DSX 18 (2024) 102944

Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Barriers and facilitators of lifestyle management among adult South Asian migrants living with chronic diseases: A mixed-methods systematic review

Purva Gulyani [a,b,*], Priya Rawat [b], Yusra Elmi [b], Sabrina Gupta [c], Ching Shan Wan [d,e]

[a] Department of Sport, Exercise and Nutrition Sciences, La Trobe University, Bundoora, Australia
[b] Diet Yumm, Craigieburn, Victoria, Australia
[c] Department of Public Health, School of Psychology and Public Health, La Trobe University, Bundoora, Australia
[d] Nursing Research Institute, St Vincent's Health Network Sydney, St Vincent's Hospital Melbourne & Australian Catholic University, Australia
[e] National Health and Medical Research Council Centre of Research Excellence in Wiser Wound Care, Menzies Health Institute Queensland, Griffith University, Australia

ARTICLE INFO

Keywords:
Migrants
Disease management
Theoretical domains framework
Type 2 diabetes
Metabolic syndrome

ABSTRACT

Background and aim: South Asian migrants have a higher prevalence of chronic diseases than Caucasians. Despite much literature that has explored challenges in chronic disease management amongst the South Asian population in the past decades, their chronic disease management is still suboptimal. Understanding their determinants of disease management behaviour using the Theoretical Domains Framework will inform the development of a culturally sensitive intervention relevant to consumer-end-users. This study aimed to synthesise qualitative and quantitative studies on chronic disease management among adult South Asian immigrants.
Methods: A mixed-methods systematic review was conducted using electronic databases. The Mixed Methods Appraisal Tool assessed the quality of the included studies. Quantitative data were transformed into qualitative data and analysed thematically. Subthemes were mapped in the Theoretical Domains Framework presenting barriers and facilitators under each theme.
Results: 18293 studies were identified, of which 37 studies were included. The barriers and facilitators identified were categorised into four overarching themes: patient-provider interaction and relationship (e.g., complex language use by health professionals), the impact of migration (e.g., weather conditions had an impact on engagement with physical activity), heritage-based practices (e.g., an obligation to consume energy-dense food in social gatherings), and chronic disease management strategies (e.g., lack understanding of appropriate disease management strategies).
Conclusion: This review provides a comprehensive understanding of the complexity of chronic disease management among South Asian migrants and insights into developing multifaceted interventions to address barriers to chronic disease management, guiding the healthcare professionals in helping overcome South Asians perceived barriers to managing chronic disease in the host countries.

1. Introduction

1.1. Background

South Asians (SA) are a rapidly growing migrant community in Western countries [1], and have a higher prevalence of chronic diseases (CDs) including type 2 diabetes (T2D) [2], hypertension [3], hyperlipidaemia and obesity [4] when compared to the host population. Various explanations for this high prevalence include higher truncal fat at a lower body mass index, increased levels of C – reactive protein [5,6], increased sedentary lifestyle, acculturation towards unfavourable dietary habits [13], and changes in socio-economic status post-migration [7,8]. Despite much literature exploring SA challenges in CD management, their disease management remains unsatisfactory [9,10].

Some studies have shown the effectiveness of culturally tailored lifestyle (diet and exercise) interventions in the host countries in managing CD [11–13] in improving nutritional knowledge, reduction in HbA1c and body mass index (BMI) in the SA migrants with diabetes, it is unclear about the sustainability of these interventions in CD management. Developing a theory-informed intervention targeting SA immigrants' perceived barriers to CD management has shown to be more

* Corresponding author. Department of Sport, Exercise and Nutrition Sciences, La Trobe University, Bundoora, Victoria, Australia.
E-mail address: p.gulyani@latrobe.edu.au (P. Gulyani).

https://doi.org/10.1016/j.dsx.2024.102944
Received 13 May 2023; Received in revised form 5 January 2024; Accepted 8 January 2024
Available online 18 January 2024

Table 1
Determination of selection criteria based on the elements in the PICo (population, phenomena of interest, context) questions.

	Population	Phenomena of interest	Context	Study type	Limits
Inclusion criteria	South Asian migrants aged 18 or above	Viewpoints, attitudes, perceptions, experiences, barriers, and facilitators to lifestyle changes in managing obesity, hypertension, T2D, and dyslipidaemia	Any study setting including community, primary and tertiary care	Qualitative studies Quantitative studies Mixed-methods studies	Published English Empirical studies
Exclusion criteria	South Asian in native country Healthcare professional's perspectives	Chronic diseases other than obesity, hypertension, T2D, and dyslipidaemia Chronic disease prevention		Grey literature, editorial, conference abstract, unpublished studies, and dissertations	

effective and sustainable than interventions that are not theory-based [14]. The scarcity of randomised controlled trials with diet and lifestyle interventions for weight management in adults from ethnic minority/non-white groups, special mention to SAs, along with the need to assess their health beliefs, barriers and motivators for behaviour change before planning lifestyle interventions [15]. Further, there is a paucity of systematic reviews that aims at comprehensive understanding of barriers and facilitators associated with lifestyle management among South Asian adults across a range of chronic diseases [16,17].

To gain a better understanding of SA immigrants' preferences and needs in CD management, it is important to use a theory-informed approach to explore further their determinants of behaviours using frameworks such as the Theoretical Domains Framework (TDF) to provide a better insight into how they adapt lifestyle recommendations and interact with the health care system of the host countries to manage their existing CD. Collating existing evidence on SA perceptions and experiences of CD management in a host country using systematic review methodology, followed by mapping SA immigrants' perceived barriers and facilitators to managing CD to TDF allows the identification of common factors contributing to their CD management in the host countries. It enables researchers to identify key determinants of disease management behaviours that need to be addressed in an intervention to improve culturally relevant and patient-centred care and improve disease management in SA migrants.

However, no study of our knowledge synthesises qualitative and quantitative evidence on SA immigrants' barriers and facilitators of CD management in the host countries using a rigorous theoretical approach such as TDF mapping. The uniqueness of using TDF in this review demonstrates the benefits of using an implementation science framework, which is found useful in developing effective health service research-related interventions, in improving patient-centredness care. It is hypothesised that using this theory-informed approach help to disentangle key influential factors of CD management among SA immigrants, which subsequently provides a theoretical basis and guides the intervention development to address barriers in each contributing factor.

1.2. Aim

This study aimed to synthesise qualitative and quantitative studies on barriers and facilitators to managing CDs among adult SA immigrants living with CDs in the host countries.

2. Methods

2.1. Design

This mixed-methods systematic review aimed to identify, appraise, and synthesise all the peer-reviewed empirical evidence (both qualitative and quantitative) that were relevant to investigate barriers and facilitators to lifestyle management of obesity, hypertension, T2D and dyslipidaemia among SA migrants living in Western countries. As both quantitative and qualitative research designs could address the research questions, the convergent integrated approach described in the JBI Manual for Evidence Synthesis Handbook [18] was the most appropriate approach for this systematic review and was followed.

The literature screening, critical appraisal and data extraction processes were conducted independently by any of the two reviewers (PG, YE, PR and CA) as recommended in the Cochrane Handbook guidelines [19]. Any disagreements that arose between the reviewers were resolved through discussion. Any further discrepancies were resolved by a third reviewer with methodological expertise (CSW).

The reporting of this review was aligned with the Preferred Reporting Items for Systematic Reviews and Meta-analysis (PRISMA) Statement 2020 [20] and American Psychological Association (APA) reporting standards for mixed-methods research [21]. The protocol was registered in the PROSPER, International prospective register of systematic reviews (CRD42021247942).

2.2. Search strategy

Given the descriptive nature of this review, PICo (population, phenomenon of interest and context) tool was used as a guide to formulate selection criteria and search strategies that were relevant to the research questions [22], as stated in the JBI handbook. The determination of selection criteria (inclusion and exclusion) based on PICo of research questions was presented in Table 1. Three types of search strategy terms were used to identify studies of interest based on the terms below.

1. South Asian migrants (which were defined as migrants who originated from Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka) [23].
2. CD of interest including obesity, hypertension, T2D and dyslipidaemia
3. Perceptions or experiences

The text words and MeSH and EMTREE terms used for these three search strategies were checked with an experienced university librarian. The following databases were systematically searched on April 9, 2021: Medline, CINAHL, ProQuest, Scopus, EMBASE, and Cochrane Central Library. They were searched under title and abstract and then combined using Boolean operators:

(Search strategy 1) AND (Search strategy 2) AND (Search strategy 3).

