

REVIEW

Factors affecting reductions in dietary salt consumption in people of Chinese descent: An integrative review

Alex Chan^{1,2}  | Sally Wai-chi Chan³  | Masuma Khanam⁴  | Leigh Kinsman¹ 

¹School of Nursing and Midwifery, University of Newcastle, Callaghan, New South Wales, Australia

²School of Nursing, University of Wollongong, Liverpool, New South Wales, Australia

³Tung Wah College, Hong Kong, China

⁴School of Medicine and Public Health, University of Newcastle, Callaghan, New South Wales, Australia

Correspondence

Alex Chan, School of Nursing, University of Wollongong, Liverpool, NSW, Australia. Email: chana@uow.edu.au

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Abstract

Aims: To identify and synthesize the evidence on the perceptions of the health effects of dietary salt consumption and barriers to sustaining a salt-reduced diet for hypertension in Chinese people.

Design: A systematic integrated review integrating quantitative and qualitative studies using the PRISMA guidelines.

Data sources: Three databases, MEDLINE, PubMed and CINAHL, were systematically searched for articles published between January 2001 and July 2020.

Review methods: The quality of the included studies was appraised using the Joanna Briggs Institute's critical appraisal tools for cross-sectional and qualitative studies. Descriptive analysis and constant comparison methods were used to analyse the extracted data.

Results: Fourteen studies met the inclusion criteria. The synthesized results identified that (i) adequate salt-related health education had a positive influence on dietary behaviour modifications, (ii) the level of educational exposure to the health benefits of salt reduction influenced Chinese people's perceptions of the health impact associated with high salt intake, (iii) the complexity of salt measurement was a barrier to salt reduction, (iv) salt reduction is a challenge to Chinese food culture, and (v) Chinese migrants may experience linguistic and cultural challenges when they seek appropriate dietary education and advice for hypertension management in their host countries.

Conclusion: There is room for improvement in recognizing and translating the knowledge of salt-related health issues and the benefits of that knowledge about salt reduction into action. Future nursing interventions should incorporate individuals' cultural needs and the dietary culture of immediate family members.

Impact: This integrative review reveals that unique Chinese customs and practices reduce the effectiveness of salt reduction campaigns. The effects of education vanish without family support, resulting in suboptimal adherence to dietary salt reduction strategies.

KEYWORDS

barriers, Chinese, diet, family-based approach, hypertension, literature review, perceptions, salt

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1 | INTRODUCTION

High dietary salt intake is a worldwide health issue and has been identified as a significant risk factor for many non-communicable diseases such as kidney disease and hypertension (World Health Organization [WHO], 2020). People from culturally and linguistically diverse (CALD) backgrounds, including people of Chinese ancestry, may have different needs for and expectations of the health care services available, particularly regarding the way health information is delivered (Choi et al., 2018; Tompkins et al., 2016). Chinese are one of the biggest diasporic ethnic groups in the world (Song, 2019). A review study conducted by Liu et al. (2020) reported that approximately 32.4% of the studied Chinese populations in the Genetic Epidemiology Network of Salt Sensitivity study were genetically at risk of suffering from sodium (salt)-sensitive hypertension. Due to the rise of China's economy and globalization, more Chinese people will have opportunities to work and study abroad. The incidence of dietary salt-induced hypertension among these Chinese people may become a health issue in their host countries.

Hypertension is a progressive chronic medical condition and was classified as Stage A chronic heart failure by the American College of Cardiology and the American Heart Association in 2013. This chronic medical condition affects more than 1.13 billion people worldwide (WHO, 2019). However, there are many undiagnosed cases around the globe (Haider & Das Gupta, 2020), especially in rural areas (Zhou & Fang, 2019). Therefore, the actual number of people living with hypertension may be significantly higher.

High dietary salt intake is responsible for causing multiple harmful effects on human blood pressure regulation. These effects include alterations in fluid regulatory hormones, systemic peripheral resistance and endothelial structure, and increases in arterial stiffness and sympathetic nerve activity (Farquhar et al., 2015; Grillo et al., 2019). Dietary salt intake reduction has been proven as a cost-effective primary and secondary self-caring strategy for hypertension management and overall cardiovascular disease risk reduction (Hua et al., 2019; WHO, 2020).

1.1 | Background

1.1.1 | Hypertension in Chinese people

Hypertension results in a major burden of disease in China (Zheng et al., 2016). It is estimated that more than 200 million Chinese were living with hypertension in 2013 (Shao et al., 2017). However, less than half of the Chinese people living with hypertension were formally diagnosed with hypertension and of these, only 40.7% of people received treatment and only 15.3% had their hypertension under control (Campbell & Zhang, 2018). Although the causes of hypertension are generally multifactorial, recent studies reveal that high dietary salt intake is a key risk factor for hypertension in Chinese ethnic groups (Liu, Chen, et al., 2015a).

1.1.2 | Dietary salt practice in Chinese people

High salt intake in Chinese people is associated with several factors, these include cooking methods, family eating habits and cultural food preferences such as fermented food products (Liu, Li, et al., 2015b). The WHO (2020) recommends that healthy adults consume no more than 5 g of salt per day. However, a systematic review found that the dietary salt intake in Chinese children aged 3–6 years were 5 g per day while older children consumed almost 9 g per day (Tan et al., 2019). The salt intake of Chinese adults in China was found to be 10.7 g/day in 2002 (Li & Zhang, 2016) and among Singaporean-Chinese was 8.5 g/day in 2010 (Oh, 2016).

High dietary salt intake is a global health concern. The average salt consumption in France was estimated to be 8.7 g/day for men and 6.7 g/day for women in 2017 (Petit et al., 2019) and in Britain was 8.1 g/day in 2011 (He et al., 2019). However, processed foods are the main sources of salt intake in the Western countries but in China, approximately 80% of the salt intake is from homemade foods (Zhang et al., 2020).

1.1.3 | Potential barriers to following a salt-restricted diet

Dietary salt has an important role in the sensory properties of food. A reduction of salt in food often reduces the overall appetitive responses to food, thus increasing the perceived intensity of a bitter taste. As a consequence, changing dietary practices and following a salt-restricted diet (SRD) are often difficult to maintain in many older people, who may also suffer from dysgeusias (Syed et al., 2016).

