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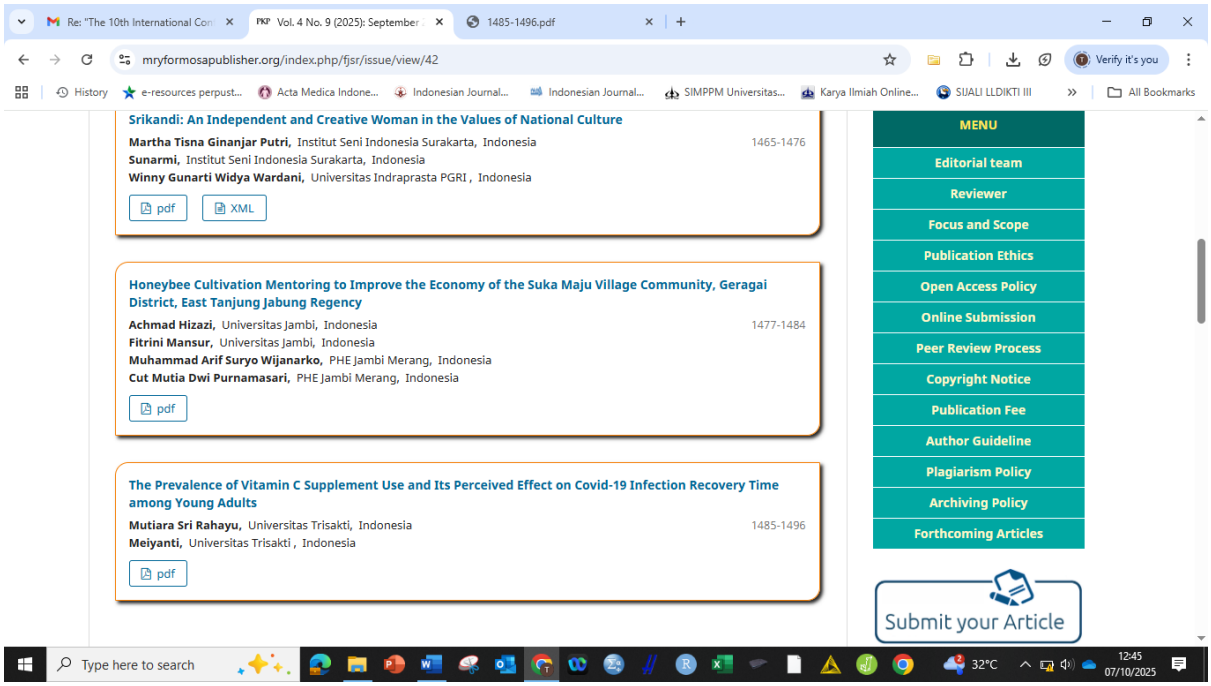

