Study the Efficacy of Vitamin C Intake Among Patients and Healthcare Professionals in Melaka General Hospital (MGH) towards Management of Covid-19

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Abstract

Consumption of some vitamins, one of them is vitamin C, have been a new routine in the community as either prevention or treatment of common cold symptom caused by Covid-19 virus. Henceforth, this study is conducted to determine the efficacy of vitamin C intake among healthcare professionals and patients in MGH. The focus point is to analyse general knowledge of vitamin C among patients and healthcare professionals in MGH with 3 specific objectives. First, to identify the influence of the education level of our respondents on their point of view about whether consuming vitamin C will be enough to prevent covid-19. Second, to evaluate the relationship between the age of the respondents and their understanding of the effects of vitamin C megadose, and thirdly, to study the frequency of vitamin C intake influence on Covid-19 diseases. A cross-sectional survey was conducted over 3 months (from March 2022 to June 2022) at the MGH. A pre-validated questionnaire was used to capture patients' and allied healthcare professionals' demographic characteristics, vitamin C related attitudes, and knowledge toward post-COVID care. The result showed a particular pattern of a significant trend for the relationship between the education level, age, and covid-19 survivors with general knowledge of vitamin C among patients and healthcare professionals in MGH. The null hypothesis has shown that all of them are not related to their knowledge of vitamin C. In conclusion, age, education level and covid-19 survivors do not impact their knowledge of vitamin C. More campaign should be held to spread awareness among our community from various education levels and age to have clearer understanding on the usage of vitamin C as the first line human immune system.

Keyword: Vitamin C, Covid-19, Cross-Sectional Survey, Chi-square Test

Introduction

Coronavirus (Covid-19) is a global pandemic with towering morbidity and at the beginning of the outbreak it became an economic burden in 2020. The World Health Organization declared a pandemic on March 12, 2020, due to thousands of deaths caused by Covid-19. Until now, 6.28 million deaths recorded around the globe reported (Bialek et al., 2020). This contagious illness easily transmits when those infected sneeze, or cough, resulting in small airborne particles containing the virus, splashed, or sprayed in the eyes, nose, or mouth, by unhealthy people, and rarely via contaminated objects. (Çalıca Utku et al., 2020).

Those symptoms can be treated without demanding special treatment. Nevertheless, those infected can also be severely ill and require serious medical treatment. Multiple therapy regimens have been tested under compassionate use indications since the commencement of the Covid-19 pandemic. Apart from remdesivir, which showed promising results and was given emergency permission by the Food and Drug Administration (FDA) to be used in the treatment of Covid-19, no antiviral drug has been demonstrated to be successful (Morgenstern, 2022). As a result, supportive therapy, such as micronutrient supplementation, for instance, vitamin C, has become an important aspect of Covid-19 therapy (Hemilä & Chalker, 2013).

Vitamin C, also known as ascorbic acid, was discovered in the early twentieth century as scientists were looking for a chemical that may induce scurvy. Ascorbic acid, or vitamin C, is a water-soluble vitamin that cannot be produced naturally by the human body (Hemilä & Chalker, 2013). During the acute stage of the coronavirus illness, vitamin C levels in serum and leukocytes are low. High production and supply of vitamin C is prominent in regulating and performing the immune system.

Clinical research has shown that taking a high-dose vitamin C supplement reduces the severity and duration of respiratory virus infections (Hemilä & Chalker, 2013). Vitamin C may be employed in the management of COVID-19 based on several findings, since it may increase the immune response to the new coronavirus (SARS-CoV-2). The SARS-CoV-2 infection causes pathological damage in part owing to direct viral pathogenicity, but the majority is due to a huge host immunological response and oxidative stress because of the free radical release (Çalıca Utku et al., 2020). Thus, comes vitamin C which is a strong reducing agent and antioxidant that interacts with oxidants generated by phagocytes, potentially affecting immune system functioning.

Since the COVID-19 outbreak in Malaysia, we all acknowledge the use of the vitamin as a shield from getting the virus. From mother to child, or doctors to their patients, they would advise consuming vitamin C as a precaution, whether they had been infected or not. This vitamin is available in various forms such as dispersible tablets, chewable tablets, capsules, and caplets, all taken based on personal preferences.