Cultural food preferences may further reduce some people's willingness to change their dietary behaviours. Dietary practices often represent an adult's cultural background and ethnic identity (Kenny, 2015). This creates a challenge for nurses in delivering care to people living with hypertension, especially people from different CALD backgrounds. According to the Health Behaviour Model (HBM), people are more likely to sustain a health behavioural change if they perceive the health benefits are greater than the perceived barriers, and they are capable of making the change (Rosenstock et al., 1988). An individual's perception of the health risks and perceived barriers plays an important role in salt-related behavioural changes. Therefore, there is a need to gain a better understanding of the perceived barriers to adhering to an SRD so that nurses can ensure the recommended interventional strategies are culturally appropriate.

2 | THE REVIEW

2.1 | Aims

The aim of this integrative review was to explore and synthesize current research findings on perceptions of the effects of dietary salt on human health and the perceived barriers to sustaining health

behavioural change among people from a Chinese cultural background. This review addressed the question: What are the perceptions of the effects of dietary salt on human health and the perceived barriers to sustaining the health behavioural change required for hypertension management (primary and secondary) among people from a Chinese cultural background?

Whittemore and Knafel (2005) to analyse the results. This included data reduction, which was accomplished by classifying the studies into subgroups based on their design and on the aspects of diet adherence presented in each of them. Subsequently, a data extraction matrix was applied to compare and identify the themes, thematic categories and subcategories that would help with integrating the results.

2.2 | Design

Whittemore and Knafel's (2005) five-stage framework was used to guide this integrative review: problem identification (refining the focus of the review); literature search; data evaluation; data analysis; and presentation. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) were followed to conduct the literature search and data evaluation processes.

2.3 | Search methods

A three-step search strategy was employed to identify all relevant qualitative studies. A preliminary search of MEDLINE, PubMed and CINAHL was conducted to identify articles on the topic. This was followed by an analysis of text words contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles. A second search was then conducted using the identified keywords and index terms in all included databases (Table 1). Finally, the reference lists of all studies selected for critical appraisal were screened to identify additional studies.

The inclusion criteria were: (1) published between January 2001 and July 2020; (2) published in English or Chinese peer-reviewed

journals; (3) focus on exploring the perceptions of dietary salt and/or the perceived barriers to maintaining salt-reduction practices for hypertension management (primary and secondary) in Chinese ethnic populations; and (4) primary research studies. The exclusion criteria were: (1) studies which did not have a focus on dietary salt restriction in hypertension management, such as pharmaceutical treatment and position statements; and (2) conference abstracts, commentaries and the grey literature. The review protocol is registered on the database of the International Prospective Register of Systematic Reviews, better known as PROSPERO (Page et al., 2018) (registration number: CRD42020212038).

2.4 | Search outcomes

Following the search, all identified articles were collated in EndNote X9 (Clarivate Analytics) with duplicates removed. The first author read titles and abstracts of each article and made the decisions to include articles in the review, based on the selection criteria listed above. Another author (MK) checked the accuracy of the inclusions; all disagreements were resolved through regular meetings with all authors.

2.5 | Quality appraisal

The quality of included studies was assessed using the Joanna Briggs Institute's (JBI) critical appraisal tools for analytical cross-sectional (Moola et al., 2020), case control (Moola et al., 2020), quasi-experimental (Tufanaru et al., 2020) and qualitative (Lockwood et al., 2015) studies (Tables 2-5). The quality appraisal was completed by two authors (AC and KL), and all included studies were deemed to adequately fulfil the criteria for methodological quality.

2.6 | Data abstraction

Descriptive analysis and constant comparison methods were used to analyse the extracted data (Whittemore & Knafel, 2005). Data extracted from

TABLE 1 Literature search terms used to conduct the systematic review

Population	Malaysia or Singapore or China or Taiwan or Singapore* or Taiwan* or Malaysia* or Chinese or Hong Kong or Asian continental ancestry group
AND Hypertension	High blood pressure or Hypertension or blood pressure
AND Dietary salt	(Salt or sodium or dietary sodium or diet or sodium restricted or salt restricted) or (shoyu or soy sauce or soya sauce)
AND Behaviours	facilitat* or barrier* or compl* or adher* or impede* or impediment* or hurdle* or obstacle* or opportunit* or challenge* or educat*
OR Perceptions	perception* or think* or believ* or insight or understanding

the studies included specific details about the study's aim, population, geographical location, study methods, key findings, and risk of bias (see Table 6).

2.7 | Synthesis

The four phases of data analysis recommended by Whittemore and Knafl (2005) were followed.

2.7.1 | Data reduction and data display

The data collated in Table 6 were divided into subgroups and simplified based on the locations, salt-related knowledge, behaviours, perceptions of and barriers to sustaining an SRD. Relevant data in each subgroup were compiled into a spreadsheet.

2.7.2 | Data comparison, conclusion drawing and verification

The key aspects of the findings related to the perceptions of and perceived barriers to sustaining an SRD in people from a Chinese background were constantly compared and contrasted. We synthesized the findings by categorizing the relevant content into themes. The accuracy and relevance of the themes were reviewed and discussed among all authors.

3 | RESULTS

The searches yielded a total of 371 studies; 61 were duplicates, and thus were removed. The remaining 310 studies were screened for relevance using the titles and abstracts. Two hundred and fifty-four studies were not in the scope of the review topic, resulting in 55 studies being retrieved for potential inclusion. The full text of retrieved articles was assessed against the inclusion criteria. Forty-one studies did not meet the inclusion criteria due to various reasons, e.g. the study was about the effects of salt on other body systems, and were excluded (see Figure 1). The reference lists of these studies were screened to identify relevant studies for inclusion. However, no new studies were identified. A total of 14 studies were appraised using the JBI's critical appraisal tools. No article was excluded after the quality appraisal, leaving a total of 14 studies in the review. The search process and outcomes are presented using the PRISMA diagram (see Figure 1).

3.1 | Characteristics of the included studies

Eleven included studies adopted a cross-sectional design (Bi et al., 2014; Chen et al., 2013; Chen et al., 2014; Hu et al., 2013; Huang, Zhang, et al., 2011a; Lee et al., 2018; Modesti et al., 2019; Newson

TABLE 2 Critical appraisal checklist for analytical cross sectional studies

JBI checklist	Bi et al. (2014)	Chen et al. (2013)	Chen et al. (2014)	Hu et al. (2013)	Huang, Zhang, et al. (2011a)	Lee et al. (2018)	Modesti et al. (2019)	Newson et al. (2013)	Qin et al. (2014)	Zhang et al. (2016)	Zhang et al. (2013)
Were the criteria for inclusion in the sample clearly defined?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Were the study subjects and the setting described in detail?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was the exposure measured in a valid and reliable way?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Were objective, standard criteria used for measurement of the condition?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Were confounding factors identified?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Were strategies to deal with confounding factors stated?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Were the outcomes measured in a valid and reliable way?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Was appropriate statistical analysis used?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note: Y = Yes, N = No, U = Unclear and N/A = Not applicable. Adapted from "Systematic reviews of etiology and risk," by S. Moola et al., in E. Aromataris and Z. Munn (Eds.), 2020, *JBI Manual for Evidence Synthesis*. JBI. (<https://synthesismanual.jbi.global>). Copyright 2020 by JBI.

