

Knowledge regarding nutrition to strengthen immune system and food consumption behavior to enhance immune response during COVID-19 pandemic of Bangkok students in grades 10-12

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Abstract: Background: Covid-19 is an infectious disease caused by the corona virus and it can be transmitted from person to person via respiratory droplets. People contact with unclean surfaces and proceed to touch their eyes, nose or mouth, this is how the virus enters the host, resulting in rapid transmission on a large scale. Having appropriate health behavior including foods could strengthen immunity against this virus.

Objective: To assess nutrition and immunity related knowledge and food consumption behavior which enhances immunity during COVID- 19. And to study factors influence food consumption behavior during COVID-19 pandemic

Design: Cross-sectional online survey between April-May 2022.

Participants: Approximately 146 students who studied grade 10-12 across in Bangkok ,Thailand with access to the internet via smartphone or personal computers, were invited to participate in this study.

Result: Most participants reported a moderate level of Nutrition and Immunity related knowledge (M=6.00, SD=1.91) and a low level of Food Consumption Behavior during COVID-19 pandemic (M=50.00, SD=9.10). 43.8% (n=64) of participants reported that they did not take any vitamins or supplements, 30.1% (n=44) took vitamins and supplements at the same amount as usual and 26% (n=38) took more vitamins and supplements than usual. Taking vitamins and supplements during COVID-19 was a predictive factor for food consumption behavior during COVID-19 of participants.

Conclusion: Taking more vitamins and supplements during the pandemic predict Food Consumption Behavior to Enhance immune responses during the COVID-19 pandemic. Therefore health and nutrition education campaign should be provided to the public in order to have a good food consumption behavior to enhance immune responses.

Keywords: food consumption, immune system, COVID-19.

1. BACKGROUND INFORMATION

The ongoing COVID-19 pandemic which began in December of 2019 has reportedly affected 525 million people and resulted in 6.28 million casualties worldwide. On the 13th of August, 2021, the number of daily new cases in Thailand reached a high of 23,413 people. Covid-19 is an infectious disease caused by the corona virus and can be transmitted from person to person via respiratory droplets - this includes mucus from the nose and saliva. These droplets don't travel a great distance once existing ones' body due to the weight; instead, they fall onto various surfaces including skin. People coming into contact with unclean surfaces and proceeding to touch their eyes, nose or mouth¹ - an action that isn't strictly monitored - is how the virus enters the host, resulting in rapid transmission on a large scale.

Protecting oneself and others from the new coronavirus (COVID-19) is a protocol everyone should strictly adhere to in order to reduce the risk of becoming infected and decrease the severity of the outbreak. Maintaining a distance of at least 1 metre from others, avoiding physical contact, staying out of crowded areas or places that are considered high risk and most importantly, staying home when feeling unwell are all measures people should take on to slow the spread of the virus. Furthermore, this in turn will result in enough medical resources for those who are truly in need of them. Another preventive measure people should follow is to thoroughly wash their hands using soap or hand sanitizer after engaging in different activities or coming into contact with surfaces in public. Constantly monitoring your own symptoms and strictly following the protocols not only reduces the risk of the disease, but it also allows the individual to be tested immediately when symptoms of covid-19 are present and receive treatment as soon as possible if the test appears positive.

Vaccinations for covid-19 to stimulate the production of antibodies and enhance the immune system may not be 100% effective when it comes to preventing individuals from becoming infected; however, vaccines do reduce the severity of the disease. In regards to strengthening ones' immune system and increasing the effectiveness of their immune response, the most important factor is maintaining good health which is done by consuming nutritious food, exercising, and receiving adequate rest.

The aim of this research is to study the knowledge in regards to the relationship between nutrition and strengthening the immune system as well as food consumption behaviour to enhance the immune response of grade 10-12 students in Bangkok during the covid-19 pandemic. Due to the fact that Bangkok is a highly populated area with overcrowded schools, people are more susceptible to becoming infected if they have a weak immune system. Consuming the correct types of food to strengthen ones' immune system is a behaviour people can do on a daily basis.

