infrastructures may differ substantially. In addition, the review included only studies published in English, which may have introduced language bias and potentially excluded relevant evidence from non-English publications. Several included trials also had relatively small sample sizes (eg, Liang et al, n = 24;[21] Sinclair et al, 2020,[17] n = 48), which may limit the generalizability and statistical power of the findings. Finally, publication bias may exist, as studies with non-significant or negative results are less likely to be published.

Conclusion

This systematic review of 14 randomized controlled trials suggests that culturally tailored DSMES interventions may improve diabetes self-management and selected clinical outcomes across diverse populations. Both traditional and technology-assisted culturally adapted approaches were generally associated with improvements in behavioural outcomes, diabetes knowledge, self-efficacy, and glycemic control (HbA1c) in several studies. These findings highlight the potential value of incorporating culturally responsive DSMES programs into diabetes care. Further large-scale and longitudinal studies are needed to evaluate long-term effectiveness and to support the development of standardized frameworks for cultural adaptation in diabetes education.

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The authors declare no conflict of interest related to this study.

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