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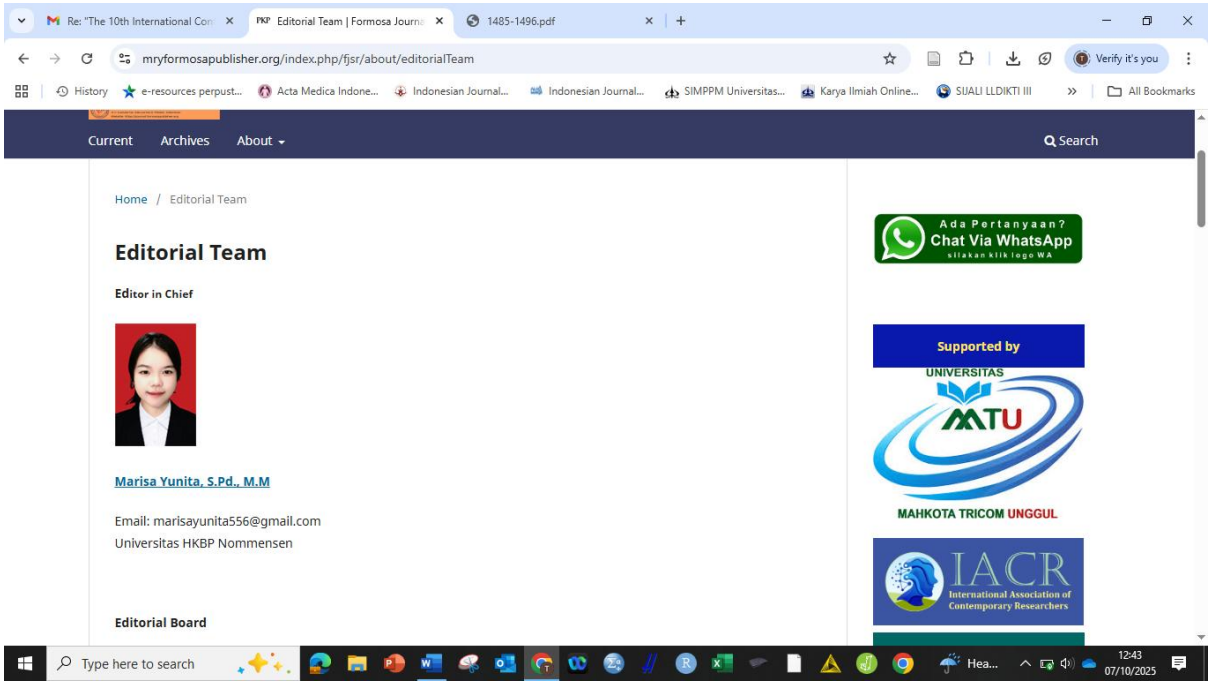

