

REVIEW ARTICLE

A Scoping Review on Salt Reduction Intervention

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ABSTRACT

Excessive salt intake has been linked to the development of hypertension and non-communicable diseases. This study aims to explore the different types of salt reduction intervention implemented among adults aged ≥ 18 years and to identify the suitable settings, duration and tools used for effective salt reduction interventions. This review adapted the established structured scoping review framework by Arksey and O'Malley. Related articles from the year 2008 to 2018 were retrieved based on the study objectives using keywords in electronic databases and through a bibliographic search of books, reports, conference proceedings, posters and summaries. Out of 130 potentially relevant full-text articles assessed, 14 articles were included in the review. Suitable salt reduction initiatives for the community who regularly consume home-cooked food are through cooking and usage of a tool such as a salt-restriction spoon, together with awareness on the benefits of salt reduction in their daily diet. Healthy catering initiative should be implemented in the workplace or institution-based settings. Policy development targeting the source of salts such as mandatory usage of salt-substitutes or Front-of-Pack labelling of salt content in all food products suitable for population-level intervention.

Keywords: Salt reduction intervention, adult, non-communicable disease, Malaysia

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INTRODUCTION

Health problems concerning excessive salt intake have become one of the alarming global issues. Excessive salt intake has been linked to the development of hypertension and several other non-communicable diseases (NCD) such as cardiovascular disease, stroke and chronic kidney disease (1). According to the World Health Organization (WHO), the prevalence of hypertension was highest in WHO African region (27.0%) and lowest in WHO America Region (18.0%). It was also reported by the WHO that a review on current trends of adults suffering from hypertension has increased from 594 million in 1975 to 1.13 billion in 2015. The trend was observed to happen in low- and middle-income countries (2).

The prevalence of hypertension among adults aged 18 years and above in Malaysia from 2006 to 2015 experienced a slight increment as reported in National Health and Morbidity Survey (NHMS) (3). The prevalence

has increased from 34.6% in 2006 to 35.3% in 2015. In 2019, the prevalence of hypertension reduced to 30.0% as reported in NHMS 2019 (4). Findings from Responding to Increasing Cardiovascular disease prevalence (REDISCOVER) study on the prevalence of hypertension for adults aged 30 years old and above stated that nearly one in two Malaysians were hypertensive (5). The prevalence from the findings (47.0%) was higher than the prevalence stated in NHMS 2011 (43.5%) when comparing with the same age cut-off ≥ 30 years old. Moreover, among the Southeast Asia countries, Malaysia has the highest prevalence of hypertension among adult ≥ 18 years old (30.0%) compared to Singapore (26.6%), Indonesia (23.0%) and Thailand (20.5%) (6-7).

Available data regarding sodium intake among adults in Southeast Asian countries showed that the intake of sodium was generally higher than the recommendation by WHO, 2 grams/ day of sodium for adults which is equivalent to 5g/day of salt (8-9). The highest total sodium intake among adults in Southeast Asia was among Thai military men with a mean of 7.12g of sodium per day (8). It is also reported that the studies with data of both men and women on sodium intake found that, men had consistently high sodium intake compared to women. Meanwhile, the mean global sodium intake

was 3.95g/day which is equivalent to 10.06g/day of salt intake per day. This amount was doubled from the amount recommended for salt and sodium intake by WHO. The mean intake of sodium was seen higher (~10%) in men compared to women and the highest intakes were observed in Southeast Asia, Central Asia and Eastern Europe (mean >4.2g/day) (10). In Malaysia, a nationwide salt intake survey conducted in the year 2018 had reported that salt intake among the population was 7.9g/day and 79% of the population had exceeded the recommended amount for salt intake by WHO (11).

Sodium reduction initiatives have been identified as one of the targets of the Global Monitoring Framework for NCDs (adopted at the 66th World Health Assembly in 2013) and priority intervention for Non-Communicable Diseases (NCD) prevention (12). WHO has classified national-level salt reduction interventions into three main pillars: consumer behaviour, product reformulation and environmental changes. In Malaysia, the National Salt Reduction Strategy is to promote, educate and collaborate with all related stakeholders to reduce salt intake among the Malaysian population to achieve a 30% reduction of the average salt intake (from 8.7 g/day to 6.0 g/day) of the adult population by the year 2025 (13).

