

Vitamin C Consumption Affects the Treatment Period of Covid-19 Patients at Dr Pirngadi Regional General Hospital

Virani Mahardika¹, Ikhfana Syafina², Sri Rezeki Arbaningsih³, Hapsah⁴

¹Faculty of Medicine, Muhammadiyah University of Sumatera Utara, Jalan Gedung Arca Nomor 53 Medan 20217, Sumatera Utara

²⁻³Departement of Pulmonology, Muhammadiyah University of Sumatera Utara, Jalan Gedung Arca Nomor 53 Medan 20217, Sumatera Utara

Corresponding Email: viranimh01@gmail.com

Abstract: *Severe Acute Respiratory Syndrome Coronavirus-2* (SARS-CoV-2) or what we now know as *Coronavirus disease* (COVID-19) is a viral infection that has hit the world in the last three years. The management of patients confirmed with COVID-19 continues to be researched. Vitamin C is one of the therapies that can be given to COVID-19 patients from mild to severe or critical degrees. Vitamin C is an antioxidant whose function can reduce oxidative inflammation and greatly affect the human immune system. The dose of vitamin C administration in COVID-19 patients can be given up to high doses. Due to the protective properties of vitamin C, it can affect the treatment period of COVID-19 patients. This study aims to determine the relationship between vitamin C consumption and the length of treatment of COVID-19 patients at DR Pirngadi General Hospital. This study is an observational analytical study with a *cross-sectional design*. A total of 66 samples were obtained divided into low and high doses of vitamin C which were then analyzed using *Chi Square*. The results of the study found that there was a significant result ($P=0.039$) in the relationship between vitamin C consumption and the treatment period of COVID-19 patients. Vitamin C consumption affects the treatment period.

Keywords: COVID-19, Vitamin C dosage, treatment time

INTRODUCTION

Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) currently known as COVID-19 is an infection caused by a virus and has hit the world in the last three years.¹ The COVID-19 virus was first reported in Wuhan City on December 31, 2019, initially the case was a mysterious case of pneumonia. The virus spread to other countries and in January 2020, the WHO designated the outbreak as a *Public Health Emergency of International Concern* (PHEIC) which was later

designated as a pandemic on March 11, 2020. The spread of the COVID-19 virus is transmitted through splashes with the most symptoms, namely dry cough, fever, and difficulty breathing which arise starting from the fifth day after exposure to the virus.²

The World Health Organization (WHO) recorded COVID-19 cases from the end of 2019 to June 2022, the number of cases worldwide that were confirmed positive had reached 535,863,950 cases, which included 6,314,972 deaths due to COVID-19 infection. Some of the countries

that also have the most confirmed positive cases of COVID-19 are the United States with 85,007,630 cases, then India with 43,270,577 cases, and followed by Brazil with a total of 31,611,769 cases. COVID-19 in Southeast Asia also has the most cases as in the European Continent. Southeast Asia accounted for 58,305,870 cases with 789,407 deaths due to COVID-19.³

Indonesia announced its first case on March 2, 2020, and then the COVID-19 virus spread so quickly that as of June 19, 2022, there have been 6,068,075 confirmed cases and 156,687 deaths.⁴ The largest accumulation of COVID-19 incidents in Indonesia fell to the city of Jakarta which has 1,257,229 cases and for North Sumatra to date 155,122 people have been recorded who have been confirmed positive with a total of 3,258 deaths. In North Sumatra, Medan City is ranked first with a total of 72,912 cases as of May 6, 2022.⁵

Vitamin C is an antioxidant whose function can reduce oxidative inflammation and greatly affects the human immune system as a result of the effect of increasing the synthesis of *vasopressor* that vitamin C has.¹ Phagocyte cells, such as neutrophils, can accumulate vitamin C and kill microbes by increasing phagocytosis, chemotaxis and reactive oxygen. Vitamin C has been shown to ward off free radicals and protect cells from damage caused by the presence of *Reactive Oxygen Species* (ROS).² In leukocytes, vitamin C also accumulates 500-100 times as high as in plasma cells. When the formation of *Reactive Oxygen Species* (ROS) occurs, it will be followed by pro-inflammatory transcription factors such as *Nuclear Factor* kB (NF-kB), this will have an impact on the therapy that can be given in cases of COVID-19 infection.⁶

In a study conducted in China, IV administration of vitamin C at a dose of 10 grams per day in patients with moderate COVID-19 can accelerate the treatment period which initially ranges from 7-10 days to 3-5 days.⁷ In Indonesia, as many as 54 samples in a study conducted at Bitung

Hospital, North Sulawesi Province, showed that vitamin C is a good management of COVID-19 because it is proven to shorten the treatment and healing process of COVID-19 patients.⁸

The dosage of vitamin C use in Indonesia can be seen in the book published by the Indonesian Pulmonary Doctors Association (PDPI) edition 4, namely 200-400 mg/8 hours given intravenously and an oral dose of 500 mg which can be given for COVID-19 patients 2 times a day during the treatment period at mild and moderate degrees. Even vitamin C is still given to severe or critical patients with the same dose.⁹

This study aims to determine the relationship between vitamin C consumption and the length of treatment of COVID-19 patients at DR Pirngadi General Hospital.

