SODIUM CONTENT OF PROCESSED FOODS IN BRUNEI DARUSSALAM

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ABSTRACT:

Prevalence of hypertension is increasing in Brunei Darussalam. Knowledge on the current status of sodium content in processed foods is important to establish concrete baseline data for monitoring of future public health initiative in reducing population exposure to sodium. The study aimed to establish a comprehensive database on sodium content of processed foods, to determine the extent of processed foods that meet sodium benchmarks of two established food nutrient guidelines, and to compare the mean sodium content of processed foods in Brunei Darussalam and other countries. Sodium content in milligrams per 100 gram was obtained from the packages of processed foods in major supermarkets. Data collected included names of products, country of origin or manufacture and serving size. Proportion of food products that meet the sodium benchmarks and mean sodium content of food sub-categories were analysed. Data from 1470 food products were collected, in which 425 (29%) did not display quantity of sodium on the packages. We analysed 806 food products with sodium guidelines in 11 food categories and 52 food sub-categories. Overall, 411(51%) food products did not meet the recommended sodium benchmarks. Nine food sub-categories consisted of all food products with sodium content above the recommended benchmarks. The greatest difference between the means sodium content and the recommended benchmarks was found in recipe mixes (Asian), fresh and frozen meat and poultry as well as soup and broth sub-category. Faced with an increasing prevalence of hypertension, Brunei Darussalam is in definite need of a national sodium reduction initiative. Strategically targeting consumer education on commonly consumed foods with the highest sodium content and facilitating food reformulation among food manufacturers in and outside Brunei Darussalam may serve as an effective strategy in reducing the population salt intake.

Keywords: Enabling environment, Hypertension, Salty food, Sodium, Processed foods, Brunei Darussalam

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INTRODUCTION

Excessive intake of sodium is associated with high blood pressure or hypertension, which is a major risk factor for cardiovascular diseases such as stroke, myocardial infaction and aortic anuerysms. The prevalence of hypertension in Brunei Darussalam currently stands at 33.8% [1] a marked increase from 28.6% in 1997 [2]. In England, 31% of men and 29% of women had hypertension or were being treated for hypertension [3] while in Australia, 32% adults had hypertension or took antihypertensive medication [4]. The current trend poses a clear and present danger to public health. With respect to sodium intake, findings from the Malaysian Adult Nutrition Survey 2008 [5] showed that Malaysian adults' mean intake of sodium was 2575mg, equivalent to about 6.4g of salt per day. Adults from Sabah and Sarawak reportedly consumed the highest intake of sodium in Malaysia; 2923mg sodium (7.3g salt) and 2831mg sodium (7.1g salt) respectively. Meanwhile, the National Nutrition Survey Singapore 2010 [6] which used the 'gold standard' of 24-hour urinary sodium excretion documented

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that adults in Singapore consumed about 8.3g salt per day. These intakes far exceed the maximum recommended limit of 5g salt per day set by the World Health Organisation (WHO) [7]. Unfortunately, there is a lack of data on dietary salt intake in Brunei Darussalam.

Public health initiatives have been established to reduce population salt intakes around the world with countries like Japan, Finland and the United Kindgom (UK) showed an extensive documented impact of sodium reduction strategies on the population salt intake. These strategies encompassed three main pillars recommended by the WHO in 2006 [8] "*Consumer education through awareness on the harmful effects of excessive salt intake and education on food labels and choosing healthier options; Establishment of an enabling environment where choosing the healthiest foods is the easiest and most affordable option and; Product reformulation through engagement with food industry in reducing sodium content in processed foods*"

In Brunei Darusalam, multisectoral effort to establish an enabling environment, increase availability of healthier food choice and facilitate product reformulation among food manufacturers are just being initiated. For effective implementation of a sodium reduction strategy, it is imperative to establish strong baseline data on the level of sodium in processed foods. Although this information may not represent a direct marker of the population salt intake, it does offer an insight into the extent of the population exposure to sodium. The information will help to identify intervention priorities and develop public health strategy recommendations. The data will also serve as a potential reference point on which future public health actions on sodium can be based on.

The aims of the study were to establish a comprehensive database on sodium content of processed foods in Brunei Darussalam, to provide primary evidence on the extent of the food products that meet Singapore's Healthier Choice Symbol (HCS) Nutrient Guidelines on sodium [9] and the UK Food Standards Agency (FSA) 2010 sodium targets [10] and to compare the mean sodium content of processed foods in Brunei Darussalam, Australia and the UK [11].

