Cultural adaptations of food exchange lists: A scoping review of applications in non-communicable disease management

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ABSTRACT

Background and Objectives: Non-communicable diseases (NCDs), including diabetes, cardiovascular diseases, and obesity, remain major global health challenges largely driven by suboptimal dietary patterns. The Food Exchange List (FEL) is a structured dietary planning tool originally developed for diabetes management to support balanced nutrient intake. Although FELs are widely used across diverse cultural and clinical contexts, evidence regarding their direct role in NCD prevention and management is limited. This scoping review examines the historical development, core principles, and global applications of FELs, with a focus on their use in dietary planning and NCD control, aiming to identify gaps in the existing literature. **Methods and Study Design:** Following Joanna Briggs Institute (JBI) methodology and the PRISMA-ScR checklist, four databases (PubMed, ProQuest, Web of Science, and Cochrane Library) were searched between November 18, 2024, and January 2, 2026, to identify primary research published from 1990 to 2026. Of 500 records screened, 38 studies met the inclusion criteria. Notably, 60% (n = 24) focused exclusively on FEL development without evaluating clinical or behavioral outcomes. **Results:** Findings from randomized and quasi-experimental studies, as well as small pilot interventions, suggest that FELs can support meal planning, nutritional adequacy, and attainment of specific dietary targets. However, their cognitive complexity may negatively affect adherence and contribute to higher dropout rates. Evidence for FEL effectiveness in NCD management remains limited, particularly among low-literacy populations. **Conclusions:** Overall, there is a clear need for long-term studies evaluating culturally adapted and simplified FELs and their independent effects on clinical outcomes, including glycemic control, cardiovascular risk, quality of life, and medication use.

Key Words: food exchange lists, global health concerns, non-communicable diseases

INTRODUCTION

The worldwide prevalence of non-communicable diseases (NCDs) is high and rising at an alarming rate. In 2019, NCDs accounted for 74.3% of all deaths worldwide,[1] with cardiovascular diseases (CVD), cancers, chronic respiratory diseases, and diabetes together responsible for over 60% global mortality.[2] Poor dietary choices and excessive energy intake, combined with physical inactivity, are major contributors to NCDs, with dietary risk factors alone responsible for 22% of all adult deaths worldwide, approximately 11 million deaths annually.[3] Over the past decades, the global burden of NCDs has steadily increased due to

factors such as urbanization, poor diet, and sedentary lifestyles. This trend is expected to continue, with an estimated 7.4 million new cases of NCDs appearing annually by 2050, reflecting a 16% increase from current levels, according to the European Federation of Pharmaceutical Industries and Associations (EFPIA). By that year, NCDs could account for 86% of the 90 million deaths recorded each year.[4]

A Food Exchange List (FEL) is a structured system of categorized, weighed food items, grouped by approximate macronutrient composition (carbohydrates, proteins, and fats), allowing swapping one food for another within the same list without affecting the overall intake of macronutrients and energy. It was originally developed for diabetes management to help control carbohydrate intake (CHO). This approach uses carbohydrate counting to plan meals and focuses on estimating the macronutrient content that primarily affects the postprandial glycaemic response. It was initiated by the American Dietetic Association, the American Diabetes Association (ADA), and the United States Public Health Service.[5] Since then, FELs have evolved significantly to meet the complex requirements of modern nutrition. Currently, there are two main types of FELs accessible: adaptations that are clinically tailored and those that are culturally relevant.

Clinical-specific FELs have been developed to address metabolic conditions such as CVDs, obesity, and renal diseases.[6, 7] Beyond disease management, FELs have been customized for special populations with unique nutritional requirements. This includes athletes,[8] vegans,[9] children on the autism spectrum,[10] individuals with rare metabolic disorders like phenylketonuria and maple syrup urine disease,[11] and those requiring supplementation to combat malnutrition.[12]

Parallel to clinical advancements, there has been a growing emphasis on culturally relevant FELs. These versions accommodate cultural preferences by integrating local cuisines, traditional foods, and ethnic-specific portion sizes. The fundamental rationale behind cultural adaptation is that ethnic variations and traditional practices profoundly influence food choices. Therefore, incorporating culturally accepted foods into dietary planning is essential to promote adherence to healthy eating.[13] Research in diabetes and cardiovascular care demonstrates that aligning dietary recommendations with cultural food preferences and traditional meal patterns significantly enhances patient compliance, satisfaction, and long-term metabolic outcomes.[14, 15] Numerous countries, such as Ecuador (South America),[16] China,[17] Lebanon,[18] Jordan,[19] Qatar,[20, 21] Saudi Arabia,[22] Mali,[23] Samoa,[24] Spain,[25] Korea,[26] Greece,[27] and the Philippines[28] have already developed culturally-specific FELs, making dietary planning more relevant and practical for their populations.

Although numerous countries and clinical disciplines have developed FELs, the literature remains highly fragmented. Most current publications mainly concentrate on the creation or adaptation of FELs for certain diseases or groups, while their structure, classification methods, targeted outcomes, and implementation strategies vary across settings. As a result, there is a lack of a thorough compilation that illustrates the effectiveness of culturally tailored FELs that have been developed. This absence of conceptual mapping makes it difficult for clinicians and researchers to understand the scope of culturally tailored FEL applications or to identify areas requiring further investigation.

Given the expanding role of FELs beyond diabetes management into broader diet-related NCDs and culturally tailored nutrition interventions, a scoping review is warranted to systematically map the available evidence. The objectives of this review are to: (1) to map the global evolution of culturally adapted FELs; (2) to evaluate their clinical and behavioral impact on NCD management; and (3) to identify specific barriers to adherence in diverse populations.

MATERIALS AND METHODS

This scoping review was conducted according to the guidelines of the Joanna Briggs Institute (JBI)29, with reporting directed by the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) checklist.30 No protocol for the review was made public before its execution.

Inclusion criteria

This scoping review included primary research studies involving adults (18+ years), including both those with NCDs such as type 2 diabetes mellitus (T2DM), hypertension, obesity, or metabolic syndrome and healthy individuals at risk of disease or undergoing exchange list dietary pattern validation. The concept of interest included both standard (non-culturally adapted) and culturally adapted FELs used in the dietary management of NCDs. Culturally modified FELs were characterized as those altered to include local cuisines, traditional foods, or portion sizes specific to certain ethnic groups. Standard FELs were included to facilitate mapping and comparison of the differences in the application and implementation contexts, as well as the reported behavioural and clinical outcomes between culturally adapted and non-adapted tools.

The review considered evidence from all geographic regions and healthcare contexts, including primary care, hospital-based services, and community or public health settings,

without restriction by country or setting. In line with the scoping review methodology, a broad range of study designs was included, such as quantitative, qualitative, and mixed-methods studies, which examined the development, adaptation, validation, or application of FELs in adults with NCDs. This comprised primary research designs, including experimental, quasi-experimental, observational, and descriptive studies, as well as secondary research such as review articles, including systematic reviews and meta-analyses. Grey literature sources were also included to ensure comprehensive mapping of the evidence and comprised academic outputs such as theses and dissertations. Narrative reviews, editorials, opinion pieces, letters to the editor, and conference abstracts with insufficient primary data were excluded.

To support mapping of how culturally adapted FELs have been used in practice, studies were required to report at least one clinical or behavioural outcome with quantitative data (e.g., glycaemic measures, blood pressure, body weight, or lipid profiles). Studies that only described the development of an FEL without reporting its application or associated outcomes were excluded. Only peer-reviewed articles published in English between 1990 and 2025 were included. The eligibility criteria were formulated based on the Population, Concept, Context (PCC) framework suggested by JBI guidelines,[29] and are summarised in Table 1.