The maximum daily dose for vitamin C is 2000 mg for a healthy adult (Anis et al., 2020). A megadose of vitamin C is not dangerous in typically healthy individuals because once the body's tissues are saturated with vitamin C, absorption declines, and any excess is eliminated in urine. However, at daily doses larger than 3000 mg, side effects such as diarrhea, increased

development of kidney stones in people with renal problems or a history of stones and increased uric acid levels (risk for gouts) are likely. People who are typically healthy and well-nourished, on the other hand, have not been proven to benefit from consuming bigger doses (Anis et al., 2020). Vitamin C can swap functions and behave as a tissue-damaging pro-oxidant instead of an antioxidant in cell experiments at very high doses too.

As the demand for vitamin C has towering since the outbreak occur in Malaysia, we conducted a cross-sectional study to understand attitude and knowledge among patients and staff in MGH towards vitamin C intake as this is a possible alternative for Covid-19 prevention and therapy.

Methodology

Study Type and Design
A cross-sectional survey has been conducted over the past 3 months which is from March 2022 until July 2022 in MGH, specifically in pharmacy departments. A pre-validated questionnaire was used to capture patients and allied healthcare professionals' demographics characteristics, vitamin C related attitudes and perspective towards post-covid care.

Study Population
The questionnaires were self-administered among the patients and authorised willing providers from the pharmacy departments.

Study Sample
Convenience sampling method was used. The patients and authorised healthcare providers who fulfilled the following inclusion and exclusion criteria were invited to join the study:

Inclusion criteria:
1. Permanent pharmacy workforce including pharmacist, pharmacist assistants, provisionally registered pharmacists or healthcare assistants working in the pharmacy department in MGH.
2. Nurses with permanent posts working in medical department of HM:
3. Able to read and understand English language
4. Patients or guardians of the patients who attend to collect their medicine in the Outpatient department and Satellite 5 Outpatient department.

Exclusion criteria:
1. Allied healthcare professionals who were currently undertaking their internships in HM.
2. Allied healthcare professionals who were not willing to participate in the research.
3. Patients in HM who were not willing to participate in the research.

Calculation of sample size
A list of healthcare professionals and patients in HM (as listed in the inclusion criteria) has been obtained. The sample size of this research was limited to 200 participants and has been receiving 150 respondents who were willingly to participate in the research.

Data Collection Tool

The questionnaires contained four sections:

Section A consisted of 8 items that documented the respondents' background information.

Section B, fellow respondents were asked about basic knowledge of vitamin C with open-ended questions. The respondents can answer more than 2 answers that are available in the answer sections. Besides, 4 questions were asked about an ideal dosage of vitamin C for kids, teens, adults, and pregnant women. The respondents were also asked about the side effects of vitamin C if a person were taking more than the dose limit daily.

Section C consisted of the vitamin C attitudes survey, in which a total of 20 statements relating to qualities of basic knowledge about vitamin C and current endemic are included in the questionnaires. Each of the statements was elaborated precisely to provide a clear understanding to the respondents. Participants were asked to mark their evaluation with 100% agreement until 100% disagreement with each statement.

Section D, the participants need to answer their practice towards vitamin C intake in management of COVID-19 which is where do they know about vitamin C from, how frequently they take vitamin C, follow the recommended dosage according to their own conditions, and either they get it naturally or by taking supplements.

Data Analysis

This research has obtained the result by exporting the data and performed analysis using the IBM Statistical Package for Social Science software (SPSS) version 16.0. This research used Chi-square test to prove and show if the objective of this research has the relationship between two categorical variables that has been chosen. Statistically significant is considered the main factor in contributing to the pattern of efficacy of vitamin C in COVID-19 which was known by the two categorical variables that showed and proved that they are related. A p-value higher than $<.05$ is considered significant and related. Meanwhile if the *p*-value is under the range it is vice versa. The research is observed by collecting respondents to spend a bit of their time to answer the survey that has been distributed. Background information, attitudes survey towards Vitamin C, knowledge about vitamin C, as well as the community practice towards Vitamin C intake in management of Covid-19.

Results

Respondents' Demographic Profile (Section A)

Table 1 (Appendices) shows the demographic data of respondents from our survey. A total of 150 responded to our survey. From the survey, the majority were female (68%). Most of the respondents (80.7%) were Malays. Most respondents have a bachelor's degree as the highest education level (33.3%). Most respondents involved are students (36.7%). Other than that, the majority were single (57.3%). More than half of the participants tested COVID-19 negative (59.3%). The great mass of the respondents had their family members tested COVID-19 positive (71.3%).