MATERIALS AND METHODS

Data collection

Data collection was carried out by thirteen volunteers from *Persatuan Kemajuan Insan* (KESAN). KESAN is a non-profit organization aims to help and support charity bodies and other establishments through community work. Prior to collecting data, a half-day workshop was conducted to train the volunteers on the procedure of data collection and data entry. All volunteers were provided with a USB flash drive with pre-saved Microsoft Excel spreadsheet template for data entry. Practical sessions were conducted to enhance volunteers' competencies in data collection and data entry. The volunteers were divided into five groups of two to three and were tasked to collect data from the front and back of food packages in major supermarkets in Brunei-Muara District. The data included name of food products, brands, country of origin or manufactured, serving size, calorie, sugar, fat, sodium and dietary fibre content per 100g. In order to expedite the process of data collection, images of the food products were taken using mobile phone camera. The volunteers were instructed to capture a clear image of the front and back of packages. Due to the lack of published data on the main sources of salt and the commonly purchased processed foods by households in Brunei Darussalam, the volunteers were instructed to collect data from as many different food products as possible. For this reason, major supermarkets were chosen due to the wide range of food products available in the supermarkets. Data collection was carried out from January to March 2014. Prior to collecting the data, written permission was sought from the management of the supermarkets.

The Healthier Choice Symbol (HCS) Nutrient Guidelines

The HCS Nutrient Guidelines, 2011 [9] was used to assess the sodium content of processed foods in our study due to the lack of a guideline or target sodium for processed foods in Brunei Darussalam. The Nutrient Guidelines were introduced in Singapore primarily to aid customers make healthier food choices and facilitate products reformulation. The guidelines consist of a set of nutritional criteria that food manufacturers need to adhere to in order to be eligible to carry a Healthier Choice Logo on their products. The guidelines include recommended level of fat, saturated fat, sugar, sodium and dietary fiber on a range of food products such as dairy products, cereals, seafood, meat and poultry, beverages, sauces, soups and convenient foods.

Data management

Data from the images were later entered onto Microsoft Excel spreadsheet. Data that was presented as salt in gram per 100g were multipled by 400 to generate the sodium content in miligram.

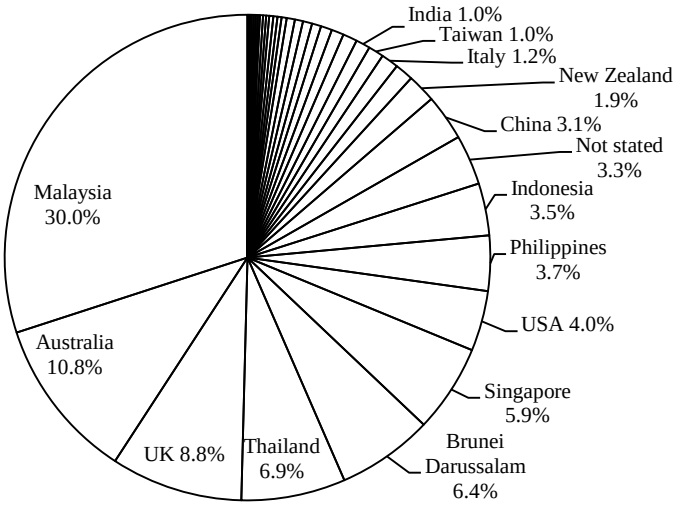

Figure 1 Country of origin or manufactured

Food products meeting the Nutrient Guidelines were identified. All datasets from the volunteers were later merged into one master database. The database was checked for duplication, inconsistencies and error in data entry. Mistyped letters or codes were either corrected or removed and all outliers were cross-checked with the images of the food products or the actual data on the product packages. Data was cleaned and verified by the principal investigator.

DATA ANALYSIS

Data was analyzed using descriptive statistics. For the purpose of this study, data on country of origin or manufacturer and sodium content were extracted and analysed. The number and percentage of processed foods in each food sub-category that met the Nutrient Guildelines on sodium were analysed and the mean and range of sodium content was calculated. The results are presented in Table 1 and 2. Due to the lack of published data on the sodium content of processed foods from countries in this region, cross-country comparison was performed using results extracted from Grimes et al [10] for processed foods sold in Australia and the UK [11]. Australia and the UK used the 2010 sodium benchmark set by the FSA. Details on the development of the target benchmark using Salt Model Illustrative Targets were mentioned elsewhere [12]. For the purpose of this part of investigation, we re-categorized and analysed our data based on sodium content targets set by FSA [10]. The results are presented in Table 3 and 4. The analysis was carried out using SPSS version 22.0 [13].

RESULTS

We collected data from a total of 1470 food products from January to March 2014. All food products except 49 (3.33%) displayed detail on the country of origin or manufactured on the packages. The food products were manufactured from a total of 38 different countries. Malaysia contributed to the largest percentage of the food products, 441 (30.0%), followed by Australia, 159 (10.8%), the UK, 129 (8.8%) and Thailand, 102 (6.9%). Food products from Brunei Darussalam accounted for 94 (6.4%) of the data we collected. In general, majority of the food products, 1327 (93.4%) were manufactured outside Brunei Darussalam (Figure 1).

Of the 1470 food products, 425 (29%) food products did not display sodium or salt content on the packages. In proportion to the number of food products from each country, Brunei Darussalam had the largest percentage of food products that did not display sodium content, 90 (95.7%), followed by China, 22 (48.9%) and Malaysia, 197 (44.7%).