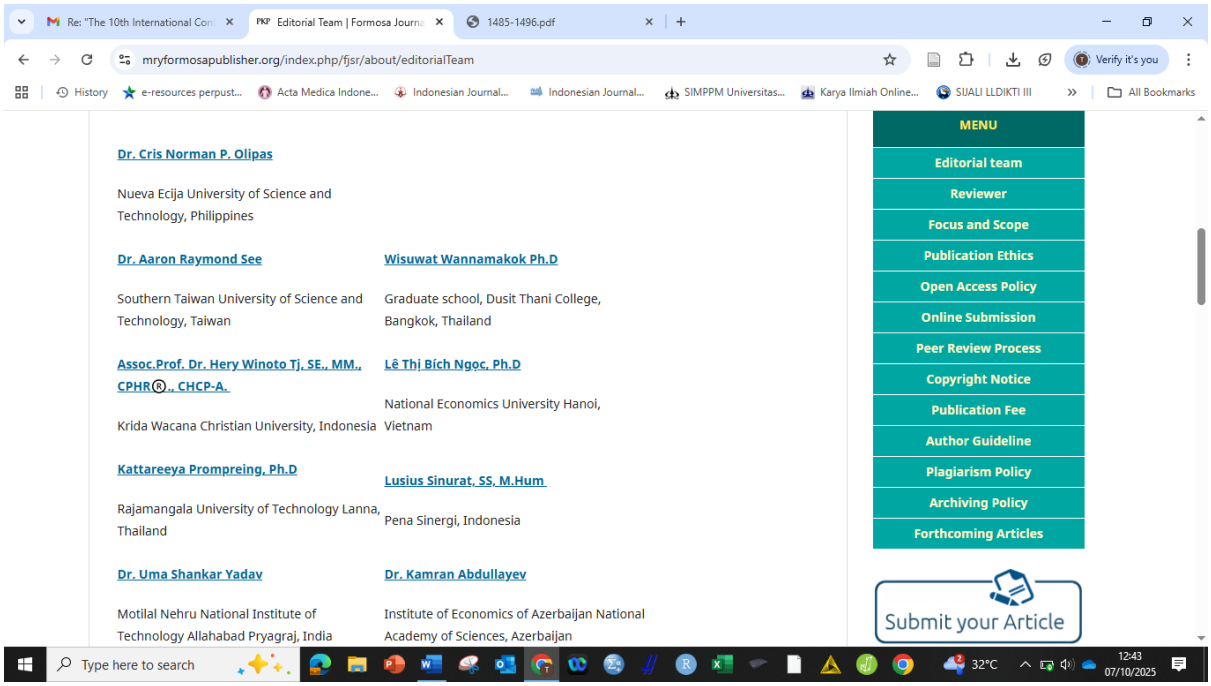

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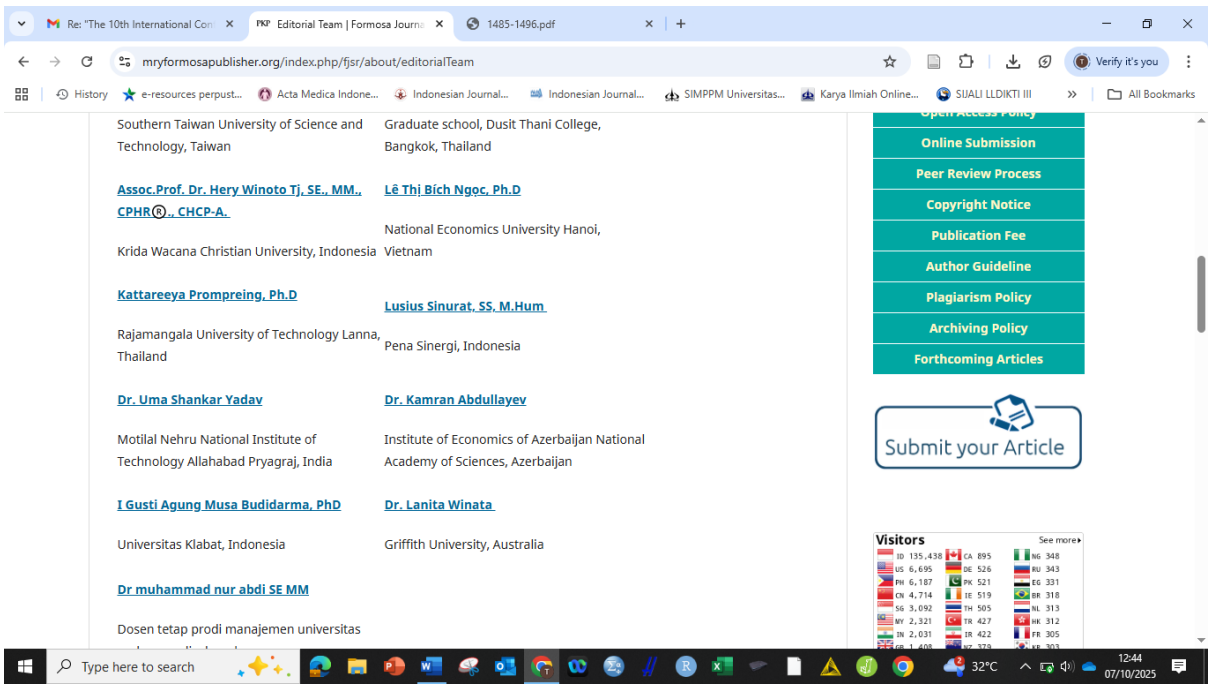