Search strategy

The search for relevant studies followed a 3-step process outlined by JBI guidelines. Step 1 included an initial limited search conducted in PubMed to identify keywords from titles and abstracts, as well as Medical Subject Headings (MeSH terms). Step 2 involved further searching using all identified keywords. A concept-driven search strategy was followed, focusing primarily on FELs', to ensure maximum sensitivity by capturing a wide range of evidence without excluding relevant studies due to the diverse terminology of NCD outcomes. While population and outcome filters were applied during manual screening, the use of secondary disease-specific search strings was deemed unnecessary. This strategy was designed to ensure maximum sensitivity and to encompass the full breadth of evidence, regardless of how specific NCD outcomes were indexed. The refined search strategy was validated by a second reviewer and consistently utilized across four electronic databases: PubMed, Public Health (ProQuest), Web of Science (WoS), and Cochrane Library, employing Boolean operators ("OR" for expansion, "AND" for narrowing).

To minimize geographic bias and ensure a comprehensive mapping of the FEL literature, regional databases such as Global Index Medicus (SciELO) were also searched. This was

deemed necessary as the FEL is a culturally specific tool often researched in low-to-middle-income countries where studies may be published in English-language regional journals not currently indexed in PubMed or ProQuest.

The search was performed on the selected databases from 18 November 2024, with an update on 2 January 2026. The full search strategy applied to PubMed was as follows (Food Exchange List[Title/Abstract]) OR (Exchange system diet[Title/Abstract])) OR (Food exchange system[Title/Abstract])) OR (exchange group method[Title/Abstract])) OR (exchange diet[Title/Abstract])) OR (American diabetic association[Title/Abstract])) OR (culturally tailored[Title/Abstract])) OR (meal[Title/Abstract]))) OR (nutrition education program[Title/Abstract]) AND (meal plan*[Title/Abstract]). Filters were applied to include studies published from 1990 to the present. This date range was selected to capture the seminal research following the major 1986 revision of the Food Exchange System, ensuring that the review encompasses the most relevant period of the tool's clinical application and cultural adaptation in the management of NCDs. Additionally, filter for the following types of studies were considered: Adaptive Clinical Trial, Clinical Study, Clinical Trial, Comparative Study, Controlled Clinical Trial, Evaluation Study, Meta-Analysis, Multicentre Study, Network Meta-Analysis, Observational Study, Randomized Controlled Trial, Scientific Integrity Review, Systematic Review, Validation Study. The search was limited to articles published in English. A summary of the search strategy is presented in Table 2. The final step of the search strategy included referring to the reference list of all identified reports and articles for additional studies.

The final step of the search strategy included referring to the reference list of all identified reports and articles for additional studies. The initial search and screening were conducted by the lead author to ensure accuracy and minimize bias. The resulting articles were then reviewed by two independent reviewers (RT and AAR), with any uncertainties or discrepancies resolved through collective discussion and consensus among all authors.

RESULTS

Extracting and charting the results:

The initial electronic database search yielded a total of 500 records: PubMed (n=220), Public Health via ProQuest (n=45), WoS (n=182), and Cochrane Library (n=53). Regional databases such as SciELO were also consulted; however, all identified studies from these sources were already indexed in PubMed and were thus consolidated. To facilitate efficient processing in Rayyan software, a manual pre-screen was conducted to remove studies completely out of

scope, resulting in 143 retrieved articles (68 from PubMed, 20 from ProQuest, 37 from WoS, and 18 from Cochrane). Including additional identified studies, a total of 147 references were exported to EndNote and subsequently uploaded to the Rayyan software for screening. After the automated detection and removal of 34 duplicates, 113 unique articles remained for title and abstract screening. During this stage, 69 articles were excluded, leaving 44 articles to be assessed for eligibility. Upon full-text review, 22 studies were excluded because they focused exclusively on the development of FELs. Ultimately, 15 studies that met the inclusion criteria were included in this review. The complete selection process, following the PRISMA guidelines, is illustrated in Figure 1.

Characteristics of included studies

Out of 15 studies on the application of FEL for managing non-NCDs, most were conducted in the USA (n=10) between 1990 and 2009, coinciding with the development of the American Diabetes Association (ADA) diabetic exchange list. These studies primarily compared the exchange list system with other menu planning methods, such as carbohydrate counting and calorie computation, mainly in diabetic populations (n=6). The focus areas included glycaemic control (n=8), nutrient intake (n=6), dietary adherence (n=4), and patient satisfaction (n=2).

A review of studies related to FELs reveals that 60% focus specifically on the development of culturally adapted FELs. Most of these lists have been created in Asia (n=8 studies), followed by the Middle East (n=5), Europe (n=3), North America and US-affiliated regions (n=3), Africa (n=2), and South America (n=2). This description a significant emphasis on culturally tailored dietary adaptations in Asian and Middle Eastern contexts. However, only a few countries have conducted outcome studies on the developed FELs, namely Thailand (n=1), Japan (n=1), China (n=1), and Indonesia (n=1).

Mapping of culturally relevant FEL applications in prevention and management of diet-related NCDs

A summary of studies on FELs in the prevention and management of diet-related NCDs is presented in Table 3.

Across the 15 included studies, the FEL was applied in four main clinical areas: obesity and weight management (n=2),[31, 32] chronic kidney disease (CKD) (n=2),[7, 33] T2DM (n=6),[34-39] and cardiovascular risk and prevention (n=5).[40-44] The FEL formats varied and included standard American Diabetes Association exchange lists[34-39, 44] culturally adapted exchange

lists (Indonesian, Thai, Mediterranean, and Chinese)[32, 40-43] and clinically modified renal exchange lists.[7, 33] (Table 3).

Obesity and weight management

Two studies evaluated FEL use in weight management. One single-arm intervention using a culturally adapted Indonesian FEL reported a reduction in body weight from 71.6 kg to 68.4 kg over 30 days.[32] Another intervention study using an energy-restricted exchange system over 32 weeks reported an average weight loss of 7.8 kg along with reductions in energy intake and decreases in micronutrient intake, including vitamin E, calcium, iron, and zinc.[32]

Chronic kidney disease (CKD)

Two studies investigated FEL application in CKD populations using modified renal exchange systems. A 4-year longitudinal follow-up using a Thai low-protein exchange list reported stable renal parameters, including glomerular filtration rate and serum creatinine levels, while 24-hour urinary protein excretion decreased from 1.0 to 0.8 g/day, suggesting a possible role of culturally adapted FELs in stabilizing renal function and delaying disease progression over time. This suggests that the modified FEL combined with drugs may help stabilize renal function and delay disease progression over time.7 A cohort study in peritoneal dialysis patients comparing personalised exchange-based menu planning with traditional education reported higher dietary protein compliance in the exchange-based group (57.1% vs 22.9%).[33]

Type 2 diabetes mellitus (T2DM)

Six studies assessed FEL use in individuals with T2DM. Outcomes measured included glycaemic control, dietary intake, lipid profile, patient preference, adherence, and nutrition knowledge. Compared with alternative dietary approaches, exchange-based meal planning produced comparable improvements in glycaemic outcomes. HbA1c reductions ranged from 0.9–1.9 % in FEL groups versus 1.5–1.9 % in comparator groups.[34-36] Fasting glucose decreased by 0.9–1.6 mmol/L in FEL interventions compared with 0.9 mmol/L in simplified dietary strategies such as Healthy food choices (HFC) and Vegetables-Before-Carbohydrate strategies.[34, 37] Similarly, calorie-defined diets,[37] nutrient-based diet guides,[39] or prepared meal plans[36] also demonstrated comparable glycaemic outcomes to exchange-based planning. Beyond glycaemic control, body weight reductions were also similar between exchange-based and calorie-defined or prepared meal plans, ranging from 2.0–3.0 kg for FEL compared with 1.0–2.5 kg in comparator groups.[36, 37, 39] However, participants using exchange-based planning demonstrated higher dietary flexibility and nutrition knowledge scores.[37, 39]

Cardiovascular risk and prevention

Five studies evaluated the use of FEL in populations at cardiovascular or metabolic risk, using Mediterranean-style exchange lists or modified ADA exchange lists.[40-44] Measured outcomes included dietary intake changes, plasma fatty acids, carotenoids, body weight, inflammatory markers, lipid profile, and blood pressure.

