Available online: http://journal.ipb.ac.id/index.php/jgizipangan ***J. Gizi Pangan, November 2021, 16(3):129-138***
Accredited based on DGHE, Republic of Indonesia No. 28/E/KPT/2019 DOI: https://doi.org/10.25182/jgp.2021.16.3.129-138
ISSN 1978-1059 EISSN 2407-0920

Assessment of Sodium Content of Processed Food Available in Indonesia

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ABSTRACT

This study was conducted to identify the sodium content in processed food and determine the proportion of products that meet the World Health Organization (WHO) global sodium benchmark criteria. Spesific concern was placed for sodium content in instant noodles. A comparative analysis was conducted to determine the relevance between the WHO and Indonesian Food and Drug Authority (Indonesian FDA) benchmarks in limiting sodium in instant noodles. Data on sodium levels (mg/100 g) of processed food was obtained from the register in the Indonesian FDA, Directorate of Processed Food Registration for 2019 to 2020. There were 3,850 products, consisting of 3,036 Local Products (LP) and 814 Imported Products (IP). These products were grouped into seven food categories and 18 types of food. The highest sodium content was found in chili sauce at 2,254,06 mg/100 g, and the lowest was in wafers at 218.64 mg/100 g. Overall, 2,538 of all products (66.56%) did not meet the sodium criteria based on the WHO benchmark. While for instant noodles, only 14.2% of the products met the sodium criteria based on the Indonesian FDA regulations and only 7.4% comply to the WHO sodium benchmark. The Cohen's Kappa test showed a strong agreement (K=0.650; 95% CI; p=0.00, strong) between the two regulations in limiting sodium levels in instant noodles. This study provides an overview of sodium levels in processed food in Indonesia. The sodium content in most products including instant noodles, as one of the most frequently consumed products, are still above the recommended value. Therefore, it is necessary to develop sodium benchmark of wider range of food categories in national level that might contribute to sodium intake, as well as for instant noodles. In order to achieve this goal, involvement of multi stakeholder among government, food industry and expert are also needed to deliver effective policies regarding sodium intake concerns.

Keywords: assessment, benchmarks, processed food, sodium, WHO

INTRODUCTION

Salt plays an important role in processed food formulation by enhancing aroma and reducing the bitterness of a food product. In human body, sodium in salt is needed to transmit nerve impulses, muscle relaxation, regulates osmotic pressure and maintains water balance (De & De 2019). Sodium in food can be naturally contained or added to food through household cooking, processed and eating out food (Zhang *et al.* 2015).

The results of the 2014 Individual Food Consumption Survey (IFCS) analysis showed that the average salt intake of the Indonesian population reached 6.68±5.85 g/day exceeding the government recommendation of 5 g/day (Atmarita *et al.* 2017). Excessive sodium intake can be associated with increased prevalence of Non-communicable Diseases (NCDs) such as hypertension and cardiovascular diseases (Grillo *et al.* 2019). Meanwhile, the Indonesian 2018 Basic Health Research (BHR) showed that the number of people with hypertension had increased from 25.8 to 34.1%. This result can also be associated with high sodium intake (MoH RI 2013; MoH RI 2018a).

The correlation between NCDs prevalence and excessive salt intake urges the Government of Indonesia to issue a 2013 Minister of Health regulation concerning the inclusion of sugar, salt, and fat information and health messages in processed and prepared foods that recommends sodium intake of <2 g/day which is equivalent to salt <5 g/day. As WHO direction, its member countries are suggested to strengthen food and nutrition policies, one of which is mandatory nutrition labeling on processed foods (WHO 2018).

In Indonesia, the WHO directive is carried out through the issuance of Indonesian FDA

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(Received 22-06-2021; Accepted 03-09-2021; Published 29-11-2021)

No. 22 of 2019 concerning Nutritional Value Information which regulates the obligatory inclusion of nutrition facts in processed food label. Although the research conducted by Mauludyani *et al.* (2021) showed that 69.4% of respondents rarely read the information on the label, the inclusion of nutrition facts is necessary to increase consumer awareness about the nutrient content of the food they consumed.