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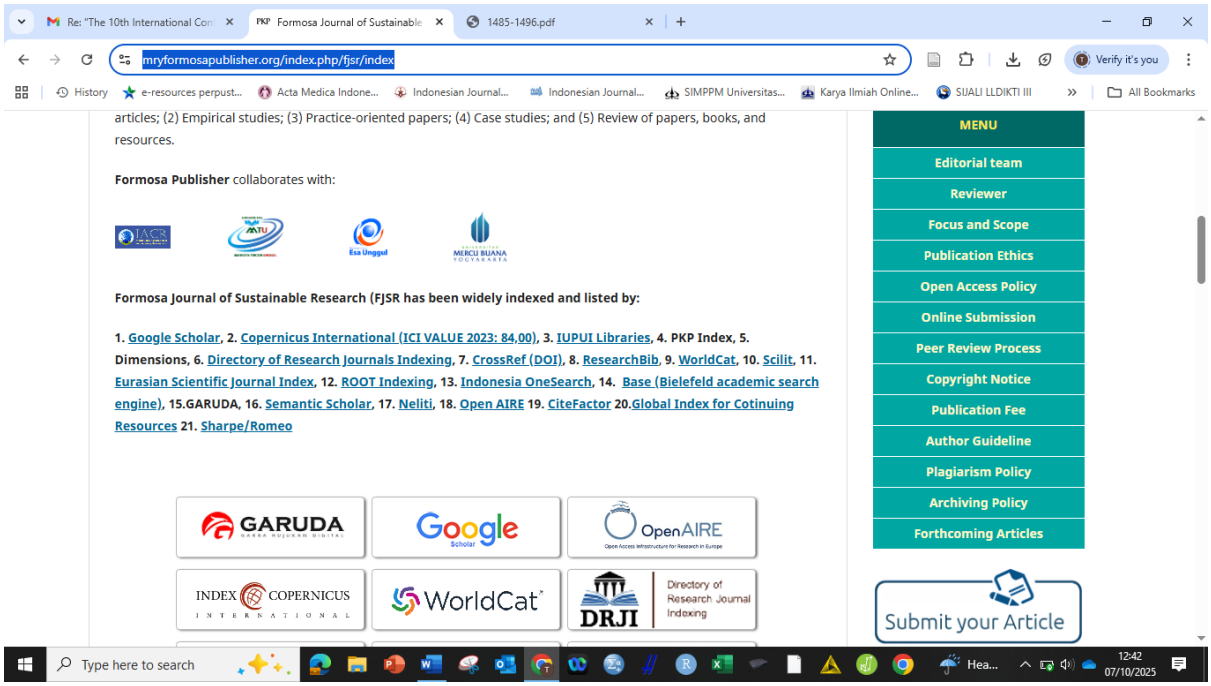
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The Prevalence of Vitamin C Supplement Use and Its Perceived Effect on Covid-19 Infection Recovery Time among Young Adults

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ABSTRACT

Background: Young adults are a high-risk group for COVID-19 exposure due to their participation in social interaction activities. Recovery from COVID-19 is influenced by immune and nutritional factors, including vitamin C supplementation. Methods: A cross-sectional analytical observational study was conducted on 94 COVID-19 patients who recovered in Grogol Village, West Jakarta. Data were collected through questionnaires and analysed using Chi-square test in SPSS version 29. Results: Most respondents (94.7%) consumed vitamin C supplements, with tablets being the most common form (49.5%) and obtained through a doctor's prescription (50%). Most respondents recovered within ≤14 days (87.2%). Statistical analysis showed no significant association between vitamin C supplement consumption and recovery time (p-value = 0.503). Conclusion: Vitamin C supplements were not found to affect the recovery duration of adult COVID-19 patients

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INTRODUCTION

Early adulthood is a transitional period from adolescence to more advanced adulthood. This transition involves moving from a stage of constant dependence to becoming more economically independent, having the right to choose activities, and engaging in things that interest them. The changes from adolescence to adulthood are accompanied by continuous developments. According to population census data from 2020, those born between 1997 and 2012, estimated to be between 8 and 23 years old, account for about 27.94% of Indonesia's total population and fall into the Gen Z category. This indicates that almost one-third of Indonesia's population is in early adulthood (BPS, 2021). This transitional period can lead to a tendency to interact with others and go out of the house, which increases the likelihood that individuals in early adulthood are more at risk of contracting COVID-19.