By introducing a mix of awareness campaigns, negotiated target settings, voluntary reformulation from industry and community surveillance of salt use, the 'upstream' strategies involving national salt mitigation strategies were established in 75 countries in 2015. These strategies lead to a 1.4g/day decline in community salt consumption between the years 2001 and 2011. Another salt reduction strategy is the 'downstream' approach where it relies on individuals altering behaviour interventions approach. The interventions include health education, dietary modification, dietary counselling and public awareness campaign (14). There was evidence to show that an effective method of encouraging healthy men in the workplace was through the incorporation of 'informed choice' within health promotion literature. At present, the "downstream" approach had been widely implemented for tobacco control and alcohol policies in Malaysia.

Despite the different approaches of sodium reduction actions, we are still unclear and have inadequate evidence to identify the most appropriate interventions that can be implemented in this country. Therefore, this study aims to explore the different types of salt reduction intervention implemented among adults aged 18 years and above around the world. This study also aims to identify the suitable settings, duration and tools used for effective salt reduction interventions.

METHOD

The present study design is a scoping review. Scoping

review attempts to map the key principles underpinning a research field and the main references and forms of evidence available, and may be carried out as stand-alone projects in their own right, particularly when an area is complex or has not been extensively reviewed before (15). This review was performed to study the types of salt reduction interventions conducted worldwide among adults aged 18 years and above. In this context, salt refers to sodium or sodium chloride intake (16). This review adapted the established structured scoping review framework by Arksey and O'Malley (2005) (15) which are 'identifying the research questions', 'identifying relevant studies', 'study selection', 'charting the data' and 'collating, summarising and reporting the results. Members of the research team consulted Nutrition and Non-Communicable Disease Divisions from the Ministry of Health Malaysia to improve the review. The study was registered with National Medical Research Registry Malaysia (NMRR), Ministry of Health Malaysia (NMMR-18-4112).

Identifying the research questions

The questions were: (i) What are the different types of interventions related to salt reduction among adults aged 18 years and above? (ii) What are the types of settings, duration and tools used in the interventions?

Identifying relevant studies

The team of researchers performed a thorough search in published scientific journals, unpublished work, grey literature and annual reports in English and Malay languages published from the year 2008 to 2018. The electronic databases were MEDLINE/ Pubmed, Ovid, ISI Web knowledge, Cochrane Library and Scopus. Manual searches in pertinent websites for research such as World Health Organisations (WHO), Google Scholar and Ministry of Health Malaysia for newsletters and references from selected articles or bulletin were also conducted. Manual searches related to salt reduction intervention studies were also conducted through a bibliographic search of books, reports, conference proceedings, posters and summaries.

Based on PRISMA-ScR (Preferred method in reporting systematic review and meta-analysis extension for Scoping Reviews), the process of searching, screening, reviewing and extraction of data were conducted systematically. The researchers autonomously reviewed titles, abstracts and keywords for eligibility. The search strategy included all forms of studies. The search strategy for related articles' search is shown in Table I. To handle the references and delete duplications, Endnote software and Microsoft Excel software were used.

Study selection

The selection of the articles was based on the aims of this study. A team of 10 researchers were assigned as five pairs for the screening of the titles and abstracts. Abstracts that did not serve the study's scope were

Table 1: Search Strategy

Criteria 1	Criteria 2	Criteria 3
'Sodium reduction'	Intervention*	Communit*
'Sodium chloride reduction'	Initiative*	Work place
'Salt reduction'	Program*	Work site
'Dietary salt reduction'	Activit*	Population
'Natrium chloride reduction'	Diet*	Adults
'Dietary salt decrease'	Campaign*	man
'chloride decrease'	Tool*	male
'Reduce salt'	Package*	18 years and above
'Reduce sodium'	Material*	men
'Reduce dietary salt'	Study	woman
'Salt cut down'	AND studies	AND female
'Lower salt'	Action*	women
'Lower sodium'	Plan*	human
'Lower dietary sodium'	Strateg*	
'Less salt'	Mechanism*	
'Less sodium'	Instrument*	
'Less dietary salt'	Treatment*	
'Less dietary sodium'	Education*	
'Low salt diet'		
'Salt restriction'		
'Salt Intake'		
'Sodium Intake'		
Salt		
Sodium		
'Sodium Chloride'		
'Natrium Chloride'		