2. OBJECTIVE OF THE STUDY

1. Measure the knowledge, understanding and attitudes in regards to nutrition and strengthening the immune system as well as evaluate food consumption behaviour to strengthen the immune system
2. Study the factors that affect food consumption behaviour to strengthen the immune system

3. CONCEPTUAL FRAMEWORK

In order for students to have the correct attitude towards nutrition and strengthening the immune system, they must have an understanding of hygiene. This research aims to study the factors affecting the attitude towards nutrition and strengthening the immune system by utilizing Pender's logic. He claimed that one's attitude towards enhancing their health stemmed from 3 factors: 1) personal reasons, 2) cognitive behavior when it comes to health and support from other people, 3) outcome behaviors. This study mainly focuses on the second factor (cognitive behavior when it comes to health) which consists of knowing the benefits and challenges of having the correct attitude as well as knowing what one can do when it comes to food consumption to strengthen the immune system. All of this will influence hygienic behaviors as illustrated in figure 1



Figure 1

4. STUDY METHOD

This research uses predictive correlation to study the factors affecting food consumption behavior to strengthen the immune system.

5. POPULATION AND SAMPLING

The population of this study consists of grade 10-12 students in Bangkok

The sample group are Thai people between the ages of 18-60 who are currently living in Thailand and grades 10-12 students in Bangkok, with both groups being able to access the internet and are part of the online community. Subjects were chosen based on the following criterias: 1) willing to help with the research, 2) willing to be a part of the research. From a total of unknown number of citizens, calculated by using Taro Yamane's formula and establishing a level significance of 0.05, a total of 400 samples were obtained.

6. INSTRUMENT AND TOOLS

An online survey was used to conduct this research; the survey was developed by following the process of developing a survey. The details are as follows: 1. Study about general nutrition and nutrition in strengthening the immune system, the knowledge about infectious diseases, and covid-19. 2. Create a survey on the bases of the research's conceptual framework and purpose which consists of 4 parts.

1) Information about the population's gender, grade level, study program, parent's occupation, platform used to receive news about hygiene and preventing the spread of infectious diseases, and congenital diseases - a total of 7 questions

2) Questions to assess the knowledge and understanding of hygiene and ways of preventing the spread of a disease were presented as multiple choice questions; 3 choices were given with 1 correct answer. The 15 questions covered knowledge about hygiene in general, the importance of hygiene, infectious diseases, and how to prevent and manage an outbreak. A high score is equivalent to having a high level of understanding and knowledge about the topic whereas a low score means having a low level of understanding knowledge.

3) There were 8 questions to assess the participants' attitude on good hygiene with the questions being presented as a scale of 1-5. A high score corresponds to extremely willing whereas a low score means extremely unwilling.

4) Hygienic behaviors and behavior when it comes to preventing and managing an outbreak were assessed with 15 questions were also presented on a scale of 1-5. A high score corresponds to extremely willing whereas a low score means extremely unwilling.

The participants' scores for behavior in regards to food consumption to strengthen the immune system can be interpreted using 4 levels. An average of 1.00-2.00: low = participants' food consumption behavior to strengthen the immune system are considered low. An average of 2.01-3.00: medium= participants' food consumption behavior to strengthen the immune system are considered medium. An average of 3.01-4.00: low = participants' food consumption behavior to strengthen the immune system are considered high. An average of 4.01-5.00: low = participants' food consumption behavior to strengthen the immune system are considered extremely high. To assess the quality of the created survey, the researchers checked the content validity and the reliability by presenting the survey to 3 experts, they then determined whether the questions were appropriate and correct of 33 questions.

7. DATA COLLECTION

The survey was created on google forms and the link was distributed amongst grades 10-12 students by using different social platforms which is easily accessible by all students.

8. DATA ANALYSIS

1. Descriptive statistics - including frequency distribution, mean and standard deviation was used to analyze personal information about Nutrition and Immunity related knowledge.