In addition, the Indonesian FDA regulation No. 22 of 2019 also regulates nutrient profiles as a requirement for voluntary inclusion of the "healthier choice" logo on the labels. As an initiation stage, the nutrient profile only sets a limit on the sodium content of instant noodles, which is ≤900 mg/100 g (Indonesian FDA 2019). This decision on the limitation of sodium content in instant noodles was based the 2014 IFCS analysis which showed that instant noodles is a processed food that provides the largest contribution to the sodium intake of the Indonesian population in all age groups by 11.78% (MoH RI 2018b).

Due to the large contribution of processed food in sodium intake, it is important to identify sodium levels in various processed food (Nieto *et al.* 2018). This data is expected to help identify interventions needed to reduce sodium intake from processed foods. It also provides an opportunity for manufacturers to reformulate their products by reducing the sodium added to their products (Kamis *et al.* 2015).

Therefore, this study was conducted to analyse the proportion of food products that comply with WHO sodium benchmark targets (WHO 2021). An assessment of the sodium content of instant noodles was also carried out refering to sodium criteria set by the government and WHO. In addition, comparative analysis was conducted to determine the relevance and classification of the two benchmarks in limiting sodium contents in instant noodles. The data from this study might be beneficial for public health officials in developing strategies to reduce and monitor sodium trends in the food supply chain.

METHODS

Design, location, and time

This is a cross sectional descriptive study, utilizing a secondary data on sodium content of processed food products registered in the Indonesian FDA. Data collection and analysis were carried out in Jakarta from March to May 2021.

Sampling

Processed food in this study refers to food or beverage that is processed in a certain way or method with or without additional ingredients. The sample for the study was data from processed foods that can contribute to sodium intake. Data were obtained from processed food products registered in the Indonesian FDA trough the Directorate of Processed Food Registration, from 2019 to 2020. The variables included on this assesment were food category, type of food, sodium content as well as product origin. The product origin divided into Local Products (LP) and Imported Products (IP). There were 3,850 products' data used in this study, consisting of 3,036 LP and 814 IP products.

Data collection

Data on sodium levels were obtained from the database of the nutritional value of processed foods registered through the e-registration (e-reg) of the Indonesian FDA. Data was collected based on the distribution approval number, registration number, the type of food, and its sodium content. Data with the same marketing approval number were excluded to avoid duplication. The processed food data collected was grouped into seven food categories and specified into 18 types of food (described in the brackets) based on Indonesian FDA Regulation No. 34 of 2019 on Food Categories.

The Food category are as follow: food category 01.0 (dairy products and their analogues (processed cheese and cheese)), food category 06.0 (cereals and cereal products (cereals and instant noodles)), food category 07.0 (bakery products (cookies, wafers, crackers, white bread, and sweetbreads)), food category 08.0 (meat and meat products including poultry and game meats (processed meat and chicken)), food category 09.0 (fish and fishery products including molluscs, crustaceans, and echinoderms (processed fish)), food category 12.0 (salt, spices, soups, sauces, salads, and protein products (soy sauce and chili sauce)), and food category 15.0 (ready-to-eat snacks (savoury snacks, chips, extruded snacks, also nuts and their products)). Then, the processed foods studied would be described as 18 types of food. The data presented is the sodium content of "as sold" food product in mg/100 g units.

Data analysis

Data analysis was carried out descriptively using SPSS 22 software to identify the median, interquartile range, minimum and maximum values of sodium content for each type of food. Statistical analysis using the Mann-Whitney test ($p<0.05$) was conducted to determine the difference in sodium levels among LP and IP products. The proportion of products that exceeded the WHO sodium benchmark and sodium criteria for instant noodles based on the Indonesian FDA Regulation No. 22 of 2019 was set out and presented descriptively.