The search strategy was adapted for each database and is presented in Supplementary Table 1. All retrieved studies were imported to the systematic review management software Covidence for screening, critical appraisal and data extraction.

The bibliographies of relevant systematic reviews identified were screened in the screening process. For any relevant dissertations or conference abstracts identified, reviewers used Google Scholar to look for related peer-reviewed publications. Backwards and forward reference searching using bibliographies of included studies and Google Scholar and Scopus respectively were used to search for additional publications. Researchers in relevant fields were contacted for assistance in identifying studies if necessary.

2.3. Inclusion criteria

Any empirical study using any qualitative or quantitative research design to explore viewpoints, attitudes, perceptions, experiences, barriers and facilitators of lifestyle changes to manage CDs of interest among adult SA migrants was included. There was no striction on study settings to capture barriers and facilitators to manage chronic diseases in the community, primary and tertiary care. Only studies written in English and published in peer-reviewed journals were included in this review, with no limitation on the year of publication.

2.4. Exclusion criteria

Given that the target population of this systematic review were SA migrants, studies that failed to specify the ethnicity of the population studied were excluded. Similarly, studies focusing on SA in their native country or healthcare professionals' perspectives on chronic disease management were excluded. As this systematic review focused on obesity, hypertension, T2D and dyslipidaemia management, studies related to broader chronic disease prevention or other CDs were excluded. Non-peer-reviewed journal articles, grey literature, editorial, conference abstracts, unpublished studies, and dissertations were excluded from this review.

2.5. Critical appraisal

The methodological quality of included studies was appraised using the Mixed Methods Appraisal Tool (MMAT) designed to appraise the methodological quality of five types of study designs (which were qualitative research, randomised controlled trials, non-randomised studies, quantitative descriptive studies and mixed-methods studies) in a mixed-methods systematic review [24].

2.6. Data extraction

Data from all included studies were extracted using a standardised form tailored for this systematic review modified from the JBI data extraction form. Data collection included the first author's name, year of publication, location of study, objectives, study design, data collection methods, number of participants, participants' characteristics, and reported qualitative and quantitative findings (Supplementary Table 2). Themes, findings, and participant quotations were extracted from qualitative findings. Outcome measures, numerical results and descriptive narratives written by the authors were extracted from quantitative findings. Both qualitative and quantitative data were extracted concurrently. For included mixed-methods studies, qualitative and quantitative data were extracted separately. The triangulated qualitative data were extracted as qualitative data. For studies that used open-ended questions in surveys, the data were extracted as qualitative data.

2.7. Data transformation

Given the convergent approach in data synthesis in which qualitative and quantitative data from included studies carry equal weight [25], quantitative data qualitisation was recommended as a less error-prone approach to transform data into a mutually compatible format and allow integration with qualitative data [26]. One reviewer (CSW) was responsible for qualitising data which involved narrative description and interpretation of the quantitative results based on descriptive statistics such as averages or percentages scores, and variables identification and pattern description based on statistical analyses [26]. Original authors' narrative summaries on quantitative findings were used to validate the qualitised data.

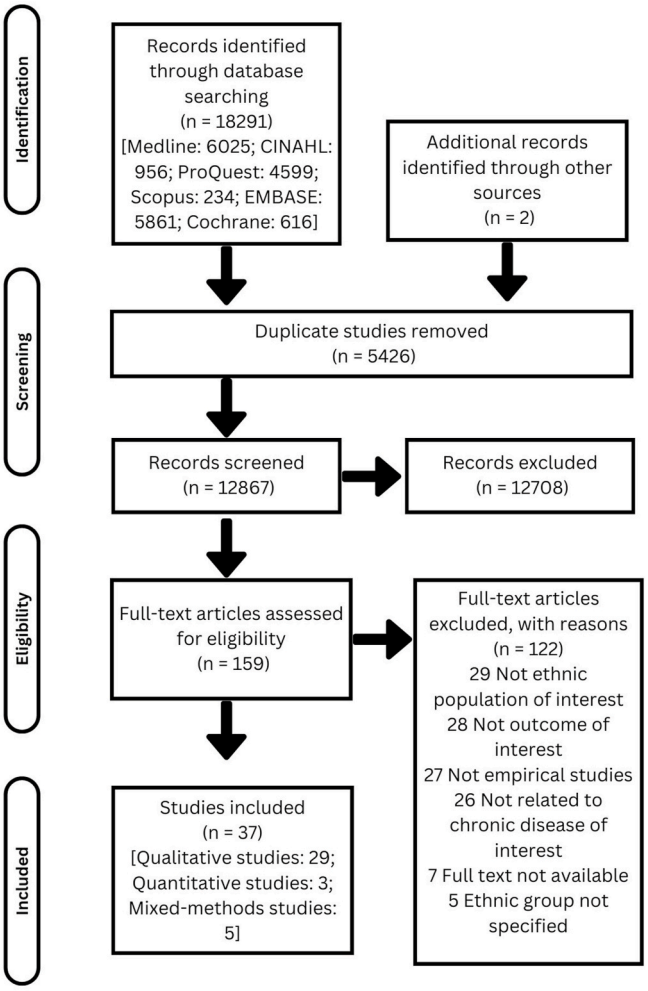

Fig. 1. PRISMA flow diagram.

2.8. Data analysis

Qualitised data from quantitative studies were assembled and analysed with the qualitative data in original studies. A thematic synthesis approach was used to analyse and synthesise all findings [27]. It involved coding findings, followed by grouping common codes into defined categories. Categories that were sufficiently similar in meaning were aggregated into synthesised themes. This allowed aggregating grouped findings into specific themes, providing a summary of the evidence for each particular theme. Given that the TDF is framework commonly used in implementation research to develop behaviour change interventions in a systematic and theoretically informed way, the themes identified were then mapped into the TDF [28,29]. The descriptors of each construct in each of the 14 theoretical domain was used to allocate themes under the relevant TDFs [29]. The thematic synthesis was conducted by one reviewer (PG) for all included studies, with a second reviewer (YE) independently analysing a subset [10] of randomly selected included studies. The themes identified were compared between the two reviewers. Any contrasting items were discussed to reach an agreement. Any further disagreements were resolved by a third reviewer with methodological expertise (CSW). The themes that emerged were then allocated into theoretical domains through discussion between PG, PR, YE and CSW. NVivo 12 (QSR International Pty Ltd.) was used to assist with qualitative data management.

Table 2
Study and participant characteristics of included studies, stratified by study design.