Food products that met the Singapore HCS Nutrient Guidelines on sodium by food sub-categories

Table 1 shows the HCS Nutrient Guidelines on sodium, the total number of food products, the number of food products that displayed sodium or salt content and the number and percentage of food products that met the Nutrient Guidelines for each food sub-category. Out of 1045 food products that displayed sodium content, we analysed 806 food products in 11 food categories and 52 food sub-categories with sodium guidelines. Five food sub-categories were found to consist of food products

Table 1 Food products meeting the HCS Nutrient Guidelines on sodium in Brunei Darussalam

Food category and sub-category	Nutrient guidelines on Sodium (mg/100g)	Total, *n*	Food products that displayed sodium/salt content, *n*	Food products meeting the nutrient guidelines, *n* (%)
Dairy products				
- Liquid milk, plain and flavoured	No guideline	44	31	-
- Dried milk powder	No guideline	23	10	-
- Evaporated and condensed milk	No guideline	26	3	-
- Cheese	≤ 600	47	40	8(20)
- Processed sliced cheese	No guideline	18	18	-
- Cheese spread	No guideline	17	16	-
- Yoghurt	No guideline	20	19	-
- Frozen yoghurt	≤ 120	6	6	6(100)
Cereals				
- Flour, wholemeal	No added sodium	0	-	-
- Flour, self-raising	≤ 350	9	8	4(50)
- Instant oats/Oatmeals	No added sodium	8	8	7(88)
- Breakfast cereal, cereal bars, (ready-to-eat) – Adult's cereal	≤ 400	44	44	31(71)
- Cereal beverages	≤ 120	20	16	5(31)
- Pasta	≤ 120	17	17	16(94.1)
- Oriental noodles (Dry) - Brown rice vermicelli 'bee hoon' or wheat noodles	≤ 180	26	15	5(33.3)
- Oriental noodles (Fresh) – Hokkien Yellow Noodles, Rice noodles	≤ 400	9	4	4(100)
- Bread (loaf), breadcrumbs, flat breads (pita, wraps), pizza crust	≤ 450	21	2	2(100)
- Buns, rolls (filled) - Cream, jam, fruits, custard, savoury	≤ 400	16	5	5(100)
- Cakes, muffins	≤ 300	20	5	4(80)
- Biscuits and crackers	≤ 420	118	112	80(71)
Legumes, nuts and seeds				
- Legumes, canned	≤ 300	35	31	28(90)
- Legumes, nuts and/or seeds, ready to eat	≤ 120	29	25	5(20)
- Nuts and seed butters – peanut butter	No added sodium	10	5	0(0)
- Soy milk/beverage	≤ 40	11	5	4(80)
- Soybean curds, soft and hard	≤ 120	8	5	4(80)
Fruit and vegetables				
- Frozen/chilled vegetables	≤ 300	15	10	9(90)
- Frozen/chilled fruit	No added sodium	7	7	0(0)
- Frozen potato	≤ 120	13	10	5(50)
- Canned vegetables	≤ 300	17	11	5(45)
- Canned fruit	No guideline	15	12	-
- Dried vegetables	≤ 120	6	0	-
- Dried fruit	No added sodium	12	10	3(30)
- Vegetable juice	≤ 120	4	3	1(33)
- Fruit juice (at least 60% fruit juice)	No guideline	39	35	-
- Fruit and vegetable juice	≤ 120	10	10	10(100)
Seafood				
- Frozen (plain)	No added sodium	16	2	0(0)
- Canned seafood and fish	≤ 400	146	95	30(32)
- Processed, fish and seafood fillet/fish finger	≤ 450	10	4	2(50)
- Surimi products, fish ball, crab stick, fish cake	≤ 550	18	4	0(0)
Meat and poultry				
- Fresh and frozen	≤ 120	12	2	0(0)
- Canned and processed	≤ 450	44	22	8(36)
Eggs and egg products				
- Fresh eggs	No guideline	1	0	-
- Egg substitutes; egg products eg. egg tofu	≤ 250	2	1	1(100)
- Egg jam (kaya)	No guideline	8	5	-
Fats and oil				
- Margarine/fat spreads	≤ 400	20	18	8(44)
- Edible oil	No guideline	45	40	-
- Salad dressing/mayonnaise	≤ 500	23	19	5(26)

Table 1 Food products meeting the HCS Nutrient Guidelines on sodium in Brunei Darussalam (cont.)

