



## OVERVIEW OF HIGH SODIUM EATING HABITS BEFORE AND AFTER COVID-19 PANDEMIC IN INDONESIA

*Gambaran Pola Konsumsi Makanan Tinggi Sodium Sebelum dan Setelah  
Masa Pandemi Covid-19 di Indonesia*

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### ABSTRACT

National and global reports showed a high prevalence of sodium intake above the recommended threshold. The pandemic situation might have altered people's eating habits into a healthier diet to improve the immunity system. A high-sodium diet, which has previously been reported as a substantial contributor to several degenerative diseases, might be considered unhealthy eating habits. This study aimed to analyze whether the Covid-19 pandemic has changed the eating habits of high sodium foods and drinks in college students. This cross-sectional study used a food frequency and perception questionnaire in December 2019 - August 2020, conducted in direct interviews and online questionnaires. Forty-three college students enrolled in the present study as respondents. The number of respondents with above-average high sodium eating habits decreased during the covid-19 pandemic, although not statistically significant ( $p > 0.05$ ). More than 60 percent of respondents admitted no significant changes in packaged foods and drinks intake, even though 79.1 percent of respondents reported healthier food and drinks intake during the Covid-19 pandemic. College students/adolescent needs to restrict their consumption of high sodium foods and drinks, especially during the Covid-19 pandemic to improve the immune system. It is also important to emphasize on the massive and continuous promotion of healthy eating habits among college students.

**Keywords:** Covid-19, eating habits, sodium, pandemic

### ABSTRAK

Data nasional dan global menunjukkan tingginya prevalensi konsumsi sodium diatas batas rekomendasi asupan. Kondisi pandemi Covid-19 dapat mengubah pola konsumsi masyarakat menjadi lebih sehat untuk meningkatkan sistem imun. Diet tinggi natrium dilaporkan sebagai penyebab penting dalam perkembangan berbagai penyakit degeneratif, sehingga dapat dikategorikan sebagai kebiasaan makan yang tidak sehat. Penelitian ini bertujuan untuk menganalisis apakah pandemi Covid-19 telah mengubah kebiasaan makan dan minum tinggi natrium di kalangan mahasiswa. Penelitian ini menggunakan metode *cross-sectional* dengan kuesioner FFQ dan persepsi makan. Penelitian ini berlangsung pada Desember 2019 – Agustus 2020 yang dilaksanakan secara wawancara langsung dan menggunakan kuesioner *online*. Responden terdiri dari 43 mahasiswa. Jumlah responden dengan pola konsumsi tinggi natrium menurun selama pandemi Covid-19 meskipun tidak signifikan ( $p > 0.05$ ). Lebih dari 60 persen responden mengakui tidak ada perubahan signifikan terkait konsumsi makanan dan minuman kemasan, meskipun 79.1 persen melaporkan konsumsi makanan dan minuman menjadi lebih sehat selama pandemi. Mahasiswa/remaja perlu mengurangi konsumsi makanan dan minuman tinggi natrium, terutama selama masa pandemi Covid-19 untuk meningkatkan sistem imun. Penting untuk diperhatikan bahwa promosi pola konsumsi makanan sehat di lingkup mahasiswa perlu dilakukan dengan langkah yang masif dan berkelanjutan.

**Kata kunci:** Covid-19, pola makan, natrium, pandemi

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I ncreasing trends in sodium intake have led to more stringent rules to limit an individual's daily consumption. Our daily intake is inseparable from macronutrients and micronutrients contents, including sodium. World Health Organization (WHO) and the Indonesia Ministry of Health has sodium intake guideline from children to adults. The recommended sodium intake from WHO was < 2000 mg/day, equal to salt intake of 5000 mg/day for adults aged  $\geq$  years old.<sup>1</sup> Meanwhile, Indonesia Ministry of Health regulation No. 28 the Year 2019 clearly stated that Recommended Nutrient Intake (RNI) of sodium was 1500 mg/day for adults aged 19 - 49 years old.<sup>2</sup>

However, adults' global sodium intake was 3950 mg/day or equal to 10060 mg/day of salt intake.<sup>3</sup> This number was almost twice the recommended threshold by WHO. Meanwhile, in Indonesia, according to the Total Diet Study (SDT) 2014, a total of 18.3 percent oopulation had an above threshold sodium intake, which was more than 2000 mg/day.<sup>4</sup> This condition showed that the global and national community's sodium intake was still above the threshold, even though it was stated clearly in RNI.