Author, year	Country	Methodology		South Asian Participants				Study focus
		Setting	Data collection method	Total number	Age (Range)	Country of origin	Chronic disease/ condition	
Qualitative								
Choudhury et al., 2009 [51]	United Kingdom	Community	Individual interviews	14	26–67	Bangladesh	T2D	Examine the understanding and beliefs of T2D and opinions on educational programmes
Chowdhury et al., 2000 [52]	United Kingdom	Primary Care	Individual interviews and focus groups	40	24–78	Bangladesh	T2D	Explore food beliefs and classification system
Fagerli et al., 2005 [41]	Norway	GP clinic, hospital	Semi-structured interviews	15	38–66	Pakistan	T2D	Explore participants' response to dietary advice
Greenhalgh et al., 1998 [53]	United Kingdom	GP clinics	Semi-structured interviews, Focus groups	40	Not specified	Bangladesh	T2D	Explore beliefs, attitudes and experiences of T2D management
Gupta et al., 2018 [58]	Australia	GP clinics, Primary care, hospitals and community	In-depth, semi-structured interviews	41	28–80	India or Sri Lanka	T2D	Explore perceptions and experiences of T2D management
Hempler et al., 2015 [49]	Denmark	Primary care, community	Individual interviews	11	34–70	Pakistan	T2D	Explore perspective on dietary education and healthy food choices
Islam et al., 2012 [39]	United States	Community	Focus groups	47	Not specified	Bangladesh	T2D	Understand barriers and facilitators of T2D
Kelleher et al., 1994 [54]	United Kingdom	Primary care	Individual interviews	40	Not specified	Bangladesh	T2D	Explore the integration of traditional and religious food practices within T2D participants.
Khalid et al., 2018 [42]	Norway	Community	Semi-structured interviews	9	28–58	Pakistan	Overweight	Understand better which changes among food traditions are necessary to prevent overweight.
King-Shier et al., 2019 [36]	Canada	Primary care, community	Semi-structured interviews	27	24–76	India, Pakistan, Bangladesh, Sri Lanka or Nepal	Hypertension (HTN)	Develop an in-depth explanation of how and why South Asians manage (or do not) their HTN.
Kokanovic & Manderson, 2007 [43]	Australia	GP clinics, community	In-depth interviews	8	44–82	India	T2D	Explore the perception of patient-provider interaction regarding diagnosis, treatment and management of T2D.
Lawton et al., 2005 [74]	United Kingdom	GP clinics, community	In-depth individual interviews	32	Not specified	India, Pakistan	T2D	Explore the perception and experiences of medication use
Lawton et al., 2006 [56]	United Kingdom	GP Clinics, community	In-depth individual interviews	32	Not specified	India, Pakistan	T2D	Explore the views and perceptions about diabetes services
Lawton et al., 2006 [75]	United Kingdom	GP clinics, community	In-depth individual interviews	32	Not specified	India, Pakistan	T2D	Explore the perceptions and experiences about undertaking physical activity
Lawton et al., 2008 [7]	United Kingdom	GP clinic, community	In-depth individual interviews	32	Not specified	India, Pakistan	T2D	Explore participant's perception of barriers and facilitators on dietary, social and cultural factors in T2D management
Majeed-Ariss et al., 2015 [50]	United Kingdom	Community	Semi-structured interviews	15	31–76	Pakistan	T2D	Explore the effects of T2D on individual identity and self-management
Mian & Brauer, 2009 [37]	Canada	Community	Focus groups	53	Not specified	Pakistan, Bangladesh, Sri Lanka, India	T2D	Examine perceived needs and preferences for diet counselling resources
Morrison et al., 2014 [55]	United Kingdom	GP clinic, community,	Narrative-based semi-structured interviews	24	Not specified	India, Pakistan	Overweight, borderline T2D	Explore the experiences of participating in a lifestyle intervention
Naeem, 2003 [44]	United Kingdom	Hospital, community	Structured interview	106	Not specified	Pakistan	T2D	Explore the experience and attitude towards T2D control
Patel et al., 2017 [11]	United Kingdom	GP clinics, community	Semi-structured interviews, pile-sorting exercise.	10	61.0 ± 12.5*	India	T2D	Explore the influence of health and cultural beliefs and behaviours on T2D management

(*continued on next page*)

Table 2 (*continued*)

Author, year	Country	Methodology		South Asian Participants				Study focus
		Setting	Data collection method	Total number	Age (Range)	Country of origin	Chronic disease/ condition	
Prinjha et al., 2020 [76]	United Kingdom	Community	Focus group	56	18–84	India, Pakistan, Bangladesh, Sri Lanka	T2D	Explore perceptions of T2D using mobile health SMS text messaging
Singh et al., 2012 [60]	United Kingdom	Hospitals	Semi-structured interviews	12	52.6 ± 13.3*	South Asia; not specified	T2D	Explore barriers and support systems for optimising T2D
Stone et al., 2005 [46]	United Kingdom	GP clinics	Semi-structured interviews	15	37–80	India	T2D	Explore the experience and attitudes of T2D
Tan et al., 2018 [47]	Singapore	Hospitals	Semi-structured interviews, Focus Group	4	Not specified	India	T2D	Explore the experience, perception, expectations, and barriers in T2D management
Uppal et al., 2016 [38]	Canada	Primary Care, Community	Semi-structured interviews	9	44–70	India	T2D	Explore the ethnocultural influences managing T2D
Venkatesh & Weatherspoon, 2013 [40]	United States	Community	In-depth interviews	30	Not specified	India	T2D	Determine social and health care provider support in T2D self-management
Wilkinson et al., 2014 [57]	United Kingdom	GP Clinics	Semi-structured interviews	28	34–77	Not Specified	T2D	Explore support need on self-management
Wilkinson et al., 2014 [77]	United Kingdom	GP Clinics	Semi-structured interviews	28	34–77	India, Pakistan, Bangladesh	T2D	Explore perspectives on T2D diagnosis to support quality care
Zhang et al., 2018 [48]	New Zealand	GP clinics, Primary care, community	Focus group	6	Not specified	India	T2D	Explore participant's experiences, beliefs, and emotions on nutritional management
Quantitative								
Abuelamgd et al., 2018 [35]	Norway	Community	Questionnaire, face-to-face interviews	120	55.7*	Pakistan	T2D	Assess response to lifestyle changes
Mixed-methods								
Baradaran & Knill-Jones, 2004 [28]	United Kingdom	GP Clinics, community	Survey, Questionnaire	145	58.3 ± 11.9*	India, Pakistan	T2D	Assess knowledge, attitudes and understanding of T2D
Emadian et al., 2017 [29]	United Kingdom	Community	Semi-structured interviews	63	44.83 ± 9.90*	India, Pakistan, Bangladesh, UK	Obesity	Understand dietary intake and related behaviours
Hawthorne & Tomlinson, 1999 [30]	United Kingdom	GP clinic, primary care	Individual Interview, Questionnaire	201	53*	Pakistan	T2D	Explore factors in self-management of T2D
Hyman et al., 2017 [31]	Canada	Community	Survey, questionnaire, face-to-face interviews	100	Not specified	Bangladesh, Pakistan, Sri Lanka	T2D	Examine provider- and patient-related factors in self-management
Neblett et al., 2019 [32]	Malaysia	Primary care	Focus groups, In-depth interviews	10	50–79	India	T2D	Explore belief, knowledge, and barriers and facilitators for T2D self-care
Patel et al., 2015 [33]	United Kingdom	GP clinics	Questionnaire, semi-structured interview	67 ± 12.5*	61.0	India, Pakistan, Bangladesh, Nepal	T2D	Explore sociocultural influence on T2D self-management
Venkatesh et al., 2013 [34]	United States	Community	In-depth Interview	30	Not specified	India	T2D	Explore acculturation and glycaemic control

T2D: Type 2 Diabetes; HTN: Hypertension.

3. Results

3.1. Study selection

The search strategy resulted in 18291 papers from six databases. After removing 5246 duplicates, 12867 were eligible to be screened for titles and abstracts. Full-text screening was performed on 159 studies out of which 35 studies were included. Another two studies were identified via forwards and backward referencing, so 37 studies were included in this systematic review. Most excluded studies were either not of the ethnic population of interest (n = 29) or not related to the perceptions and experiences of SA in managing CDs (n = 28). The PRISMA diagram is presented in Fig. 1.

3.2. Study characteristics

Details on the study and participant characteristics are presented in Table 2. The majority of the included studies (n = 29) used qualitative methodology to explore the barriers and facilitators among the target population, followed by seven mixed methods studies [30–36] and one quantitative study [37]. Included studies were mainly conducted in the United Kingdom (n = 21), alongside four studies in Canada [33,38–40] and three each in the United States [36,41,42] and Norway [37,43,44]. Most included studies recruited participants either in primary care or communities.

3.3. Participant characteristics

The total number of participants in the included studies was 1559, of which 16 studies included participants from two or more SA countries. Ten included studies had participants of Indian origin [34,36,40,45–50], six from Pakistan [32,37,43,44,51,52] and five from Bangladesh [41, 53–56]. Most of the studies were conducted with a focus on people living with T2D (n = 33), three studies included overweight/obese participants [31,44,57] and only one study focused on hypertension [38].

Table 3
Quality assessment of included studies using the Mixed-Methods Appraisal Tool, stratified by study design.