Cohen's Kappa ($p<0.05$) test was conducted to determine the agreement between the Indonesian FDA regulation and WHO global sodium benchmark in classifying the sodium content in instant noodles. Kappa score is a statistical ratio of categorical data that describes the proportion (%) of the number of measurements that are consistent (similar) between two raters compared to the proportion (%) of the number of measurements that differ between two raters. The kappa value result ranges from -1.0 to 1.0 and the level of agreement can be determined as follow ≤0.20 (poor), ≤0.21−0.40 (fair), ≤0.41−0.60 (sufficient), ≤0.61−0.80 (strong), and ≥0.81 (very strong). The greater the kappa coefficient, the stronger the relevance between the two raters in classifying the recommended dietary sodium criteria.

RESULTS AND DISCUSSION

Processed food that potentially become a contributor to sodium intake

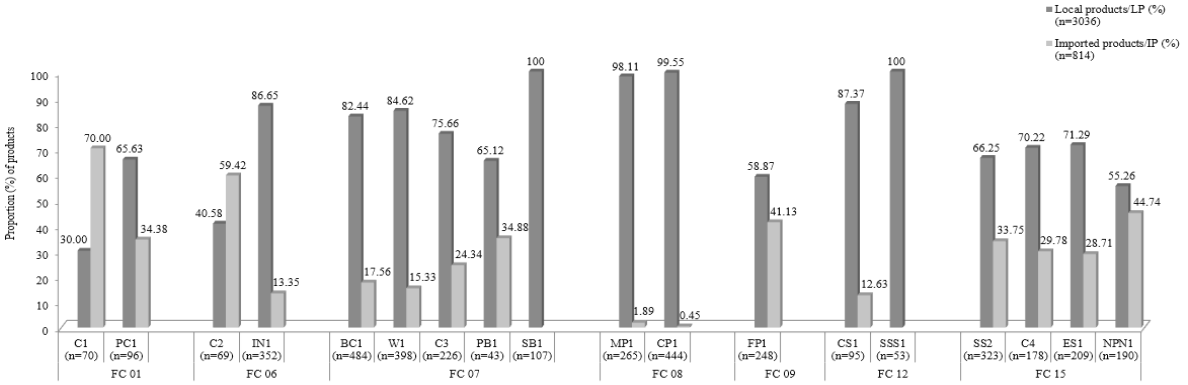
There were 3,850 processed food products identified as contributor to sodium intake collected from the e-reg database. The data was divided into 3,036 (78.86%) local products (LP) and 814 (21.14%) Imported Products (IP). The results of food grouping were divided into seven Food Categories (FC) and 18 types of food. The proportion of products in each food category analyzed in this study is described in Figure 1.

For sweet bread and sweet soy sauce, the data is only represented by local products because there is no imported product in the database for those types of food. However, for cheese and cereals, the proportion of Imported Products (IP) is higher than local products by 70 and 59.42%, respectively. Overall, the largest number of product samples was from meat and meat product category (FC 08) with as many as 709 products. Meanwhile, white bread had the smallest number with only 43 products. The types of foods identified were almost the same as the assessment of sodium levels in processed food conducted in Malaysia (Haron *et al.* 2020) which included processed meats (fish, chicken, and beef), breakfast cereals, sauces, cheeses, savory snacks, sweet snacks, and white bread.

Sodium levels in 18 types of processed foods registered in the Indonesian FDA from 2019 to 2020

The top three in the highest average of sodium content regardless of the product origin is shown in chili sauce (1,854 mg/100 g), soy sauce (1,319 mg/100 g), and instant noodles (1,275,31 mg/100 g). Similar results was also found in Brunei Darussalam by Kamis *et al.* (2015) where the sauces and seasonings showed the highest sodium content among other types of food. Analysis conducted by Prihatini *et al.* (2016) showed that sodium intake in the age group 6−18 year from sauces products were 7.9%, which was ranked second after instant noodles (13.2%). Study by Amarra and Khor (2015) from the 2012 National Socio-Economic Survey (SUSENAS) stated that sodium intake per capita in Indonesia from the consumption of instant noodles, sweet soy sauce and chili sauce were 144.13, 115.32 and 3.43 mg/day, respectively. In line with this, based on the 2014 Individual Food Consumption Survey (IFCS) analysis in DKI Jakarta province conducted by Setyowati *et al.* (2018) showed that the average daily consumption of those three types of food was 36.25, 4.02 and 1.76 g/day in all age groups of the population.