In a randomized trial, the Mediterranean exchange list significantly increased dietary quality, with fruit and vegetable intake rising from 4.0 to 8.6 servings/day and monounsaturated fat (MUFA) intake increasing by 48%, while no changes were observed in the control group.[41] Similarly, another study reported a 55% increase in plasma carotenoids and a 25% increase in plasma MUFA after 6 months of an exchange-based Mediterranean diet, although blood lipids, insulin, glucose, and C-reactive protein did not significantly change compared with a usual diet.[40]

In individuals at increased cancer risk, adherence was similar between the Mediterranean exchange list and telephone counselling. However, the exchange-list group showed weight reduction and decreased C-reactive protein (CRP) among overweight participants.[42]

A large randomized controlled trial (RISCK) demonstrated that exchange-based dietary planning successfully modified macronutrient composition: saturated fat intake decreased to ≤10% of energy compared with 17% in the reference diet, and MUFA intake increased to 17% of energy versus 12% in the control diet (p = 0.001). The glycaemic index between intervention arms differed by 9 units (p = 0.001), confirming effective dietary manipulation using the exchange model.[43]

When compared with prepared meal plans, exchange-based self-selected diets achieved similar reductions in body weight, blood pressure, and cholesterol among compliant participants, but dietary adherence was lower (72% vs 83%).[44]

DISCUSSION

Overall interpretation of findings

The findings of this scoping review highlight the versatility of the FEL system across diverse clinical populations, including those managing obesity, CKD), T2DM, and cardiovascular risks. While the FEL remains a cornerstone of medical nutrition therapy (MNT), the results suggest that its efficacy is highly dependent on cultural adaptation, the level of professional support, and the cognitive burden placed on the patient.

Evidence from intervention and randomized controlled studies on exchange-based approaches in menu planning has shown efficacy in meeting dietary targets like calorie-

counting methods, while allowing for more flexibility in food choices. However, most evidence comes from short-duration interventions that favour perceived convenience, thereby limiting insights into the long-term sustainability of these methods. A notable finding from Benezra et al. 2001 indicates that energy-restricted FEL diets, while effective for managing macronutrients, can lead to significant reductions in micronutrient intake, including Vitamin E, Calcium, Iron, and Zinc. This highlights the need for practitioners to ensure adequate micronutrient density and consider supplementation during calorie restriction.[31]

Clinical effectiveness and adherence of FEL

The FEL has long been considered one of the most appropriate tools for the management of NCDs including CVD,[45] diabetes,[46] obesity and CKD.[7] Evidence from multiple clinical contexts demonstrates that FEL-based interventions can effectively improve metabolic, cardiovascular, and renal outcomes, particularly when combined with lifestyle modifications such as exercise and professional coaching. Rizal et al. (2023) demonstrated that a culturally adapted Indonesian FEL led to significant weight reduction over 30 days,[32] while Tungsanga et al. (2005) demonstrated that a modified, low-protein FEL can stabilize renal function over a 4 year periods.[7] Personalized FELs approaches, such as individualized menu suggestion, have also shown to adherence to protein targets compared with traditional education (57.1% vs 22.9%).

In diabetes management, FEL interventions results in significant improvements across various metabolic outcomes, including glycaemic control, lipid profiles, and weight reduction. However, its relative efficacy often diminishes when compared to simpler, rule-based strategies, such as the HFC plan and the 'Vegetables Before Carbohydrate' (VBC) method.[34, 35] Differences in glycaemic outcomes between FEL and simplified strategies may be due to qualitative variations in foods with identical exchange values, highlighting limitations of FEL's focus on macronutrient quantity rather than food quality factors such as fiber matrix or food structure, which influence postprandial exursions.[47]

Beyond diabetes and CKD, exchange-based dietary interventions have been applied in other NCD-related contexts. In a randomized trial among individuals at increased risk of colon cancer, two dietary intervention strategies based on exchange lists were compared: one aligned with the Healthy People 2010 goals and the other with the Mediterranean diet, were compared.[42] Although weight loss was not the primary intervention goal, participants experienced a reduction in body weight and a decrease in CRP levels from baseline. These findings suggest that the Mediterranean food exchange-based intervention may offer

additional benefits for overweight or obese individuals, particularly in reducing inflammation and supporting weight management.[42]

Overall, these findings underscore the versatility and adaptability of FELs across NCDs, while also highlighting that outcomes are influenced by intervention design, duration, cultural adaptation, and adherence support. In the short term, FELs appear effective in improving metabolic parameters, but in long-term interventions, alternative approaches such as structured meal plans or simplified dietary sequencing strategies may be more effective. This nuanced perspective emphasizes that FELs remain a useful tool, yet their application should be tailored to patient context, education level, and the clinical goal.

Food exchange list as an effective tool in menu planning

An effective menu-planning tool needs to be nutritionally accurate, culturally relevant, user-friendly, and psychometrically sound, demonstrating validity and reliability. In both research and clinical practice, such tools are expected to contribute to improved diet quality, dietary adherence, and health-related outcomes.48 FELs have long been used in nutrition education and therapeutic diet planning, particularly for chronic disease management, and several studies have examined their nutritional adequacy, effectiveness, and acceptability.

Evidence from intervention and randomized controlled studies suggests that FEL-based menu planning can deliver nutritionally adequate diets comparable to alternative methods. For example, in an intervention study among individuals with overweight and T2DM, no significant differences were observed between calorie-counting and FEL–based diets in macronutrient distribution, overall nutrient intake, or proportions of the Recommended Dietary Allowance (RDA) achieved, both approaches were associated with reductions in the percentage of energy derived from fat, and self-selected FEL-based diets achieved mean intakes exceeding 100 % of the RDA for all nutrients except calcium, indicating that exchange lists can support adequate dietary intake.[49] Further support for FELs comes from an investigation by Benezra et al., where an energy-restricted exchange list was used in obese and overweight women engaged in a weight-loss program. Intakes of most nutrients remained within recommended levels throughout the intervention, although transient declines in micronutrients such as vitamin E, zinc, iron, calcium, and folate were observed during initial phases of energy restriction. As energy intake progressively increased later in the 32-week study, intakes of these micronutrients also rose toward pre-study levels, illustrating the dynamic nature of dietary adaptation within exchange-based plans[31] In a separate randomized controlled trial, Moore and colleagues modified and developed an RISCK exchange list to

manipulate dietary fat and carbohydrate composition, successfully achieving targets for total fat, saturated fat, and glycaemic index, with internal validation via phospholipid fatty acid biomarkers, demonstrating that FELs can be adapted to target specific dietary components.[43] Likewise, in an intervention study among 720 participants with metabolic syndrome, the exchange-based dietary model was associated with a reduction in total fat intake from 38 % to 28 % of total energy intake. Saturated fat intake was significantly reduced to below 10 % of total energy intake, compared with 17 % in the baseline diet, while monounsaturated fat intake was significantly higher in the exchange-based diet. Additionally, the intervention was associated with reductions in circulating fatty acid concentrations and improvements in selected glycaemic indicators.[43]