Food category and sub-category	Nutrient guidelines on sodium (mg/100g)	Total, *n*	Food products that displayed sodium/salt content, *n*	Food products meeting the nutrient guidelines, *n* (%)
Beverages				
- Malted or chocolate drink	≤ 120	13	12	6(50)
- 3-in-1 or 2-in-1 coffee/tea	No guideline	33	25	-
- Non-carbonated drink/Asian drink	No guideline	14	11	-
- Isotonic drinks	No guideline	8	6	-
- Juice drinks (at last 10% fruit juice)	≤ 40	27	15	12(80)
- Carbonated drink	No guideline	13	8	-
Sauces, soups and recipe mixes				
- Light soy sauce	≤ 4500	5	4	1(25)
- Dark soy sauce	≤ 4000	9	7	0(0)
- Soy sauce (others) and marinades eg. Herb/spice-infused soy sauce	≤ 3500	5	2	0(0)
- Sweet sauce	≤ 2500	9	8	7(88)
- Oyster/vegetarian oyster sauce	≤ 3000	9	2	0(0)
- Tomato/chilli sauce	≤ 750	34	17	3(18)
- Other sauces (Asian) eg condiments, dips, glazes	≤ 1400	8	6	0(0)
- Tomato-based pasta sauce	≤ 300	25	21	16(76)
- Cream/cheese-based pasta cauce	≤ 400	10	10	3(30)
- Other sauces (Western) eg BBQ, steak sauce, mustard	≤ 800	26	25	11(44)
- Recipe Mixes, Asian eg Laksa paste, mee goreng paste, curry	≤ 250	26	21	4(19)
- Recipe Mixes, Western	≤ 300	11	5	1(20)
- Soup and broth	≤ 200	17	12	3(25)
Miscellaneous				
- Convenient meals or 'meal-type' products	≤ 400	55	41	11(27)
- Pudding	≤ 120	11	6	3(50)
- Herbs and Spices	No added sodium	17	11	9(82)
Total		**1470**	**1045 (806 with sodium guidelines)**	**395(49)**

Table 2 The mean and range of sodium content of processed foods by food sub-category

Food category and sub-category	Nutrient guidelines on sodium (mg/100g)	Mean sodium content (mg/100g)	Range sodium content (min-max)
Dairy products			
- Liquid milk, plain and flavoured	No guideline	51.8	21-120
- Dried milk powder	No guideline	273.4	196-340
- Evaporated and condensed milk	No guideline	45	35-50
- Cheese	≤ 600	908.0	40-1940
- Processed sliced cheese	No guideline	1392	650-1740
- Cheese spread	No guideline	875.3	284-1560
- Yoghurt	No guideline	79.4	24-126
- Frozen yoghurt	≤ 120	49.5	32-62
Cereals			
- Flour, wholemeal	No added sodium	-	-
- Flour, self-raising	≤ 350	461	0-838
- Instant oats/Oatmeals	No added sodium	3.34	0-12
- Breakfast cereal, cereal bars, (ready-to-eat) – Adult's cereal	≤ 400	260.6	0-833
- Cereal beverages	≤ 120	214.1	1.7-400
- Pasta	≤ 120	21.8	0-160
- Oriental noodles (Dry) - brown rice vermicelli 'bee hoon' or wheat noodles	≤ 180	305.6	3-808
- Oriental noodles (Fresh) – hokkien yellow noodles, rice noodles	≤ 400	132.9	35-169
- Bread (loaf), breadcrumbs, flat breads (pita, wraps), pizza crust	≤ 450	412	412-412
- Buns, rolls (filled) - Cream, jam, fruits, custard, savoury	≤ 400	244.2	62-320
- Cakes, muffins	≤ 300	230.2	131-700
- Biscuits and crackers	≤ 420	336.2	40-900

Table 2 The mean and range of sodium content of processed foods by food sub-category (cont.)