TABLE 3 Critical appraisal checklist for case control studies

JBI checklist	Huang, Hu, et al. (2011b)
Were the groups comparable other than the presence of disease in cases or the absence of disease in controls?	Y
Were cases and controls matched appropriately?	Y
Were the same criteria used for identification of cases and controls?	Y
Was exposure measured in a standard, valid and reliable way?	Y
Was exposure measured in the same way for cases and controls?	Y
Were confounding factors identified?	Y
Were strategies to deal with confounding factors stated?	Y
Were outcomes assessed in a standard, valid and reliable way for cases and controls?	Y
Was the exposure period of interest long enough to be meaningful?	Y
Was appropriate statistical analysis used?	Y

Note: Y = Yes, N = No, U = Unclear and N/A = Not applicable. Adapted from "Systematic reviews of etiology and risk," by S. Moola et al., in E. Aromataris and Z. Munn (Eds.), 2020, *JBI Manual for Evidence Synthesis*. JBI. (<https://synthesismanual.jbi.global>). Copyright 2020 by JBI.

TABLE 4 Critical appraisal checklist for quasi-experimental studies

JBI checklist	Zou et al. (2014)
Is it clear in the study what is the 'cause' and what is the 'effect' (i.e. there is no confusion about which variable comes first)?	Y
Were the participants included in any comparisons similar?	Y
Were the participants included in any comparisons receiving similar treatment/care, other than the exposure or intervention of interest?	Y
Was there a control group?	NA
Were there multiple measurements of the outcome both pre and post the intervention/exposure?	Y
Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analysed?	Y
Were the outcomes of participants included in any comparisons measured in the same way?	Y
Were outcomes measured in a reliable way?	Y
Was appropriate statistical analysis used?	Y

Note: Y = Yes, N = No, U = Unclear and NA = Not applicable. Adapted from "Systematic reviews of effectiveness," by C. Tufanaru et al., in E. Aromataris and Z. Munn (Eds.), 2020, *JBI Manual for Evidence Synthesis*. JBI. (<https://synthesismanual.jbi.global>). Copyright 2020 by JBI.

TABLE 5 Critical appraisal checklist for qualitative research

JBI checklist	Zou (2019)
Is there congruity between the stated philosophical perspective and the research methodology?	Y
Is there congruity between the research methodology and the research question or objectives?	Y
Is there congruity between the research methodology and the methods used to collect data?	Y
Is there congruity between the research methodology and the representation and analysis of data?	Y
Is there congruity between the research methodology and the interpretation of results?	Y
Is there a statement locating the researcher culturally or theoretically?	N
Is the influence of the researcher on the research, and vice-versa, addressed?	Y
Are participants, and their voices, adequately represented?	Y
Is the research ethical according to current criteria or, for recent studies, and is there evidence of ethical approval by an appropriate body?	Y
Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?	Y

Note: Y = Yes, N = No, U = Unclear and N/A = Not applicable. Adapted from "Qualitative research synthesis: methodological guidance for systematic reviewers utilizing meta-aggregation," by C. Tufanaru et al., 2015, *International Journal of Evidence-Based Healthcare*, 13(3), p. 184 ([10.1097/xe.000000000000062](https://doi.org/10.1097/xe.000000000000062)). Copyright 2015 by University of Adelaide, Joanna Briggs Institute.

TABLE 6 The characteristics and key findings of the included studies

	Authors, year	Location	Purpose	Sample
1	Bi et al. (2014)	Shandong Province, China	<ul style="list-style-type: none"> To investigate salt intake and hypertension, perceptions of salt consumption, and attitudes and intentions towards reducing salt intake 	$N = 15,350$ ($M = 7683$, $F = 7667$)
2	Chen et al. (2013)	Beijing, China	<ul style="list-style-type: none"> To investigate the attitudes and barriers to using a measuring spoon to restrict daily salt intake 	$N = 512$ ($M = 161$, $F = 351$)
3	Chen et al. (2014)	Beijing, China	<ul style="list-style-type: none"> To investigate salt-restriction behaviour (using a measuring spoon) and explore the related determinants among Beijing residents 	$N = 799$ ($M = 270$, $F = 529$)
4	Hu et al. (2013)	Beijing, China	<ul style="list-style-type: none"> To investigate self-care behaviours among hypertension patients in primary care 	$N = 318$ ($M = 90$, $F = 228$)
5	Huang, Zhang, et al. (2011a)	Fujian, China	<ul style="list-style-type: none"> To investigate the prevalence and epidemiological characteristics of hypertension in the Chinese She ethnic minority in Fujian, China 	$N = 5350$ ($M = 3087$, $F = 2263$)

