

BMJ Open Sodium content in sauces – a major contributor of sodium intake in Malaysia: a cross-sectional survey

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ABSTRACT

Objective To investigate the sodium content in sauces sold in Malaysian supermarkets.

Methods A cross-sectional market survey was conducted in 2017 of 233 sauces sold in Malaysian supermarkets. Information on the sodium content was collected from the product packaging and nutrient information panels of the sauces sold in the seven top supermarkets in the capital of Malaysia.

Results Of the 233 sauces surveyed, 116 did not include sodium content information on the nutrient information panel (49.8%). Soy sauce (particularly sweet soy sauce) and ketchup (particularly chilli sauce) were found to be the highest number of products surveyed in the analysis (N=54 and N=48, respectively). The highest sodium content information was displayed by fish/prawn sauce (budu/cencalok) (5192±3228 mg/100 g) which was followed by the light/thin soy sauce (5116±2084 mg/100 g), and followed by salty soy sauce (4780±988 mg/100 g). The sodium content information of the imported sauces was higher compared with local products produced in Malaysia. However, for sweet soy sauce, the sodium content information of the local products was higher compared with the imported products. Of the 116 sauces which displayed information regarding their sodium content, only 18.2% of the salty soy sauce and 25% of the light/thin soy sauce were found to be below the 2017 Malaysian sodium guidelines. Furthermore, only 21.7% of chilli ketchup and no tomato ketchup were below the 2017 UK salt guidelines.

Conclusions Almost half of the sauces surveyed did not include sodium content information on the nutrient information panel. It is recommended that sodium content information is provided on all sauces sold in Malaysia. Also, manufacturers should be urged to reduce the sodium content level of their sauces to a minimum of 5%.

BACKGROUND

Excess sodium intake globally is a significant cause of preventable heart disease, stroke and kidney disease. There is also increasing evidence to suggest that high sodium intake increases the risk of stomach cancer, osteoporosis and obesity.^{1,2} Thus, reducing sodium or salt intake has been identified as a priority intervention to reduce non-communicable

Strength and limitations of this study

- This is the first study that investigates the sodium content in different types of sauces that are available in seven top supermarkets in the capital of Malaysia and the results urged the manufacturers to reduce sodium content in the sauces.
- Such findings urged for more research in the area in other parts of the world that soy sauce and ketchup consumption are common, particularly in Asian region.
- The main limitation of this study is the sodium content of the sauces which were solely reported on based on the nutrient information panels on the food products in the capital of Malaysia.
- There was still no food analysis conducted; hence, the exact amount of sodium content in the sauces could not be examined. Further, expansion of the study should be carried out in other parts of Malaysia.

diseases (NCD). Member States of the WHO have agreed to a global target of a 30% reduction in salt or sodium intake by 2025.³ Moreover, strategies and advocacy to reduce sodium intake are particularly important in many developing countries where 80% of global blood pressure-related disease occurs.² In Malaysia, the prevalence of hypertension increased from 32.2% and 42.6% in 2006⁴ to 32.7% and 43.5% in 2011 among adults ≥18 years old and more than 30 years old, respectively, as reported by National Health Morbidity Surveys.⁵ Furthermore, in 2003, the Malaysian Adult Nutrition Survey revealed that the total sodium intake of Malaysians was 2575 mg per day⁶ or 29% higher than one teaspoon (5 g) of salt/sodium chloride (NaCl) or 2000 mg sodium per day limit as recommended by the 2010 Malaysian Dietary Guidelines (MDG)⁷ which is in agreement with the recommendation of WHO.⁸ However, it should be noted that these findings were obtained from a single