Nevertheless, previous studies reported a positive correlation between sodium intake and an individual's decreased health quality. Those studies found significant correlations between high sodium intake and the presence of hypertension and cardiovascular diseases.<sup>5-9</sup> Newest reviews had also explained the correlation between high sodium intake and the incidence of obesity. A population-based study in Korea reported a substantial correlation between excreted sodium in urine with obesity in subjects aged 20 - 74. At the same time, it also noted that the highest obesity risk was in the 20 - 39 group.<sup>10</sup> Another study from the same population data source also reported a significant correlation between sodium excretion with body fat percentage and obesity incidence, especially in late adolescents and early adults.<sup>11</sup> The highest correlation appears to be between sodium and body fat percentage, of which obesity emerged in late adolescence to early adulthood.

This condition plausibly happened since sodium or salt intake could stimulate thirst and

appetite and thus provoke an individual's willingness to consume a higher caloric intake.<sup>12</sup> Another study supported this report that found sodium consumption affects ghrelin regulation, a hormone aimed to stimulate hunger and appetite.<sup>13</sup>

High sodium intake generally associated with high intake of processed foods such as packaged food and drinks. A study in the US that had analyzed more than 200.000 types of processed foods reported that the medium value for sodium content in such products was 250mg/100g.<sup>14</sup> Meanwhile, in Indonesia, food and drinks products are categorized as high sodium when it reaches above 500mg/100g of sodium content.<sup>15</sup> A study conducted for children in Spain found that the most consumed high sodium content of foods was from ultra-processed food and processed food, such as meat and processed meat, cereals, fast food, and milk and dairy products.<sup>16</sup>

Hence, this study aimed to analyze eating habits of high sodium foods and drinks in college students, consists of most consumed types of food and eating frequency in the last two months from respondents filling out the questionnaire. Since the pandemic situation emerged during our data collection time; thus, this study also analyzed whether significant changes in high sodium eating habits before and during the Covid-19 pandemic in college students persist.

The existing presumption that the pandemic situation could lead to a substantial change in human daily lifestyle, including a healthy lifestyle and the people's eating habits.<sup>17</sup> People tend to independently search for or are more prone to get massive exposures on how to boost their immune system to prevent infectious diseases, which most likely comes from balance and healthy nutrition intake.<sup>18</sup> Meanwhile, high sodium eating habits were considered unhealthy.

Our study participants are college students, regarded as the primary target market for high sodium foods and drinks products<sup>19</sup>. Apart from that, the pandemic situation, which resulted in several locations calling for lockdown, and the government urges people to quarantine themselves, has changed the learning system into an online approach. Which, consequently, could affect food choices that were usually

consumed by college students before the pandemic<sup>20,21</sup>.

There was not much data to analyze high sodium food and drinks in this Covid-19 pandemic in college students. We expect this study to deliver illustration in such a topic and present information on whether the pandemic situation changes students' eating habits and drives people to shift their eating patterns into healthier ones.

## METHODS

This research was an observational analysis in a cross-sectional study. Data collection comprises Food Frequency Questionnaire (FFQ) conducted in direct interviews and modified online FFQ with Google Form. The present study formerly meant to analyze the correlation between sodium intake and body fat percentage in college students. Preliminary study to create the list of high sodium foods and drinks consumed by the respondents and baseline FFQ took place in December 2019 – Februari 2020. However, it was then interrupted due to Covid-19 lockdown. After 3 months of lockdown, we invited the respondents to participate in a survey on the effects of pandemic on their sodium intake using the same FFQ in baseline measurement. The respondents included included all nutrition science students class of 2017 both men and women.

At the first data collection before the pandemic, we collected high sodium food and drink consumption using FFQ in direct interviews with 50 respondents. However, due to social restriction after the pandemic hit, the students are back to their hometown and continued studying through online platform. Thus, we decided to conduct the second survey by modifying the FFQ used in baseline measurement into a google form questionnaire for easier access. The methods used in this second data collection was self-report. However, 7 students had failed to report their sodium food and drink consumption in the online FFQ, hence our total respondents in the end of the research were 43 respondents.

We divided high sodium foods and drinks classification into three categories; first, packaged foods are food sealed and available at the store or shopping center. Second, snack

foods are street foods, ready-to-eat available in outdoor stalls, easily accessible in public, and cheaper. Third, packaged drinks are drinks sealed and open at the store or shopping center.