Methods	Findings		
	Knowledge and behaviours related to dietary salt	Perceptions/barriers to reducing salt intake	Risk of bias
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Administered by trained staff face-to-face 24-hour dietary recall diary and urinary analysis 	<ul style="list-style-type: none"> No difference in hypertension control between rural and urban areas. Salt intake increased by age. Levels of salt intake: little has changed in last 10 years. Awareness and treatment of hypertension were significantly lower in rural areas. Most dietary salt came from condiments, e.g. salt added in cooking. 	<ul style="list-style-type: none"> Salty taste preferences and the traditional cuisine (food patterns) heavily influenced health behaviours. 	<ul style="list-style-type: none"> Blood pressure was taken on a single occasion. Wastage of condiments was a self-report. Participants might over or under estimate the salt intake from the source. The p-aminobenzoic acid (PABA) test was not used to validate 24-hour urine completeness.
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Urban and rural residents in Beijing, China Administered by trained staff face-to-face 24-hour urinary analysis 	<ul style="list-style-type: none"> 22.7% of people in rural areas adhered to the salt restriction vs 45.3% in the urban area. Individuals of older age, more knowledge and higher education level had better salt-restriction behaviour. Health benefits did not outweigh the importance of the sensory properties of foods. 	<ul style="list-style-type: none"> Adherence to using a measuring spoon to reduce salt intake was affected by health benefit, severity of disease, knowledge and age in the urban group. Income and education were additional factors (perceived barriers) in the rural group. 	<ul style="list-style-type: none"> 36% of the participants were excluded from the study because of no submission of urine sample. The excluded participants were mostly in the young age groups.
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Urban and rural residents in Beijing, China Administered by trained staff face-to-face 24-hour urinary analysis 	<ul style="list-style-type: none"> Only 19.9% of respondents correctly used a measuring spoon to restrict salt intake. 54% of urban respondents and 26.3% of rural respondents used a measuring spoon to restrict salt intake. 	<ul style="list-style-type: none"> The correct use of a measuring spoon was an important determinant of salt-restriction behaviour. Lack of knowledge of using a measuring spoon to restrict salt intake and salt amount calculation, and being unaccustomed to using a measuring spoon in cooking were barriers to changing cooking behaviour. 	<ul style="list-style-type: none"> More than half of the rural residents did not have the specific measuring spoon in this study.
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Rural area in Beijing, China Administered by trained staff face-to-face; anthropometric (a blood pressure assessment) 	<ul style="list-style-type: none"> Salt is used as a preservative of foods in rural areas of China. 12.9% of participants had their blood pressure under control. Adherers to a low-salt diet were likely to be older and women. 81.1% of participants reported avoiding adding salt to food while cooking and eating. 48.4% reported self-assessment of salt content while cooking. 	<ul style="list-style-type: none"> Family members preferred high-salt food (66%) and this preference affected individuals' choices. Participants with shorter history of hypertension, who were younger and male and who often had poor self-care behaviours. 	<ul style="list-style-type: none"> Some participants' characteristics (n = not reported) were different from the other participants.
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Face-to-face, closed-ended questionnaire Anthropometric – measured by health care professionals 	<ul style="list-style-type: none"> 46.41% of the She population had hypertension. Education level was generally low in the She population. The illiteracy rate was 72.37%. Over 52% of She people consumed more than 10 g of salt per day. 	<ul style="list-style-type: none"> She liked to use salt to preserve fresh foods (culture). She lived in mountain areas and were unable to acquire relevant knowledge of recommended salt intake amounts. Only 25.7% of the She people believed that a light diet benefits health, and only 7.6% believed eating too much can cause disease. 	<ul style="list-style-type: none"> Limitations of the study were not identified in the study. The questionnaire was completed by participants or their representatives. Note: 41% of the participants had received no formal education.

TABLE 6 (Continued)

	Authors, year	Location	Purpose	Sample
6	Huang, Hu, et al. (2011b)	Hubei Province, China	<ul style="list-style-type: none"> To evaluate the effects of a community intervention program, which focused on improving hypertension knowledge, diets and lifestyles in a rural Chinese area (Hubei Province) 	$N = 1632$ ($M = 844$, $F = 788$)
7	Lee et al. (2018)	Philadelphia, USA	<ul style="list-style-type: none"> To investigate and compare health behaviour practices among Chinese and Filipino Americans with cardiometabolic disease (CMD) 	$N = 211$ first generation Chinese ($M = 100$, $F = 111$); of these, 121 Chinese had no CMD
8	Modesti et al. (2019)	Prato, Italy	<ul style="list-style-type: none"> To assess 24-hour urinary salt and potassium excretion in Chinese migrants in Italy and to explore possible associations with hypertension, hypertension awareness, and length of residence in Italy 	$N = 319$ ($M = 165$, $F = 154$)
9	Newson et al. (2013)	Multi-national study Note: Germany, Austria, USA, Hungary, India, China, Brazil and South Africa (only findings from the Chinese cohort were included in the review)	<ul style="list-style-type: none"> To investigate salt-intake attitudes and explore communication preferences 	$N = 999$ Chinese (Gender not reported)

Methods	Findings		
	Knowledge and behaviours related to dietary salt	Perceptions/barriers to reducing salt intake	Risk of bias
<ul style="list-style-type: none"> Quantitative – Experimental study Self-administered questionnaire Experimental group received hypertension education, and dietary and lifestyle guidance 	<ul style="list-style-type: none"> Knowledge of hypertension was very low at baseline. After the intervention (3 years), people had significant improvement in their knowledge and perceptions of hypertension and dietary and lifestyle behaviours (intervention group > control group). Significant dietary salt intake improvement in the Intervention Group. 	<ul style="list-style-type: none"> No significant difference in pickled food intake was detected in either group (eating traditional food) after 3 years. 	<ul style="list-style-type: none"> Blood pressure was taken manually by a group of data collectors (healthcare staff).
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Self-administered questionnaire 	<ul style="list-style-type: none"> 59.2% of Chinese participants added salt to every meal vs 41.1% of Chinese with CMD. There was a significant reduction of salt intake in the group of Chinese participants living with CMD. Chinese participants with no CMD consumed more salt than individuals with disease (59.2%, n = 71 vs 41.1%, n = 37). 	<ul style="list-style-type: none"> Chinese participants, especially those without cardiovascular disease, did not perceive excessive salt consumption was a health threat. 	<ul style="list-style-type: none"> The validation process for both Chinese and Tagalog versions of instruments was not reported in the study.
<ul style="list-style-type: none"> Quantitative – Cross-sectional study 24-hour urine collection, anthropometric measurements and self-reported questionnaire 	<ul style="list-style-type: none"> Most Chinese participants did not comply with the daily salt intake recommended by the World Health Organization. Chinese immigrants were mostly from Zhejiang and Fujian, China. 	<ul style="list-style-type: none"> Hypertension awareness was not a motivation to reduce salt consumption. Hypertension awareness in Chinese immigrants was associated with drug treatment but the reduction of salt intake was not translated into action at the patient level. 	<ul style="list-style-type: none"> The sample included documented and undocumented migrants. Some undocumented migrants (participants) were excluded from the study because contact details were missed.
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Self-report (online) 	<ul style="list-style-type: none"> 83% of Chinese participants were interested in changing their salt intake but only 30% had maintained salt reduction efforts for over 6 months. The other 70% indicated no interest in making a change. 34% of Chinese participants were aware of the recommended salt intake. 74% of Chinese participants wanted to know why salt is bad for health (indicating lack of knowledge). 66% of Chinese participants reported not knowing or incorrectly identifying the recommended maximum daily salt intake. 	<ul style="list-style-type: none"> Lack of knowledge/education. Chinese participants believed salt could replace what was lost in sweat, increased blood pressure and thirst, and was important if exercising. Chinese participants believed salt intake reduction was important and healthy. 42% of Chinese participants added salt to food before tasting. 	<ul style="list-style-type: none"> A new salt questionnaire was developed for the study but it was not validated across all countries.