omitted. Full articles were obtained for the remaining potentially relevant abstracts. Each pair independently reviewed the articles for their ability to meet the research questions of this study. Any disagreement on the selection of articles was resolved through a third reviewer who was assigned by the principal investigator of the study. The third reviewer was selected from the team of the 10 researchers but from a different pair.

Charting the data

The extracted data from the articles were charted in a standardised charting form. The data included author(s), publication year, study objectives, location of study, setting, duration, design, characteristics of the sample and size, instruments (if any) and tools used in their respective studies and also the studies' outcome.

Collating, summarising and reporting the results

The characteristics of the outcome from the selected articles were defined depending on the intervention types, study designs, settings and outcomes. These are summarised in a table of evidence.

RESULTS

From selected electronic databases and other resources, a total of 328,966 titles were extracted. Out of these, 415 abstracts were included while 328,551 abstracts were omitted after the initial screening process as they were

duplicates, unrelated to the research subject and non-English articles (Fig.1). After 130 potentially relevant full-text articles were assessed, 116 of them were excluded as these studies were conducted among the children/ adolescent population, hospitalized patients and post-stroke patients undergoing treatment. Articles that could not address the research questions of this study were also excluded. Following this, only 14 articles were included in the review and the characteristics of the study are shown in Table II.

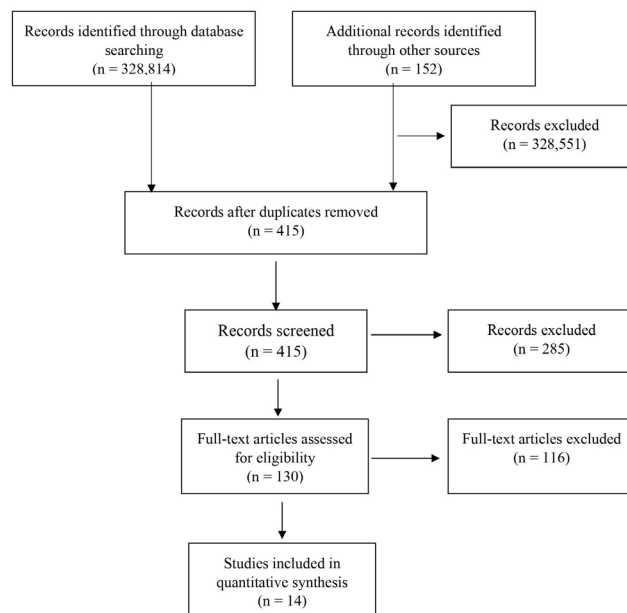


Figure 1: Flow chart of scoping review (based on framework by Arskey and O'Malley, 2005) (15)

From this review, we identified usage of improved salt-restriction spoon, cooking classes, healthy catering, usage of salt-substitute, awareness on front-of-pack (FoP) labelling, communication for behavioural impact (COMBI) based awareness programs, counselling on lifestyle modification and applying the Mediterranean diet as salt reduction initiatives practised in certain countries. The country of origin of the studies was China, Japan, Canada, Australia, United Kingdom, Ireland, Finland, Tibet, Vietnam, South Africa and Greece. Among the study designs involved were community-based intervention studies, between-group experimental research, randomized control trials, reviews and cross-sectional studies. The majority of the studies' setting was community-based (12 studies, 86%) while only two studies were workplace-based. The workplace-based studies involved interventions conducted in a hospital cafeteria through a healthy catering initiative while lifestyle modification was applied in a railroad company. The sample size for the studies ranged between 41 – 1272 adults aged 18 years and above while the duration of the studies was between one month to three years. Salt reduction initiatives using cooking class was conducted for a duration of two months, usage of salt-substitute was between two to eight months, usage of improved salt-restriction spoon was conducted for six