For packaged foods and drinks, we included all items with sodium content of more than 500 mg per 100 g according to the item's nutrition facts in the packaged cover. As for the snack foods, we included all snack foods that commonly available in the street. It was divided into two categories, high sodium high calories if the food processing requires added salt and are high in calories. The second is high sodium fried foods if the food processing requires added salt and had to undergone deep-frying.

The result of FFQ from direct interviews and online self-report were categorised into five categories that are never (score: 0), 1-3 per month (score: 5), 1 per week (score: 10), 1 per day (score: 15) and more than once per day (score: 25). The score was then calculated and summed from each respondent to find the average score of total respondents. This study used Rank Spearman test to analyze the correlation between nutritional status and sodium eating habits before and during the pandemic. The correlation of sodium eating habits before and after the pandemic was analyzed using Paired t-test, while the differences of sodium eating habits was analyzed using Kruskal-Wallis test.

The Health Ethics Committee of Medical Faculty, Jenderal Soedirman University, approved thesis study protocols with reference number 115/KEPK/VII/2020.

## RESULTS

### Subject Characteristics

Table 1 showed that our respondents are mostly women in their early 20s. During the pandemic and self-quarantine, when the learning methods changed into online-based distance learning, 97.67 percent of the respondents lived with their parents; hence 62.8 percent did not necessarily have to process or prepare their meals. According to the Body Mass Index (BMI) classification for the Indonesian Population<sup>15</sup>, 69.8 percent of respondents have normal nutritional status, while 30.2 percent have malnutrition, whether underweight or obese. No respondent was classified as severely

underweight. We presumed that our respondents have not fully reached the optimum nutritional status.

### Food Grouping

Table 2 illustrates the different types of commonly consumed packaged foods, snack foods, and packaged drinks by our respondents in the last two months before data collection. This time-span was used to describe respondent's habits during pandemic. Thirty-eight items from various brands were categorized into nine groups according to their similar characteristics in high sodium packaged foods. The most commonly consumed high sodium packaged foods were chips and crackers with 34.2 percent and 26.4 percent items, respectively. Whereas, the least consumed by our respondents were chocolate & confectioneries as well as wafers with each

percentage was 2.6 percent or only 1 item our respondents consumed each.

Around half of our respondents had consumed high sodium snack foods in the past two-months. This illustrated that even during self-quarantine movement urged by the government during the pandemic, our respondents still managed to go outside and consumed high sodium street food.

There were only nine items or brands of high sodium drinks meet our characteristics that were commonly consumed by our respondents. It varied between coffees, teas, milk, and isotonic water. The respondents listed milk products as the most widely consumed with four items (44.4%). Meanwhile, isotonic water was the least with only one item was consumed by our respondents (11.2%).

Table 1  
Respondents' Characteristics Enrolled in This Study

Variable	Respondents (n = 43)		
	Mean±SD	n	%
Sex			
- Male		2	4.65
- Female		41	95.35
Residence During Covid-19 Pandemic			
- Parent's House		42	97.67
- Boarding House		1	2.33
Food Preparation Practice During Covid-19 Pandemic			
- Self-Food Preparation		16	37.2
- No Self-Food Preparation		27	62.8
Aged	20.77±0.751		
- 19 years-old		2	4.7
- 20 years-old		11	25.6
- 21 years-old		26	60.5
- 22 years-old		3	7.0
- 23 years-old		1	2.3
Body Mass Index (BMI)	22.34±4.05		
- Severely Underweight (< 17.0 kg/m <sup>2</sup> )		0	0
- Underweight (17.0 - 18.5 kg/m <sup>2</sup> )		6	13.9
- Normal (18.5 – 25.00 kg/m <sup>2</sup> )		30	69.8
- Overweight (25.00 – 27.00 kg/m <sup>2</sup> )		3	7.0
- Obesity (≥ 27 kg/m <sup>2</sup> )		4	9.3

Table 2  
High Sodium Food and Drinks Grouping

Food and Drinks Grouping	n	%
High Sodium Packaged Foods	38	100
- Chocolate & Confectionery	1	2.6
- Biscuit	5	13.2
- Chips	13	34.2
- Crackers	10	26.4
- Instant Noodles	4	10.6
- Wafer	1	2.6
- Processed Meats (Sausages)	2	5.2
- Nuts	2	5.2
High Sodium Snack Foods	31	100
- High Sodium & High Calories	17	54.8
- High Sodium Fried Foods	14	45.2
High Sodium Packaged Drinks	9	100
- Coffee	2	22.2
- Milk	4	44.4
- Tea	2	22.2
- Isotonic water	1	11.2