TABLE 6 (Continued)

	Authors, year	Location	Purpose	Sample
10	Qin et al. (2014)	Xuzhou City, China	<ul style="list-style-type: none"> To investigate knowledge of salt intake in relation to blood pressure control 	N = 2687 (M = 1177, F = 1325)
11	Zhang et al. (2016)	Liaoning, Hebei, Shanxi, Shaanxi, and Ningxia, China	<ul style="list-style-type: none"> To assess the relationship between salt intake behaviours and perception of the harmfulness of high salt intake and knowledge about salt and health among older adults in rural northern China 	N = 4693 (M/F: 50/50)
12	Zhang et al. (2013)	Shandong Province, China	<ul style="list-style-type: none"> To investigate the current knowledge, attitudes and practices related to salt and hypertension among the general adult Shandong population and to inform them about effective salt reduction initiatives 	N = 15,350 (M/F: 50/50)
13	Zou et al. (2014)	Zhejiang, China	<ul style="list-style-type: none"> To evaluate the preliminary effectiveness of a cardiovascular disease risk reduction package in Zhejiang <p><i>*Salt is only a small part of this study</i></p>	N = 153 (M = 109, F = 44)

Methods	Findings		
	Knowledge and behaviours related to dietary salt	Perceptions/barriers to reducing salt intake	Risk of bias
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Subjects aged 18 years with diagnosed hypertension Face-to-face, questionnaire 	<ul style="list-style-type: none"> Mean salt intake was 9.8 g/day. Rural participants had higher salt consumption than urban participants. 69.9% had a salt intake higher than 6 g/day. 35% of people knew the daily recommended salt intake. 94.9% knew that excessive salt intake could cause hypertension. 85.8% of patients had never received formal low-salt diet education. 	<ul style="list-style-type: none"> Knowledge of recommended salt intake was inappropriate or ineffective in patients, despite knowledge of a low-salt diet. 	<ul style="list-style-type: none"> The salt intake was measured based on household instead of individual salt usage.
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Men over 50 and women over 60 Rural villages in 5 provinces were selected because both salt intake and cardiovascular disease burdens were high Face-to-face, closed-ended questionnaire 	<ul style="list-style-type: none"> 60% of participants reported they believed high salt intake would be harmful to their health. The belief about the harm of high salt intake was negatively associated with age, positively associated with years of schooling, and slightly higher for women than men. 30% knew eating less salt can lower blood pressure. 5% knew the recommended upper limit of daily salt intake. People with medical conditions were more likely to change their diet. 	<ul style="list-style-type: none"> Beliefs were significantly associated with healthy salt intake behaviour. No significant association between healthy salt intake behaviours and knowledge about salt and health. 	<ul style="list-style-type: none"> The age requirement of participants were men over 50 and women over 60 years old. A simple questionnaire (5 questions) was used in this study.
<ul style="list-style-type: none"> Quantitative – Cross-sectional study Face-to-face, closed-ended questionnaire 	<ul style="list-style-type: none"> 50% of participants were not aware of the relationship of salt with hypertension. Females knew more about the health effects of salt than males. 1/3 of participants reported that they consumed excessive amounts of salt. Less than 50% of participants had taken action towards salt reduction. Females were more likely to perceive themselves at risk of consuming excessive salt. Green onion, garlic and vinegar were used to improve the taste of food instead of salt. 	<ul style="list-style-type: none"> 31% of participants believed less salt consumption resulted in less physical strength. 80% of participants felt that the taste of their food would be affected if they added less salt. 	<ul style="list-style-type: none"> The Chinese Nutrition Guideline's recommended daily salt intake for an adult was used in this study, i.e. 6 g/day instead of WHO's 5 g/day. Self-reported dietary salt attitude and practices might over or under-estimated their actual attitude and practices of salt consumption.
<ul style="list-style-type: none"> Quantitative – Experimental study Questionnaire (administered by general practitioners) 	<ul style="list-style-type: none"> There was almost no change in salt intake. 	<ul style="list-style-type: none"> The average salt intake of each family member slightly reduced at 2 months but returned to the baseline level at 3 months (despite on-going consultations and support). 	<ul style="list-style-type: none"> Different instruments and quality control procedures were used for the routine health checkups and research checkups.

TABLE 6 (Continued)

	Authors, year	Location	Purpose	Sample
14	Zou (2019)	Canada	<ul style="list-style-type: none"> To determine the facilitators and barriers influencing healthy eating behaviours among aged Chinese-Canadians with hypertension 	N = 30 mature adults (mean age 60.8 years; M = 14, F = 16)

et al., 2013; Qin et al., 2014; Zhang et al., 2013; Zhang et al., 2016), two were experimental studies (Huang, Hu, et al., 2011b; Zou et al., 2014) and one was a qualitative phenomenological approach (Zou, 2019). The included studies were conducted in China ($n = 10$), USA ($n = 1$), Italy ($n = 1$) and Canada ($n = 1$), and one was a multi-national study from which only the findings for the Chinese cohort were included in the review (Newson et al., 2013). Most of the studies used staff-administered ($n = 9$) or self-administered ($n = 4$) questionnaires. One study used semi-structured telephone interviews to collect data.

A total of 48,403 people from a Chinese background participated in the fourteen studies identified. Of these, 47,843 participants resided in China, and the remaining 560 lived in Western countries. In the thirteen studies that reported participants' gender, 23,721 participants were male and 23,683 were female. Across all the included studies, the reported participants' ages ranged from 18 to 65 years. Nine studies reported educational qualifications of the participants: no formal education ($n = 4128$), completed primary school ($n = 3497$), high school ($n = 3045$) and university ($n = 758$). The characteristics and key findings of the included studies are summarized in Table 6.

3.2 | The influence of salt-related health education

3.2.1 | The positive influence of adequate salt-related education on dietary behaviour modifications

Overall, the studies included in this review found that participants' knowledge of the effects of salt on humans and hypertension

was low (Bi et al., 2014; Huang, Hu, et al., 2011b; Huang, Zhang, et al., 2011a; Qin et al., 2014). However, the included interventional studies reported that Chinese participants would modify their dietary behaviours if they had opportunities to receive adequate and appropriate salt-related education (Huang, Hu, et al., 2011b; Zou, 2019; Zou et al., 2014). The findings of an interventional study in China showed that participants who had received salt-related health education over 1 year had significant improvement in their knowledge and perception of hypertension and dietary behavioural changes (Huang, Hu, et al., 2011b). It is important to note that this study was conducted in two rural areas in China. Many participants worked in the agricultural industry, were less educated and had no history of heart disease, diabetes mellitus or renal disease. In general, this population group is often the least health-conscious in their diet and unlikely to initiate behavioural changes (Huang, Hu, et al., 2011b).