Table II: Findings

No	Author (s)	Year of publication	Objective of the study	Study location/country	Setting	Duration	Sample size & characteristics	Design	Tools/ instruments used	Outcome of the study
1.	Geaney et al. (??)	2011	To examine the impact of a structured catering initiative on food choices in a public sector workplace setting	Ireland	Workplace	2007-2008	100 random participants aged 18-64 years (50 intervention, 50 non-intervention) who consumed at least one main meal in the hospital staff canteen daily	Cross-sectional comparison study	Intervention Hospital (IH): <ul style="list-style-type: none"> All menus were modified to ensure that the healthiest option was available for patients and staff. High-salt products (gray, mixes, stock cubes) and processed meat (bacon, corned beef) were replaced with low-salt options (turkey, chicken and fish). Fresh herbs, spices and garlic were introduced to develop additional flavour. Salt was removed in all cooking processes. In the staff canteen, salt was removed from the tables but small salt sachets were available at service. Nutrition information on salt reduction and a healthy diet was displayed in the canteen area. No sauces or accompaniments were added to any meals without the customer's consent. Staff members were encouraged to consume extra salad and vegetable options with no extra cost. Cooking methods with limited oil. All desserts were fruit-based. Control Hospital (CH): <ul style="list-style-type: none"> healthy and unhealthy food options were available in the staff canteen. 	IH: <ul style="list-style-type: none"> Mean intakes of total sugars ($p < 0.001$), total fat ($p < 0.000$), saturated fat ($p < 0.000$) and salt ($p < 0.046$) were significantly lower when adjusted for age and gender. 72% of respondents, compared with 42% in the CH, complied with the recommended under 3 daily servings of food high in fat and sugar ($p < 0.005$). 43% of respondents exceeded the recommended salt intake of 4-6g/d, compared with 57% in the CH.
2.	Wyness et al. (??)	2011	To describe the UK Food Standards Agency's (FSA) salt reduction programme undertaken between 2003 and 2010 and to discuss its effectiveness.	United Kingdom	Community	Between 2003 and 2010	Adults from UK-wide surveys	Review Study	<ul style="list-style-type: none"> Reformulation of processed foods Front-of-pack labelling Public awareness campaign 	<ul style="list-style-type: none"> Up to 70% reduction in salt levels in food, monitored using commercial label data and information collected through an industry self-reporting framework. Campaign evaluation showed increased awareness of the benefits of reducing salt intake on health, with 43% of adults in 2009 claiming to have made a special effort to reduce salt in their diet compared with 34% of adults in 2004.
3.	Morikawa et al. (??)	2011	To investigate the effectiveness of the newly developed workplace salt reduction intervention program on blood pressure	Japan	Workplace	4 weeks	41 hypertensive male workers of a railroad company	Intervention study	AI recruitment, Intervention Group (IG) and Control Group (CG) both received group counselling on lifestyle modification based on Standardised Health Assessment and Life Style Modification Advice Program. IG: <ul style="list-style-type: none"> received e-mail containing information on salt content in foods, methods for salt reduction and a message encouraging a salt-reduced diet through their cellular phones, 10 times over the study period. Daily salt excretion from overnight urine was estimated using electronic salt sensor. CG: <ul style="list-style-type: none"> no intervention other than the initial group counselling. 	IG: <ul style="list-style-type: none"> mean systolic blood pressure (SBP) decreased by 5.4 mmHg ($p = 0.012$), diastolic blood pressure (DBP) decreased by 6.2 mmHg ($p = 0.001$) daily salt excretion decreased by 0.7g (95% CI: -1.3, -0.2, $p = 0.008$) CG: <ul style="list-style-type: none"> mean SBP decreased by 2.2 mmHg ($p = 0.131$), DBP decreased by 1.6 mmHg ($p = 0.210$)
4.	Sarkkinen et al. (??)	2011	To determine the feasibility and effect on blood pressure of replacing NaCl (regular salt) with a novel mineral salt [50% sodium chloride and rich in potassium chloride (25%), magnesium ammonium potassium chloride, hydrate (25%)] (Smart Salt)	Finland	Community	8 weeks	45 respondents between 25-75 years old	A randomized, double-blind, placebo-controlled parallel study	Intervention Group (IG): <ul style="list-style-type: none"> provided with test foods (main dishes, bread, frankfurters/ cold cuts and Edam cheese cooked with Smart Salt. Only use Smart Salt for cooking baking and as table salt. Control Group (CG): <ul style="list-style-type: none"> provided with test foods (main dishes, bread, frankfurters/ cold cuts and Edam cheese cooked with regular salt. Use regular salt for cooking baking and as table salt. 	<ul style="list-style-type: none"> The substitution of Smart Salt for regular salt in IG subjects with high, normal or mildly elevated BP resulted in a significant reduction in their daily sodium intake as well as a reduction in SBP over the 8 weeks (-7.5 mmHg; $p = 0.016$). SBP increased (+3.8 mmHg, $p = 0.072$) slightly in CG. The difference in the change of SBP between IG and CG was significant ($p < 0.002$).