Author, year	Question 1	Question 2	Question 3	Question 4	Question 5
Qualitative					
Choudhury et al., 2009 [51]	Can't tell	Can't tell	Can't tell	Yes	Can't tell
Chowdhury et al., 2000 [52]	Yes	Yes	Can't tell	Can't tell	Can't tell
Fagerli et al., 2005 [41]	Yes	Can't tell	Can't tell	Yes	Can't tell
Greenhalgh et al., 1998 [53]	Yes	Yes	No	Yes	Yes
Gupta et al., 2018 [58]	Yes	Yes	Yes	Yes	Yes
Hempler et al., 2015 [49]	Yes	Yes	Yes	Yes	Yes
Islam et al., 2012 [39]	Yes	Can't tell	Can't tell	Yes	Can't tell
Kelleher et al., 1994 [54]	Yes	Can't tell	Can't tell	Yes	Can't tell
Khalid et al., 2018 [42]	Yes	No	No	Yes	Can't tell
King-Shier et al., 2019 [36]	Yes	Yes	Yes	Yes	Yes
Kokanovic & Maderson, 2007 [43]	Yes	Can't tell	Yes	Yes	Yes
Lawton et al., 2005 [74]	Yes	Yes	Can't tell	Yes	Can't tell
Lawton et al., 2006 [56]	Yes	Yes	Can't tell	Yes	Yes
Lawton et al., 2006 [75]	Yes	Can't tell	Yes	Yes	Yes
Lawton et al., 2008 [7]	Yes	Yes	Can't tell	Yes	Can't tell
Majeed-Ariss et al., 2015 [50]	Yes	Yes	Can't tell	Yes	Yes
Mian & Brauer, 2009 [37]	Yes	Yes	Can't tell	Can't tell	Can't tell
Morrison et al., 2014 [55]	Yes	Can't tell	Yes	Yes	Yes
Naeem, 2003 [44]	Yes	Can't tell	Can't tell	Can't tell	No
Patel et al., 2017 [11]	Yes	Yes	Yes	No	Yes
Prinjha et al., 2020 [76]	Yes	Yes	Yes	Yes	Yes
Singh et al., 2012 [60]	Yes	Can't tell	No	Yes	Can't tell
Stone et al., 2005 [46]	Yes	Yes	Can't tell	Yes	Yes
Tan et al., 2018 [47]	Yes	Yes	Yes	Yes	Yes
Uppal et al., 2016 [38]	Yes	Can't tell	Can't tell	Yes	Yes
Venkatesh & Weatherspoon, 2013 [40]	Can't tell	No	Yes	No	Can't tell
Wilkinson et al., 2014 [57]	Can't tell	Can't tell	Yes	Yes	Yes
Wilkinson et al., 2014 [77]	Yes	Yes	Yes	No	Yes
Zhang et al., 2018 [48]	Yes	Yes	Can't tell	Yes	Yes
Quantitative					
Abuelamgd et al., 2018 [35]	Yes	No	Can't tell	Yes	Yes
Mixed-methods					
Baradaran & Knill-Jones, 2004 [28]	Yes	Can't tell	Yes	Can't tell	Yes
Emadian et al., 2017 [29]	Yes	Yes	No	Can't tell	Yes
Hawthorne & Tomlinson, 1999 [30]	Yes	Can't tell	Can't tell	Can't tell	Can't tell
Hyman et al., 2017 [31]	Yes	Yes	Yes	Can't tell	Yes
Neblett et al., 2019 [32]	Yes	Can't tell	Can't tell	Yes	Can't tell
Patel et al., 2015 [33]	Yes	Yes	Yes	No	Yes
Venkatesh, 2013 [34]	Can't tell	No	Yes	No	Can't tell

3.4. Quality appraisal

A detailed description of the results of the quality appraisal has been provided in Table 3. Most of the studies (89.5 %) provided enough information about the appropriateness of the research methodology. Nearly half (52.6 %) of studies outlined the appropriateness of data collection and 44.7 % adequately reported data analysis or synthesis.

3.5. Key study findings

Barriers and facilitators were identified in seven TDFs (Table 4), including "environment context & resources", "knowledge", "social influences", "skills", "social/professional role and identity", "beliefs about capabilities", and "intentions" domains. These barriers and facilitators were categorised into four overarching themes, which are patient-provider interaction and relationship, the impact of migration, heritage-based practices, and chronic disease management strategies. The summary of the findings are also visually represented in Fig. 2.

3.5.1. Patient-provider interaction and relationship

This theme describes SA immigrants' views on interaction with health professionals (HPs). Barriers and facilitators related to improving patient-centred care were identified in the "environment context & resources", "knowledge" and "social influence" domains. In 46 % of included studies, the main barrier to managing CDs for SA migrants was the lack of culturally appropriate dietary and lifestyle advice [36–39,41,43,45,47,48,51,52,55,57–61], along with 27 % indicating the lack of information provided about disease management [34,40,43,45,48,50,51,59–61] by the HP. Another common barrier was the use of complex language during the consultation [39,42,43,45,48–51,59–61]. Despite the above-stated barriers, HP was viewed as a trusted source of information in 30 % of the included studies [34,37,40,49,50,53,55,60,62]. SA migrants were appreciative of the respectful patient-provider relationship. They felt equal and respected during the consults by HP gestures such as getting up to greet them, which was considered a facilitator for them in following advice [33,42,58,61].

3.5.2. Impact of migration

This theme elaborates on how migration affected disease management among SAs. Barriers and facilitators related to the impact of migration were identified in the "environment context & resources", "skills" and "belief about capabilities" domains. The struggle to meet financial needs in the host country was documented as a common barrier in managing their CDs [33,39,41,46,53]. For instance, they reported a lack of cognitive competence in planning lifestyle changes due to multiple jobs to fulfil the financial needs related to settlement and post-migration and unaffordable health insurance that covers disease management costs as a hindrance to managing T2D [33]. Furthermore, as cited by 22 % of the studies, SA migrants mentioned that the increased household duties post-migration hindered CD management because they were shared between family members before migration [31,38,39,49,51,53,57,60]. Coming from subtropical weather to Western countries with cold weather, SA migrants found it difficult to meet their physical activity recommendations by engaging in physical activity outdoors [31,36,39,43,53,55,57]. In addition, some studies mentioned the safety concern in the form of fear of racial discrimination while walking

Table 4
Barriers and Facilitators in managing Chronic Disease among South Asian migrants stratified based on the domains of Theoretical Domian Framework (TDF).

	Contributing Factors of Chronic Disease Management		
TDF Domain	Construct	Barriers	Facilitators
Theme 1 – Patient-provider Interaction and relationship			
Environment context & resources	Organisational Culture	- Not using layperson language in appointments [37,40,41,43,46–49,57–59] - Lack of cultural understanding reflected in patient-provider interaction [40,41,49,59] - Dissatisfaction due to not being physically examined by HP[a] [56] - Time constraint in consultation with the HP[a] [48]	- Respectful patient-provider relationship [31,40,56,59]
	Resources	- Lack of culturally appropriate dietetic and lifestyle advice [34–37,39,41,43,45,46,49,50,53,55–59]	- HP[a] as a trusted source of information [32,35,38,47,48,51,53,58,60] - Women favouring dietitians as a source of dietary advice [58] - Short text messaging helped in disease self-management [72]
Knowledge	Procedural Knowledge	- Lack of information provided about disease management [32,38,41,43,46,48,49,57–59] - Inadequate understanding or misinterpretation of dietary advice [48,54,59]	- Health care advice provided by the HP[a] easily incorporated into practice [35,51,59]
Social Influences	Social Support	- Perceived poor advanced knowledge of HP[a] about disease management [40]	- HP[a] with shared cultural background to provide culturally specific advice [38,41,56]
Theme 2 – Impact of migration			
Environment context & resources	Resources	- Struggling to meet basic needs financially influenced disease management [31,37,39,44,52] - Lack of awareness of HC[b] services available [48] - Lack of convenient facilities to do physical activity [44,51,53]	- Minimal financial cost in attending healthcare services [56]
	Person × Environment Interaction	- Cold weather restricted them from doing physical activity [29,34,37,41,51,53,55] - Unsafe environment (e.g., fear of racial discrimination) hindered physical activity [32,44,53]	- More easily accessible resources to facilitate disease management in host countries [58,61] - Increased consumption of fruits due to increased availability in the host country [52]
		- Exposure to atherogenic food and beverages [52,58] - Increased sedentary lifestyle post migration [38,39]	
Skills	Skills	- Illiteracy negatively influences patient-provider communication [28] - Unfamiliarity with and lack of understanding on how to cook local foods [37,52] - Not ready to make changes in cooking style [44,46,47,49,53,59]	Nil
Beliefs about Capabilities	Perceived competence	- Lack of time to make lifestyle changes to manage disease due to additional responsibilities post migration [29,36,37,47,49,51,55,58] - Traveling overseas for family gatherings reduced perceived competence in management [46]	Nil
Theme 3 – Heritage based practises			
Social/ professional role and identity	Social Identity	- Cultural commitments hindered making lifestyle changes [29,53,58,59] - Gender – females finding it difficult to manage diseases [30,46,50] - Respect for the elderly, making it difficult to refuse food from them [42] - Fatalistic attitude towards health and disease [33,36,44,56]	- Cultural beliefs such as the concept of niyom – following a routine and rules help in self-management of the disease [39] - Good self-care and disease management as a family obligation [55]
	Group Identity	Nil	- Religious activity of praying and use of CAM[c] believed to promote health [39] - Religion and spirituality provide psychological support in disease management [60]
	Identity	- Cultural beliefs related to food, health, and disease [52–54,58,59] - Female patients felt discomfort in the presence of opposite-sex HP[a] [46,55]	Nil
Beliefs about Capabilities	Beliefs	- Not believing in the seriousness of the disease [28,36,47]	Nil