Food category and sub-category	Nutrient Guidelines on Sodium (mg/100g)	Mean sodium content (mg/100g)	Range sodium content (min-max)
Legumes, nuts and seeds			
- Legumes, canned	≤ 300	119.7	0-530
- Legumes, nuts and/or seeds, ready to eat	≤ 120	300.4	17.8-1176
- Nuts and seed butters – peanut butter	No added sodium	407.5	360-440
- Soy milk/beverage	≤ 40	20.2	9-51
- Soybean curds, soft and hard	≤ 120	34.6	0.9-166
Fruit and vegetables			
- Frozen/chilled vegetables	≤ 300	89	0-600
- Frozen/chilled fruit	No added sodium	100	100-100
- Frozen potato	≤ 120	184.8	30-360
- Canned vegetables	≤ 300	319.5	120-520
- Canned fruit	No guideline	5.68	0-10
- Dried vegetables	≤ 120	-	-
- Dried fruit	No added sodium	50	0-330
- Vegetable juice	≤ 120	167	105-240
- Fruit juice (at least 60% fruit juice)	No guideline	42	0-779
- Fruit and vegetable juice	≤ 120	44	15-76
Seafood			
- Frozen (plain)	No added sodium	335.5	221-450
- Canned seafood and fish	≤ 400	709	74-6000
- Processed, fish and seafood fillet/fish finger	≤ 450	379	117-590
- Surimi products, fish ball, crab stick, fish cake	≤ 550	660	580-720
Meat and poultry			
- Fresh and frozen	≤ 120	867	867-867
- Canned and processed	≤ 450	660	195-982
Eggs and egg products			
- Fresh eggs	No guideline	-	-
- Egg substitutes; egg products eg. egg tofu	≤ 250	181	181-181
- Egg jam (kaya)	No guideline	60	20-100
Fats and oil			
- Margarine/fat spreads	≤ 400	512.6	5-900
- Edible oil	No guideline	0	0
- Salad dressing/mayonnaise	≤ 500	592	406-800
Beverages			
- Malted or chocolate drink	≤ 120	199	50-500
- 3-in-1 or 2-in-1 coffee/tea	No guideline	63.7	10-204
- Non-carbonated drink/Asian drink	No guideline	49	0-122
- Isotonic drinks	No guideline	55.7	0-117
- Juice drinks (at last 10% fruit juice)	≤ 40	31	0-115
- Carbonated drink	No guideline	6.56	2-11
Sauces, Soups and Recipe Mixes			
- Light soy sauce	≤ 4500	5843	3299-7483
- Dark soy sauce	≤ 4000	6049	4600-8260
- Soy sauce (others) and marinades eg. Herb/spice-infused soy sauce	≤ 3500	6717	3933-9500
- Sweet sauce	≤ 2500	1659	866-3267
- Oyster/vegetarian oyster sauce	≤ 3000	4620	4520-4720
- Tomato/chilli sauce	≤ 750	914	20-2000
- Other sauces (Asian) eg condiments, dips, glazes	≤ 1400	5833	2179-10133
- Tomato-based pasta sauce	≤ 300	186	0-765
- Cream/cheese-based pasta cauce	≤ 400	931	204-3100
- Other sauces (Western) eg BBQ, steak sauce, mustard	≤ 800	1055	190-2788
- Recipe Mixes, Asian eg Laksa paste, mee goreng paste, curry	≤ 250	3656	30-14666
- Recipe Mixes, Western	≤ 300	715	30-1160
- Soup and broth	≤ 200	1095	170-4490
Miscellaneous			
- Convenient meals or 'meal-type' products	≤ 400	974	100-2770
- Pudding	≤ 120	95	28-136
- Herbs and Spices	No added sodium	71	0-397

that all met the sodium content requirement under HCS Nutrient Guidelines. These food sub-categories were frozen yoghurt, fresh oriental noodles, bread, fruit and vegetable juice, and egg substitutes or egg products. On the other hand, none of the food products in nine food sub-categories included nuts and seed butters, fozen or chilled fruit, frozen seafood, surimi products, fresh and frozen meat and poultry, dark soy sauce, soy sauce (others) and marinades, oyster or vegetarian oyster sauce and

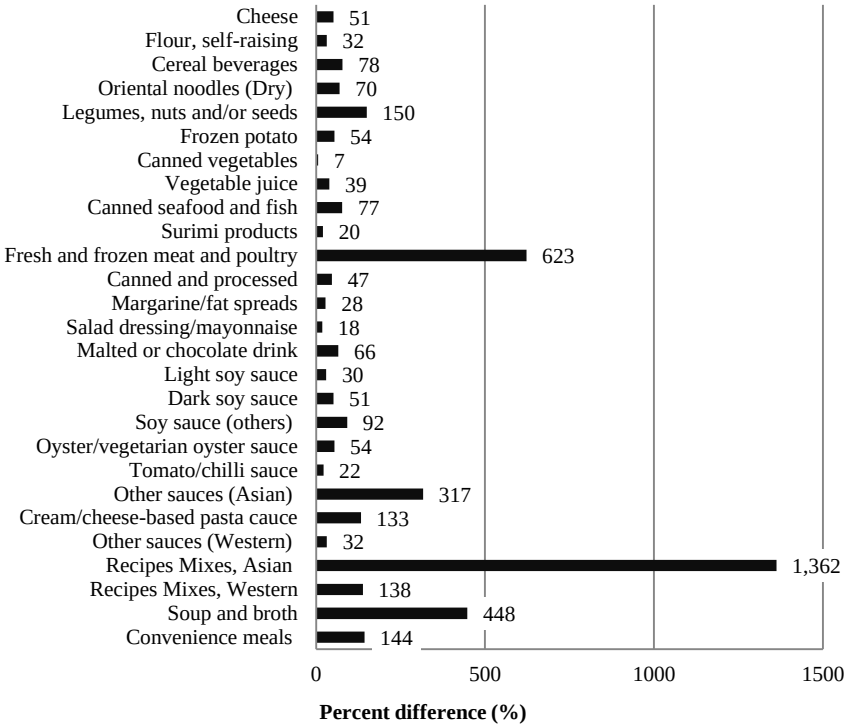

Figure 2 The difference between the sodium benchmarks and mean sodium content of processed foods that exceeded the sodium benchmarks

other sauces (Asian) met the Nutrient Guidelines. Overall our data shows that 395 (49%) food products met the Nutrient Guidelines on sodium.