METHOD

This type of study is an analytical observational study using a *cross-sectional research design* in which the researcher analyzes the relationship between 2 variables, namely vitamin C dose as an independent variable and treatment period as a dependent variable and measured in one measurement. This research was conducted at the Dr Pirngadi Regional General Hospital, Medan from October 2022 – November 2022. The sample of this study was a moderate COVID-19 patient who was treated in an isolation room at Dr Pirngadi Hospital, Medan in May – July 2021. Sampling followed the inclusion and exclusion criteria with *the total sampling* technique and the total sample obtained was 66 samples.

This study took data in the form of secondary data which included the patient's identity, the number of doses of vitamin C given, and the length of treatment of the patient while in the isolation room. Then the data obtained has been analyzed using *Chi-Square data analysis*.

RESULT

Table 1. Distribution of Demographic Characteristics by Gender

Gender	Q (n)	Percentage (%)
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Man	18	27,3%
Woman	48	72,7%
Total	66	100%

Table 1. describes the demographic characteristics by gender divided by men who amounted to 18 people (27.3%) and women who had the most gender as many as 48 people (72.7%).

Table 2. Distribution of Demographic Characteristics by Age

Age	Qt (n)	Percentage
16 – 20 y.o	12	18,2%
21 – 25 y.o	9	13,6%
26 – 30 y.o	11	16,7%
31 – 35 y.o	19	28,8%
36 – 40 y.o	15	22,7%
Total	66	100%

Table 2 explains that the demographic characteristics based on the most age are 31 – 35 years old, which is 19 people (28.8%) followed by 36 – 40 years old as many as 15 people (22.7%), age 16-20 years old as 12 people (18.2%), 26 – 30 years old as many as 11 people (16.7%), and 21 -25 years old as many as 9 people (13.6%).

Table 3. Distribution of Demographic Characteristics by Occupation

Work	Qt (n)	Percentage (%)
Student	21	31,8%
Doctor	1	1,5%
Private Employees	1	1,5%
Nurse	2	3,0%
Teacher	1	1,5%

Prison Guards	1	1,5%
Self-employed	9	13,6%
Private Employees	8	12,1%
Students	1	1,5%
Civil Servants	6	9,1%
Housewives	10	15,2%
Not working	4	6,1%
Makeup Artist	1	1,5%
Total	66	100%

Table 4.3 explains that the demographic characteristics of patients based on the most occupations are 21 students (31.8%) compared to IRT as many as 10 people (15.2%), patients with self-employed jobs as many as 9 people (13.6%), patients with jobs as private employees as many as 8 people (12.1%), civil servants as many as 6 people (9.1%), patients who do not work as many as 4 people (6.1%), nurses as many as 2 people (3.0%), and there are 1 person (1.5%) each with jobs as doctors, private employees, teachers, prison guards, students, and makeup artists.

Table 4. The Relationship of Vitamin C Consumption to Treatment Time

	Treatment Time				P Value
	Non Prolonged		Prolonged		
	N	%	N	%	
High Dose	19	38,8	2	11,8	0,039
Low Dose	30	61,2	15	88,2	
Total	49	100	17	100	

DISCUSSION

The results showed that the most genders affected by COVID-19 were women who amounted to 48 people (72.7%) and men amounted to 18 people (27.3%). This is in line with research from Yaslina *et al*, which found that the percentage of COVID-19 incidence in women (82%) is higher than in men (18%).¹⁰ This research is also in line with research by Fortunato *et al* with the number of COVID-19

patients obtained as many as 1175 patients and 596 patients of which were female (50.7%).¹¹ These results are related to the research conducted by Putri *et al* with the results obtained that women suffer more from COVID-19 with a total of 40 people (54%) than men (46%) of the total samples obtained.¹² This is also in line with the research by Samrah *et al* which obtained a total sample of 157 people and more than half of them were women, namely 90 people (57.3%).¹³

The results of this study based on age characteristics were obtained from the age range of 31 – 35 years more infected with COVID-19 followed by the age range of 36 – 40 years. In this study, the age range taken was 18 – 40 years old. This is in line with research from Ayu *et al* found that adults (26 – 45 years) have the highest risk of COVID-19.¹⁴ This is also in line with research from Nela *et al* where out of a total of 54 samples, the most patients aged 26-44 years were 50 people (92.6%).⁸ These results are also in line with research by Elviani *et al* which found that the age range of 26 – 35 years (23.9%) had the highest risk of being confirmed to have COVID-19.¹⁵

The results obtained are also in line with research by Agus which shows that the age range of 31 – 45 years dominates the incidence of COVID-19 because it is included in the productive age. At that age, mobility is high, especially for people who have jobs, so the possibility of high interaction between others can trigger vulnerability to COVID-19.¹⁶ The ease with which a person is exposed to COVID-19 can be seen in the patient's immune response. Generally, this is based on increasing age, the body's ability to fight infections will be lower due to a physiological decline in the immune system due to low immunoglobulin production. It can also be accompanied by a decrease in the production of T cells and B cells that play a role in controlling viral infections, including in patients with comorbidities.¹⁷