(continued on next page)

Table 4 (*continued*)

	Contributing Factors of Chronic Disease Management		
TDF Domain	Construct	Barriers	Facilitators
		- Prefer CAM[c] therapy than medication prescribed by HP[a] [32,37] - Perception that traditional cultural diet was unhealthy [29] - Stress and social stigma associated with the disease diagnosis and management [33, 41,43,46,49,50,58, 60]	
Social Influences	Social Pressure	- Forced consumption of energy-dense food in social gatherings as a barrier to adhering to dietary recommendations [30,37,39,40,42,54, 55,58–60]	Nil
	Social Norm	- Buffet-style eating may lead to overeating [42] - Fasting for religious purposes may affect disease management [44, 49,54] - Consumption of calorie-dense food when celebrating feasts and festivals [53,55] - Late meal timings [37]	Nil
Theme 4 – Chronic disease management strategies			
Knowledge	Procedural Knowledge	- Difficulty interpreting food labels in native language [37, 49 [37, 49]	Nil
	Knowledge	- Lack understanding of the diseases [28, 36,39,44,51,53]	- Acknowledging the role of lifestyle modification in managing diseases [29,33, 58] - Learning from repeated experiences made management easier [28,36]
Skills	Skills	Nil	- Home cooking to optimize dietary management [37]
Beliefs about Capabilities	Perceived competence	- Past negative experiences reduced competence in self-management [50, 73]	- Increased self-confidence through positive self-management experiences' [29, 33,39,50]
Intention	Stages of change model	- Unwillingness to compromise taste over health [36,42, 47] - Lack of motivation to make recommended lifestyle changes [29,33,39,44]	- Willingness to change food beliefs and adopt new strategies to manage diseases [33,52] - Following the recommended intervention

Table 4 (*continued*)

	Contributing Factors of Chronic Disease Management		
TDF Domain	Construct	Barriers	Facilitators
			believed to benefit the whole family [55]
Social Influences	Social Support	- Lack of psychological support from HP[a], friends and family to motivate lifestyle changes [49,50]	- Family, friends, and HP[a] support in managing disease has been crucial [29,37,40, 49,50] - Having family members with chronic disease helped in self-management [45, 50] - Community activities such as walking groups encourage self-management of disease [39]

[a] HP: Health Professional.
[b] HC:Health Care.
[c] CAM: Complementary and Alternative Medicine.

outdoors or in gyms [34,46,55] as a prominent barrier to physical activity. The positive impact of migration in regard to the healthcare system on CD management has also been reported in studies conducted in UK, Australia and Canada as compared to the studies conducted in USA. The access to health care appointments at a minimal financial cost [58], and more readily available resources such as glucometers in host countries were facilitators to disease management among SA migrants [60,63].

3.5.3. *Heritage-based practices*

This theme describes how their cultural beliefs and values, religious practises and social interaction influence CD management. Barriers and facilitators related to the heritage-based practices were identified in the "social/professional role and identity" "belief about capabilities" and "social influences" domains. A total of 27 % of included studies report the social obligation of consuming energy-dense food in social gatherings was reported as the most common barrier to following dietary recommendations [32,39,41,42,44,56,57,60–62], as denying food offered is considered a sign of disrespect. The fatalistic attitude towards health and disease, believing that CDs were inevitable, was a barrier for the SAs [35,38,46,58]. The participants mentioned distress when they were initially diagnosed with T2D mainly due to perceived consequences of the condition such as lifelong use of medication to manage blood glucose levels [35,45]. Cultural obligations in following specific diets, such as fasting, celebrating festivals with energy-dense foods, praying and not denying any food offered at religious places, have often been perceived as a barrier to following diet recommendations and managing chronic diseases [31,54–56,58,60,61].

Diagnosis and management of diseases were stressful and stigmatising for the SA migrants as stated in 22 % of the studies [35,43,45,48, 51,52,60,62]. Females of the SA families found it difficult to look after themselves or manage their conditions due to their gender-based roles and responsibilities in the household [32,48,52]. To comply with perceived social etiquette and avoid social stigma related to being judged for developing diabetes, participants found it difficult to comply with the diet recommendations [52,62].

Regarding facilitators to CD management, before resorting to allopathy, participants in some studies achieved control of their blood glucose through complementary and alternative medicines (CAM) (such as Ayurveda) [34,39].

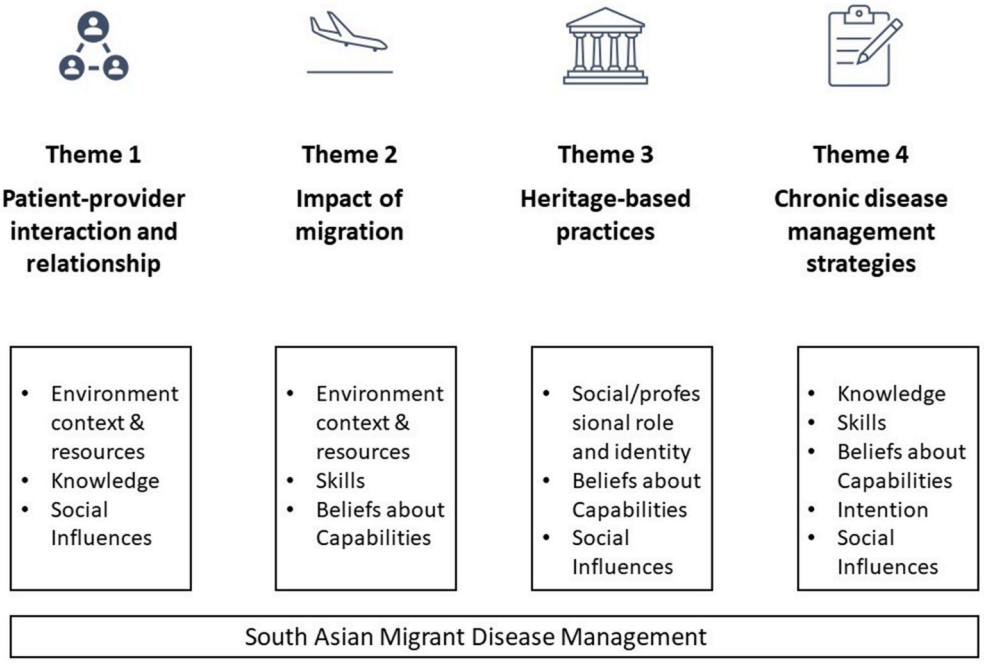

Fig. 2. Themes Identified straitified based on the Theoretical Domains Framework domains.

3.5.4. Chronic disease management strategies

This theme described SA migrants' views on CD management strategies. Barriers and facilitators related to CD management strategies were identified in the "knowledge", "skills", "belief about capabilities", "intentions" and "social influences" domains. According to 30 % of the studies included, SA migrants described difficulty in understanding disease-related information [39,42,43,45,48–51,59–61], along with difficulty in interpreting food label information present in different languages [39,51] as a barrier. A reluctancy towards compromising taste over health [38,44,49] and lack of motivation to adapt to recommended lifestyle changes by the HP [26,30,36,48], which may link back to the non-culturally appropriate advice, was noted as a barrier in self-managing CDs. The confidence in self-managing diseases was reported with learnings from repeated and positive past experiences of friends and families living with CDs [31,35,41,52]. Family and friends have been mentioned as a support structure for the migrant community in various studies. They served as a trusted source of information [31,39,42,51,52]. Cooking at home from scratch was noted as a facilitator in optimising dietary management [39].

4. Discussion and conclusion

4.1. Discussion

This review aimed to identify SAs' perceived barriers and facilitators to CD management and found four main themes as contributing factors to influence SA disease management, which are patient-provider interaction and relationship, the impact of migration, heritage-based practices, and chronic disease management strategies. It provides new insights into four imperative areas that need to be addressed when developing a patient-end-user-focused, theory-based and multi-level intervention to improve CD management among SA immigrants. Table 5 provides a summary of suggestions on areas for further research from the individual to the organisational level.