Table 3  
Correlation of Nutritional Status and High Sodium Eating Habits Before and During Covid-19 Pandemic

Before and During Covid-19 Pandemic	High Sodium Eating Habits		p-value <sup>a</sup>
	Above Average (n)	Below Average (n)	
Before Covid-19 Pandemic			
- BMI Category			0.22
- Underweight	4	2	
- Normal	11	19	
- Overweight	2	1	
- Obesity	0	4	
TOTAL	17	26	43
During Covid-19 Pandemic			
- BMI Category			0.12
- Underweight	3	3	
- Normal	8	22	
- Overweight	1	2	
- Obesity	1	3	
TOTAL	13	30	43

<sup>a</sup>: Rank Spearman Test (CI: 95%)

Table 4  
Eating Habits According to Food and Drinks Preferences Before and During Covid-19 Pandemic

High Sodium Eating Habits	Before Covid-19 Pandemic		During Covid-19 Pandemic		p-value <sup>b</sup>
	n	%	n	%	
Packaged Foods (n= 38)					
- Above-Average	9	23.67	6	15.8	0.18
- Below-Average	29	76.3	32	84.2	
Snack Foods (n=31)					
- Above-Average	22	71.0	18	58.1	0.16
- Below-Average	9	29.0	13	41.9	
Packaged Drinks (n=9)					
- Above-Average	3	22.2	4	44.4	0.35
- Below-Average	6	66.8	5	55.6	

<sup>b</sup>: Paired T-Test (CI: 95%)

### Correlation Between Nutritional Status and High Sodium Eating Habits

Table 3 presents the correlation test between high sodium food and drinks eating habits and nutrition status based on BMI. We categorized high sodium eating habits as above the average and below the average of total respondents' consumption. It appears that high sodium eating habits in our respondents only experienced slight changes before and during the Covid-19 pandemic. According to the Rank Spearman Correlation test, there were no significant differences between nutritional status and high sodium eating habits, both before and during the Covid-19 pandemic ( $p > 0.05$ ).

### High Sodium Eating Habits According to Food and drinks Preferences and Individual Consumption

Table 4 reports that among the three categories of high sodium food and drinks found in our study, our respondents' most commonly consumed before and during the Covid-19 pandemic were from snack foods groups. It was found that the number of respondents with above-average high sodium snack foods consumption before and during the pandemic were 71 percent and 58.1 percent, respectively. However, there were no significant differences in high sodium intake in all three categories before and during the Covid-19 pandemic ( $p > 0.05$ ).

Table 5 implies that more respondents had below-average of high sodium eating habits in both data collection times, indicating persistent

healthy eating habits even before the pandemic situation. During the Covid-19 pandemic, four respondents changed their dietary behavior by switching from above-average high sodium eating habits to below-average eating habits. This substitution resulted in slightly fewer respondents with below-average high sodium consumption from 60.5 percent to 69.8 percent during the pandemic. However, these changes were not statistically significant ( $p > 0.05$ ); thus, no significant differences in high sodium eating habits before and during the Covid-19 pandemic occurred in this study.

### High Sodium Foods and Drinks Eating Perception

Table 6 illustrates respondents' perception of changed or decreased in high sodium food and drinks eating habits before and during the Covid-19 pandemic. The majority of respondents reported no change in their high sodium packaged food and drinks eating habits before the pandemic (60.5% and 65.1%), whereas 53.5 percent reported changes in their snack foods eating habits. Besides, our respondents primarily reported decreased consumption of high sodium packaged foods, snack foods, and packaged drinks (53.5%, 51.2%, and 51.2%) than those who reported no decreased consumption. Lastly, according to the perception of healthier eating habits questionnaire, most of our respondents said increased vegetables and fruit intake, indicating a healthier eating habit during the Covid-19 pandemic.