There was a significant difference ($p<0.05$) between sodium levels in LP and IP products found in processed cheese, instant noodles, biscuit and cookies, wafers, crackers, white bread, chips, and processed nuts. Sodium content tends to be higher in local products rather than imported products for processed cheese, biscuits, wafers, crackers and nuts. Whereas in instant noodles, white bread and chips, the sodium content were tended to be lower in local products compared to imported products. The average sodium content in each food types and the product origin are depicted in Table 1.



Note: Food category 1 /FC01 (C1: Cheese; PC1: Processed cheese); FC06 (C2: Cereals; IN1: Instant noodle); FC07 (BC1: Biscuit/Cookies; W1: Wafers; C3: Crackers; PB1: Plain bread; SB1: Sweet bread); FC08 (MP1: Meat processed; CP1: Chicken processed); FC09 (FP1 : Fish processed); FC12 (CS1 : Chili sauce; SSS1 : Sweetsoy sauce); FC15 (SS2: Savoury snacks; C4: Chips; ES1: Extrudate snacks; NPN1: Nut and processed nuts)

Figure 1. Proportion (%) type of food products contributing to sodium intake in each food category (FC)

The proportion of products meeting the WHO global sodium benchmark

In general, the median sodium levels of the food products exceeded the limits set by WHO, except for wafers, crackers, and cereals (Table 2). Their proportion that met the WHO sodium criteria were 73.87, 68.14, 56.52%, respectively. These results were followed by sweet breads (48.59%), extruded snacks (45.93%), cheese (45.71%), and nuts and their processed products (45.26%). WHO stated that if more than 45% of products have met the target, then the sodium level threshold tends to be loose and can be lowered to become more stringent (WHO 2018).

Six products with the least proportion of meeting the criteria of the WHO global sodium benchmark were shown in processed fish (2.42%), chili sauce (6.32%), instant noodles (7.39%), white bread (9.30%), processed cheese (14.58%), and savoury snacks (15.17%). According to Rosewarne *et al.* (2020), if the number of products on the market has met the criteria of around 33%, with a range of 10% above or below (23−43%), the sodium content limit tends to be feasible and appropriate. In the other hand, WHO stated that if less than 10% of existing products meet the criteria, then the sodium level threshold can be increased/loosened. So that, it is easier and more feasible to achieve (WHO 2018). It is important to set the sodium threshold that is appropriate to sodium content of products that are available in the national market. Thus, setting national benchmarks is more recommended rather than an approach to reach international benchmark. Still, the percentage of products that complied with WHO sodium benchmark could be considered as an overview of reference point regarding feasibility and later as comparison of sodium criteria across food category in national level (Kloss *et al.* 2015).

The proportion of products that meet the WHO global sodium benchmarks criteria can be seen in Table 2.

The difference between the WHO global sodium benchmark and the sodium content of processed foods

The sodium content used as a reference is the median value gained from the descriptive analysis. It better represented the distribution of abnormal data obtained in this study (Rahman 2020).

The percentages (%) of sodium levels that are the most different from the WHO benchmarks are shown in chili sauce and processed fish at 187.54 and 176.57%, respectively. Those numbers exceeded almost twice the sodium limit recommended by WHO. Analysis of sodium levels in chili sauce in Malaysia conducted by Shahar *et al.* (2019) showed that the average sodium content in chili sauce was 1,240 mg/100 g. Judging from its conformity with the WHO sodium benchmark, there is a difference of about 90.77%, which is still smaller than what was found in this study. This is different from the analysis of sodium levels of chili sauce in Brunei (Kamis *et al.* 2015), which showed the average sodium content in chili sauce was 914

Table 1. Sodium content of various types of processed food registered in Indonesian Food and Drug Authority from 2019 to 2020