Mean and range of sodium content of food products by food sub-category

Across all food sub-categories, top three highest mean sodium content were in soy sauce (others) (6717mg), dark soy sauce (6049mg), and light soy sauce (5843mg), Table 2. Compared against the HCS Nutrient Guidelines, 28 (54%) food sub-categories had mean sodium content above the Singapore's sodium benchmark. The greatest difference between the mean and the sodium benchmark was in the recipe mixes (Asian), followed by fresh and frozen meat and poultry and, soup and broth sub-category. The difference between the sodium benchmark and the mean sodium content of processed foods is as shown in Figure 2.

Comparison of percentage food products meeting the FSA targets in Brunei Darussalam, Australia and the UK

Based on the FSA [10], data was re-categorized into 13 food categories. Comparing the proportion of food products that met the FSA sodium targets, Brunei Darussalam fared worse in white bread, processed cheese, sausages, meal-based sauces and Italian/ traditional/other with accompaniment sub-categories. In contrast a greater proportion of food products in Brunei Darussalam met the targets in the sweet and low fibre breakfast cereals, dry packet mix and canned soup, canned beans and spaghetti and canned vegetables sub-categories. Overall 184 (49%) food products sold in Brunei Darussalam met the FSA sodium targets, while data from Grimes et al. indicated 46% and 56% food products sold in Australia and the UK met the sodium targets respectively, Table 3 [11].

Comparison of the mean sodium content with data from Australian and the UK

Figure 3 shows comparison of the mean sodium content of processed foods in Brunei Darussalam, Australia and the UK. The mean sodium content of two food sub-categories in Brunei Darussalam; dry packet mix (soup) and meal-based sauces were found to be strikingly higher than similar data from Australia and the UK [11]. The mean sodium content of hard and processed cheese, sausages and canned tuna in Brunei Darussalam were slightly higher compared to data in Australia and the UK, Table 4 [11].

Table 3 Food products meeting the FSA targets in Brunei Darussalam, Australia and the UK

Food category and sub-category	FSA 2010 targets (mg/100g)[a,b]	Total, *n*	Food products that displayed sodium/salt content, *n*	Food products meeting the FSA targets (%)		
				Brunei Darussalam	Australia †	UK †
Bread						
White	400[a]	21	2	0	17	21
Wholemeal	400[a]	0	0	-	8	46
Cheese						
Hard	670[b]	47	40	38	74	21
Processed	1170[b]	18	18	6	44	89
Breakfast cereal						
Sweet	300[b]	15	15	60	29	11
Low fibre	300[b]	9	9	33	0	11
High fibre	300[b]	20	20	70	82	60
Biscuits						
Plain dry biscuits	500[a]	22	20	70	46	88
Savoury snack	500[a]	30	28	57	7	40
Chocolate and sweet	280[a]	66	64	67	65	36
Edible oils and emulsions						
Regular butter and margerine	550[a]	19	17	53	67	32
Meat products						
Sausages	550[a]	9	2	0	0	38
Hamburger patties	400[a]	3	0	-	50	67
Fish products						
Canned tuna	300[a]	48	27	22	43	0
Canned salmon	300[a]	4	4	50	50	0
Soup						
Dry packet mix	280[b]	12	7	57	33	17
Canned	250[b]	5	5	60	11	21
Pizza						
High salt toppings	470[b]	0	0	-	80	63
Without high salt toppings	400[a]	0	0	-	50	33
Sauces						
Cook in meal base sauces	470[b]	16	12	0	25	50
Cook in pasta sauces	470[b]	34	28	64	67	69
Pre-prepared meals						
Italian/traditional/other with accompaniment	250[b]	2	2	0	30	73
Italian/traditional/other w/out ccompaniment	300[b]	0	0	-	100	92
Asian with accompaniment	300[b]	0	0	-	100	26
Asian without accompaniment	400[b]	8	8	13	n/a	8
Canned beans and spaghetti	300[a]	13	9	100	17	46
Canned vegetables	50[a]	44	38	45	15	0
Total				**49**	**46**	**56**

[a]The FSA proposed target (maximum levels) to be achieved by 2010 [10]. [b]The FSA proposed target (average levels) to be achieved by 2010 [10]. †Extracted from Grimes et al. [11]