Respondent Knowledge of Vitamin C (Section B)

Table 2 (Appendices) shows the respondent's knowledge of vitamin C. The answer for Q1 is 'fruits' and 'vegetables', respondents who answered 'fruits' are 144 people (96%), answered 'vegetables' are 2 people (1.3%), answered 'sun' are 3 people (2%) and answered 'do not know' is 1 person (0.7%). The answer for Q2 is 'yes', respondents who chose 'yes' are 125 people (83.3%), chose 'no' are 3 people (2%) and chose 'maybe' are 22 people (14.7%). The answer for Q3 is '15mg – 45mg', respondents who answered 'do not know' are 49 people (32.7%), answered '15mg - 45mg' are 91 people (60.7%) and answered '50mg – 80mg' are 10 people (6.7%). The answer for Q4 is '65mg – 75mg', respondents who chose 'do not know' are 44 people (29.3%), chose '15mg – 45mg' are 24 people (16%) and chose '65mg – 75mg' are 82 people (54.7%). The answer for Q5 is '75mg – 120mg', respondents who answered 'do not know' are 37 people (24.7%), answered '15mg – 45mg' are 3 people (2%) and answered '75mg – 120mg' are 110 people (73.3%). The answer for Q6 is '80mg – 120mg', respondents who chose 'do not know' are 81 people (54%), chose '15mg – 45mg' are 11 people (7.3%), chose '80mg – 120mg' are 39 people (26%) and chose '120mg – 160mg' are 19 people (12.7%). The answer for Q7 is 'diarrhea' and 'nausea', respondents who answered 'do not know' are 69 people (46%), answered 'diarrhea' are 61 people (40.7%), answered 'nausea' are 8 people (5.3%), answered 'insomnia' are 5 people (3.3%), answered 'rashes' are 1 person (0.7%), answered 'fever' are 3 people (2%) and answered 'fatigue' are 3 people (2%).

Respondent Attitude of Vitamin C (Section C)

Table 3 (Appendices) shows the respondent attitude of vitamin C. Most of them agreed that vitamin C supplement has beneficial effects in management of COVID-19 and the higher the amount of vitamin C they take, the more efficient it is. Apart from that, the majority also agreed that daily consumption of vitamin C increases their immune system and younger people with COVID-19 do not usually get severe symptoms. Besides that, most of them felt neutral about all vitamin C is the same and mega dose of vitamin C do not have any side effects because it is not considered as medication. Other than that, the majority agreed that all form of vitamin C, such as capsules, powder, liquid, chewable tablets, work the same and speak with a healthcare professional is crucial before adding this supplement to their routine.

Respondent Practice of Vitamin C (Section D)

Table 4 (Appendices) shows respondent practice toward vitamin C intake in the management of COVID-19. Most respondents were recommended by their doctors to take vitamin C daily and almost all of them adhered to it according to the recommended dose. Apart from that, the most common source of vitamin C for the great mass of the respondents was fruits. Based on the survey conducted, most of the respondents did not take any vitamin C supplements.

The influence of the education level of the respondents on their point of view about whether consuming vitamin C will be enough to prevent Covid-19

Null hypothesis: Education level and belief in vitamin C alone are enough as prevention of COVID-19 are independent.

Alternative hypothesis: Education level and belief in vitamin C alone is enough as prevention of COVID-19 is dependent.

Table 1 show a chi-square test of independence examined the relationship between education level (uneducated, PMR, SPM, STPM, Diploma, Bachelor, Master, and Ph.D.) and belief in vitamin C alone is enough to prevent COVID-19 (Table 5.6). The relationship between these variables was statistically not significant, Chi-square (28, n = 150) = 23.389, p = .713. The null hypothesis was not rejected as the p-value is more than 0.05. As the result, education level and belief in vitamin C alone are enough as prevention of COVID-19 are independent.

Table 1: Chi-square test between education level and belief in vitamin C alone is enough as prevention of COVID-19

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.389a	28	.713
Likelihood Ratio	27.416	28	.496
Linear-by-Linear Association	1.377	1	.241
N of Valid Cases	150		

a. 28 cells (70.0%) have expected count less than 5. The minimum expected count is .28

The impact of covid-19 disease on the frequency of vitamin C intake

Null hypothesis: Ever tested positive for COVID-19 and frequency of vitamin C intake are independent.

Alternative hypothesis: Ever tested positive for COVID-19 and frequency of vitamin C intake are dependent.

A chi-square test of independence examined the relationship between ever tested positive for COVID-19 and frequency of vitamin C intake as shown in Table 2. The relationship between these variables was statistically not significant, Chi-square (3, n = 150) = 7.753, p = .051. The null hypothesis was not rejected as the p-value is more than 0.05. As the result, the ever-tested positive for COVID-19 and frequency of vitamin C intake are independent.