Type of food	n Total	Total Median (IQR) Min−Max	n (LP)	Local products Median (IQR) Min−Max	n (IP)	Imported products Median (IQR) Min−Max
Cheese**	70	689.23 (358.81)	21	707.84 (160.05)	49	686.32 (513.18)
		49.23−2,167,60		140.94−1,534,09		49.23−2,167,60
Processed cheese*	96	1,207,60 (716.13)	63	1,390,14 (570.81)	33	809.73 (505.12)
		86.31−3,225,50		86.31−3,225,50		149.64−1,600
Cereal**	69	230 (208.63)	28	203.39 (148.52)	41	296.00 (243.64)
		10.38−1,093,16		93.90−604,203,39		10.38−1,093,16
Instant noodle*	352	1,275,31 (545.33)	305	1,258,22 (475.24)	47	1,692,28 (1,112,88)*
		309.98−3,645,37		405.67−3,359,50		309.98−3,645,37
Biscuit cookies*	484	307.08 (154.12)	399	308.42 (138.87)	85	276.02 (213.19)
		16.68−1,197,02		16.68−1,197,02		44.45−600.00
Wafers*	398	169.66 (155.51)	337	180.47 (145.06)	61	105.59 (113.50)
		2.93−1,144,39		51.61−1,144,39		2.93−870.30
Crackers*	226	507.97(223.63)	171	525.00 (267.85)	55	453.77 (180.55)
		15.44−1,569,50		15.44−1,301,51		195.71−1,569,50
Plain bread*	43	446.22 (137.10)	28	422.84 (79.39)	15	617.58 (268.14)
		235.71−1,035,50		235.71−559.93		384.87−1,035,50
Sweet bread	107	313.84 (154.08)	107	313.84 (154.08)	0	-
		84.80−737.42		84.80−737.42		
Processed meat**	265	711.58 (405.78)	260	714.79 (404.64)	5	572.61 (568.32)
		40.72−4,680		40.72−4,680		439.46−1,181,12
ProcessedChicken**	444	621.46 (320.23)	422	621.46 (321.82)	2	616.14 (-)
		25.31−2,276,90		25.31−2,276,90		484.00−748.28
Processed fish**	248	746.73 (320.01)	126	750.02 (400.97)	102	745.95 (274.36)
		50.63−4,565,20		50.63−1,749,98		314.15−4,565,20
Chili, tomato sauce**	95	1,868,98	82	1,868,98 (986.90)	12	1,980,03 (3,912,47)
		(1,041,57)		421.26−8,456,86		263.73−5,374,10
Sweet soy sauce	53	1,319,00 (713.77)	53	1,319,00 (713.77)	0	-
		124.55−3,288,06		124.55−3,288,06		
Savoury snacks**	323	736.83 (584.76)	214	760.32 (566.90)	109	711.39 (619.75)
		33.18−2,131,36		33.18−1,799,00		97.74−2,131,36
Chips*	178	387.44 (340.24)	125	364.13 (315.63)	53	560.00 (384.09)
		15.82−1,490		15.82−1,253,89		89.98−1,490,00
Extrudate snacks**	209	564.60 (606.08)	149	627.81 (657.09)	60	481.03 (455.90)
		14.17−1,845,72		25.00−1,845,72		14.17−1,750,00
Nut and processed nuts*	190	303.69 (418.15)	105	346.36 (395.77)	85	215.00 (399.28)
		0.00−1,505,41		2.81−1,505,41		0.00−946.81
Total	3,850		3,036		814	

*p<0.05; ** p>0.05; LP: Local products; IP: Imported products

Table 2. Proportion of products that meet sodium limit of WHO Global Sodium Benchmarks