Comparative studies have yielded mixed results when exchange lists are evaluated against simplified dietary strategies. In one trial among urban African Americans with T2DM, an exchange-based meal plan and a simple HFC method both resulted in significant reductions in fat intake over the study period, with similar decreases in the use of sugar-containing foods, leading authors to conclude that FELs are as effective as simplified healthy food guidance in modifying fat and sugar consumption.[34] In contrast, a two-year randomized trial among Japanese patients with T2DM comparing an exchange-oriented plan with a strategy emphasizing consumption of vegetables before carbohydrates found more pronounced reductions in carbohydrate intake, increases in dietary fiber, and significant rises in β-carotene equivalents in the vegetable-first group. The exchange-based group also reduced carbohydrate intake, but without significant improvements in fiber intake, indicating that simpler food-sequencing approaches may be more effective than exchange lists in promoting certain food choices, such as high-fiber vegetables, in specific populations.[35] However, culturally tailored exchange lists appear to yield favourable dietary outcomes. Studies assessing Mediterranean-style exchange lists among women in Greece reported increased consumption of fruits and vegetables and a higher relative intake of monounsaturated fats (MUFA).[41] A six-month randomized trial in healthy women further demonstrated that increases in plasma carotenoid concentrations were associated with use of a Mediterranean FEL, suggesting meaningful changes in fruit and vegetable consumption. Collectively, these findings illustrate that FELs, particularly when culturally adapted, can influence dietary behaviours beyond nutrient adequacy.[40] Taken together, the reviewed evidence indicates that FELs are nutritionally adequate and effective tools for menu planning and improving food choices.

Sustainability of the Food Exchange List approach

While FELs are nutritionally robust tools for menu planning, this review identifies a significant variability in adherence and satisfaction over time. Participants typically demonstrate moderate to high adherence to FEL in the short term (10 weeks to 3 months). Studies consistently report good initial compliance, with approximately 73% of participants achieving American Heart Association Step 1 goals in a 10-week study,[38] high early instructional engagement (≈78 % attendance during the first 12 weeks),[31] and rapid dietary improvements, such as increased monounsaturated fat and fruit and vegetable intake within three months.[41] However, as intervention duration extends beyond six months, adherence to exchange-based approaches frequently declines. Longitudinal data report substantially higher dropout rates (up to 69 % at 24 months)[35] and 41 % at 2 months to rising to 52 % by 6 months,[34] reduced participation in educational sessions (78 % first 12 weeks to 61 % in the final 20 weeks),[31] and stagnation of dietary improvements compared with simpler or rule-based strategies.[39] Additionally, lower long-term compliance with exchange-based usual care diets has been reported over one year (≈37 %), while prepared meal plans or simplified rules demonstrate more sustained adherence.[36]

This decline is likely attributable to the high cognitive and behavioural demands inherent to the approach. Exchange systems require sustained understanding of portion equivalency, continuous self-monitoring, and independent meal planning, which many participants find difficult to maintain without ongoing professional support. While early educational sessions often generate a short-term motivational effect, the quantitative and prescriptive structure of FELs may become burdensome as motivation wanes, leading to declining engagement and higher attrition.

Cultural adaptation importance

Despite the challenges in cognitive burden and behavioural factors, sustainability is notably improved when the tool is tailored to the individual. Studies incorporating culturally adapted exchange lists, individualized menu planning, and structured education tend to report more favourable dietary behaviours in the long term.[33] This underscores the importance of tailoring exchange-based tools to user needs. Studies utilizing Indonesian, Thai, Greek-Mediterranean, and Chinese exchange lists reported better engagement. Adapting the FEL to include local foods and traditional dishes is not merely a matter of preference but a clinical necessity to ensure the tool is relevant to the patient's lived experience

Global distribution of evidence

FELs have been developed and culturally adapted across diverse geographic regions to reflect traditional dietary patterns and commonly consumed foods. Countries in South America (Ecuador[16] and Peru[50]), Asia (China,[17, 33] Korea,[26] Japan,[35] Thailand,[7] Indonesia,[32] Philippines,[28] Myanmar[51] and SriLanka[52]), the Middle East (Lebanon,[18] Jordan,[19] Saudi Arabia,[22] Qatar,[20, 21] and the United Arab Emirates (UAE)[53]), Africa (Mali,[23] South Africa[54, 55]), Oceania (Samoa[24]), Europe (Spain,[25] Greece[27]) and North America (United States,[46] Guam (US territory)[56]) have developed culturally-specific FELs aimed at improving dietary relevance and practicality within their populations.

Some of these countries further tailored FELs to address the special needs of specific population groups or disease conditions. For example, China developed FEL with a focus on pregnant women[17] and renal patients.[33] Similarly, Mali,[23] Myanmar,[51] Korea,[26] Japan,[35] and the USA[46] created FEL with a specific focus on patients with diabetes. Korea also introduced an exchange list designed for individuals with autism spectrum disorder (ASD).[10] In addition, South Africa and Thailand developed FELs specifically for patients with renal disease.[7, 54, 55]

However, despite the extensive development and clinical application of culturally adapted and condition-specific FELs, evidence evaluating their effectiveness remains limited (Figure 2). Notably, few studies have assessed metabolic, clinical, or long-term health outcomes in the specific populations for which these FELs were designed. The paucity of outcome-based evaluations underscores a critical evidence gap, particularly regarding the impact of culturally tailored FELs on metabolic control and disease-related outcomes in targeted populations.

Evidence gaps in the literature

A major gap exists in the literature regarding the acceptability of FELs among populations with low literacy or limited socioeconomic resources. There is currently insufficient evidence to determine the general population's confidence in applying exchange lists independently. Addressing this "literacy gap" through real-world evaluations is essential to transition the FEL from a complex educational model to a sustainable clinical tool.

Furthermore, no long -term studies quantified the independent impact of the FEL on key clinical markers such as glycaemic control, cardiovascular risk profiles, quality of life or medication-sparing effects. This aligns with the Academy of Nutrition and Dietetics Evidence Analysis Library (EAL), which currently reports no strong evidence for FEL across multiple domains., underscore a significant and persistent gap in dietetic research. The fact that both this scoping review and a major evidence-based library independently identified the same

research void highlights that the FEL continues to be used in clinical practice primarily based on historical precedent and expert consensus rather than contemporary empirical validation. These gaps underscore the need for more rigorous evaluation to understand its true clinical impact.

Strengths and limitations

The primary strength of this review lies in its systematic approach and focus on recent, clinically relevant practices. However, certain limitations should be acknowledged. The strict inclusion criteria, which only allowed studies published in English, resulted in the exclusion of some relevant research due to language restrictions. Additionally, a broad 35-year timeframe was chosen to maintain technological and methodological relevance. While expert consultation was not included in this review, our reliance on established guidelines and a thorough literature review enhances the reliability of our findings.