Table 2: Chi-square test between ever tested positive for COVID-19 and frequency of vitamin C intake

|	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.753a	3	.051
Likelihood Ratio	8.134	3	.043
Linear-by-Linear Association	7.129	1	.008
N of Valid Cases	150		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 2.44

Discussion

150 respondents responded to the study of efficacy vitamin C intake among patients and healthcare professionals in MGH on management of Covid-19. Aims of the study are to determine 3 objectives. First, to identify the influence of the education level of our respondents on their point of view about whether consuming vitamin C will be enough to prevent covid-19. Second, to evaluate the relationship between the age of the respondents and their understanding of the effects of vitamin C megadose, and third, to study the impact of covid-19 disease on frequency of vitamin C intake.

Firstly, we want to determine whether education level influence the belief in vitamin C alone is enough to prevent Covid-19. The null hypothesis for this objective is education level and their point of view about whether consuming vitamin C will be enough to prevent covid-19 are independent. Based on the findings, the result indicated that they are not statistically significant with each other, with $p > 0.05$, thus we do not reject the null hypothesis. 13 respondents were strongly agreeing that vitamin C can prevent themselves from covid-19 while 17 respondents were strongly disagreeing with the statement. Based on **figure 1**, the most significant answers are from STPM and diploma students, who strongly disagree with the statement. This contradicts the hypothesis which suggests that with a higher level of education, they will be more cautious in the prevention of covid-19, not only rely on one supplement. The result met our expectations and support our hypothesis in this objective. This result indicates that there should be more variety of micronutrients and some more prevention such as wearing a mask, frequent hand washing, or maintaining a safe distance which is 1 meter with one another are more significant as prevention of COVID-19. Vitamin C doesn't seem to make you any less likely to acquire a cold, according to research on its efficiency against viruses that cause the common cold, but it may help you recover from a cold faster and lessen the severity of the symptoms (Hemilä et al., 2013). Prevention of Covid-19 is not about protecting we only but also about protecting others.

Figure 1: Respondents' Likert scale on belief in vitamin C alone is enough to prevent covid-19
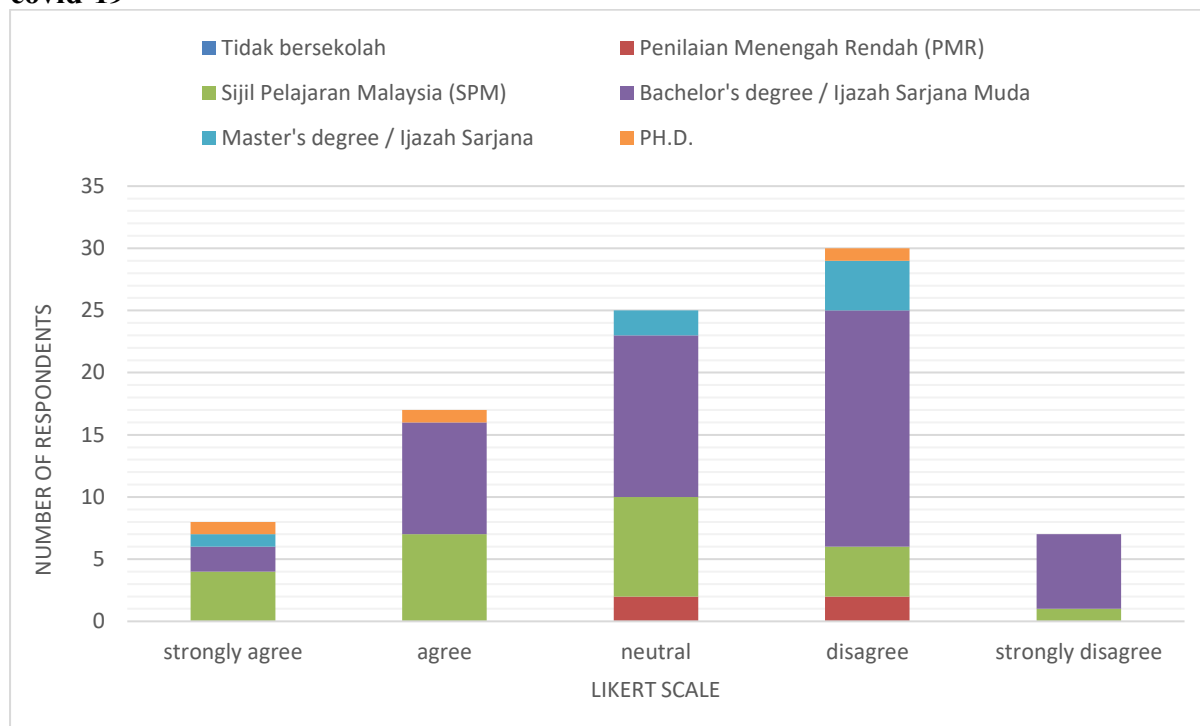
Relationship between age and awareness of the adverse effects of megadose vitamin C.
Second objective is to determine the relationship between age and awareness of the adverse effects of megadose vitamin C. The result as shown in **figure 2**. The null hypothesis for this objective is age and awareness of the adverse effects of vitamin C overdose are independent. Based on the findings, the result indicated that they are not statistically significant with each other, with $p>0.05$, thus we do not reject the null hypothesis. Next, from the total respondent of 153, there is 54% of the respondent responded with at least knowing one side effect of overdoing vitamin C. The hypothesis was not rejected because the 46% of respondents who answered, 'i don't know', 33% of it came from age 21-30. This contradicts the hypothesis which suggests that age more than 60 is more prone to not knowing the side effect of overdoing vitamin C.