(Continue.....)

Table II: Findings (continued)

No	Author (s)	Year of publication	Objective of the study	Study location/ country	Setting	Duration	Sample size & characteristics	Design	Tools/ instruments used	Outcome of the study
5.	Coodman et al.	2012	Examined the efficacy of four types of front-of-package (FOP) sodium labels at influencing consumers' selection of products low versus high in sodium	Canada	Community	November 2010 and June 2011	Adults (n=430) aged ≥18 years	Between-group experimental research.	<ul style="list-style-type: none"> Participants were randomly assigned to one of five experimental conditions: Control Group (CG) - no FOP label Intervention Group (IG) 1 - basic numeric FOP label IG 2 - numeric FOP label with 'high' & 'low' sodium content descriptors IG 3 - detailed Traffic Light (TL) labels with colour coding, content descriptors and numeric information IG 4 - simple TL label with no numeric information 	<ul style="list-style-type: none"> Participants in the three FOP conditions with 'high/low' sodium content descriptors were significantly more likely to choose the lower-sodium product compared with the CG. The detailed TL label was ranked most effective at helping participants select low-sodium products and was rated significantly higher than other formats in liking, understanding and believability.
6.	Chen et al.	2013	To evaluate the effect of an improved salt-restriction spoon on the attitude of salt-restriction, the using rate of salt-restriction-spoon, the actual salt intake, and 24-hour urinary sodium excretion (24HUNa)	China	Community	6 months	403 local adult residents being responsible for home cooking	Community intervention study	<ul style="list-style-type: none"> Intervention Group (IG) provided with an improved salt-restriction-spoon and health education and were informed of their actual salt intake and 24HUNa. Control Group (CG) No intervention given 	<ul style="list-style-type: none"> IG daily salt intake decreased by 1.42g 24HUNa decreased by 34.8 mmol CG daily salt intake decreased by 0.28g 24HUNa decreased by 33.7 mmol.
7.	Zhao et al.	2014	To evaluate the effects of a low-sodium and high-potassium salt-substitute on lowering blood pressure (BP) among Tibetans living at high altitude (4300 meters).	Tibet	Community	February and May 2009	282 Tibetans aged 40 or older with known hypertension	Participant-blinded randomized controlled trial	<ul style="list-style-type: none"> Intervention Group (IG) received 3 months' supply of salt-substitute (65% sodium chloride, 25% potassium chloride and 10% magnesium sulfate) Control Group (CG) received regular salt with 100% sodium chloride 	<ul style="list-style-type: none"> Overall decline in SBP/DBP and the proportion of patients with BP under control (SBP/DBP <140 mmHg) was significantly higher in IG compared to CG (19.2% vs 8.8%, p=0.027)
8.	Trieu et al.	2015	To quantify progress with the initiation of salt reduction strategies around the world in the context of the global target to reduce population salt intake by 30% by 2025	75 countries around the world with national salt reduction strategies	Community	Initiatives implemented until 2014	-	Systematic review	<ul style="list-style-type: none"> Food reformulation consumer education front-of-pack labelling interventions in public institution settings 	<ul style="list-style-type: none"> 12 countries have reported reductions in population salt intake, 19 reduced salt content in foods and 6 improved in consumer knowledge, attitudes or behaviours relating to salt.
9.	Land et al.	2016	To determine the effect of a multi-faceted community-based salt reduction intervention on mean salt intake, as estimated from measures of 24-h urinary sodium excretion made before and after the intervention was implemented	Australia	Community	March 2011 to May 2014	419 individuals at baseline (2011) and 572 at follow-up (2014).	Community Intervention Study	<ul style="list-style-type: none"> Using the Communication for Behavioral Impact (COMBI) framework: administrative mobilization and public advocacy to engage key stakeholders community mobilization a comprehensive advertising strategy interpersonal communication point of service contact using tools to support intervention 	<ul style="list-style-type: none"> Mean salt intake estimated from 24-h urine samples fell from 8.8 g/day in 2011 to 8.0 g/day in 2014 (p<0.001). Significant increases in the proportion of participants that knew the recommended upper limit of salt intake (18 % vs. 29 %; p<0.001). Knew the importance of salt reduction (64 % vs. 78 %; p<0.001). Reported changing their behaviours to reduce their salt intake by using spices (5 % vs. 28 %; p<0.001). Avoiding eating out (21 % vs. 34 %; p<0.001).
10.	Takada et al.	2016	To investigate the effect of cooking classes focusing on salt reduction on the salt intake of housewives and their families	Japan	Members of Japan Agricultural Cooperative Shirakawa branch	2 months (Sept-Oct 2015)	35 housewives (40 years and above) and 33 family members (20 years and above)	Single Blinded, Cluster randomized trial	<ul style="list-style-type: none"> Intervention Group (IG) Cooking Classes by registered dietitians, general physician and a nephrologist Control Group (CG) Lectures on healthy living (no salt reduction information) 	<ul style="list-style-type: none"> IG: The mean salt intake was 8.95 (SD 2.45) g/day CG: The mean salt intake was 10.30 (SD 1.78) g/day. The mean difference was 1.19 g/day (95% CI: 2.29, 0.09); P= 0.034).