3.2.2 | The level of educational exposure to the health benefits of salt restriction and its influence on Chinese people's perceptions of the health impact of high salt intake

The present review found that many people were unable to access formal salt-related education that affected their perceptions of and adherence to an SRD. Many studies reported that Chinese people encountered difficulties in acquiring adequate education and knowledge about the adverse health effects of salt and effective salt reduction strategies, such as using salt substitutes (Huang, Zhang, et al., 2011a;

Methods	Findings		
	Knowledge and behaviours related to dietary salt	Perceptions/barriers to reducing salt intake	Risk of bias
<ul style="list-style-type: none"> • Qualitative study • Telephone interview, two open-ended questions • Study conducted soon after five-week dietary educational training 	<ul style="list-style-type: none"> • Aged Chinese immigrants yielded to other family members' dietary wishes to avoid disagreement. • >60% of the people said they had been exposed to healthy eating education. • Low accessibility to grocery stores led to poor diet and health outcomes. • There were positive outcomes if all family members worked together. • Those with personal health conditions were more engaged in a salt-restricted diet. 	<ul style="list-style-type: none"> • Difficulty changing traditions/ eating habits acquired over a lifetime. • Barriers were the English language and beliefs about traditional Chinese medicine. • Traditional cooking practices • Low intrinsic motivation especially when an individual is healthy. • Influences of children's food preferences on their parents' dietary behaviour. • Succumbing to different preferences within the family. • Having a unique family structure (living alone or being a single parent). • Frequently eating at restaurants • Living a busy and fast-paced lifestyle. 	<ul style="list-style-type: none"> • More than half of the participants (n = 16) were from the low socioeconomic backgrounds.

Newson et al., 2013; Zhang et al., 2013). A study conducted in Northern China reported that 70% of people did not know that eating less salt could lower blood pressure, and 95% did not know the recommended upper limit of daily salt intake (Zhang et al., 2016). Newson et al. (2013) found similar results: 66% of the Chinese people reported not knowing the salt intake recommendation; and overall, 74% of people wanted to receive more information about the negative impact of salt on health. Qin et al. (2014) found that 85.8% of their participants had never received formal salt-related health education. Also, a study in Canada reported that language barriers posed a significant challenge to Chinese migrants, especially the older generations, in acquiring proper health education in a non-Chinese-speaking country (Zou, 2019).

Inadequate salt-related education has led to a misconception about the effects of salt, and the health risks associated with high salt intake were not recognized. Two studies revealed that Chinese people believed salt was a source of energy and essential for the human body (Zhang et al., 2013), and that salt could replace the loss in sweat and was particularly important if they exercised (Newson et al., 2013). However, there is a missing link between awareness of hypertension (the perceived severity of a disease) and dietary salt reduction (cues to action). Some people were aware of being hypertensive, but such awareness did not often translate into action. Hu et al. (2013) reported that 81.1% (n = 258) of participants living with hypertension reported reducing the use of salt while cooking and eating, but of these, only 48.4% (n = 125) had assessed the salt content while cooking. In some cases, awareness of hypertension increased adherence to pharmacologic treatment, but the use of an SRD as a management strategy was not translated into action at an individual level (Modesti et al., 2019). The practice of salt reduction

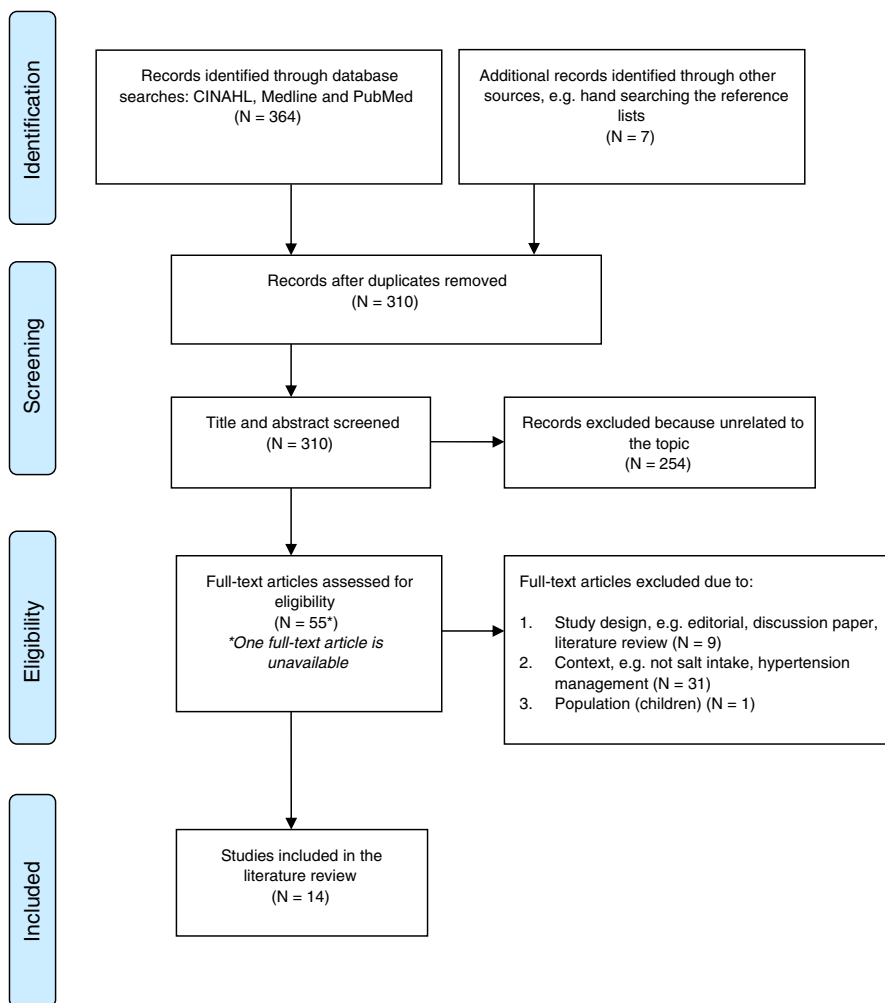
being used as a self-care strategy for hypertension management or prevention was ineffective. Studies conducted on Chinese people in China, USA, Italy and Canada reported that adherence to an SRD as a self-care strategy in hypertension management was suboptimal (Chen et al., 2013; Hu et al., 2013; Lee et al., 2018; Modesti et al., 2019; Zhang et al., 2013; Zhang et al., 2016; Zou, 2019; Zou et al., 2014). Accordingly, low rates of adherence to an SRD more often occurred among those who perceived themselves at low risk or had a short hypertension history (Hu et al., 2013; Lee et al., 2018). Overall, young males who had: (i) less exposure to the disease (hypertension) often had low intrinsic motivation to sustaining an SRD for hypertension and (ii) a lower education level were likely to receive less salt-related education (Hu et al., 2013; Zhang et al., 2013; Zhang et al., 2016; Zou, 2019). In comparison, this review found that older Chinese females with a higher education level often perceived they were more at risk of hypertension and its effects on their well-being (i.e. seriousness of the disease) (Chen et al., 2013). This latter group was more likely to translate salt-related knowledge to action, resulting in better self-care behaviour in controlling their salt consumption (Chen et al., 2013).