Several limitations were identified across the reviewed literature that impact the generalizability and implementation of the findings:

- Chronological relevance and "Evidence-Lag": A significant portion of the evidence base is dated, with key studies (Kendall et al., 1990[39]; Keller et al., 1991[37]) conducted over 35 years ago. This chronological gap suggests that many findings may not reflect contemporary dietary patterns, ultra-processed food environments, or updated clinical standards, such as the KDOQI 2020 guidelines.
- Ethnic diversity and cultural friction: Many studies evaluating the effectiveness of the FEL included participants from diverse ethnic backgrounds without sufficient cultural tailoring of the exchange lists. This lack of customization often led to a mismatch between prescribed exchanges and traditional food preferences, likes, and dislikes, ultimately contributing to lower compliance and higher attrition rates in multi-ethnic cohorts.
- Methodological constraints: Many studies relied on self-reported food records, prone to memory bias and underreporting. Several trials utilized single-arm designs (Rizal et al. 2023[32]) or small sample sizes (Tungsanga et al. 2005[7], n=17), limiting causal inference.
- Sustainability: Most studies were short-term (8 weeks to 6 months), leaving a lack of evidence regarding long-term sustainability. Furthermore, effective FEL use requires significant time from dietitians for personalized menus and education, which may not be scalable in resource-limited settings.

Implications for practice and policy

For clinical practice:

- Prioritize behavioural simplicity: For patients with low functional health literacy, practitioners should favor simplified plans (e.g., "HFC") or rule-based strategies like "vegetable-before-carbohydrate" over the technical complexity of FELs to ensure long-term adherence.
- Translate abstraction into visualization: Outcomes in dialysis and diabetes improve when abstract exchanges are converted into individualized, visualized menu suggestions. This transforms the FEL from a calculation tool into a user-friendly reference.
- Monitor micronutrient density: Practitioners must screen energy-restricted FEL protocols for micronutrient inadequacies (e.g., Vitamin E, Zinc, Calcium) to prevent deficiencies during weight management.

For Policy and public health,

- Institutionalize cultural adaptation: National guidelines should integrate culturally adapted FELs that reflect regional food biodiversity to enhance population engagement.
- Focus on longitudinal support: Policy should shift funding from short-term nutritional interventions to long-term adherence strategies, as FEL benefits are only sustained through continuous behavioural reinforcement.

Conclusion

In conclusion, FELs are a powerful tool for menu planning, effectively meeting dietary goals like high MUFA intake and offering flexibility in food choices. However, their cognitive complexity results in reduced adherence and increased dropout rates. Additionally, there is a critical need for research on their application in low literacy populations and their effectiveness for NCDs. While short-term health benefits of FEL exist, conditions like obesity, CKD, and diabetes, its success is heavily dependent upon cultural adaptation and the intensity of professional support. Given that much existing evidence is outdated, and there is a significant gap in studies that assess culturally relevant FELs and their impact on patient-centred outcomes. Future research must focus on developing simplified, culturally tailored FELs to improve long-term adherence across diverse populations.

Future research

Future research should prioritise long-term evaluations of FELs to assess sustained acceptability, dietary adherence, and real-world usability beyond short-term intervention

periods. There is a particular need for studies examining the acceptability and comprehension of FELs among populations with limited literacy or numeracy, using standardized and validated measures of usability and satisfaction. Additionally, future interventions should move beyond comparisons with calorie-counting or prepared meal approaches and instead evaluate how culturally adapted exchange lists, individualized menu guidance, and structured nutrition education influence long-term dietary behaviours and health outcomes. Research such as pragmatic randomized controlled trials (RCTs) conducted in community and primary-care settings rather than controlled trial environments would further strengthen the evidence base and inform scalable implementation strategies. Finally, assessing population-level knowledge, confidence, and self-efficacy in independently applying exchange lists may help guide the development of more accessible and user-centred menu-planning tools

CONFLICT OF INTEREST AND FUNDING DISCLOSURE

The authors declare that they have no conflict of interest.

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Table 1. Inclusion and exclusion criteria based on PCC framework

	Defining characteristics
Inclusion criteria	
Population	Adults (≥18 years) including both those with NCDs and healthy individuals at risk of disease ndergoing exchange list dietary pattern validation.
Concept	Focus on the development, validation, or clinical application of Food Exchange Lists (FELs).
Context	Global applications in the context of any healthcare setting (primary care, hospitals, or community centres).
Study types	Quantitative, qualitative, and mixed-methods studies that examined the development, adaptation, validation, or application of Food Exchange Lists (FELs) in adults with NCDs were eligible for inclusion. Grey literature sources, including academic outputs (theses and dissertations)
Outcomes	Focusing on at least one clinical or behavioural outcome, specifically those providing numeric data (e.g., Mean ± SD or Confidence Intervals) for HbA1c, blood pressure, weight, or lipid profiles.
Language/ Time	Peer-reviewed articles published in English from 1990 to 2025.
Exclusion criteria	
Reasons for exclusion	-Paediatric populations or individuals without a diagnosed NCD who are not identified as being at-risk Narrative literature reviews, editorials, opinion pieces, letters to the editor or conference abstracts with insufficient primary data and review protocols labelled as incomplete research -Studies that only describe a tool without reporting any application or outcome data. -Non-English publications or those published before 1990.

PCC: xxxx; NCDs: xxxx .

Table 2. Summarised search strategy

List	Details
Search Date	Initial search on November 18, 2024, updated January 2, 2026.
Databases	4 Databases: PubMed, Public Health (ProQuest), Web of Science and Cochrane Library.
Search terms	((((((((((Food Exchange List[Title/Abstract]) OR (Exchange system diet[Title/Abstract])) OR (Food exchange system[Title/Abstract])) OR (exchange group method[Title/Abstract])) OR (exchange diet[Title/Abstract])) OR (American diabetic association[Title/Abstract])) OR (culturally tailored[Title/Abstract])) OR (meal[Title/Abstract]))) OR (nutrition education program[Title/Abstract]) AND (meal plan*[Title/Abstract]).
Study designs	Adaptive Clinical Trial, Clinical Study, Clinical Trial, Comparative Study, Controlled Clinical Trial, Evaluation Study, Meta-Analysis, Multicenter Study, Network Meta-Analysis, Observational Study, Randomized Controlled Trial, Scientific Integrity Review, Systematic Review, Validation Study
Time frame	From 1990 to present
Language	English

Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Chronic kidney Disease (CKD)					
1	Rizal et al. 2023[32]	Single-arm trial	61 Adult participants (female:91.8%)	Culturally adapted (Indonesian FEL)	An online Indonesian FEL–based nutrition coaching program + exercise guidance, nutrition education, daily support, and professional Q&A*.
	Indonesia	30 days	Mean Age:33		
2	Benezra et al. 2001[31]	Intervention study	219 overweight/obese premenopausal women	Clinical-specific FEL	Energy-restricted diet using exchange system + walking
	USA; 6 university sites	32 weeks		(Energy restricted standard FEL)	

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Chronic Kidney Disease (CKD)				
1	Rizal et al. 2023[32]	Change in body weight.	Culturally adapted FELs combined with exercise and nutrition education demonstrated potential benefits for weight loss	Study design: Single-arm trial lacks a control group.
	Indonesia	Baseline: 71.6 kg Post-intervention: 68.4 kg (p <0.001).		
2	Benezra et al. 2001[31]	Primary outcome: Nutrient intake	Despite the energy reduction, weight loss, and the intake of most nutrients remains acceptable.	Micronutrient deficiency: FEL-based calorie restriction led to significant drops in Vit E, calcium, iron, and Zinc; requires supplementation.
	USA; 6 university sites	-Energy intake: 23% - 36% reduction -Vitamin E: Dropped by 19%- 24% -Calcium: Decreased by 11% -Iron: decrease by 11-15% -Zinc: Decreased by 16- 19% Secondary outcome: Body weight: -7.8 kg	However, a calorie-restricted FEL diet may require micronutrient supplementation due to drops in intake.	