24-hour recall dietary intake, of which under-reporting is a major limitation.⁹

A number of more recent surveys are also available. For instance, a survey involving normotensive staff of the Ministry of Health (MoH) used a more accurate method in analysing urine excreted over a 24-hour period. The survey revealed that the salt intake of the respondents was 3429 mg sodium/day which exceeded the 2010 MDG by 1.7 times. In other words, the daily sodium consumption of about 79% of the respondents exceeded the recommended guidelines.¹⁰ In another study of hypertensive outpatients in a health clinic in the Klang Valley, Malaysia reported that ¾ of the subjects had poor control of hypertension which was related to high sodium diet, coffee consumption and inadequate milk intake.¹¹ The contribution of sodium in diet varies from 60% in Japanese food to 95% in UK processed foods. In the Japanese diet, 20% of the dietary salt originates from soy sauce alone. Further, the amount of dietary sodium in such processed food products, such as bread, breakfast cereals, processed meats, dairy products, soups and sauces (particularly soy sauce and fish sauce in many Asian countries), biscuits and salty snacks differs from country to country.¹² In Malaysia, the addition of salt and salty sauces to food has been identified as the major sources of sodium in the Malaysian diet.¹³ There was notable increase in sales of the sauces in Malaysian market from 0.97 billion ringgit (US\$0.23 billion) in 2012 to 1.06 billion ringgit (US\$0.26 billion) in 2016.¹⁴

Light soy sauce, dark soy sauce, oyster sauce and tomato and chilli sauce have been identified as among the top 10 sodium sources in the Malaysian diet leading to high salt consumption.¹⁵ However, the limitation of this study was they did not specify whether these sauces were added in cooking or as a condiment. Nevertheless, the usage was still considered to be high based on the sales of sauces and condiments data. Even when Malaysians reduce their sodium intake by not adding sodium to their food, they are still consuming high amounts of sodium already in processed foods and sauces. Thus, reducing sodium intake by changing behaviour is only partially effective.

Reformulation and the reduction of sodium content in processed foods have been recognised as effective strategies, as these changes do not rely on changes in consumer behaviour.³ In fact, several countries, such as Finland and Japan in the 1970s and the UK in the 2000s, successfully reformulated various processed foods.¹⁶ Notwithstanding, numerous international, national and regional government advisory groups, including WHO, the UK's Scientific Advisory Group on Nutrition, the US Institute of Medicine and the Pan American Health Organization, have been actively encouraging manufacturers to reduce the sodium content in processed foods.^{3 16}

In Malaysia, although sodium in sauces is a significant contributor to the daily intake of sodium, little is known about the sodium content of these sauces. Furthermore, the reformulation of sauces to reduce the population's sodium intake has not yet been implemented. Therefore,

a cross-sectional market survey was conducted to determine whether the information about sodium content was provided on the labels of sauces and to assess the variations of sodium levels in these sauces. These significant findings would help to determine the feasibility of reformulations and the reduction of sodium as strategies to reduce sodium intake particularly in Asia.

METHODS

Study design and data collection

This study is a cross-sectional market survey which obtained ethical approval and also in collaboration with the Malaysian MoH. The study was collected at seven top supermarkets in the capital of Malaysia, that is, Kuala Lumpur. Data were collected by two fieldworkers from Dietetic background between May and September 2017. Data were first collected from product packaging and nutrient information panels involving a comprehensive survey on all sauce products sold at the supermarkets. The fieldworkers collected the data by taking photos of the products and nutrient information of all the sauces that were available in the selected supermarkets. Information collected included product name, company name, pack weight, serving size and sodium per 100 mL and also per serving. Additional information on other nutrient contents and ingredients were also collected. Sauce products with no evident labels were accessed through the product's website. When there were missing figures, they were calculated where possible, for example, the missing sodium or salt values were converted by multiplying by 2.5 (sodium to salt) or dividing by 2.5 (salt to sodium). However, no details on sodium contents are available currently. In conducting the survey, 10% of the entries were randomly selected for actual checking with the original source by the independent fieldworkers to ensure that the data were reliable. The primary outcome of this study was the sodium content of the sauces, expressed in the unit (mg/100 g).