Table 5  
The Differences of High Sodium Food and Drinks Eating Habits Before and During Covid-19 Pandemic

Eating Habits According to Individual Consumption	Respondent (n = 43)		p-value <sup>c</sup>
	n	%	
High Sodium Eating Habits Before Covid-19 Pandemic			0.18
- Above-Average	17	39.5	
- Below-Average	26	60.5	
High Sodium eating Habits During Covid-19 Pandemic			
- Above-Average	13	30.2	
- Below-Average	30	69.8	

<sup>c</sup>: Kruskal Wallis Test (CI: 95%)

Table 6  
High Sodium Foods and Drinks Eating Perception

Perception Variables	Variable Components	Respondents (n = 43)	
		n	%
Perception of Changes in High Sodium Foods and drinks Eating Habits Before and During Covid-19 Pandemic	Changes in Packaged Foods Eating Habits		
	- Change	17	39.5
	- Not Change	26	60.5
	Changes in Snack Foods Eating Habits		
	- Change	23	53.5
	- Not change	20	46.5
	Changes in Packaged drinks Eating Habits		
	- Change	15	34.9
Perception of Decreased in High Sodium Foods and drinks Eating Habits During Covid-19 Pandemic	- Not Change	28	65.1
	Decreased in Packaged Foods Consumption		
	- Yes	23	53.5
	- No	20	46.5
	Decreased in Snack Foods Eating Habits		
	- Yes	22	51.2
	- No	21	48.8
	Decreased in Packaged drinks Eating Habits		
Perception of Healthier Eating Habits During Covid-19 Pandemic	- Yes	22	51.2
	- No	21	48.8
	Increased of Vegetables Intake During Pandemic		
	- Yes	34	79.1
	- No	9	20.9
	Increased of Fruits Intake During Pandemic		
	- Yes	30	69.8
	- No	13	30.2
	Healthier Food and drinks Intake During Pandemic		
	- Yes	34	79.1
	- No	9	20.9

## DISCUSSION

High sodium foods and drinks products are widely available in the market, varying from packaged foods, processed foods, or street foods. College students are susceptible to consuming high sodium foods and drinks as part of their daily intake since these age groups are considered to have increased prevalence in snacking habits.<sup>22</sup> Meanwhile, our study found that most snack foods with high consumption frequency are categorized as high sodium content.

It can be seen from our food list grouping in Table 2 that there are 14 groups of high sodium foods and drinks consist of 78 items ranging from packaged foods, snack foods, and packaged drinks. According to our findings in Table 4, more respondents had above average consumption of snack foods even though packaged foods have more items than snack foods. The number was twice that of those who consumed below-average snack foods before the pandemic.

All of the listed foods and drinks in this study are classified as discretionary foods, which are not necessarily essential to meet an individual's nutrition needs, yet it meant to enrich someone's diet variety<sup>23</sup>. However, packaged foods, snack foods, and packaged drinks eating habits could likely elevate sugar, salt, and fat/oil intake above the recommended threshold.

Following According to Indonesia Ministry of Health recommendation contained in Minister of Health Regulation No. 30 Year 2013, Indonesian residents are encouraged not to have more than 2000 mg/day of salt intake, 50 g/day of sugar intake, and 67 g/day fat/oil intake.<sup>24</sup> This guideline aimed to prevent the adverse effects of consuming too much sugar, salt, and fat/oil intake, known for their risk factor in developing nutrition-related non-communicable diseases.<sup>25</sup>

Despite sugar, salt, and fat/oil restriction in individuals' daily diet, a large-scale national study called Total Diet Study conducted in 2014 found that residents in the age group of 19-55 were still consuming sugar, salt, and fat/oil above the recommendation.<sup>4</sup> High sodium eating habits are known to stimulate one's appetites and thirst, which might provoke overeating. Consequently, it can be manifested

into overweight or obesity in a long-term condition.<sup>[10]</sup> Likewise, another study also suggested a positive correlation between high sodium intake with obesity, due to high sodium drinks available are mostly sugar-sweetened beverages with high-calorie content.<sup>26</sup>

Nonetheless, our study found no significant correlation between high sodium foods and drinks eating habits with our respondent's nutritional status, both before and during the Covid-19 pandemic. This finding plausibly due to our respondents' characteristics was primarily categorized as normal (69.8%), with only 16.38 percent of our respondents were classified as obese. This is an interesting finding in the present study, that a small number of our respondents are obese even though they are a nutritional science student. This suggests that knowledge was not necessarily a significant factor for individuals to maintain a healthy eating and lifestyle, and that other contributing factors might play significant role for dietary behavior among nutritional science college students. Previous study had reported similar findings, that nutritional knowledge levels had no significant correlation with Body Mass Index<sup>27</sup>.