Coronavirus Disease 2019 (COVID-19) is a new health problem caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (Sars-CoV-2). (Amalia & Mashabi, 2023; Susilo et al., 2020) The coronavirus is generally transmitted through respiratory droplets. COVID-19 is transmitted via droplets from a distance of less than two meters. In addition to droplets, the disease can also spread through the air with smaller particle sizes. This results in human-to-human transmission and has spread globally to various countries, causing a pandemic over several years. (Susilo et al., 2020) As of January 27, 2021, the daily development in the management of COVID-19 continues to increase, reaching around 10,974 people. The daily addition of recovered cases has increased the total number of patients declared recovered from COVID-19 to 831,330 people, or 81.2%. According to COVID-19 Analysis data, the recovery rate for ages 19 – 30 is 25% of the total. (KemenkesRI, 2020)

The recovery rate of COVID-19 patients is greatly influenced by many factors, such as the immune system, nutrition, habits, comorbid diseases, etc. When various types of infections attack the body, the immune system plays the main role in fighting the infection. However, for immune cells to function properly, they are influenced by various factors, one of which is the use of vitamin C. (Putra Barus & Tehja, 2021) The coronavirus is a pathogen that attacks the immune system, making the body unable to fight the invading virus, but vitamin C is a substance that can enhance neutrophil migration, phagocytosis, antioxidant formation, and combat microbes..(Tegally et al., 2022) Vitamin C also plays a role in enhancing the programmed cell death of neutrophils by the body, the clearance of neutrophil debris by macrophages, and reducing neutrophil damage so that host tissues are protected and cellular immune function is maintained because there is no cell damage. This is why vitamin C can be considered as one of the treatments for COVID-19 infections and other viral infections. (Elviani et al., 2021)

Several previous studies have been conducted to examine the relationship between vitamin C consumption and the recovery duration of COVID-19 in young adults aged 18-24, with varying research results. Studies by Heidra et al. and Hemilä et al. showed that vitamin C consumption is associated with COVID-19 recovery. (Hemilä et al., 2021; Hiedra et al., 2020) However, research

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conducted by Thomas et al. and Zhank et al. concluded differently, stating that vitamin C consumption was not significantly related to COVID-19 recovery.(Angraini, 2014; Zhang et al., 2021) Therefore, further research is needed to examine the relationship between vitamin C consumption and the duration of COVID-19 recovery in young adults aged 18-24 years.

METHODS

This study uses an analytical observational design, with a cross-sectional method, which aims to examine the relationship between vitamin C supplement consumption and the recovery duration of COVID-19 patients in early adulthood. The sample in this study consists of early adulthood age groups, and the research was conducted in the Grogol Pertamburan sub-district, West Jakarta province. The research sample was selected using consecutive non-random sampling. Inclusion criteria in this study include males and females aged 18-24 years, having a history of mild COVID-19 infection within approximately the past year, and willing to participate in the study by signing an informed consent form. Exclusion criteria include patients with comorbidities and COVID-19 patients who were hospitalized.

Based on sample calculations using the finite infinity sample calculation formula no = $za^2 \times p \times q / d^2$, with a recovery prevalence value of 25%, the minimum required sample size is 81 people. The total sample for this study was 94 respondents from completed questionnaires given to recovered COVID-19 patients to obtain data on subject characteristics, history of mild COVID-19 with complaints or symptoms (fever, cough, sore throat, headache, loss of smell and taste), and daily activities in Grogol, specifically in the Grogol subdistrict work area. Data analysis was carried out using the chi-square test or Fisher's exact test with a significance level of 95%, considered significant if $p < 0.05$, and not significant if $p \geq 0.05$. Statistical analysis was conducted using SPSS version 29.0. This research has received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Trisakti University, No. 107/KER-FK/VII/2022.

RESULT AND DISCUSSION

This study involved 94 research respondents. The results showed that the majority of respondents were female, totaling 63 respondents (67%), with the most common income below the regional minimum wage (UMR), accounting for 58 respondents (61.7%), and the most common education level was higher education, with 92 respondents (97.9%).