Inclusion and exclusion criteria

As mentioned earlier, the top supermarkets in the capital of Malaysia were selected in order to collect data (ie, Mydin, Giant, Tesco, Aeon Big, Jaya Grocers, Cold Storage and Village Grocers). These supermarkets were chosen based on their reputation as the top 10 supermarkets in Malaysia.¹⁷ The larger outlets were selected based on the followings: (1) For those outlet that had both hypermarkets and supermarkets, a random sample of the hypermarket was chosen. Specifically, Mydin and Tesco had two hypermarkets; thus, only one was randomly selected. Giant only had one hypermarket; thus, it was automatically chosen. (2) For those outlets that had no hypermarkets, the larger one based on the most densely population were randomly selected. Only the larger outlet of each supermarket was included. Other smaller retailers such as Speedmart or local grocers were excluded from the survey. Data were collected for supermarket own brand,

local and imported branded products. Also, only products labelled as either soy sauce, ketchup and other related sources were included in the sample, and if more than one size was available, the standard weight (usually the medium size) was chosen as the sample. Sauces which added as ingredient in food products were excluded.

Product categories

The sauce products were categorised into five main categories based on their label as either soy sauce (ie, salty soy sauce, sweet soy sauce, dark/thicksoy sauce, light/thinsoy sauce, thick caramel soy sauce), oyster sauce, fish/prawn sauce (budu/cencalok), ketchup (ie, tomato ketchup, chilli ketchup) and others. The classification of some sauces was identified by following the Nutrient Composition of Malaysian Foods categories¹⁸ or from the opinions of experts and by local qualified nutritionists and dietitians. If the sauce was not stated in the Nutrient Composition of Malaysian Foods, it was classified in the 'Others' group. Within each category, the products were observed as either having or not having a salt or sodium content label and whether they were branded as local (including the supermarket brand) or branded as imported products.

Statistical analysis

All data were analysed by using the SPSS V.23 and the data analysis included a descriptive analysis using frequency, percentages, mean and SD. For each sauces type, we calculated the total number and percentage of the products that met the Nutrient Criteria Healthier Choice Logo sodium target from Nutrition Division, MoH Malaysia¹⁹

and the Public Health England Salt Reduction Target 2017.²⁰

Patient and public involvement

This is a market survey and did not involve human or animal subjects.

RESULTS

A total of 233 types of sources were included in the survey. Nearly half (50%) of products surveyed were soy sauce (42.8%), followed by tomato ketchup (6.8%), chilli sauce (19%), oyster sauce (12.5%), others (9.9%) and fish/prawn sauce (budu/cencalok) (9.1%). The products categorised as 'others' were those products which could not be classified as residing within the other four categories such as fried sauce and barbecue sauce. Generally, half of the food items surveyed did not have a label for salt or sodium (figure 1). The main types of sauces not having sodium or salt nutrition labelling included sweet soy sauce (61.3%), oyster sauce (62.1%), fish/prawn sauce (budu/cencalok) (57.1%), tomato sauce (50.0%), chilli sauce (47.7%), dark/thick soy sauce (46.7%), others (43.5%), salty soy sauce (42.1%), salty thick caramel (40%) and light/thin soy sauce (36%) (table 1).

The remaining 116 food items were found to have basic nutrition labelling (ie, total calorie, carbohydrate, protein and fat content) with no label of 'sodium' provided. The mean sodium as indicated on the sauces label was 3184±2196mg/100g. As shown in table 2, the highest salt content was displayed by fish/prawn sauce (budu/cencalok) (5192±3228mg/100g).