2. Multi regression analysis was used to analyze the factors that affected Food Consumption behavior during the COVID-19 pandemic.

9. RESULTS

From the study about knowledge and behaviour in regards to nutrition and strengthening the immune system during the covid-19 pandemic of grades 10-12 students in bangkok, it has been found that there were a total of 146 respondents with the majority being female (n=103, 70.5%). Most of the participants were in grade 12 (n=56, 38.4%), followed by grade 10 (n=52, 35.6%) and finally grade 11 (n=38, 26%). It was also found that most of the participants were enrolled in a maths-science program (n=113, 77.4%), followed by the maths-art program (n=15, 10.3%) and finally, other programs that were unlisted (n=18, 12.3%). When it comes to the occupation of the parents, the parents of most participants were business owners (n=52, 35.6%), followed by employees (n=50, 34.2%), freelancers (n=17, 11.6%), other jobs unlisted (n=17, 11.6%) and health-science related jobs (n=10, 6.8%) respectively. The majority of the participants had no congenital diseases 80.8% (n=64). Most participants took no vitamins or supplements during covid-19 (n=64, 43.8%) whilst 30.1% (n=43) took the same amount both during and prior to covid-19, and 26% (n=38) consumed additional vitamins and minerals.

In regards to nutrition and immunity related knowledge, most participants had a moderate level score (M=6.00, SD=1.91). Male participants (M=6.02, SD= 2.04) scored higher than female participants (M=5.92, SD= 1.86). When looking at grade levels, grade 11 participants (M= 6.34 SD = 1.90) scored the highest, followed by grade 12 participants (M= 5.96, SD = 1.86) and participants in grade 10 scored the lowest (M=5.65, SD=1.93). Participants enrolled in a math-science program (M=6.22, SD=1.80) scored the highest, those enrolled in a math-art program (M=5.07, SD=2.12) had the next highest score whilst those enrolled in study programs not listed (M=5, SD=1.94) scored the lowest. Participants whose parent was an employee (M=6.16, SD= 1.63) had the highest scores, followed by participants whose parent was business owners (M=6.11, SD=1.87). Participants whose parent had an unlisted occupation (M=5.94, SD=1.95) had the third highest score, followed by the scores of participants whose parent had a health science occupation (M=5.40, SD=2.07) and participants whose parent were freelancers (M=5.18, SD=2.50) scored the lowest. Participants who didn't have a congenital disease (M=6.05, SD= 1.84) scored higher than those who did have a congenital disease (M=5.50, SD=2.13). Participants who didn't take any supplements and vitamins during covid-19 (M=5.98, SD=2) scored the same as participants who took the same amount of supplements and vitamins prior and during covid-19 (M=5.98, SD=1.97). Participants in both categories scored higher than participants who took more vitamins and minerals than usual (M=5.86, SD=1.71)

As for consumption behaviour to strengthen immunity, most participants had a low score (M=50.00, SD=9.10). Male participants (M=50.12, SD= 8.97) scored higher than female participants (M=49.39, SD=9.19). When comparing grade levels, participants in grade 11 (M=50.34, SD= 8.68) had the highest scores, followed by participants in grade 10 (M=49.79, SD=9.59) and participants in grade 12 (M=48.93, SD=9.04) had the lowest scores. Participants enrolled in a math-art program (M=52.93, SD=10.59) had the highest scores, those enrolled in a maths-science program (M=49.96, SD=8.65) had the second highest scores whilst those enrolled in a program not listed as a choice (M=44.56, SD=9.12) had the lowest scores. Participants who had a parent had a health-science related occupation (M=50.80, SD=7.87) scored the highest, followed by participants whose parent was a business owner (M=50.21, SD=9.27). Participants whose parent was an employee (M=49.16, SD=8.54) had the third highest scores with participants whose parent was a freelancer (M=49.12, SD=12.09) following and participants whose parent had an unlisted occupation (M=48.82, SD=8.28) had the lowest scores. Participants who didn't have a congenital disease (M=50.09, SD=8.86) scored higher than those who did have a congenital disease (M=47.53, 9.93). Participants who took additional supplements during covid-19 in comparison to before scored (M=52.55, SD=9.07) scored the highest, those who took the same amount of vitamins and minerals during covid-19 (M=51.34, SD=8.42) had the second highest scores and those who didn't take any vitamins and minerals at all during covid-19 (M=46.66, SD=8.81) scored the lowest.