3.3 | Perceived barriers to reducing salt intake

3.3.1 | The complexity of salt measurement and calculation

The complexity of daily salt amount calculation and the use of a measuring spoon to determine the amount of salt added to meals

FIGURE 1 Flow diagram of search strategy and study selection



were reported to be the major perceived barriers to changing salt-related behaviours. Hu et al. (2013) found that only 48.4% of participants in their study considered the salt content in condiments and pickles during cooking. Studies showed that approximately half of the Chinese people hardly ever used a measuring spoon to determine the amount of salt being added in food preparation (Chen et al., 2014; Hu et al., 2013; Huang, Zhang, et al., 2011a). In other words, using a measuring spoon to calculate the amount of salt during the food preparation process was a challenge to their routine cooking habits that had been acquired over a lifetime.

3.3.2 | The challenge posed by salt reduction to Chinese cultural traditional food taste, dietary preferences and cooking habits at the individual and family levels

In Chinese culture, salt has been used as a food preservative for various reasons, such as lack of reliable refrigeration due to electricity supply issues in rural areas (Hu et al., 2013; Huang, Zhang, et al., 2011a), and this food preservative practice has become a part of Chinese food culture. Bi et al. (2014) reported that people were used to the salty taste of their cultural cuisine and experienced

difficulties in translating the knowledge of salt reduction into action or maintaining the behavioural change. A study in Shandong Province, China, found that most dietary salt intake came from condiments and cooking salt, which were directly added by participants during food preparation (Bi et al., 2014). This cultural food preparation practice has not changed significantly over the years (Bi et al., 2014). Two studies reported that the majority of participants were interested in reducing their salt intake, but only approximately one-third of the people had successfully controlled their salt intake amount (Newson et al., 2013; Zhang et al., 2013). Factors that influenced people's attitudes towards the maintenance of an SRD included no intention/interest in making a change and the belief that salt restriction reduces food taste and their physical strength (Newson et al., 2013; Zhang et al., 2013).

Two cross-sectional studies in China found that people considered food taste more important than health benefits, and thus they continued their high-salt diet (Bi et al., 2014; Chen et al., 2013). A qualitative study of Chinese living in Canada found that cultural dietary habits acquired over a lifetime were a major barrier to health behavioural changes (Zou, 2019). In addition, salt-related health behavioural changes could be influenced by the family structure (e.g. living with extended family members) and the attitudes of family members towards an SRD. Immediately after a five-week period of

dietary educational training, the average salt consumption of each family member was reported as slightly decreased at two months. However, their salt intake returned to the base-line level at three months, even if on-going medical consultations and support were provided to the families. Further, aged Chinese people who lived with their extended family members stopped adhering to their SRDs or intention to make salt-related changes to avoid disagreement with their family members (Zou, 2019).

4 | DISCUSSION

Dietary salt reduction is a cost-effective self-care strategy for the prevention and control of hypertension. However, following an SRD can be very challenging for some people if their dietary practice is influenced by their own culture and perceptions of healthy eating (Grimes et al., 2020; Leyvraz et al., 2018). This integrative review aimed to explore and synthesize the current research findings on perceptions of the effect of dietary salt on human health and the perceived barriers to sustaining health behavioural change among people from a Chinese cultural background.

4.1 | Perceptions about the health impact of dietary salt intake

The perceptions of health and illness and the adherence to a recommended SRD are often affected by individuals' preferences, dietary habits, and beliefs about what makes food tasty (Chan, 2018). This review found that Chinese people with salt-related knowledge might not follow an SRD because they perceived that taste preferences and traditional cultural food practices were more important than health benefits (Bi et al., 2014; Chen et al., 2013). It is concerning that Chinese people who were aware of the health risks associated with high salt intake did not perceive that they were at significant risk of hypertension. In addition, the complexity of salt amount calculations, especially of the salt content listed in condiments, may further affect their perceptions of an SRD (Hu et al., 2013). As a result, salt-related knowledge alone did not influence Chinese people's perceptions enough for them to modify their dietary behaviour (Chen et al., 2013; Hu et al., 2013; Modesti et al., 2019). Similar concerns about the gaps in knowledge, awareness and actual dietary behaviour have also been raised in different cohorts (Ghimire et al., 2019; Land et al., 2014). A recent study conducted in Australia found that awareness of the impact of salt on health did not trigger a change in dietary behaviour (Grimes et al., 2020). According to the HBM (Rosenstock et al., 1988), people were more willing to change their dietary behaviour if they perceived that the benefits of changing the health behaviour outweighed the associated health risks and the barriers to behaviour change. A study in the present review found that young males with a lower education level and/or shorter hypertension history were the most at-risk group of people but the least willing to reduce their

dietary salt consumption (Hu et al., 2013; Zhang et al., 2013; Zhang et al., 2016; Zou, 2019). This suggests the need for salt-related health risks education for the younger male population groups.

4.2 | Perceived barriers to following a salt-restricted diet

This review identifies that there are two main perceived barriers to adhering to a recommended SRD: i) food taste preferences that people have acquired over a lifetime; and ii) a less than adequate knowledge about the seriousness of hypertension and the health benefits of salt reduction. In Chinese food culture, cooking salt, condiments and pickled foods are the main sources of salt intake in household cooking (Zhao et al., 2015). Salt is often added during cooking without the food being tasted or the salt measured (Chen et al., 2014; Leong et al., 2018), and this practice has changed little in over a decade (Bi et al., 2014).