*= Cultural FEL.

ADA = American Diabetes Association; CCr = Creatinine clearance; EXCH = Exchange group; FG = Fasting Glucose; GFR = Glomerular Filtration Rate; HGI = High Glycaemic Index diet; HM = High MUFA; LF = Low Fat; LGI = Low Glycaemic Index diet; SF = Saturated Fat.

Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management (cont.)

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Chronic kidney disease (CKD)					
3	Tungsanga et al. 2005 [7] Thailand; King Chulalongkorn Memorial Hospital, Bangkok	longitudinal follow-up study 4 years	17 early-stage CKD patients	Clinically specific cultural FEL (Modified low-protein Thai FEL)	Multidisciplinary approach using modified Thai FEL + drugs vs standard care*
4	Chen et al. 2006[33] China; First Hospital, Peking University, Beijing	Longitudinal cohort study 8 months	70 clinically stable patients on peritoneal dialysis (each group n=35) 52.9% females Mean Age = 52 years	Personalised clinically specific renal exchange list	Menu suggestions based on individual preferences and education on exchange list usage vs Traditional nutrition education*

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Chronic kidney disease (CKD)				
3	Tungsanga et al. 2005 [7] Thailand; King Chulalongkorn Memorial Hospital, Bangkok	Baseline to post-intervention: -Serum Creatine: from 252 µmol/Lto 313 µmol/L -CCr: from 37.5 to 35.7 mL/min -GFR: from 24.4 to 25 mL/min/1.73 m² Urine protein: from 1.0 to 0.8 g/24h	Modified cultural FEL combined with drugs may stabilize renal function and delay disease progression over long periods.	Causality: -Observational nature limits causal inference -Very small sample size (n=17). Only 38% of CKD patients received dietary counselling, indicating a need to investigate barriers to dietary education and its impact on health.
4	Chen et al. 2006[33] China; First Hospital, Peking University, Beijing	Primary outcome: Dietary compliance ($p < 0.05$). -Menu suggested group: 57.1% -Traditional nutrition education: 22.9%	Personalized menu suggestions significantly improve protein target compliance when using FEL.	The optimal dietary protein intake (DPI) for peritoneal dialysis patients was unclear, with recommendations varying from 0.8 to 1.2 g/kg/day, potentially introducing bias into the results. Resource Intensive: Requires high-level dietitian involvement to create personalized lists, which may not be scalable.

*= Cultural FEL.

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Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management (cont.)

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Type 2 Diabetes (T2 DM)					
5	Ziemer et al. 2003[34]	RCT	648 urban African Americans T2 DM for 4.8 years	Standard ADA exchange list	ADA exchange-based meal plans vs Healthy food choices (HFC) meal plan
	USA; Grady Diabetes Clinic, Atlanta	6 months	(65% female) Mean age: 52		
6	Imai et al. 2011 [35]	RCT	101 Japanese patients with T2 DM	Standard diabetic exchange list	Exchange-based meal (EXB) plan vs Vegetables before carbohydrate (VBC)
	Japan; Kajiyama Clinic, Kyoto	2 years	VBC group, n= 69 55% female; Mean age = 63 EXB group, n= 32 46% female; Mean age = 65		

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Type 2 Diabetes (T2 DM)				
5	Ziemer et al. 2003[34]	HbA_{1c} decline:(p <0.0001) -EXCH group, dropped from 9.6% to 7.7%. -HFC group dropped from 9.7% to 7.8%. Fasting glucose:(p <0.0001) -EXCH group: decreased from 10.8 to 9.2 mmol/L -HFC group: from 9.9 to 9.0 mmol/L No significant difference in BP and total or LDL cholesterol between the two groups.	A simple meal plan is just as effective as FEL for glycaemic control in urban populations.	Complexity: Traditional FEL was found to be overly complex for urban, low-literacy populations compared to simple choices.
	USA; Grady Diabetes Clinic, Atlanta			
6	Imai et al. 2011 [35]	Primary outcome: HbA_{1c} change: -VBC: from 8.3 to 6.8% -EXB: from 8.2 to 7.3%. Secondary outcome: Carbohydrate intake: -VBC: 336 to 229g -EXB: 301 to 243 g Fibre intake: -VBC: 14.8 to 18.4 g -EXB: no significant change	VBC group achieved significantly lower HbA_{1c} levels than EXB over 24 months. Both groups exhibited similar improvements in dietary practices with respect to intake of carbohydrate, fats and sweets, while the VBC group had a significant increase in consumption of green vegetables leading to higher fibre and beta carotene intake.	Behavioural Barrier: FEL required more cognitive effort than simple meal sequencing (VBC), leading to lower relative efficacy.
	Japan; Kajiyama Clinic, Kyoto			

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Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management (cont.)

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Type 2 Diabetes (T2 DM)					
7	Metz et al. 2000 [36] USA; 5 university-based medical centres	Randomized multicentre study 1 year	302 participants (85% white/ Caucasian) (56% female) Age: 25-70 years HTN & dyslipidaemia (n=183) Type 2 DM (n=119)	Standard ADA exchange list	Usual-care diet (UCD) based on ADA exchange list vs prepackaged meal plan that meets the Recommended Dietary Allowance (RDA)
8	Keller et al. 1991 [37] USA	Clinical trial 8 weeks	12 insulin-dependent diabetic participants (6 male, 6 females; age 40-82 years)	Standard ADA exchange list	Diet using Diabetic FEL vs Calorie diet (diet defined by total amount of allowed daily calories)

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Type 2 Diabetes (T2 DM)				
7	Metz et al. 2000 [36] USA; 5 university-based medical centres	Primary outcome: Weight change: ($p < 0.001$) HTN/dyslipidaemia group: -prepared meal plan: -5.8 kg -UCD plan: -1.7 kg Type 2 DM group: ($p < 0.001$) -prepared meal plan: -3 kg -UCD group:-1.0 kg Secondary Outcomes: Meal Plan group: Significantly greater improvements in SBP, glucose, HbA_{1c}, and total/HDL cholesterol ($p< 0.05$). Superior dietary compliance and QoL ($p <0.001$).	Prepared meal plan group showed significantly greater weight loss, cardiovascular risk improvement and higher adherence and compliance compared to exchange list diet group	Sustainability: Self-selected FEL is consistently less effective than providing pre-prepared meals.
8	Keller et al. 1991 [37] USA	Primary outcome: Weight change: -both diets achieved similar weight loss (2.0–2.5 kg). Secondary outcome: Fasting blood glucose: -significantly lower-calorie diet Serum lipoproteins were similar after both diet periods.	Despite similar weight loss, a simplified calorie diet led to better glycaemic control and significantly higher patient preference (10/12 participants) than the exchange system. This highlights the need for flexible dietary tools that are easier to apply to instant and processed foods.	User Preference: High patient burden; 83% of participants preferred simple calorie counting over the FEL system.

*= Cultural FEL. ADA = American Diabetes Association; CCr = Creatinine clearance; EXCH = Exchange group; FG = Fasting Glucose; GFR = Glomerular Filtration Rate; HGI = High Glycaemic Index diet; HM = High MUFA; LF = Low Fat; LGI = Low Glycaemic Index diet; SF = Saturated Fat.

Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management (cont.)