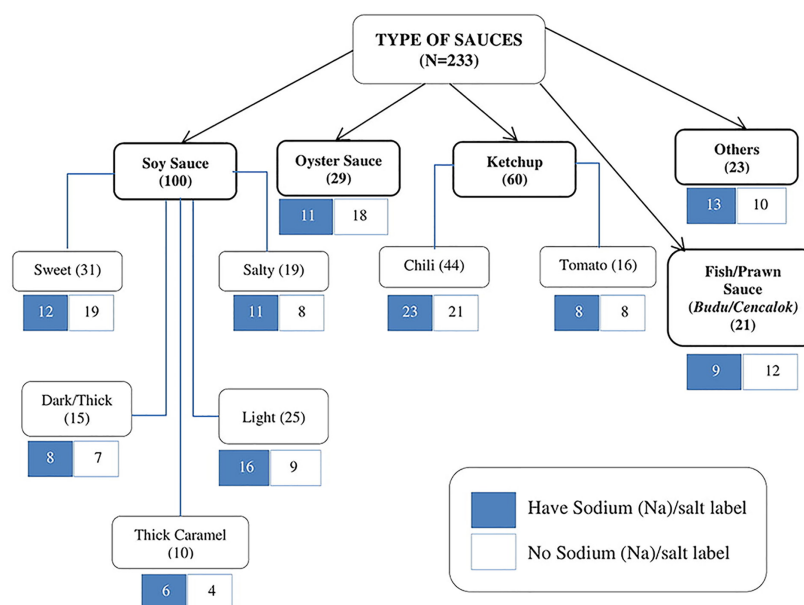


Figure 1 Type of sauces and number of products with sodium (Na)/salt label and no label in Malaysian market.

Table 1 Percentage of sauces with and without sodium or salt nutrition information

Type of sources	Have sodium/salt label			Without sodium/salt label		
	Local, N	Imported, N	Total, N (%)	Local, N	Imported, N	Total, N (%)
Salty soy sauce	10	1	11 (57.9)	8	0	8 (42.1)
Sweet soy sauce	9	3	12 (38.7)	18	1	19 (61.3)
Dark/thick soy sauce	6	2	8 (53.3)	7	0	7 (46.7)
Light/thin soy sauce	11	5	16 (64.0)	9	0	9 (36.0)
Thick caramel soy sauce	6	-	6 (60.0)	4	-	4 (40.0)
Oyster sauce	11	-	11 (37.9)	18	-	18 (62.1)
Tomato ketchup	6	2	8 (50.0)	8	0	8 (50.0)
Chilli ketchup	16	7	23 (52.3)	20	1	21 (47.7)
Fish/prawn sauce (budu/cencalok)	3	6	9 (42.9)	7	5	12 (57.1)
Others	9	4	13 (56.5)	8	2	10 (43.5)
Total	87	30	117 (50.2)	107	9	116 (49.8)

The second highest sodium content was displayed by light/thin soy sauce (5116 ± 2084 mg/100 g), followed by salty soy sauce (4780 ± 988 mg/100 g), sweet soy sauce (3696 ± 2000 mg/100 g) and dark/thick soy sauce (3680 ± 2180 mg/100 g).

Most of the sauces were produced locally, and only 16.7% were imported products and the sodium content information of the imported sauces was higher compared with local products. However, for sweet soy sauce, the sodium content information of the local products was found to be much higher compared with the imported products.

Table 3 and figure 2 shows that from the 117 products with known sodium content, 83.3%, of both the thick caramel sauce and sweet soy sauce and 75% of the dark/thick soy sauce were below the Healthier Choice Logo (HCL) sodium target (≤ 4500 mg/100 g).¹⁹ Furthermore, only 18.2% of salty soy sauce and 25% of light/thin soy sauce was below the target for less than 4500 mg/100 g of sodium content. In comparison with the international

target,²⁰ only 21.7% of chilli ketchup were below the UK target and none of the tomato ketchup was below the salt target (< 1.7 g/100 g or 680 mg sodium/100 g).

DISCUSSION

This study demonstrates that the sodium content in sauces sold and consumed in Malaysian supermarkets is considerably high. Of all the different types of products, light/thin soy sauce and salty soy sauce were found to have the highest sodium content, and less than 20% of these products met the HCL target of less than 4500 mg sodium/100 g. There was also a wide range in the variability of sodium content and the findings indicate that most of the products in this category are produced locally, thereby suggesting that reformulation efforts are a possible and tangible target for the reduction of sodium intake in Malaysia. Furthermore, naturally brewed soy sauce, which was found to be lower in sodium, has the potential to be used as a replacement for cooking salt

Table 2 Sodium levels (mg/100 g) for each type of sauce between local brand and imported brand products