This review suggests that awareness of the seriousness of hypertension is generally low, especially among people with less exposure to hypertension or a shorter hypertension history (Hu et al., 2013; Modesti et al., 2019). As a result, people did not perceive salt-induced hypertension to be a sufficient threat to their health to motivate them to initiate and maintain the behavioural changes required. This finding is consistent with a Chinese study that lifestyle modifications such as salt reduction were often resisted by the people who were most at risk of hypertension (Pan et al., 2019). Moreover, the included studies reported that food taste outweighed the health benefits of following an SRD (Bi et al., 2014; Chen et al., 2013). So, people's food taste preferences are a barrier to dietary modifications, and this barrier is more significant among people with less exposure to hypertension (Hu et al., 2013; Modesti et al., 2019) and young males (Hu et al., 2013).

The impact of Westernization and industrialization on the traditional Chinese diet, particularly the amount of salt content (hidden salt), cannot be underestimated, but this topic has not yet been well-documented. Dining out has been reported as a challenge for salt reduction (Grimes et al., 2020). In this review, only one study reported the impact of living a busy and fast-paced lifestyle on the participants' salt reduction plans (Zou, 2019). This suggests further investigation is warranted to explore the impact of non-traditional Chinese dietary patterns on salt intake.

Food is an important part of the social fabric in human-to-human connection. People who follow an SRD may experience difficulties in connecting with their friends and family members if they cannot share meals with them at the dining table. Chinese family values may outweigh the importance of an SRD and become a significant barrier for people who live with their extended family members but want to maintain an SRD. The findings of this review show that family members' attitudes towards an SRD play a vital role in successful long-term adherence (Hu et al., 2013; Zou, 2019). This is particularly important for older generations, because some older Chinese people may give up their dietary plans to avoid intergenerational conflict in the family

(Zou, 2019). This indicates that health behavioural modification may be more successful if the entire family recognizes the high-salt dietary risks and believes an SRD could bring health benefits for them. In other words, the educational impact dissipates without family support. Therefore, the delivery of salt-related education and related recommended dietary modification strategies should be adapted to individuals' family circumstances, including their immediate family members' knowledge of and attitudes towards an SRD (Zou, 2019).

The inadequacy of salt-related education and knowledge about salt measurement and calculation is a public health concern. Although the present review found that the main source of dietary salt intake among participants in the included studies was homemade food (Bi et al., 2014; Newson et al., 2013), processed foods are convenient and widely accessible in modern society and Western countries. Processed foods may become a popular meal option in this population group. However, no studies explored the Chinese people's food literacy level in reading the processed food labels. A study conducted in South American countries reported that people did not realize that processed foods contain salt, and the majority did not check salt content on food labels (Sánchez et al., 2012). This suggests the need for further study about the relationship of food literacy and awareness of daily salt intake in Chinese populations. This is particularly important for Chinese people living in Western countries where language and cultural differences may have an impact on their food literacy.

To the best of our knowledge, this is the first integrative review on this topic. Fourteen studies conducted in four countries were reviewed. The subjects included Chinese people who originated from different regions of China, with a broad range of educational backgrounds. Most of the included studies ($n = 11$) had a quantitative cross-sectional design. This suggests a potential gap in knowledge because of the differences between quantitative and qualitative studies, in that issues such as behaviour and attitudes towards dietary changes are not well-reported in quantitative studies, but are better studied using qualitative methods. It is important to note that four out of the 14 studies included in this present review were conducted in Western countries. This focus on the Chinese diaspora in Western countries may be associated with globalization, highly educated or wealthy Chinese people who have opportunities to migrate to Western countries. As a result, dietary salt consumption among Chinese ethnic groups has become a health concern in their host countries. However, there is insufficient evidence to show that there is a significant difference in salt-related attitudes and behaviours between the Chinese people in China and overseas in this review. The changes of food choices and attitudes towards an SRD before and after the migration have not been fully explored.

4.3 | Limitations

Accessing grey literature in English language were beyond the resources of this study. However, our search strategy accessed 371 articles from five countries, which included China, Singapore, USA,

Italy and Canada. We are confident that the review represents a comprehensive range of international literature. Also, some of the Chinese publications may only be indexed in bibliographic databases, which may require specific Chinese keywords that the authors were not familiar with. Furthermore, only one qualitative study was included. The humanistic or idealistic aspects and motivations towards an SRD for hypertension management may be under-represented in this review.

5 | CONCLUSION AND IMPLICATIONS

The findings of this integrative literature review reveal a need for improvement in the design of and approach to current salt-related health education. Lack of knowledge of the effects of dietary salt on the human body, failure to measure salt during food preparation and under-recognition of salt-related health risks have resulted in suboptimal outcomes when following an SRD. Unique Chinese customs may also reduce the effectiveness of salt reduction campaigns. On another note, Chinese people who live overseas may face an increased challenge when they seek appropriate education and dietary modification advice for hypertension management. Apart from the possibility of language barriers, mainstream salt-related awareness programs and recommended self-care interventions in their host countries may show lack of awareness of cultural differences and thus provide less-than-optimal levels of health advice. Therefore, health education and salt-reduction strategies should be culturally adapted, based on the needs and lifestyle of a family instead of an individual. For example, assisting a family to design some cooking recipes using herbs and spices instead of salt. This not only reduces the overall household salt intake, but also brings harmony and closeness within the family.

5.1 | Implications for future research

Further qualitative research will fill gaps in knowledge regarding salt-related education and the challenges in producing dietary modifications among Chinese people. The findings from qualitative studies will inform the unique support needs and expectations of how health information is delivered to this population group. Moreover, research activities will enable stakeholders to co-design culturally appropriate salted-related hypertension education programs.

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AUTHOR CONTRIBUTIONS

AC, LK, SC and MK: Made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of

data; AC, LK and SC: Involved in drafting the manuscript or revising it critically for important intellectual content; AC, LK, SC and MK: Given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content; AC, LK and SC: Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

PEER REVIEW

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ORCID

Alex Chan  <https://orcid.org/0000-0003-2614-0178>

Sally Wai-chi Chan  <https://orcid.org/0000-0001-5484-4645>

Masuma Khanam  <https://orcid.org/0000-0002-2103-6462>

Leigh Kinsman  <https://orcid.org/0000-0002-0790-5887>

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