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Type 2 Diabetes (T2 DM)					
9	Pi-Sunyer et al. 1999 [38]	Randomized multicentre trial	202 individuals with T2 DM Aged 25–70 years	Standard FEL	Self-selected diet (SSD) based on the exchange list vs Campbell's Centre for Nutrition and Well
	USA: 10 medical centers	10 weeks	83% white, 11% African American. 2.5% Hispanic, 2.5% Asian or Pacific Islander, and 1% Native American.		ness (CCNW) meal program
10	Kendall et al. 1990[39]	Comparative study	105 subjects WITH noninsulin-dependent diabetes.	Standard FEL	food-group (exchange lists) approach vs nutrient-based (diet guide) approach
	USA	6 months			

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Type 2 Diabetes (T2 DM)				
9	Pi-Sunyer et al. 1999 [38]	Primary outcome: Glycaemic control, Body weight, lipid profile	Both diets improved glycaemic control, lipid profile and body weight. Additionally, both diets lowered energy, total and saturated fat,	Adherence: High drop-out rates often associated with the difficulty of maintaining self-selected exchange portions.
	USA: 10 medical centers	Secondary outcome: Daily nutrient intake	cholesterol, and sodium intakes, with higher carbohydrate and fiber consumption.	
10	Kendall et al. 1990[39]	Outcomes Measured:	Participants preferred the diet guide method for its ease of use, though menu planning was	Education Gap: FEL was less effective at teaching applied nutrition than a simple nutrient-based diet guide.
	USA	-User Perceptions (Usability) -Time Efficiency (Menu Planning/Evaluation) -Psychological/Attitudinal Changes -Nutrition knowledge	quicker with the exchange list (16 minutes vs. 25 minutes daily). Additionally, the diet guide led to greater improvements in applied nutrition knowledge compared to the exchange lists.	

*= Cultural FEL.
ADA = American Diabetes Association; CCr = Creatinine clearance; EXCH = Exchange group; FG = Fasting Glucose; GFR = Glomerular Filtration Rate; HGI = High Glycaemic Index diet; HM = High MUFA; LF = Low Fat; LGI = Low Glycaemic Index diet; SF = Saturated Fat.

Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management (cont.)

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Cardiovascular risk & prevention					
11	Djuric et al. 2009 [40]	Randomized clinical trial	69 healthy, nonobese women (85% white/Caucasian)	Cultural FEL	Modified Greek-Mediterranean exchange list diet for 6 months vs participant's usual diet*
	USA; University of Michigan	6 months	(ages 25–59 years)	(Greek Mediterranean exchange list)	
12	Djuric et al. 2008 [41]	Randomized trial	69 women (85% white/Caucasian)	Cultural FEL (Mediterranean exchange list)	Self-selected diet using Mediterranean exchange list vs participant usual diet for 6 months*
	USA; University of Michigan	6 months	(ages 25–59)		

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Cardiovascular risk & prevention				
11	Djuric et al. 2009 [40]	Primary outcome:	While there were no significant changes in primary outcomes, an increase in mean plasma carotenoids and MUFA indicates effective dietary changes in fruit-vegetable consumption and MUFA intake	Clinical Impact: While FEL changed food quality, it failed to move clinical markers like insulin or blood lipids in 6 months.
	USA; University of Michigan	-blood lipids, triacylglycerol, insulin, glucose, or C-reactive protein: No significant changes Secondary outcome: -55% increase in plasma carotenoids -25% increase in plasma MUFA; no changes in lipids or insulin		
12	Djuric et al. 2008 [41]	Primary outcome:	Use of a Mediterranean exchange list was associated with higher dietary MUFA intake and increased fruit and vegetable consumption, with no significant change in total fat intake.	Small sample size: limits generalizability to larger populations.
	USA; University of Michigan	Dietary intake changes. Mediterranean group: -48% increase in dietary MUFA intake -No change in total fat intake -Fruit/vegetable intake increased from 4.0 to 8.6 servings/day Non-intervention group: No changes		No specific dietary goals for n-3 fatty acids, critical in Greek diets, create gaps in health outcome understanding. Short study duration: Concern about the long-term sustainability of dietary changes for breast cancer prevention Bias: Reliance on self-reported food records The study primarily recruited college-educated women, which limits its applicability to less educated groups.

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Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management (cont.)

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Cardiovascular risk & prevention					
13	Sidahmed et al. 2014 [42]	Randomized clinical trial	120 subjects at increased risk for colon cancer	Cultural FEL (Mediterranean exchange list)	Mediterranean exchange list vs. Healthy Eating via telephone counselling
	USA; University of Michigan, Ann Arbor	6 months	(72% female) (Healthy Eating arm, n=46 and Mediterranean arm, n=47). Mean age: 53 years		

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Cardiovascular risk & prevention				
13	Sidahmed et al. 2014 [42]	Primary outcome: Patient compliance	Dietary adherence was similar in both groups	Possible bias: The study's reliance on self-reported dietary assessments
	USA; University of Michigan, Ann Arbor	Secondary outcome: dietary intakes and blood markers of health risks	The Mediterranean arm showed weight loss and decreased CRP in overweight/obese subjects. Mediterranean FEL may provide superior anti-inflammatory benefits.	Short duration: Limits the ability to assess long-term effects

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Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management (cont.)

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Cardiovascular risk & prevention					
14	Moore et al. 2009 [43] UK; 5 U.K. centres (RISCK study)	Randomized, controlled, parallel trial 24 weeks	720 participants are at higher risk for metabolic syndrome	Cultural FEL (Modified Mediterranean exchange list to isoenergetic RISCK FEL)	5 experimental diets using food exchange model Intervention: 1 out of 4 isoenergetic dietary plans; high MUFA (HM)/high GI, high MUFA/low GI, low fat/high GI, and low fat (LF)/low GI. Control: reference diet; high-SF, high-glycaemic index (GI) for 24 weeks

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Cardiovascular risk & prevention				
14	Moore et al. 2009 [43] UK; 5 U.K. centres (RISCK study)	Dietary fat intake. -Fat intake in LF group was reduced to 28% of energy (%E) compared with 38% E from the HM and LF diets. -SF intake was successfully decreased in the HM/LF diets to ≤10% E compared with 17% E in the reference diet (p=.001) -Dietary MUFA intake in the HM diets was 17% E, significantly higher than in the reference (12% E) and LF diets (10% E) (p=.001). plasma phospholipid fatty acids: HM diet: High plasma MUFA HS diet: High plasma SFA Carbohydrate quality. The GI of the HGI and LGI arms differed by 9 points (p = .001).	Modified FEL successfully achieved targets for fat, SF, and GI; validated by phospholipid fatty acids	Limited Gl manipulation suggests more research is needed on broader dietary changes to enhance Gl differences without compromising other dietary aspects. The intervention strategy did not change fiber intake, complicating the interpretation of Gl interventions and highlighting a gap. The research does not address the long-term sustainability of the dietary changes, leaving questions about maintaining these regimens in free-living populations.

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Table 3. Summary of included studies on Food Exchange List (FEL) Application in NCD prevention and management (cont.)

No	Author (Year) & Location	Study design and duration	Study population	Type of FEL	Intervention vs Control
Cardiovascular risk & prevention					
15	Metz et al. 1997 [44] USA; 10 clinical centres	Multicentre randomized trial 10 weeks	560 adults with hypertension, dyslipidaemia, and/or diabetes (314 women and 246 men) Mean Age: 54 years 85% white, 10% African American. 2% Hispanic, 2% Asian or Pacific Islander, and 1% Native American.	Standard ADA exchange list (self-selected diet)	self-selected diet based on ADA exchange list for 10 weeks (n=277) vs Prepared meal plan (n-283).