From the results of this study, the results of sample characteristics based on work showed that a total of 66 samples, only 4 samples did not work and were confirmed to have COVID-19. This is in line with research by Ayu *et al* obtained results that 655 people (56%) have a higher risk of COVID-19 than people who do not work.¹⁴ In line with research by Yaslina *et al*, people who work mainly as

health workers have a higher chance of getting COVID-19.¹⁰ The high incidence of COVID-19 in health workers is due to close contact and direct interaction with patients. In addition, there is a lack of compliance in the use of personal protective equipment (PPE) both when using and removing PPE, plus limited workspace, making it difficult for health workers to implement *physical distancing*.¹⁸ This is also in line with the results of research from Ekadipta *et al* who obtained results of 48 samples working as self-employed and followed by 43 samples as students.¹⁹ is also in line with research by Rahman *et al* where the majority of people at risk of being infected with COVID-19 are working as private employees, civil servants, and students.²⁰

In this study, on average, patients were given high-dose vitamin C administration and more patients had a shorter duration of treatment. These results are similar to the study by Makmun *et al* which obtained evidence that the results of giving high doses of vitamin C can accelerate the recovery period of COVID-19 patients and can be seen from the clinical picture after being given therapy.² In line with the study by Kumari *et al*, significant results ($P < 0.0001$) were obtained and showed that COVID-19 patients who received vitamin C spent less time in the hospital.²¹

The statistical results using *chi-square* obtained the conclusion of the related results, namely $P = 0.039$ ($P < 0.05$) regarding the relationship between vitamin C consumption and the treatment period of COVID-19 patients. The results of these statistics found that there was a relationship between the high dose of vitamin C consumption and the treatment period. The results of this study are in line with a study by Brownstein *et al* conducted on patients who were confirmed to have COVID-19 and given high-dose oral vitamin C supplements when symptoms first appeared. The study was monitored for 4 days after administration and obtained results of improvement in symptoms that are generally felt by moderate COVID-19 patients. Such as cough, fever, flu, and shortness of breath. The patient even showed an improvement in symptoms after 4 days of vitamin C administration and a recovery on the sixth day.²² This is also in line with research conducted by Hamidi *et al* where COVID-19

patients who were given vitamin C orally at a high dose of 1500 mg/kg where 2 of the patients were ICU patients and experienced the initial symptoms of cough, fever, and headache that were complained of before the patient entered the ICU room. After monitoring and therapy, the patient's oxygen levels increased and reached 96% on the second day the patient was given therapy. Then, on the fourth to sixth day, the patient's consciousness improved and the fever decreased. One patient also experienced the same complaint and was given a dose of vitamin C of 1500 mg/kg after being given management, the patient's condition improved and even the patient was able to leave the ICU room on the ninth day. This shows that high doses of vitamin C can not only accelerate the patient's treatment period in the isolation room but can also reduce the risk of patient mortality and shorten the length of the patient's stay in the ICU room.²³

High doses of vitamin C are used on average by intravenous administration of 2 grams at moderate degrees to reach 10 grams for severe or critical degrees, for oral administration vitamin C can be given in doses of 6000 mg, but it is only given to COVID-19 patients with a certain degree.¹ In this study, moderate COVID-19 patients were given a maximum of up to 1500 mg dose of vitamin C. The duration of treatment obtained from the administration of vitamin C has an average of 4 – 7 days until the patient is completely healed.²²

The results of this study are also strengthened by a study by Fowler *et al* conducted on COVID-19 patients where a comparison of intravenous vitamin C administration from a dose of 200 mg/kg bb/day showed a higher improvement result than vitamin C given at a dose of 50 mg/kg bb/day. The subjects of the study were also given to patients with severe symptoms such as ARDS and sepsis.²⁴ The study is also in line with a meta-analysis study by Hemila *et al* which obtained significant results that the administration of high doses of vitamin C intravenously and orally can shorten the treatment period of patients, even in ICU patients.²⁵ This is in line with the research by Khan *et al* where patients who were given high doses of vitamin C had a shorter duration of treatment than patients who were not given high doses of vitamin C. where the research subjects

used were aimed at patients with the use of mechanical ventilation and could be removed on the fifth day of use.²⁶

CONCLUSION

Based on the results of a study conducted at Dr Pirngadi Hospital Medan on the relationship between vitamin C consumption and the treatment period of COVID-19 patients, it is concluded that:

1. The results of the analysis data were obtained with the demographic characteristics of the sample of the most females, namely 48 people (72.7%) compared to males who amounted to 18 people (27.3%).
2. Based on the results of the analysis, the demographic characteristics of the sample were obtained.
3. Most are aged 31 – 35 years old (28.8%) with a total of 19 people.
4. Based on the results of the analysis, the demographic characteristics of the sample that have a risk of being infected with COVID-19 were obtained, namely 21 students (31.8%).
5. The administration of a high dose of vitamin C of 1500 mg for the duration of hospitalization of COVID-19 patients has an average treatment period of 3-7 days.

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