Table 1: Demographic characteristic of participants, knowledge of nutrition and immunity and food consumption behavior

Variable	n (%)	Nutrition and Immunity Related Knowledge M (SD) (1-12)	Consumption Behavior for strengthen immunity M (SD) (14-70)
Gender			
Male	43 (29.5)	6.02 (2.04)	50.12 (8.97)
Female	103 (70.5)	5.92 (1.86)	49.39 (9.19)

Class			
Grade 10	52 (35.6)	5.65 (1.93)	49.79 (9.58)
Grade 11	38 (26.0)	6.34 (1.90)	50.34 (8.68)
Grade 12	56 (38.4)	5.96 (1.86)	48.93 (9.04)
Study Program			
Maths-Science	113 (77.4)	6.22 (1.80)	49.96 (8.65)
Maths-Art	15 (10.3)	5.07 (2.12)	52.93 (10.59)
Others	18 (12.3)	5.00 (1.94)	44.56 (9.12)
Parent Occupation			
Health Science	10 (6.8)	5.40 (2.07)	50.80 (7.87)
Employee	50 (34.2)	6.16 (1.63)	49.16 (8.54)
Business Owner	52 (35.6)	6.11 (1.87)	50.21 (9.27)
Freelance	17 (11.6)	5.18 (2.50)	49.12 (12.09)
Other	17 (11.6)	5.94 (1.95)	48.82 (8.28)
Congenital Disease			
No	118 (80.8)	6.05 (1.84)	50.09 (8.86)
Yes	28 (19.2)	5.50 (2.13)	47.53 (9.93)
Vitamin and Supplement Intake During COVID-19			
No	64 (43.8)	5.98 (2.00)	46.66 (8.81)
Yes, same amount as usual	44 (30.1)	5.98 (1.97)	51.34 (8.42)
Yes, higher amount than usual	38 (26.0)	5.86 (1.71)	52.55 (9.07)
Total	146 (100)	6.00 (1.91)	50.00 (9.10)

Using multi regression analysis to find factors that affected food consumption behavior to strengthen immunity during COVID-19 pandemic, it was found that gender, class level, study program, having a congenital disease, parent occupation and nutrition and immunity related knowledge did not affect food consumption behavior to strengthen immunity of the participants. The only variable that influenced food consumption behavior to strengthen immunity was the variable: vitamin and supplement intake during COVID-19 ($p > 0.01$, $\text{Beta} = 0.267$).

Table 2: Factors affecting Food Consumption Behavior.

Variable	B	S.E.	Beta	t	Sig.	95.0% Confidence Interval for B	
						Lower Bound	Upper Bound
Gender	-0.265	1.634	-0.013	-0.162	0.871	-3.496	2.966
Class	-0.184	0.877	-0.017	-0.21	0.834	-1.917	1.55
Study Program	-1.128	1.176	-0.086	-0.959	0.339	-3.453	1.198
Parent Occupation	0.146	0.519	0.024	0.281	0.779	-0.881	1.173
Congenital Disease	-1.101	1.895	-0.048	-0.581	0.562	-4.849	2.647
Vitamin and Supplement Intake During COVID-19	2.968	0.9	0.267	3.299	0.001	1.189	4.747
Nutrition and Immunity Related Knowledge	0.756	0.399	0.158	1.895	0.06	-0.033	1.544