HPs hold a prominent position in the SA immigrant community as a trusted source of information regarding health and disease management. This trust stems from a cultural inclination towards authoritative figures in the healthcare domain. HPs require a better understanding of how SA cultural beliefs and practices influence health behaviours and CD management [60]. This review provides an overview of cultural factors contributing to CD management among SA, which are similar to the findings from other studies with different ethnic minorities such as one conducted with Hispanic individuals living in the United States [64] and African and Caribbean communities living in the UK [65], which suggested that to improve the T2D management in this population the treatment should be individualised based on their cultural preferences with the use of a culturally appropriate educational material.

Our recently published study on dietary management in diabetic SA's highlighted participants' positive perception of the Australian healthcare system's support for diabetes management. The appointment reminder system and health professionals' encouragement for self-accountability in diabetes self-management were also valued. Participants appreciated having health professionals from diverse ethnic backgrounds, as it increased the likelihood of receiving care from professionals who understood their cultural diets, reiterating our findings [66].

The challenges encountered by SA migrants in our findings in managing chronic diseases are consistent with existing literature. Cultural beliefs deeply rooted in communal meal practices emerge as significant barriers. Communal meals hold profound social and cultural significance, creating pressure to consume traditional foods, which may not align with recommended dietary guidelines for chronic disease management [9,67]. A study on the Latino population living in the USA showed a similar pattern of gender-based role identity [68] as SA's in our review, where males with CD are dependent on females to prepare and provide meals [32,48,52]. Gumber and Gumber [67] have adopted a broader perspective to explain mediators of lifestyle behavioural change in the Black, Asian and Minority Ethnic groups in the UK, which focused on the fatalist beliefs about the disease as a barrier to its management [69] which concurs with our findings.

Similar to the findings from a review article by Rosenthal [70], our review shows that migration is a complex factor contributing to the health disparities faced by migrant populations. Various factors may contribute to the increased prevalence of cardiovascular risk factors in migrant populations, including changes in diet, physical activity, and stress levels [67]. It also highlights the importance of considering cultural and socioeconomic factors in understanding the impact of migration on cardiovascular health (CVH) [67]. It supports the evidence from

Table 5
Themes, practice, policy implications and suggested areas of research.

Themes	Practice/Policy Implications	Suggested areas for further research
Patient-provider interaction and relationship	• Understanding the barriers to managing health, seeking professional guidance, and providing advice based on the issues presented by the SA community. • Obtaining health practitioners from SA backgrounds to provide evidence-based care is necessary for delivering culturally adaptive services through their deeper understanding of the client's cultural practices, beliefs, and values. • Training practitioners to pinpoint signs of reluctance or aversion in adhering to the recommended care and assuring them using culturally sensitive language and displaying empathy may improve lifestyle management.	• The evidence base for health promotion in [a]SA communities needs to be strengthened with rigorous evaluation of culturally tailored educational materials and community initiatives. • To improve cultural sensitivity in the health care system by developing training modules and providing training to the [b]HPs with a special focus on avoiding complex vocabulary, providing advice based on their cultural beliefs and religious activities, and developing trust and rapport with them.
Impact of migration	• Establish community and social support initiatives for migrants struggling to adjust/accommodate to the health system in the host country. • Educate practitioners to comprehend the needs of SA migrants about their health and address their knowledge deficits of disease management established in the host country. • Incentives or reductions in clinical treatment costs facilitate the integration of migrants into the host country's higher living standards than those of their home countries.	• Further research on evaluating the needs of SA migrants to help them facilitate disease management in the host country.
Heritage based practises	• Acquire sufficient knowledge of the cultural practices and traditions that are significant to the SA culture. Identify traditional celebrations, diets and religious holidays and develop an effective lifestyle management plan. • Develop strategies that encourage SA women to take a proactive stance towards their health, without disturbing the gender-based roles that play a culturally significant role within the SA community. Providing some form of support network can help combat this barrier.	• More research is required on methods of encouraging SA women to prioritise their health because of their commitment to family and household duties.
Chronic disease management strategies	• In-depth knowledge of the role family and the social community play in SA migrant communities makes it imperative for the community to be included in providing support networks to clients. • A family-based approach to managing chronic diseases facilitates the establishment of changes in the household diet, thus benefiting the client's lifestyle and diet. • The provision of culturally specific chronic disease diet modifications demonstrates a facilitator for SA clients to adopt lifestyle changes. Dietary suggestions should be in accordance with the traditional foods, cooking patterns, and ingredients used in SA backgrounds.	• Acknowledging the role of friends and family as a support for the SA migrants, and further evaluating the evidence-based around that to develop the best practice.

[a] SA: South Asian.
[b] HP: Health professional.

another study that reported the health issues faced by migrants and refugees who have recently arrived in Europe, suggesting that the problems are often compounded by language barriers, a lack of access to healthcare, and the stressful migration environment [71]. Further, the migrant cohorts present with variability in attained education status which is a key factor in shaping the CD management behaviour in four sequential ways: (I) access (seeking information on CD management), (ii) understand (ability to comprehend CD management information), (iii) evaluate (competence to judge the accessed CD management information) and (iv) apply (utilise CD management information to improve health). Migrants with higher education status have greater odds of improved CD management behavior [70].

Consistent with the existing literature, our finding also confirms that a family-based approach is an effective strategy for managing CDs. A study involving Mexican American adults with diabetes found that those in the intervention group with greater family support experienced noteworthy enhancements in their blood glucose regulation, physical activity levels, and dietary habits compared to the control group [71]. The importance of involving family members in diabetes management and tailoring interventions to meet the cultural needs of specific populations has been emphasised in another intervention study with Hispanic individuals with diabetes [72]. Another systemic review investigating family-centred approaches in healthcare interventions for adults with chronic diseases such as T2D, heart disease, and cancer also found that family-centred interventions were associated with improved desirable health behaviours, quality of life, and patient satisfaction [73].

The relationship between alcohol consumption and CVH of SA's living in America has been highlighted in the Mediators of Atherosclerosis in South Asians Living in America (MASLA) study. Multinomial logistic regression analysis revealed that consuming more than seven drinks per week was associated with lower odds of having an intermediate or ideal CVH score compared to non-drinkers. Binge drinking was also associated with significantly lower odds of having an ideal cardiovascular health score. This study also pointed out the need to explore the patterns and factors that influence alcohol consumption of SA's and its effect on CVH [74].

4.2. Clinical relevance

This review highlights the complexity of factors influencing CD management among SA immigrants and elicits key contributing factors to modifying CD management. Desirable patient-provider relationships and using culturally appropriate CD management strategies are facilitators to optimize disease management. Migration status and heritage-based practices are barriers to CD management. Healthcare providers should leverage the impact of migration by building rapport with patients who are SA immigrants, help navigate around heritage-based practice-related barriers to CD management, and consider a family-oriented approach in CD management education.

4.3. Strengths

Both qualitative and quantitative studies were included in the paper to capture a comprehensive understanding of SA immigrants' views. Also, the use of TDF enables systematic and comprehensive investigation of determinants of behavioural changes in managing CD among SA immigrants.

4.4. Limitations

One of the limitations of our review is that most included studies were related to T2D management, and none of them was related to dyslipidaemia. Therefore, the findings are not generalisable to dyslipidaemia management among SA immigrants. Another limitation is that most of the studies are conducted in UK and USA and hence the findings may not be generalised to newer host countries like Australia and New Zealand. Furthermore, the methodological quality of most included studies was unclear because they did not clearly state how their selection of methodologies used in data collection and analysis fit for purpose. Also, the comparison of lived experiences between SA sub-groups was impossible because most studies were related to the Indian population, and some included studies failed to specify which SA sub-group.

4.5. Conclusion

There is an urgent need to develop patient-end-user-tailored and multi-level interventions to improve the management of CD among SA immigrants who migrated to Western countries. A theory-informed intervention addressing barriers contributing to the four factors identified in this review, i.e., patient-provider interaction and relationship, the impact of migration, heritage-based practices, and chronic disease management strategies is essential. Future research is required to evaluate the effectiveness and sustainability of these aforementioned interventions.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Credit authorship contribution statement

Purva Gulyani: Conceptualization, Methodology, Investigation, Formal analysis, Writing – original draft & editing. **Priya Rawat:** Conceptualization, Methodology, Investigation, Writing – the original draft of the introduction section. **Yusra Elmi:** Investigation, Formal analysis, Writing – original draft of the results section. **Sabrina Gupta**: Methodology and editing. **Ching Shan Wan:** Conceptualization, Methodology, Supervision, Investigation, Writing – original draft of methods section, review & editing.