Type of food	n	WHO global sodium benchmarks (mg/100 g)	Median of sodium content (mg/100 g)	(n) comply	% comply
Cheese	70	≤625	689.23	32	45.71
Processed cheese	96	≤720	1,207,60	14	14.58
Cereal	69	≤280	230	39	56.52
Instant noodle	352	≤770	1,275,31	26	7.39
Biscuit, cookies	484	≤265	307.08	147	30.37
Wafers	398	≤265	169.66	294	73.87
Crackers	226	≤600	507.97	154	68.14
Plain bread	43	≤320	446.22	4	9.30
Sweet bread	107	≤310	313.84	52	48.59
Processed meat	265	≤540	711.58	227	32.02
Processed chicken	444	≤600	621.46	205	46.17
Processed fish	248	≤270	746.73	6	2.42
Chili, tomato sauce	95	≤650	1,868,98	6	6.32
Sweet soy sauce	53	NA	1,334,06	NA	NA
Savoury snacks	323	≤500	736.83	76	15.17
Chips	178	≤500	387.44	114	64.04
Extrudate snacks	209	≤520	564.60	96	45.93
Nut and processed nuts	190	≤280	303.69	86	45.26
Total					33.44

WHO: World Health Organization

mg/100 g, resulting in a difference of about 40.62% compared to the WHO benchmark. This indicates that the sodium content of chili sauce in Indonesia tends to be higher than other Southeast Asian countries, such as Malaysia and Brunei Darussalam.

The large difference in sodium levels in processed fish products was due to the WHO benchmark being low for that product category, which is 270 mg/100 g. This limit is very strict compared to the limits set by the Healthier Choice Logo (HCL) in Singapore and the WHO Regional Office for Europe nutrition profile of 550 and 680 mg/100 g, respectively (HPB 2020; Bonsmann *et al.* 2019). Thus, it needs to be discussed further considering that fishery products can contain sodium naturally. Therefore, a more comprehensive consideration is needed in setting the boundaries.

Based on Figure 2, a large difference was also seen in processed cheese (67.72%) and instant noodles (65.62%). The sodium limit set by the WHO benchmark for processed cheese was 720 mg/100 g, which was much lower than the median sodium content of locally processed cheese, which was found to be 1,390,14 mg/100 g. Imported processed chese complied better with this limit, with the average sodium content of 809.73 mg/100 g (see Table 1). Similarly, the sodium content of instant noodles (1,275,31 mg/100 g) was also higher than the sodium limit recommended by the WHO benchmark of 770

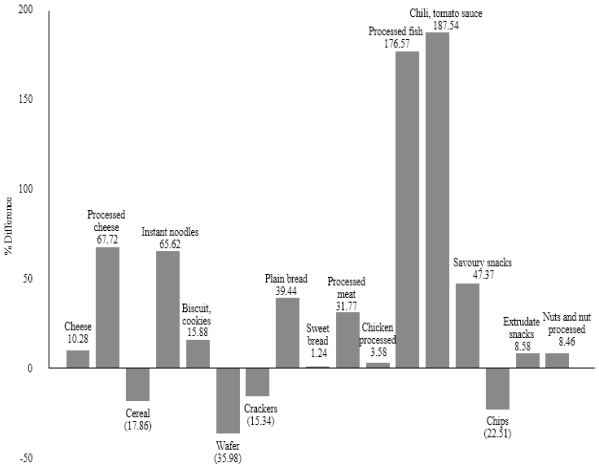


Figure 2. Difference (%) between sodium limit on WHO global sodium benchmarks and median value of sodium content

mg/100g. Compared to an assessment of instant noodles conducted in Malaysia, the median sodium content in that study was 1,800 mg/100 g (4.5 g/100 g salt) (Tan *et al.* 2019), resulting in a greater % difference of 133.77% sodium limits from the WHO benchmarks. This indicates that greater efforts are needed to reduce sodium levels in instant noodles. Despite the larger percentage difference to the WHO limit for processed cheese as compared to instant noodles, the average consumption of cheese (0.6 g/day) is still much lower than the consumption of instant noodles (36.25 g/day) based on IFCS data in DKI Jakarta (Setyowaty *et al.* 2018). Thus, limiting the sodium content of cheese may not be a priority given that its consumption tended to be low.