Type of sources	Local brand		Imported		Total	
	N	Mean \pm SD	N	Mean \pm SD	N	Mean \pm SD
Salty soy sauce	10	4720 \pm 1032	1	5360	11	4780 \pm 988
Sweet soy sauce	9	4020 \pm 2232	3	2740 \pm 300	12	3696 \pm 2000
Dark/thick soy sauce	6	3032 \pm 572	2	5640 \pm 3612	8	3680 \pm 2180
Light/thin soy sauce	11	4832 \pm 2364	5	5732 \pm 1260	16	5116 \pm 2084
Thick caramel soy sauce	6	2948 \pm 1252	0	-	6	2948 \pm 1252
Oyster sauce	11	3164 \pm 940	0	-	11	3164 \pm 940
Tomato ketchup	6	940 \pm 140	2	992 \pm 60	7	956 \pm 120
Chilli ketchup	16	1120 \pm 600	7	1512 \pm 540	23	1240 \pm 596
Fish/prawn sauce (budu/cencalok)	3	3672 \pm 580	6	5960 \pm 3800	9	5192 \pm 3228
Others	9	1660 \pm 1352	4	2840 \pm 1112	13	2024 \pm 1356
Total	87	2952 \pm 208	30	3772 \pm 496	117	3164 \pm 204

Table 3 Type of sauces meeting the salt reduction target from Malaysia and the UK followed by sodium levels (mg/100g)

Type of sources	Local brand		Imported		Total	
	N	Mean±SD	N	Mean±SD	N (%)	Mean±SD
Salty soy sauce *	2	3660±120	0	–	2 (18.2)	3660±120
Sweet soy sauce *	7	3052±420	3	2736±300	10 (83.3)	2960±400
Dark/Thick soy sauce *	5	2580±1000	1	3072	6 (75.0)	2660±920
Light/Thin soy sauce *	3	1588±680	1	1520	4 (25.0)	2140±732
Thick caramel soy sauce *	5	2496±660	0	–	5 (83.3)	2496±660
Tomato ketchup †	0	–	0	–	0 (0)	–
Chilli ketchup †	5	560±100	0	–	5 (21.7)	948±316

*Below the sodium target (≤ 4500 mg/100g) of the Nutrient Criteria Healthier Choice Logo from Nutrition Division, Ministry of Health Malaysia.

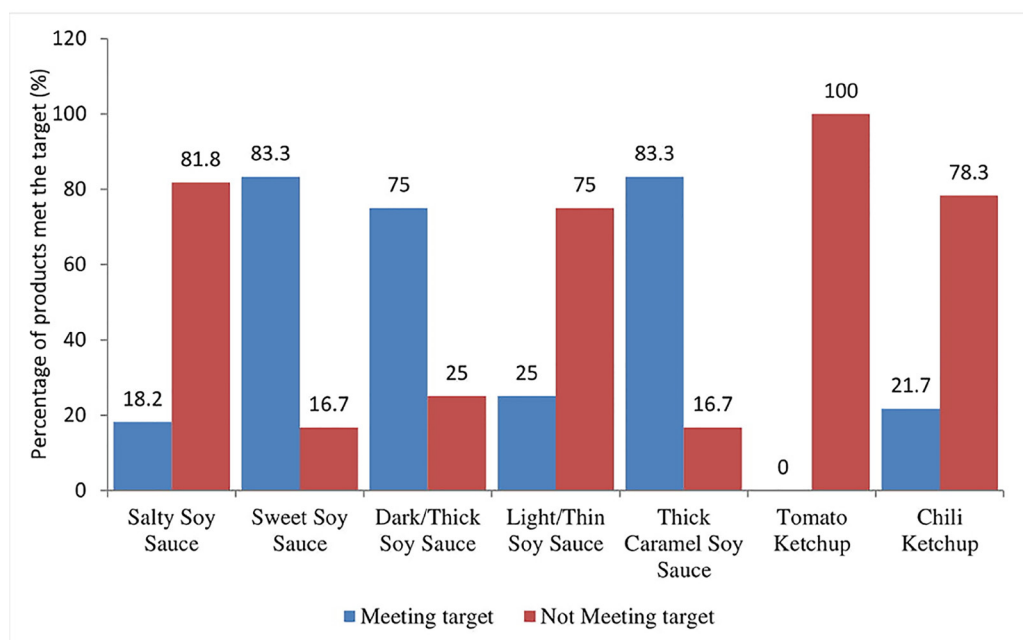
†Below the salt target (< 1.7 g/100g or 680 mg/100g sodium) of the Public Health England Salt Reduction Target 2017.