Figure 2: Respondents' answer on overdosage of vitamin C
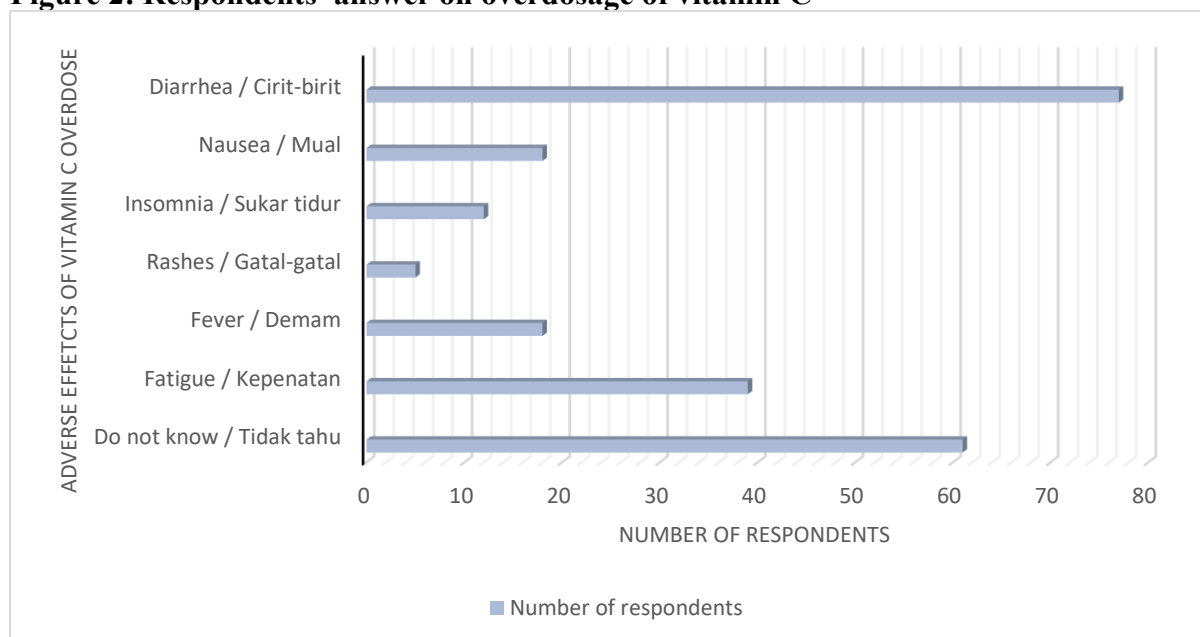
Relationship between the frequency of vitamin C intake and positive for Covid-19