(Continue.....)

Table II: Findings (continued)

No	Author (s)	Year of publication	Objective of the study	Study location/ country	Setting	Duration	Sample size & characteristics	Design	Tools/ instruments used	Outcome of the study
11.	Li et al.	2016	To determine the effects of a community-based sodium reduction program on salt consumption in rural northern China.	China	Community	May 2011 to December 2012	120 townships from five Northern Chinese provinces – 1272 respondents	Cluster-randomised trial	Intervention Group (IG) <ul style="list-style-type: none"> community-based health education and a food supply strategy to promote the use of reduced sodium & added potassium salt substitute Control Group (CG): <ul style="list-style-type: none"> continue their usual practices without introduction of any sodium reduction initiatives as IG 	IG compared with CG: <ul style="list-style-type: none"> Mean urinary sodium excretion was reduced by 5.5% (-14mmol/ day, 95% CI: -26 to -1; p = 0.03) potassium excretion was increased by 16% (+7mmol/day, 95% CI: +4 to +10; p<0.001) sodium to potassium ratio declined by 15% (p<0.001) Population sodium intake was reduced by the intervention, primarily through increased use of salt substitute.
12.	Do et al.	2016	To evaluate the effectiveness of the Eat Less Salt (ELS) intervention with a view to scaling up to a regional or national level.	Vietnam	Community	June 2013 to June 2014	Respondents aged 25 to 64 years. Baseline study: 509 respondents Follow-up: 511 respondents	Cross-sectional study	COMBELS strategies: <ul style="list-style-type: none"> using mass media communications community communication programs a focus on communicating with high-risk groups including people with hypertension 	<ul style="list-style-type: none"> Mean sodium excretion estimated from spot urine fell significantly from 8.48 g/d at baseline to 8.05 g/d at follow-up (p=0.001). Participants showed improved knowledge and behaviours following the intervention.
13.	Muthuri et al.	2016	To investigate salt reduction interventions implemented and evaluated in sub-Saharan Africa (SSA).	South Africa, Nigeria, Ghana and Tanzania	Community	Studies published between 1990-2013	-	Systematic review	<ul style="list-style-type: none"> Product reformulation consumer awareness environmental change 	All the interventions resulted in at least one significantly improved outcome measure including reduction in systolic blood pressure, 24-hour urinary sodium excretion or mean arterial BP.
14.	Vasara et al.	2017	To determine whether adherence to Mediterranean diet is related to different sodium intakes or sodium-to-potassium ratio.	Greece	Community	February 2015 – March 2016	252 participants (18-75 years old).	Cross-sectional survey	MedDietScore (MDS) was calculated for each participant to evaluate their adherence to the Mediterranean dietary pattern	<ul style="list-style-type: none"> There was no significant difference in salt or potassium intake or their ratio across MedDietScore quartiles. No significant relationships were found between salt intake and adherence to Mediterranean diet, suggesting that the perception of the health benefits of the Mediterranean diet does not hold when referring to salt consumption.