Mean and range of sodium content of instant noodles based on preparation method

In this assessment, instant noodles are grouped based on different preparation methods. The grouping also distinguishes the product's origin between LP and IP (Table 3). Based on the Mann-Whitney analysis ($p<0.05$), there was a significant difference in sodium content between the LP and IP instant noodles. As it is shown in Figure 3, the sodium content of the IP instant noodles soup tended to be higher than that of the LP product. While for fried instant noodles was lower than for IP product with 688.27 and 1,093,12 mg/100 g, respectively. The median sodium content of instant noodles was higher (1,406,43 mg/100 g) than fried instant noodles (1,083,05 mg/100 g). The same results were shown in an assessment conducted by Tan *et al.* (2019) for instant noodles in Malaysia, with average sodium levels in instant noodles soup and fried instant noodles were 1,828 and 1,136 mg/100 g, respectively, which were slightly higher than this study.

The proportion of instant noodles products that met the criteria for sodium requirements based on Indonesian FDA Regulation No. 22 of 2019

There were 14.20% of products that met the sodium criteria for instant noodles based on the Indonesian FDA Regulation No. 22 of 2019 (Table 4). For instant noodles soup, the proportion of products that met the criteria was 8.33%, smaller than fried instant noodles with 25%. There has been no similar research before. However, the small proportion of products (<10%) that met the sodium criteria for instant noodles soup was an indicator for instant noodles manufacturers to put greater efforts to meet these requirements (WHO 2018).

Data on sodium content can be used as the basis for determining nutrient profile thresholds that can stimulate reformulation of sodium levels by food manufacturers (Ahuja *et al.* 2019; Nieto *et al.* 2018). In determining the nutrient profile, it is very important to consider a realistic and achievable threshold for research and development that are relevant to nutritionists recommendations. Limits that are too tight make it difficult to reformulate (Lehmann *et al.* 2017).

Efforts on sodium content reduction had also been carried out in Kuwait. This had been conducted as a respond to lowering sodium intake through bread consumption, which is the main food contributor to sodium intake in the country. Therefore, the bread supplier in the market were encouraged to decrease its sodium content gradually every six months by 20% in 2013. Other mediterranean countries, such as

Table 3. Sodium content of instant noodles registered in Indonesian Food and Drug Authority from 2019 to 2020

Type of instant noodle	n (Total)	Total Median (IQR) Min−Max	n (LP)	Local products Median (IQR) Min−Max	n (IP)	Imported products Median (IQR) Min−Max
Instant noodles (soup & fried)*	352	1,275,31 (545.33)	305	1,258,22 (475.24)	47	1,692,28 (1,112,88)
		309.98−3,645,37		405.67−3,359,50		309.98−3,645,37
Instant noodles (soup)*	228	1,406,43 (629.42)	185	1,370.68 (534.76)	43	1,784,86 (1,005,85)
		309.98−3,654,37		493.01−3,359,50		309.98−3,645,37
Instant noodles (fried)*	124	1,083,05 (344.43)	120	1,093,12 (337.83)	4	688.27 (311.90)
		405.67−1,618,67		405.67−1,618,67		623.95−1,039,81

*$p<0.05$; LP: Local products; IP: Imported products

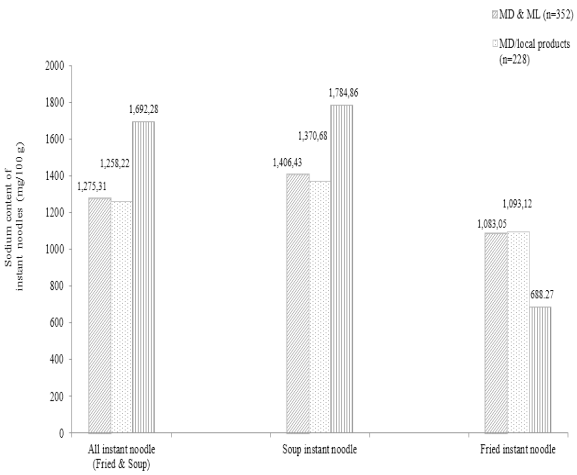


Figure 3. Median sodium content of instant noodles based on method of preparation