No	Author (Year) & Location	Outcome	Main findings & Practical implications	Research gap & Limitations
Cardiovascular risk & prevention				
15	Metz et al. 1997 [44] USA; 10 clinical centres	Dietary compliance Energy compliance Meal plan group:83% Self-selected diet: 72% CVD risk factors: The compliant subjects in both groups showed greater reduction in body weight, Blood Pressure (Systolic & Diastolic). and Cholesterol (Total & LDL). ($p < 0.05$)	Despite achieving similar reduction in CVD risk factors, prepared meal plans improve dietary adherence compared to self-selected FEL	Strict Compliance Metric: Defining adherence solely by a ± 100 kcal window may mask true behavioural changes and over-rely on the accuracy of self-reported food records. Self-Reporting and Memory Bias: Dietary compliance was assessed using self-reported 3-day food records. Short Study Duration: Concern about long term sustainability

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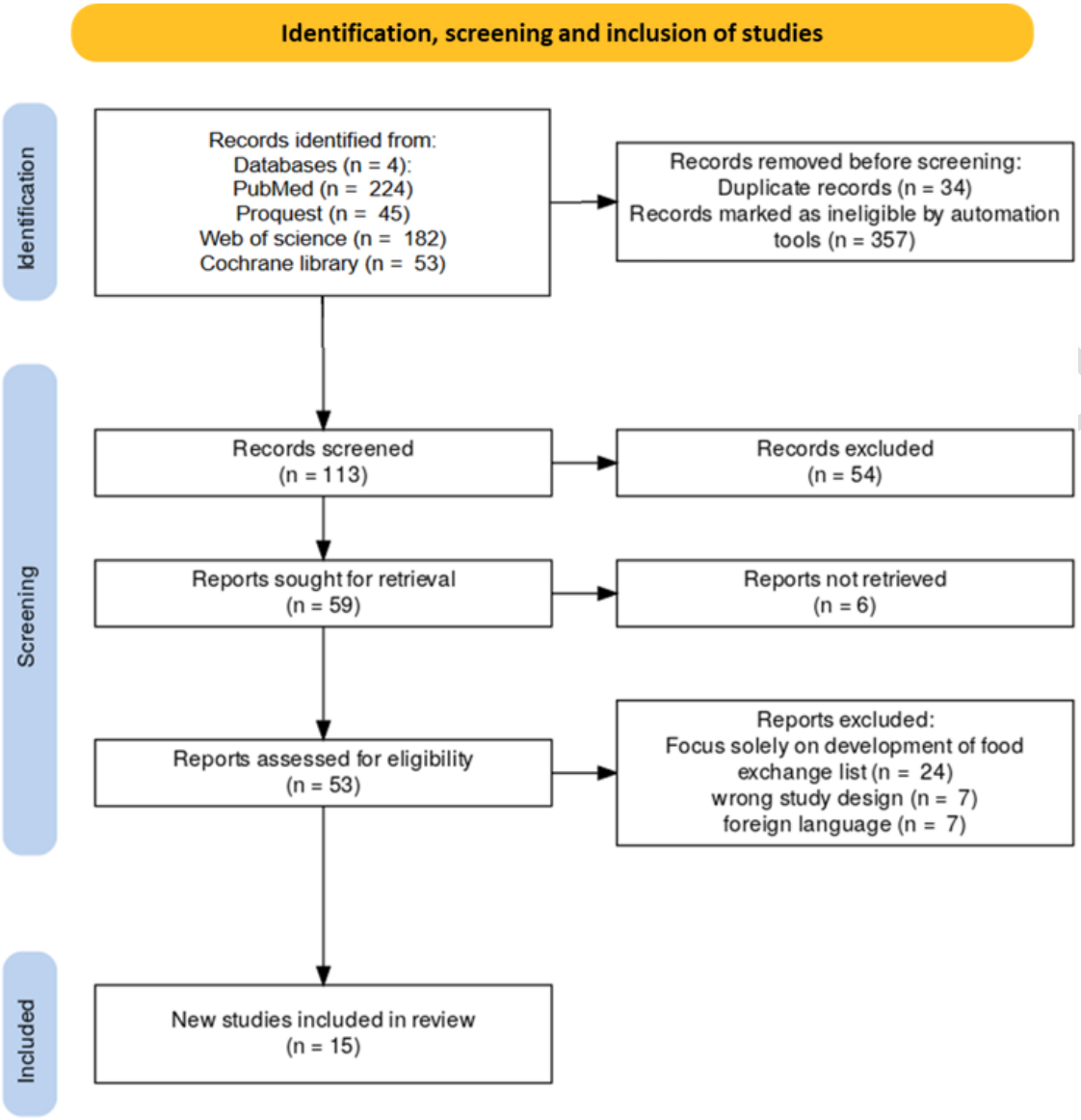

Figure 1. PRISMA flow diagram for study identification, screening, and inclusion[30]

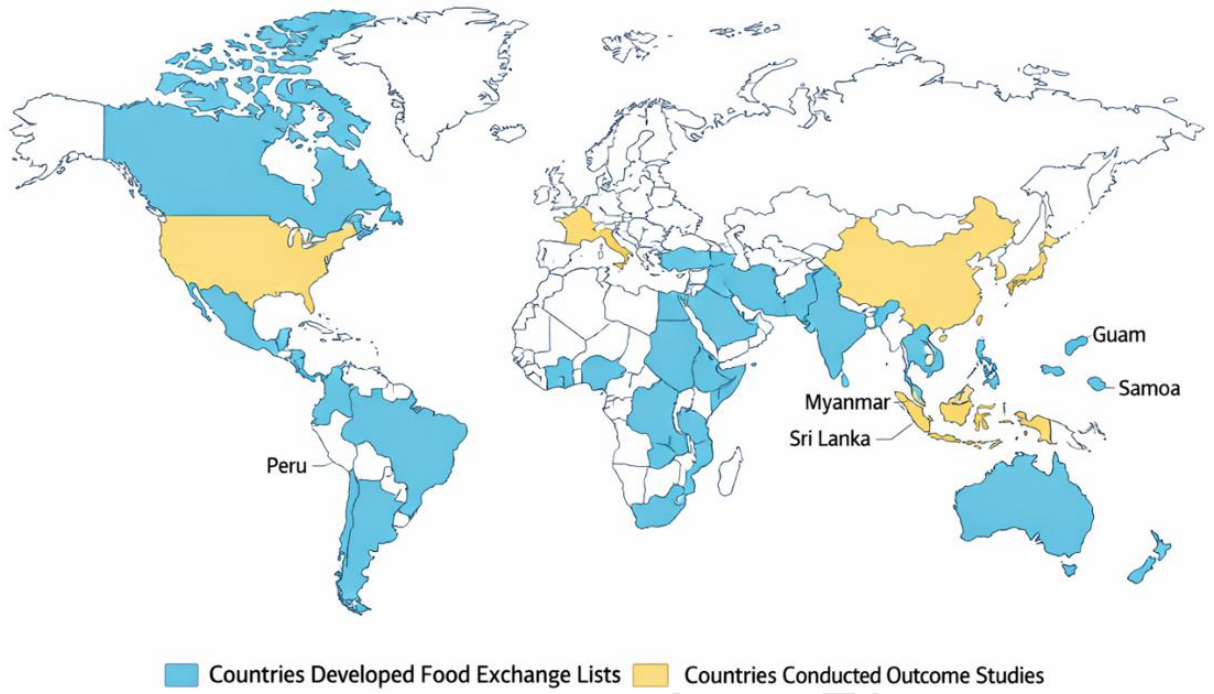

Figure 2. Global distribution of countries that developed cultural Food Exchange Lists (FELs) (light blue) and those that additionally conducted outcome-based studies evaluating FEL applications in NCD management (light yellow)