According to our findings, there was no significant difference between high sodium packaged foods, snack foods, and packaged drinks eating habits before and during the Covid-19 pandemic. Before the pandemic, the majority of our respondents already had below-average eating habits, and this number was increased during the pandemic from 76.3 percent to 84.2 percent. This indicate that our respondent's high sodium packaged foods consumption was relatively low. It might be due to existing knowledge of healthy eating behavior from our respondents as nutritional science students, which affected their daily food preferences.

A rather different result was found in the snack foods group, where the eating habits were dominated with above-average consumption before and after the pandemic with 71.0 percent and 58.1 percent, respectively. This indicates that our respondents had preferred high sodium snack foods that is available on streets stalls rather than high sodium packaged foods. However, there was an apparent decrease in the number of high sodium snack foods consumption during the pandemic although not statistically significant.



Decreased consumption of high sodium packaged foods and snack foods during the Covid-19 pandemic might be because our respondents experienced restricted access to such foods due to the government's appeal to stay at home conducting self-quarantine in an attempt to slow down the spread of coronavirus. Moreover, the government's policy to shifted the learning methods from direct to distance learning through online activities had prompted college students who previously lived in boarding houses to return to their parent's house and spent time mostly at home.

On a household scale, the pandemic situation had urged most families to cook their foods and avoid eating outside the house. This condition is supported by a published study regarding the social demographics impact of the Covid-19 from the Indonesian Central Agency of Statistic (BPS), which reported that 51 percent of the respondents experienced changes in household expenses in terms of food purchases.<sup>28</sup> The urgency to cook their own food and limit food purchases might be part of family efforts to preserve food quality, as well as financial-driven behavior to limit excessive purchase during unstable economic situation.

In contrast with decreased packaged and snack foods consumption, our study reported an increase of above-average high sodium packaged drinks consumption from 22.2 percent to 44.4 percent during the pandemic. A possible reason for these findings might be our respondents were not aware that their choices of packaged drinks were categorized as high sodium. It can be seen from our foods and drinks grouping in Table 2 that most packaged drinks were dominated by milk drinks (4 items). Our respondents might have increased their milk consumption since it is a good source of calcium and vitamin D, which was known for its stimulant effect to activate innate immune response system.<sup>29</sup> Previous study had also suggested the important role of milk in regulating human homeostasis related to the immune system, which might trigger the increased consumption of milk during the pandemic<sup>30</sup>.

According to our perception questionnaire, 60.5 percent of respondents admitted no changes in high sodium packaged foods eating habits, which was aligns with our food frequency questionnaire data. In our perception

questionnaire, 53.5 percent of respondents acknowledged changes in high sodium snack foods consumption. This response also aligns with our food frequency questionnaire data, which indicates decreased snack foods consumption during the Covid-19 pandemic even though no statistical significance found in both category. Previous study conducted in Slovenia had also reported similar findings, with the majority of the respondents reported little changes in lifestyle during lockdown.<sup>31</sup>

Our respondents acknowledged through our perception questionnaire that they experienced increase in vegetables and fruit consumption as well as implemented healthier eating habits during the Covid-19 pandemic. The pandemic situation might affect people's mindset to change their eating habits as it was expected to lower the risk of getting infected with SARS CoV-2.<sup>32,33</sup>

## CONCLUSION AND RECOMMENDATION

### Conclusion

Our study found that some of our respondents still consume high sodium food and drinks, in the form of packaged foods or street food snacks. There were no significant changes of sodium eating habits before and during the Covid-19 pandemic. The majority of our respondent had below-average consumption of packaged foods and drink, even though there was slight increase of packaged drink consumption in the form of milk product. Meanwhile the consumption of high sodium street snack foods was above-average, despite government's policy for self-quarantined and restriction of outdoor activities during pandemic.

### Recommendation

Our study limitations were that the survey was based solely on our respondent's answers and self-report. Some decreased their sodium intake while other had increased consumption. Different location and background condition might affect this behavior, indicating how pandemic evidently had different impacts on people's lifestyle or eating preferences. College students / adolescent needs to restrict their consumption of high sodium foods and drinks, especially during the Covid-19 pandemic to improve immune system and help prevent

transmission of infectious disease. It is also important to emphasize on massive and continuous promotion of healthy eating habits among college students.

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