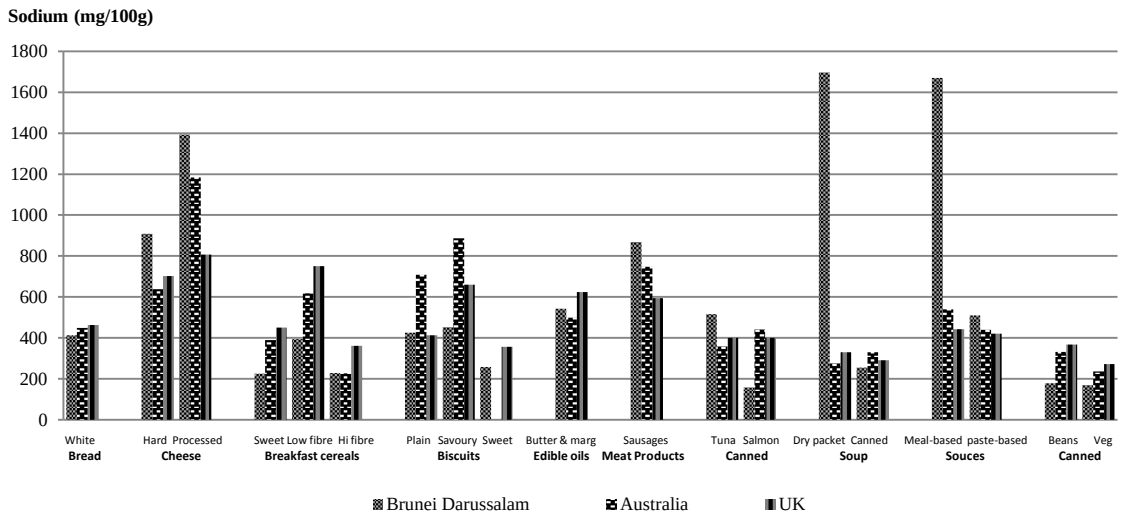

Figure 3 Comparison of mean sodium content of processed foods in Brunei Darussalam, Australia and the UK

Table 4 Mean sodium content of processed foods in Brunei Darussalam, Australia and the UK

Food category and sub-category	FSA 2010 target (mg/100g)[a,b]	Mean sodium content in (mg/100g)		
		Brunei Darussalam	Australia †	UK †
Bread				
White	400[a]	412	449	462
Wholemeal	400[a]	-	459	410
Cheese				
Hard	670[b]	908	637	701
Processed	1170[b]	1393	1183	806
Breakfast cereal				
Sweet	300[b]	225	389	450
Low fibre	300[b]	393	618	750
High fibre	300[b]	228	226	360
Biscuits				
Plain dry biscuits	500[a]	425	708	412
Savoury snack	500[a]	452	887	660
Chocolate and sweet	280[a]	258	-	356
Edible oils and emulsions				
Regular butter and margerine	550[a]	542	498	623
Meat products				
Sausages	550[a]	867	747	594
Hamburger patties	400[a]	-	440	396
Fish products				
Canned tuna	300[a]	516	357	400
Canned salmon	300[a]	158	440	400
Soup				
Dry packet mix	280[b]	1696	274	330
Canned	250[b]	254	329	291
Pizza				
High salt toppings	470[b]	-	405	444
Without high salt toppings	400[a]	-	383	477
Sauces				
Cook in meal base sauces	470[b]	1670	539	442
Cook in pasta sauces	470[b]	509	439	420
Pre-prepared meals				
Italian/traditional/other with accompaniment	250[b]	300	277	227
Italian/traditional/other w/out accompaniment	300[b]	-	236	241
Asian with accompaniment	300[b]	-	187	174
Asian without accompaniment	400[b]	489	-	300
Canned beans and spaghetti	300[a]	177	331	367
Canned vegetables	50[a]	168	235	271

[a]The FSA proposed target (maximum levels) to be achieved by 2010 [10].
[b]The FSA proposed target (average levels) to be achieved by 2010 [10].
† Extracted from Grimes et al. [11]

DISCUSSION

The aims of our study were to establish a comprehensive sodium database of processed foods, to determine the extent of the food products that met the HCS Nutrient Guidelines on sodium [9] and the FSA sodium targets [10] and to compare the mean of sodium content of the processed foods in Brunei Darussalam, Australia and the UK. This study provides for the first time, a database of nutritional contents on a wide range of brand-specific processed food products in Brunei Darussalam. The database can provide a concrete point of reference on which changes in sodium level of processed foods can be monitored over times at both individual branded product and food category level.

A large proportion of processed foods in our study did not display details on the sodium content on their packages. This was especially pronounced among processed foods that were manufactured in Brunei Darussalam. This could be attributable to the fact that nutrition labelling is voluntary in many parts of Southeast Asia including Brunei Darussalam although it does become compulsory when nutrition or health claims are made on food packages [14, 15]. Only Malaysia put mandatory labelling for energy, protein, carbohydrate, fat and total sugars for more than 50 food categories [15, 16]. The mandatory nutrition labelling however does not include sodium.