in meals. This was supported in a study by Kremer *et al*²¹ where they successfully reduced salt in soup and bread (with ham) by partially replacing it with naturally brewed soy sauce. Also, repeated exposure testing among 64 consumers showed a significant to a very significant positive effect on the liking for the products, except for a few consumers who did not like the taste of it.²¹ However, the best approach would be by reducing the sodium or salt content in products gradually.³

Sauces under fish/prawn sauce (budu/cencalok) category were also identified as being high in sodium content, although almost 60% of this product had no sodium label. Fish and prawn sauces are fermented foods usually manufactured in small local factories in which different species of fish and prawns are traditionally used as seasoning or condiment in Southeast and East Asia.²² Fish sauces in particular have been identified to consist of high nitrogen content^{22–23} and could be a good source of protein for less developed countries. Moreover, two studies

in Malaysia reported that budu or fish sauce contained between 20.72%±0.17%²⁴ and 25.10%±0.10% (weight per volume)²⁵ salt which was considered to be a very high percentage of sodium content. Indeed, in some sauces, salt has been used as a preservative as it could retard the growth of bacteria and microorganisms²⁶ and increase the shelf life of the food in markets.²⁷ However, the large variation of sodium content within the same category of sauces clearly indicates that reformulation by gradually reducing the sodium content is entirely possible, and technically should not be an issue, given similar sauces with much lower sodium levels are already in the market. Additionally, the high percentage of sauces found with no sodium labelling, as revealed in the present study, should help urge for an amendment in the regulation for these products in order to improve their quality.

Reducing sodium intake has been identified as a priority intervention to reduce NCD. Increased dietary sodium intake is a modifiable risk factor for cardiovascular disease


Figure 2 Percentage of products meeting sodium target.

and population-based dietary sodium reduction has been prioritised in various strategies to combat NCD in the Asia Pacific region.²⁷ To this end, the Member States of the WHO have agreed to work towards a global target of a 30% reduction in sodium or salt intake by 2025.³ Programmes to engage the food industry in reducing the amount of salt used in their products are also being carried out in many countries. For example, globally, there are salt reduction programmes in 59 food industries that have been identified.³ Although none of the industries were related to soy sauce. Therefore, Malaysia should take the lead to initiate reformulation of soy sauce, given it has been identified as the most important of all the sodium sources from processed products. Also, there is an urgent need for mandatory sodium labelling on products, as this present study found that at least half of the products had no sodium labelling. Further, even though the sodium target has been identified through the HCL guideline, less than one-fifth of the products surveyed had salt content below the target for sodium of less than 4.5 g/100 g or salt of less than and equal to 4500 mg/100 g. In order to reduce the high incidence of diseases associated with high sodium intake, it is recommended that sodium content information is provided and displayed on all sauces sold in Malaysia. The labelling would be in the form of a nutrition panel of information added as part of the current mandatory labelling of macronutrients (ie, calories, carbohydrates, protein and fat), as stated in the Malaysian Food Act 1983. Food manufacturers should be urged to reduce the sodium content level of their sauces to a minimum of 5% which is in line with the global target for NCD prevention.