Finally, our objective is to certify the relationship between ever testing positive for Covid-19 and the frequency of vitamin C intake. The null hypothesis for this objective is ever tested positive for Covid-19 and the frequency of vitamin C intake is independent. Based on the findings, the result indicated that they are not statistically significant with each other, with $p > 0.05$, thus we do not reject the null hypothesis. 93 respondents (62%) take vitamin C supplements daily while 40 respondents (26.7%) take vitamin C once a week. Based on **figure 3**, the most significant thing we can analyse is that respondents who have not experienced COVID-19 disease take their vitamin C supplement once a week or daily, 28 and 46 people respectively. Hence this can prove that not only respondents who tested positive implement vitamin C consumption habits in their daily life, but healthy people also consume this micronutrient as a daily supplement to boost their immune system to fight COVID-19. Here we can see that this result can be attributed to the self-awareness regarding health wellness among the respondents as most of the respondents are familiar with COVID-19 and some ways which act as prophylaxis to the disease. That explains why they have a positive practice regarding the frequency of vitamin C intake. Furthermore, with constant awareness being brought by the Ministry of Health of Malaysia activities especially regarding the importance of self-management to fight COVID-19, the benefits of consuming micronutrients and more, lead our community who are the respondents in our study to consume vitamin C frequently. It included believing that vitamin C can increase the immune system and the importance of consuming additional micronutrients can give us a myriad of advantages to the body.

Figure 3: Frequency of vitamin C intake among respondents
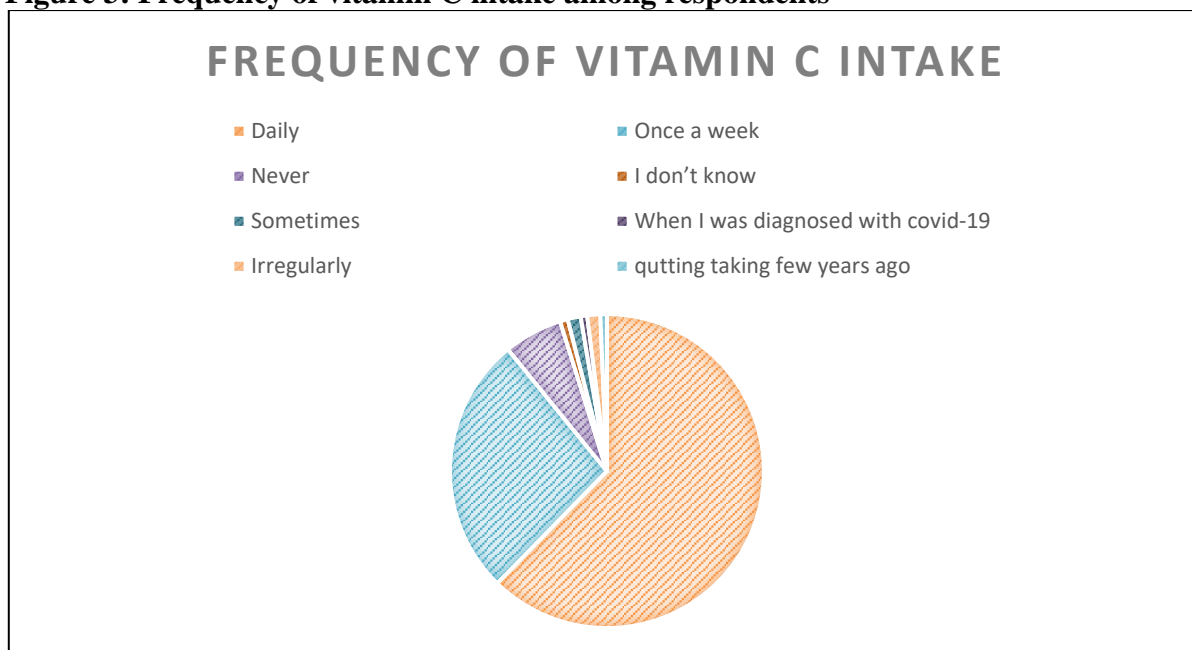
Conclusion

In conclusion, among the 150 respondents with different education levels, 43 respondents (29%) strongly agree, compared to 8 respondents (52%) who agree. This demonstrates that most educated people practice the importance of consuming more vitamin C. Due to their general understanding, deeper learning from one level to the next is likely to have an impact on the prioritization of their health. Plus, 42 respondents (28%) were neutral on the statement, while 45 respondents (30%) disagreed. This finding suggests that a greater variety of micro-nutrients is needed and that certain mole preventive methods like donning a mask, often washing your hands, or keeping a safe distance of one meter between you and another person are particularly Important for preventing COVID-19. This research has limitation and difficulty attracting more patients to fill out the surveys and some of them are declined to fill out these surveys. This research also lacked the resources necessary to prepare our results since there is still a lack of studies regarding the use of vitamin C in Covid-19 management. Finally, it is recommended to do further research with a bigger sample size that includes many more towns and random sampling with educational intervention.

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