10. DISCUSSION

Most participants reported a moderate level of Nutrition and Immunity related knowledge ($M=6.00$, $SD=1.91$) and a low level of Food Consumption Behavior during COVID-19 pandemic ($M=50.00$, $SD=9.10$). Male participants had a higher for both nutrition and immunity related knowledge and Food Consumption behavior average scores than female participants. Grade 11 students showed the highest score for both nutrition and immunity related knowledge and food consumption behavior average scores. Participants who studied Math-Science programs showed the highest knowledge scores ($M=6.22$, $SD=1.80$). Participants whose parents worked as an employee and business owner showed the highest average knowledge score whilst participants whose parents worked in the health science field reported the highest behavior score. 43.8% ($n=64$) of participants reported that they did not take any vitamins or supplements, 30.1% ($n=44$) took vitamins and supplements at the same amount as usual and 26% ($n=38$) took more vitamins and supplements than usual. Taking vitamins and supplements during COVID-19 was a predictive factor for food consumption behavior during COVID-19 of participants.

Participants' scores for nutrition and immunity related knowledge were at a moderate level most likely because the participants were in high school where basic level of nutrition education is provided but immunity related nutrition isn't taught. This knowledge can be acquired by participants through self learning via different sources of information such as social media, websites, teachers, or parents - if they are interested. Most participants who are currently high school students are fixated on preparing for college; consequently, they don't tend to turn their attention to other things². Nutrition and immunity is an advanced level of knowledge to the general population; in times when this knowledge is most needed, only a person who is interested about this topic will go educate themselves.

This study found that the average level of nutrition and immunity related knowledge of the participants was at a low level; this finding is consistent with what Alifia Bhol and et al. (2021) reported³. He conducted a survey to assess the knowledge, attitude and practice regarding immuno-nutrition during the covid-19 pandemic amongst Indians living in different countries. The survey was created on google forms and the link circulated within Indian communities in different countries through the usage of social media platforms. His data was collected from 325 Indians from 11 different countries.

Despite the participants' low leveled nutrition and immunity related knowledge scores, it was found that their food consumption behavior score was at a moderate level. This could be due to the fact that most participants, at this age, are still living with their parents; thus, their parents may be in control of their childrens' food and what they should take to prevent infections during the pandemic. A study about Thai adolescents' food consumption behavior by Paveenapat Nithitantiwat and et al. (2017) suggested that Thai adolescents have changed in comparison to the past due to the following factors: 1) knowledge 2) personal belief and values 3) economic and 4) media. Appropriate food consumption behavior is related to the individuals' health. However, the results of this study differs from that of Paveenapat Nithitantiwat and et al. (2017) regarding nutrition and immunity related knowledge and the economy most likely because the majority of the participants are under the supervision of their parents. The parents are the ones who educate their children about proper nutrition and are in control of their food consumption as well as their economic status⁴.

Nonetheless, the covid-19 pandemic has negatively affected many aspects of people's lives - including food consumption behaviors⁵. A study conducted by Thai Health (2021) found that the pandemic has affected the lifestyle and food consumption behavior amongst Thai people - it was reported that the type of food people often consumed 3-7 days per week were foods high in fat (42%), processed foods (39%), and non-alcoholic sweetened beverages (34%). This type of consumption behavior can potentially lead to NCDs in the long term.

11. CONCLUSION

Most participants reported a moderate level of Nutrition and Immunity related knowledge (M=6.00, SD=1.91) and a low level of Food Consumption Behavior during COVID-19 pandemic (M=50.00, SD=9.10). 43.8% (n=64) of participants reported that they did not take any vitamins or supplements, 30.1% (n=44) took vitamins and supplements at the same amount as usual and 26% (n=38) took more vitamins and supplements than usual. Taking vitamins and supplements during COVID-19 was a predictive factor for food consumption Behavior during COVID-19 of participants.

12. RECOMMENDATION

People should be encouraged to increase their vitamin and supplement intake in times when a strong immune system is needed. Furthermore, knowledge should be provided to the population through platforms which are easily accessible by all groups and effectively communicate the message.

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