Further, this target should be revised periodically, in order to achieve a desirable level of sodium reduction in the overall population. Notwithstanding, it should also be noted that this target could be further reduced, given there are a number of soy sauce products identified in this study that had already achieved this target. Some products even had a much lower level of sodium than the HCL target. Integrative approaches including nutrition labelling, voluntary sodium reduction programmes in processed food and legislative sodium reduction programmes are essential to reduce the sodium intake in the population and further reduce the risk of cardiovascular disease.^{28 29} For example, in Finland, salt labelling on all bread, cheeses, processed meat and fish, breakfast cereals and fat spreads are either labelled as 'lightly salted' or 'heavily salted'. This has helped to reduce the salt intake of the population by 1.8 g in men and 1.0 g in women among those choosing the lightly salted products and further by 2.5 and 1.8 g of salt used in cooking were halved.³⁰ Also, the voluntary salt reduction programme through reformulation in the UK has successfully reduced salt content in many foods including bread, which was the most significant contributor of salt to the diet of the population in the UK.³¹ Reformulation should be enforced in the food industry enabling consumers to make informed choices after reading sodium or salt labelling.³² In a

recent systematic review of the salt intake in the UK, it was reported that by implementing a nutrition labelling strategy to reduce salt intake, this might potentially be an effective mechanism, as long as the labelling system is clear and reasonably easy to understand.³³

In addition to examining soy sauces and other sauces, there is also a need to conduct a similar market survey on prepacked and processed foods in the Malaysian market, as these foods contribute significantly to sodium intake and the health of the population, particularly in younger adults. This is evidenced by a recent study among Malaysian young adults, (ie, university students) where it was found that obesity-related indices such as body mass index and waist circumference are associated with the consumption of salty foods including canned/packet soup and instant noodles.³⁴ Furthermore, another study of sodium intake among health staff of MoH reported that approximately 70% of health staff had a daily sodium intake above 5 g/day as recommended by WHO.⁸ The mean sodium intake of light soy sauce, thick soy sauce, oyster sauce, ketchup and fish/prawn sauce (budu/cencalok) among the subjects were 225.3 mg/day, 140.8 mg/day, 88.8 mg/day, 86.8 mg/day and 76.4 mg/day, respectively.¹⁵ Also, light soy sauce was reported to be the major contributor of sodium intake in cooking.¹⁵ Importantly, in this study, the market survey was based on the nutrition information provided on the labelling. Therefore, further work could also be undertaken to conduct a food analysis study to accurately access the credibility of nutrition labelling. A study of this type is considered important, based on a recent food analysis study³⁵ of core nutrients (energy, fat, carbohydrate and protein) among 300 samples of prepacked foods. The study found that from eight food categories sold in the Malaysian market, 34% of the products analysed did not comply with the tolerance limit according to the Malaysian Food Act 1983.³⁶ Nevertheless, there is also a need to survey the salt content in the other types of foods including instant noodles, processed food and fast foods that are found to be commonly high in salt content and yet commonly consumed by Malaysians.^{37 38}

There are several limitations inherent in this study. One limitation concerns the salt content of the sauces which was solely reported on based on the nutrient information panels on the food products; no food analysis was conducted. Hence, the exact amount of salt content in the sauces could not be examined. A second limitation is that the data were collected from seven of the top supermarkets in the capital of Malaysia (Kuala Lumpur) and did not include supermarkets in East Malaysia which may show variations in sauce choices. Therefore, it is recommended that this study is expanded to include East Malaysia.

CONCLUSION

Of the 233 sauces surveyed, 49.8% did not include sodium or salt content information on the nutrient information panel of the product. Further, soy sauce (particularly sweet soy sauce) and ketchup (particularly chilli sauce) were

found to be the most popular sauces sold and consumed in Malaysia. The mean sodium level for all the sauces with sodium labelled was 3164 ± 204 mg/100g. The highest sodium content information was displayed for fish/prawn sauce (budu/cencalok) (5192 ± 3228 mg/100g) followed by light/thin soy sauce (5116 ± 2084 mg/100g) and followed by salty soy sauce (4780 ± 988 mg/100g). However, for sweet soy sauce, the sodium content information of local products was found to be higher compared with imported products.

Of the 116 sauces which displayed information regarding their salt content, only 18.2% of salty soy sauce and 25% of light/thin soy sauce were below the 2017 Malaysian salt guidelines. Also, only 21.7% of chilli ketchup and no tomato ketchup were found to be below the 2017 UK salt guidelines.

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