months, awareness on front-of-pack (FoP) labelling was for eight months, Mediterranean diet for 14 months and healthy catering for two years. The longest duration of the initiative was for communication for behavioural impact (COMBI) based awareness programs which was between one to three years while the shortest was counselling on lifestyle modification (one month).

All the initiatives mentioned resulted in a positive outcome for salt reduction except for applying the Mediterranean diet which reported that the majority of the respondents on the diet exceeded the WHO recommended target for salt intake (17).

DISCUSSION

Salt reduction initiative had been given importance in many countries with nearly 75 countries worldwide had established their respective national salt reduction strategies, including Malaysia (18). In this study, we reviewed salt reduction initiatives that encompassed usage of a tool, cooking class, healthy catering, salt substitute, food labelling and behavioural changes.

A salt restriction spoon is a tool invented to facilitate people to quantify the amount of salt used in their daily cooking. It can hold 2grams of salt with a 5cm handle measurement (19). The introduction of improved salt-restriction spoon in Beijing in the year 2012 was a second attempt in reducing dietary salt intakes through cooking at the community level. The first attempt using salt-restriction spoon failed in the year 2007-2008 due to the defects in the design of the spoon. Hence, an improvised salt-restriction spoon addressing the defects in the earlier version coupled with health education yielded a positive result in salt reduction initiative through cooking in China (19). The usage of an improved salt-restriction spoon is found to be suitable for the community that mainly eats home-cooked food where the amount of salt added is within the control of the family members who cook the food compared to eating-out. Similarly, Hou et al. (2020) reported that the usage of improvised salt-restriction spoon coupled with health education had reduced the daily salt intake among their study respondents (20). Therefore, this initiative coupled with health education is suitable to be used among a community whose salt intake is mainly derived from home-cooked food (19-20).

Cooking classes, emphasizing salt reduction targeting housewives who were responsible for cooking main meals in their respective families is another initiative targeting salt reduction through cooking. Housewives were thought on estimating the amount of salt in a meal and technical tips in reducing salt in their daily cooking by health professionals. This method, which was applied in a community in Japan, indicated the success of transferring awareness on salt reduction from the housewives to their family members as well (21).

However, Hasan et al. (2019) who conducted a systematic review on the effect of cooking classes on dietary intake reported that the cooking classes were not significantly associated with changes in systolic and diastolic blood pressure among the respondents. This may indicate that the cooking classes did not significantly reduce the salt intake among the respondents (22). Therefore, the authors recommend that the salt reduction initiative through cooking classes need to be conducted with awareness on the benefits of salt reduction in daily diet. Owing to the busy modern lifestyle, eating out is unavoidable especially among those working. To address this situation, a structured catering initiative offering only healthy food choices focusing on a low salt diet was implemented in a hospital cafeteria in Ireland for two years, targeting both patients and hospital staffs. This initiative proved a success when there was an overall significant reduction in dietary intakes of salt, fat, sugar and also in total energy intake among the customers (23). These findings proved that a structured catering initiative offering only healthy food choices can create a healthy environment leading to a healthy lifestyle, not only in a workplace but in any institutions for any age group.