Our study highlights a significant finding of public health concern in which half of the processed foods in Brunei Darussalam had sodium content above the HCS Nutrient Guidelines. Essentially these are the foods that are considered to be relatively higher in salt. Nine food sub-categories in particular are of concern in which none of the food products met the Nutrient Guidelines. Comparing the mean of sodium content against the HCS Nutrient Guidelines, the recipe mixes (Asian), fresh and frozen meat and poultry and, soup and broth

sub-category far exceeded the sodium benchmarks. Public health initiative aims to establish an enabling environment should facilitate favorable change in the number of processed foods and the relative reduction in the mean sodium content in line with the Nutrient Guidelines in these food sub-categories. Targeting and focusing sodium content reductions effort on these food sub-categories can produce a large potential gain in public health. The large variations in the range of sodium content within the same food sub-category in our study highlight evidence and opportunity for our local food manufacturers to reformulate their products.

However, considering the fact that Brunei Darussalam is highly dependent on foods manufactured outside the country, it is likely that effort to reduce sodium content on local food products will only affect a very small proportion of the processed foods and impact on the population salt intake will not be as significant as what we have observed in the developed countries. Plans to maximize the impact on Bruneian population salt intake will therefore, need to include engagement with food manufacturers outside Brunei Darussalam directly and indirectly, and through various bilateral and regional cooperation mechanisms.

In the UK, products reformulation had largely contributed to the success of the salt reduction campaign. Since the start of the campaign in 2003, a number of food manufacturers in the UK have actively been involved in lowering the sodium content of their food products resulting in significant falls in the mean sodium content of many food categories. This has primarily led to a reduction in the mean population salt intake from 9.5 to 8.6 g per day [17]. However, it should be noted that the success of salt reduction campaign through products reformulation has largely been documented in developed countries, where processed foods contributed to a large proportion of the population salt intake. In these countries, as much as 75% of salt intake is derived from the consumption of processed foods [18]. In Australia, approximately two third of the population salt intake comes from processed foods [19]. Impact of product reformulation on population salt intake in countries where contribution of processed foods in the population salt intake is small is yet to be seen.

Assuming that like Singapore [20], processed foods contribute to only about a third of Brunei population salt intake, with two-third comes from table salt and sauces, then in this respect, the first pillar of sodium reduction strategy should be given a priority, although not exclusively. Customer education should also include approaches in reducing table salt and sauces in the diet, providing alternatives for flavouring in foods and voluntary action by restaurants to remove salt shakers and soy sauce from customers' tables. Furthermore, as food supply is largely driven by demand, consumer education will potentially facilitate our efforts in establishing favourable change in the food environment. Knowledge on the contribution of processed foods to Brunei population salt intake, however, is needed to validate and strategically formulate future public health action on salt.

In our study, we compared our data with data from Australia and the UK [11]. It should be noted that comparison with data from our neighbouring countries would have provided a better understanding of where we are with regard to the extent and magnitude of the population exposure to sodium in this region. Unfortunately, it was not possible to do this because of the lack of published data. Using the sodium benchmark set by the FSA [10], our study shows that the UK had the greatest proportion of products that met the FSA targets, followed by Brunei Darussalam and Australia. However, it should be noted that results derived from using FSA sodium targets to determine and monitor sodium content of processed foods commonly consumed in a predominantly Asian population has to be taken with a pinch of salt. The FSA targets were specifically developed based on food products that contribute a significant amount of sodium intake among the Caucasian-majority UK population. Many of the commonly consumed processed foods which contributed to Asian population salt intake were not included in the FSA targets. Our data, however, does highlight concerns in a number of food sub-categories in Brunei Darussalam.

Accordingly, care must be taken in interpreting our results. Generalisation of the result is limited as the study was conducted on processed foods in major supermarkets in Brunei-Muara District only. As mentioned elsewhere, our data collection was not based on the main sources of salt or the commonly consumed processed foods in Brunei Darussalam. A large number of processed foods in our study did not display the quantity of sodium, reducing the strength of our data. The reliability of our data substantially and ultimately determined by the accuracy of sodium quantity displayed on the product packages. The difference between the sodium value on the packages and the actual quantity as determined by analysis can be as high as 25% [21].

Our study paved the way for a number of recommendations. Further study on salt consumption levels in the population using the 'gold

standard' of measuring salt intake and the main sauces of salt in the diet is needed. Further study to validate the accuracy of the displayed nutritional information using laboratory determination. Mandatory nutrition labelling with a more comprehensive labelling policy inclusive of declaration on salt in processed foods should be considered. Future public health actions on sodium should give emphasis on consumer awareness through education and mass media campaigns. Consideration should also be given to the establishment of an enabling environment such as implementing healthier choice logos and healthy supermarket programmes. Voluntary product reformulation, both by the local and non-local food manufacturers need to be explored and lastly, monitoring of changes in sodium content in key food categories should be carried out over time.

In summary, faced with an emerging epidemic of hypertension, Brunei Darussalam is in urgent need for a national sodium reduction strategy. Our study identifies and highlights challenges and priorities as well as provides a starting point for developing further actions on reducing population intake of sodium. Further research on sodium intake and sources of salt in Brunei diet is needed to fill in gaps and knowledge to formulate effective public health policies and strategies in Brunei Darussalam.

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