Table 4. Proportion of instant noodle products that met the sodium profile criteria based on Indonesian Food and Drug Authority regulation No. 22 of 2019

Type of instant noodles	n	Sodium nutrient profile by IFDA regulation (mg/100 g)	(n) comply	% comply
Instant noodles (soup & fried)	352	≤900	50	14.20
Instant noodles (soup)	228	≤900	19	8.33
Instant noodles (fried)	124	≤900	31	25

Jordan and Oman, have also prepared legislation by developing sodium benchmarks that become a reference for food products that are widely consumed in the region (Al Jawaldeh *et al.* 2018).

Comparison of sodium threshold by Indonesian FDA regulation and WHO global sodium benchmarks for instant noodles

Comparative analysis of sodium requirements in these two references revealed that the proportion of products that met the criteria based on the nutrient profile of government regulation was greater (14.20%) compare to the WHO global sodium benchmark (7.4%) (Table 5). However, the two benchmarks have strong consistency and agreement based on the Kappa Cohen's analysis. This indicates almost the same classification of the two regulations in limiting sodium levels in instant noodles. There have been no published studies that specifically compare the two benchmark models for instant noodles products. However, the same method is commonly used to compare two different nutrient profile models in order to determine the suitability or reliability of the nutrient profile model used with other nutrient profile models as a reference. This was demonstrated in other studies comparing models of varied nutrient profile with different types of food (Pivk Kupirovič *et al.* 2020; Labonté *et al.* 2017). This comparison can help regulators to determine the nutrient profile model to be used as a reference (Poon *et al.* 2018).

Eventhough the two benchmarks have strong agreement based on the Kappa Cohen's analysis, the national sodium criteria for instant noodles is more attainable. It is reflected by the fact that more products are able to comply with the national regulation compared to WHO sodium benchmarks. Since the national regulation on limiting the sodium content of instant noodles is implemented voluntarily, there would be slow progress towards lowering the Indonesian sodium intake at population level. Thus, more involvement of food industry are necessary to reach the goal. In the other hand, increasing consumer awareness of health risk of high sodium intake also remains important (Kloss *et al.* 2015).

Table 5. Comparison between the sodium criteria of instant noodle based on WHO gobal sodium benchmarks and Indonesian food and drug authority regulation No. 22 of 2019

Type of instant noodles	n	% comply by IFDA regulation	% comply by WHO benchmark	Value of kappa	Level of agreement	p
Instant noodles (soup & fried)	352	14.20	7.4	0.650	strong	0.00
Instant noodles (soup)	228	8.33	5.3	0.759	strong	0.00
Instant noodles (fried)	124	25	11.3	0.553	sufficient	0.00

IFDA: Indonesian Food and Drug Authority; WHO: World Health Organization

CONCLUSION

Data on sodium content can be an important basis for identifying sodium levels in processed foods available in the Indonesian market. The study found that most food categories had high sodium level, exceeding the WHO global sodium benchmark. Thus, it is necessary to set attainable sodium threshold recommendation that could be applied at national level. Comparative analysis between the two (national and WHO) sodium benchmarks set for instant noodles showed strong relevance in limiting the sodium content of instant noodles. Nevertheless, only few that meet the sodium benchmark set by both regulation. Currently, the initiative to stimulate a voluntary reformulation of sodium levels, only applied for instant noodles through the "healthier choice" logo on labels. Therefore, it is recommended to develop sodium benchmark for broader range of food categories that are identified as main contributor to sodium intake in the population. Through this mechanism, a multi-stakeholder coordination between the government, nutrition experts, and food producers is pivotal in formulating effective public policies and strategies regarding this objective.

ACKNOWLEDGEMENT

The authors would like to express their heartfelt gratitude to the Directorate of Processed Food Registration, Indonesian Food and Drug Authority for permitting to use data on sodium levels in registered processed foods. The authors also wish to thank the Indonesian FDA, who sponsored the funding of this study

DECLARATION OF INTERESTS

The authors declare that there is no conflict of interest with other person or institution.

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