Salt substitute or smart salt are reduced-sodium and added-potassium salt which was used in three studies in Finland, Tibet and China to reduce salt or to be more specific, sodium intake among these populations (24-26). All three studies resulted in positive outcomes. In Finland, the study subjects were consuming processed foods with the salt source coming only from smart salt (50% sodium chloride, 25% potassium chloride and 25% magnesium ammonium potassium chloride) for eight weeks (24). In Tibet, three months of salt substitute (65% sodium chloride, 25% potassium chloride and 10% magnesium sulfate) was supplied to the study respondents for free of charge. The amount supplied to each respondent was ensured adequate for the whole household consumption (25). In China, only reduced-sodium, added-potassium salt substitute was made available to purchase at the village grocery shops in the intervention villages (26). Health educators together with village councils and doctors promoted the usage of the salt and also educate the villagers on the health aspect of it. At the end of the three studies, all their findings indicated a reduction in mean urinary sodium and an increase in mean potassium excretions. There were also reductions in systolic and diastolic blood pressures among the respondents in general. Although the price of the salt substitute is generally higher than the usual salt, it is still a simple and effective strategy in reducing the sodium intake of the population. The differences in the pricing between salt substitute and usual salt could be addressed through price subsidies to avoid passing the extra cost to the customers.

Front-of-Pack (FoP) labelling can be a very useful guide in making healthier choices during purchases.

It is also believed that this initiative can increase the competitiveness of food companies in reformulating their products to healthier nutrient content (27). A study conducted in Canada showed FoP labelling with colour-coding information (traffic light) on sodium content was effective in helping the respondents to select low-sodium products in the market. Findings from this study also suggested that FoP labelling with colour-coding may help consumers from any socio-economic background in understanding the nutrition labels since colours do not require numeracy skills for understanding (28). Few review studies also have found that consumers valued FoP labelling initiative, especially the use of colour-coding, as it made their shopping for healthier food choices much easier and faster (18,28-29). However, the use of a few different formats of FoP labelling was found to create confusion among the consumers. Hence, a single format of FoP labelling will be the best for the customers in making healthier food choices without any confusion (29).

Changes in behaviour would have the biggest impact on salt intakes in the population, but that would be the most challenging initiative. Few countries have conducted their own consumer awareness programs targeting sodium reduction in the population and some have incorporated the Consumer awareness Communication for Behavioural Impact (COMBI) approach. Awareness programs with the COMBI approach resulted in significant positive outcomes in the reduction of salt intakes in the population of the study (30-31). Lifestyle modifications and environmental changes are other initiatives applied to reduce salt intake (32-33). Internet era coupled with tremendous development in information technology took lifestyle modifications a step ahead with the introduction of applications assisting the people in identifying foods high in salt and disseminating nutritional advice instantly. MyFitnesspal, Nutrients, Calorie Counter & Diet Tracker, MyPlate Calorie Counter and Nutrition Facts are few examples of such applications available for smartphone users. Unlike lifestyle modifications, environmental change is dependent on many other factors which may not be feasible to be changed and much difficult to tackle.

Food manufacture's role in salt reduction initiatives is not reviewed extensively in this study. Food manufacturers can formulate food products with less salt content without compromising the taste or the price of the products. This is acknowledged as a limitation in this study as only community and workplace settings' initiatives were reviewed. Nevertheless, this study provides an additional reference for salt reduction initiatives conducted worldwide, focusing on community and workplace setting.

CONCLUSION

From this review, it can be concluded that a suitable

salt reduction initiative for the community who regularly consume home-cooked food is through cooking and usage of a tool such as a salt-restriction spoon, together with awareness on the benefits of salt reduction in their daily diet. Healthy catering initiative should be implemented in the workplace or institution-based settings. Behavioural and environmental changes can yield a significant impact on salt reduction in the population but it is very challenging, need a multi-sectoral approach and a longer duration to see the positive impact of the intervention. For an effective population-level reduction in salt (sodium) intake, policy development targeting the source of salts such as mandatory usage of salt-substitutes or FoP labelling implementation on salt content in all food products should be enforced.

ACKNOWLEDGEMENT

The authors would like to thank the Director General of Health Malaysia for his permission to publish this article.

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