Acknowledgement

We thank senior librarian Ms Elizabeth Lawrence for assistance with finalising the search strategies and Dr Charu Arora for assistance with the title and abstract and full-text screening. Their support facilitated the completion of this review.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dsx.2024.102944.

References

[1] United Nations Department of Economic and Social Affairs. Population Division 2020.
[2] World Health Organization QHO. Global report on diabetes. 2016. Online.
[3] Kearney PM, Whelton M, Reynolds K, Whelton PK, He J. Worldwide prevalence of hypertension: a systematic review. J Hypertens 2004;22(1):11–9.
[4] Misra A, Jayawardena R, Anoop S. Obesity in South asia: phenotype, morbidities, and mitigation. Curr Obes Rep 2019;8(1):43–52.
[5] Chandalia M, Lin P, Seenivasan T, Livingston EH, Snell PG, Grundy SM, et al. Insulin resistance and body fat distribution in South Asian men compared to Caucasian men. PLoS One 2007;2(8):e812.
[6] Gujral UP, Vittinghoff E, Mongraw-Chaffin M, Vaidya D, Kandula NR, Allison M, et al. Cardiometabolic abnormalities among normal-weight persons from five racial/ethnic groups in the United States: a cross-sectional analysis of two cohort studies. Ann Intern Med 2017;166(9):628–36.
[7] Lawton J, Ahmad N, Hanna L, Douglas M, Bains H, Hallowell N. 'We should change ourselves, but we can't': accounts of food and eating practices amongst British Pakistanis and Indians with type 2 diabetes. Ethn Health 2008;13(4):305–19.
[8] Lesser IA, Gasevic D, Lear SA. The association between acculturation and dietary patterns of South Asian immigrants. PLoS One 2014;9(2):e88495.
[9] Sohal T, Sohal P, King-Shier KM, Khan NA. Barriers and facilitators for type-2 diabetes management in South Asians: a systematic review. PLoS One 2015;10(9):e0136202.
[10] Gupta MD, Gupta P, Mp G, Roy A, Qamar A. Risk factors for myocardial infarction in very young South Asians. Curr Opin Endocrinol Diabetes Obes 2020;27(2):87–94.
[11] Patel N, Ferrer HB, Tyrer F, Wray P, Farooqi A, Davies MJ, et al. Barriers and facilitators to healthy lifestyle changes in minority ethnic populations in the UK: a narrative review. Journal of Racial and Ethnic Health Disparities 2017;4(6):1107–19.
[12] Renzaho AMN, Mellor D, Boulton K, Swinburn B. Effectiveness of prevention programmes for obesity and chronic diseases among immigrants to developed countries – a systematic review. Publ Health Nutr 2010;13(3):438–50.
[13] Vlaar EMA, van Valkengoed IGM, Nierkens V, Nicolaou M, Middelkoop BJC, Stronks K. Feasibility and effectiveness of a targeted diabetes prevention program for 18 to 60-year-old South Asian migrants: design and methods of the DH!AAN study. BMC Publ Health 2012;12(1):371.
[14] Teggart K, Ganann R, Sihota D, Moore C, Keller H, Senson C, et al. Group-based nutrition interventions to promote healthy eating and mobility in community-dwelling older adults: a systematic review. Publ Health Nutr 2022;25(10):1–32.
[15] Osei-Assibey G, Kyrou I, Adi Y, Kumar S, Matyka K. Dietary and lifestyle interventions for weight management in adults from minority ethnic/non-White groups: a systematic review. Obes Rev 2010;11(11):769–76.
[16] Patel T, Umeh K, Poole H, Vaja I, Newson L. Cultural identity conflict informs engagement with self-management behaviours for South Asian patients living with type-2 diabetes: a critical interpretative synthesis of qualitative research studies. Int J Environ Res Publ Health 2021;18(5).
[17] Vakil K, Desse TA, Manias E, Alzubaidi H, Rasmussen B, Holton S, et al. Patient-centered care experiences of first-generation, South Asian migrants with chronic diseases living in high-income, western countries: systematic review. Patient Prefer Adherence 2023;17:281–98.
[18] Stern C, Lizarondo L, Carrier J, Godfrey C, Rieger K, Salmond S, et al. Methodological guidance for the conduct of mixed methods systematic reviews. JBI evidence implementation 2021;19(2):120–9.
[19] Cumpston M, Li T, Page MJ, Chandler J, Welch VA, Higgins JP, et al. Updated guidance for trusted systematic reviews: a new edition of the Cochrane Handbook for Systematic Reviews of Interventions. Cochrane Database Syst Rev 2019;10.ED000142-ED.
[20] Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Bmj 2021;372:n71–.
[21] Levitt HM, Bamberg M, Creswell JW, Frost DM, Josselson R, Suárez-Orozco C. Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: the APA publications and communications board task force report. Am Psychol 2018;73(1):26–46.
[22] Lockwood C, Munn Z, Porritt K. Qualitative research synthesis: methodological guidance for systematic reviewers utilizing meta-aggregation. JBI Evidence Implementation 2015;13(3):179–87.

[23] Statistics Abo. Standard Australian classification of countries (SACC). Australian Bureau of Statistics; 1990.
[24] Hong QN, Fàbregues S, Bartlett G, Boardman F, Cargo M, Dagenais P, et al. The Mixed Methods Appraisal Tool (MMAT) version 2018 for information professionals and researchers. Educ Inf 2018;34(4):285–91.
[25] Harden A, Thomas J. Mixed methods and systematic reviews: examples and emerging issues. Sage handbook of mixed methods in social & behavioral research 2010;2:749–74.
[26] Stern C, Lizarondo L, Carrier J, Godfrey C, Rieger K, Salmond S, et al. Methodological guidance for the conduct of mixed methods systematic reviews. JBI evidence synthesis 2020;18(10):2108–18.
[27] Thomas J, Harden A. Methods for the thematic synthesis of qualitative research in systematic reviews. BMC Med Res Methodol 2008;8(1):1–10.
[28] Atkins L, Francis J, Islam R, O'Connor D, Patey A, Ivers N, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. Implement Sci 2017;12(1):1–18.
[29] Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. Implement Sci 2012;7(1):1–17.
[30] Baradaran H, Knill-Jones R. Assessing the knowledge, attitudes and understanding of type 2 diabetes amongst ethnic groups in Glasgow, Scotland. Practical Diabetes International 2004;21(4):143–8.
[31] Emadian A, England CY, Thompson JL. Dietary intake and factors influencing eating behaviours in overweight and obese South Asian men living in the UK: mixed method study. BMJ Open 2017;7(7):e016919.
[32] Hawthorne K, Tomlinson S. Pakistani moslems with Type 2 diabetes mellitus: effect of sex, literacy skills, known diabetic complications and place of care on diabetic knowledge, reported self-monitoring management and glycaemic control. Diabet Med : a journal of the British Diabetic Association 1999;16(7):591–7.
[33] Hyman I, Shakya Y, Jembere N, Gucciardi E, Vissandjee B. Provider- and patient-related determinants of diabetes self-management among recent immigrants: implications for systemic change. Canadian family physician Medecin de famille canadien 2017;63(2):e137–44.
[34] Neblett RS, Chia YC, Abdullah N, Ablah E. Goals, beliefs, knowledge, and barriers for diabetes self-care in a multi-ethnic population in Malaysia: a qualitative study. Med J Malaysia 2019;74(6):483–91.
[35] Patel NR, Chew-Graham C, Bundy C, Kennedy A, Blickem C, Reeves D. Illness beliefs and the sociocultural context of diabetes self-management in British South Asians: a mixed methods study. BMC Fam Pract 2015;16:58.
[36] Venkatesh S, Weatherspoon LJ, Kaplowitz SA, Song WO. Acculturation and glycemic control of Asian Indian adults with type 2 diabetes. J Community Health 2013;38(1):78–85.
[37] Abuelmagd W, Hakonsen H, Mahmood KQ-U-A, Taghizadeh N, Toverud E-L. Living with diabetes: personal interviews with Pakistani women in Norway. J Immigr Minority Health 2018;20(4):848–53.
[38] King-Shier KM, Dhaliwal KK, Puri R, Leblanc P, Johal J. South asians' experience of managing hypertension: a grounded theory study. Patient Prefer Adherence 2019;13:321–9.
[39] Mian SI, Brauer PM. Dietary education tools for South Asians with diabetes. Can J Diet Pract Res : a publication of Dietitians of Canada = Revue canadienne de la pratique et de la recherche en dietetique : une publication des Dietetistes du Canada 2009;70(1):28–35.
[40] Uppal G, Sibbald SL, Melling J. Exploring diabetes management amongst immigrant Sikhs in the Greater Toronto Area: a qualitative study. Ethn Health 2016;21(6):551–63.
[41] Islam NS, Tandon D, Mukherji R, Tanner M, Ghosh K, Alam G, et al. Understanding barriers to and facilitators of diabetes control and prevention in the New York City Bangladeshi community: a mixed-methods approach. Am J Publ Health 2012;102(3):486–90.
[42] Venkatesh S, Weatherspoon L. Social and health care provider support in diabetes self-management. Am J Health Behav 2013;37(1):112–21.
[43] Fagerli RA, Lien ME, Wandel M. Experience of dietary advice among Pakistani-born persons with type 2 diabetes in Oslo. Appetite 2005;45(3):295–304.
[44] Khalid TA, Glavin K, Lagerløv P. Food traditions and overweight among Pakistanis in Norway: a qualitative interview study. Health Sci J 2018;12(6):1–6.
[45] Kokanovic R, Manderson L. Exploring doctor-patient communication in immigrant Australians with type 2 diabetes: a qualitative study. J Gen Intern Med 2007;22(4):459–63.
[46] Naeem AG. The role of culture and religion in the management of diabetes: a study of Kashmiri men in Leeds. J Roy Soc Promot Health 2003;123(2):110–6.
[47] Patel V, Iliffe S. An exploratory study into the health beliefs and behaviours of British Indians with type II diabetes. Prim Health Care Res Dev 2017;18(1):97–103.
[48] Stone M, Pound E, Pancholi A, Farooqi A, Khunti K. Empowering patients with diabetes: a qualitative primary care study focusing on South Asians in Leicester, UK. Fam Pract 2005;22(6):647–52.
[49] Tan CCL, Cheng KKF, Sum CF, Shew JSH, Holydard E, Wang W. Perceptions of diabetes self-care management among older Singaporeans with type 2 diabetes: a qualitative study. J Nurs Res : J Nurs Res 2018;26(4):242–9.
[50] Zhang Z, Monro J, Venn BJ. Carbohydrate knowledge and expectations of nutritional support among five ethnic groups living in New Zealand with pre- and type 2 diabetes: a qualitative study. Nutrients 2018;10(9).
[51] Hempler NF, Nicic S, Ewers B, Willaing I. Dietary education must fit into everyday life: a qualitative study of people with a Pakistani background and type 2 diabetes. Patient Prefer Adherence 2015;9:347–54.
[52] Majeed-Ariss R, Jackson C, Knapp P, Cheater FM. British-Pakistani women's perspectives of diabetes self-management: the role of identity. J Clin Nurs 2015;24(17–18):2571–80.
[53] Choudhury SM, Brophy S, Williams R. Understanding and beliefs of diabetes in the UK Bangladeshi population. Diabet Med: A Journal Of The British Diabetic Association 2009;26(6):636–40.
[54] Chowdhury AM, Helman C, Greenhalgh T. Food beliefs and practices among British Bangladeshis with diabetes: implications for health education. Anthropol Med 2000;7(2):219–26.
[55] Greenhalgh T, Helman C, Chowdhury AMm. Health beliefs and folk models of diabetes in British Bangladeshis: a qualitative study. BMJ Br Med J (Clin Res Ed) 1998;316(7136):978.
[56] Kelleher D, Islam S. The problem of integration: Asian people and diabetes. J R Soc Med 1994;87(7):414–7.
[57] Morrison Z, Douglas A, Bhopal R, Sheikh A, Trial I, Forbes J. Understanding experiences of participating in a weight loss lifestyle intervention trial: a qualitative evaluation of South Asians at high risk of diabetes. BMJ Open 2014;4(6):e004736.
[58] Lawton J, Ahmad N, Hanna L, Douglas M, Hallowell N. Diabetes service provision: a qualitative study of the experiences and views of Pakistani and Indian patients with Type 2 diabetes. Diabet Med : a journal of the British Diabetic Association 2006;23(9):1003–7.
[59] Wilkinson E, Randhawa G, Singh M. Quality improvements in diabetes care, how holistic have they been? A case-study from the United Kingdom. Intern 2014;13:29.
[60] Gupta SS, Teede H, Aroni R. Spicing up your advice for South Asian and Anglo-Australians with type 2 diabetes and CVD: do cultural constructions of diet matter? Appetite 2018;120:679–97.
[61] Lawton J, Ahmad N, Hanna L, Douglas M, Bains H, Hallowell N. 'We should change ourselves, but we can't': accounts of food and eating practices amongst British Pakistanis and Indians with type 2 diabetes. Ethn Health 2008;13(4):305–19.
[62] Singh H, Cinnirella M, Bradley C. Support systems for and barriers to diabetes management in South Asians and Whites in the UK: qualitative study of patients' perspectives. BMJ Open 2012;2(6).
[63] Varghese S, Moore-Orr R. Dietary acculturation and health-related issues of Indian immigrant families in Newfoundland. Can J Diet Pract Res 2002;63(2):72–9.
[64] Cersosimo E, Musi N. Improving treatment in hispanic/latino patients. Am J Med 2011;124(10, Supplement):S16–21.
[65] Moore AP, Rivas CA, Stanton-Fay S, Harding S, Goff LM. Designing the Healthy Eating and Active Lifestyles for Diabetes (HEAL-D) self-management and support programme for UK African and Caribbean communities: a culturally tailored, complex intervention under-pinned by behaviour change theory. BMC Publ Health 2019;19(1):1146.
[66] Wan CS, Rawat P, Gulyani P, Elmi Y, Ng AH. Dietary management of type 2 diabetes mellitus among South Asian immigrants: a mixed-methods study. Nutrition & dietetics; 2023.
[67] Nisar M, Khan A, Kolbe-Alexander TL. 'Cost, culture and circumstances': barriers and enablers of health behaviours in South Asian immigrants of Australia. Health Soc Care Community; 2022 [n/a(n/a)].
[68] Carbone ET, Rosal MC, Torres MI, Goins KV, Bermudez OI. Diabetes self-management: perspectives of Latino patients and their health care providers. Patient Educ Counsel 2007;66(2):202–10.
[69] Gumber A, Gumber L. Improving prevention, monitoring and management of diabetes among ethnic minorities: contextualizing the six G's approach. BMC Res Notes 2017;10(1):774.
[70] Rosenthal T. The effect of migration on hypertension and other cardiovascular risk factors: a review. Journal of the American Society of Hypertension 2014;8(3):171–91.
[71] Pavli A, Maltezou H. Health problems of newly arrived migrants and refugees in Europe. J Trav Med 2017;24(4).
[72] Baig AA, Benitez A, Quinn MT, Burnet DL. Family interventions to improve diabetes outcomes for adults. Ann N Y Acad Sci 2015 Sep;1353(1):89–112. https://doi.org/10.1111/nyas.12844. Epub 2015 Aug 6. PMID: 26250784; PMCID: PMC4624026.
[73] Deek H, Hamilton S, Brown N, Inglis SC, Digiacomo M, Newton PJ, et al., FAMILY Project Investigators. Family-centred approaches to healthcare interventions in chronic diseases in adults: a quantitative systematic review. J Adv Nurs 2016 May;72(5):968–79. https://doi.org/10.1111/jan.12885. Epub 2016 Jan 10. PMID: 26751971.
[74] Chevli PA, Hari KJ, Kanaya AM, Talegawkar SA, Needham BL, Herrington D. Association of alcohol consumption and ideal cardiovascular health among south Asians: The mediators of atherosclerosis in south Asians living in America (MASALA) Study. Alcohol Clin Exp Res 2020 Sep;44(9):1825–33. https://doi.org/10.1111/acer.14422. Epub 2020 Aug 20. PMID: 32735738; PMCID: PMC7722167.