Table 1. Characteristics of Respondents (n=94)

Variables	n=94	Percentage (%)
Gender		
Male	31	33.0
Female	63	67.0
Economic Level		
≥ UMR	36	38.3
≤ UMR	58	61.7
Education Level		
Low	2	2.1
High	92	97.9
Vitamin C supplement		
yes	89	94.7
No	5	5.3
Recovery Time		
≤ 14 Days	82	87.2
≥ 15 Days	12	12.8

Description: UMR: Regional Minimum Wage (Rp 4,400,000)

Table 2. Usage, Sources, And Frequency of Vitamin C Supplement Consumption

variables	n=94	Percentage (%)
The use of vitamin C supplements		
Recipe	47	50.0
Non recipe	42	44.7
Do not consume	5	5.3
Vitamin C supplement preparation		
Foof / Drink	7	1.1
Vitamin C Tablet	47	49.5
Vitamin combination	34	35.8
Do not consume	5	6.3
Frequency of vitamin C supplement consumption		
0-2 times	20	21.3
3-5 Times	20	21.3
Everyday	49	52.1
No	5	5.3

The results in Table 1 show that out of 94 early adult respondents, most consumed vitamin C, which amounted to 89 respondents (94.7%), and early adults who recovered in less than 14 days amounted to 82 respondents (87.2%). The source of vitamin C intake was mostly obtained through doctor prescriptions, totaling 47 respondents (50%). Based on the dosage form, the most commonly consumed form was tablets, with 47 respondents (49.5%), and all respondents who consumed vitamin C supplements did so orally, with none

using injectable forms. The majority of the vitamin C user group took this supplementation daily, amounting to 49 respondents (52.1%). (Table 2)

Table 3. The Relationship Between Sociodemographic Characteristics and Vitamin C Supplement Consumption with the Duration of COVID-19 Recovery

Variables	Recovery Time for COVID-19				Total (%)	p
	≤ 14 Days		≥ 15 Days			
	N	%	N	%		
Gender						
Male	25	80.64	6	13.36	31 (100)	0.201
Female	57	90.47	6	9.53	63 (100)	
Economic Level						
≥ UMR	29	80.55	7	19.45	36 (100)	0.202
≤ UMR	53	91.37	5	8.63	58 (100)	
Education Level						
Low	2	100	0	0	2 (100)	1.000*
High	80	86.95	12	13.05	92 (100)	
Vitamin C						
yes	78	87.64	11	12.36	89 (100)	0.503*
No	4	80	1	20	5 (100)	

* = *fisher Test*

In Table 3 above, it can be seen that among female respondents who experienced COVID-19, 90.47% required less than 14 days to recover, which is higher compared to males at 80.64% (p=0.201). Based on the chi-square test results showing p > 0.05, there is no significant relationship between gender and the duration of COVID-19 recovery in early adulthood.

In Table 3 above, it can be seen that among female respondents who experienced COVID-19, 90.47% required less than 14 days to recover, which is higher compared to males at 80.64% (p=0.201). Based on the chi-square test results showing p > 0.05, there is no significant relationship between gender and the duration of COVID-19 recovery in early adulthood.

In Table 3 above, it can also be seen that among patients who consumed vitamin C while experiencing COVID-19, 87.64% required less than 14 days to recover, which is higher than those who did not consume vitamin C, at 80% (p=0.503). Based on the Fisher's test results, p>0.05, meaning there is no relationship between the consumption of vitamin C supplements and the duration of COVID-19 recovery in young adults.

Based on the results of this study, more respondents recovered within ≤ 14 days. Similar results were also obtained from a study in Ethiopia, where the average recovery time was 11 days. (Kassie et al., 2023) However, this differs from another study in Ethiopia on patients receiving care at WURH, where the average recovery time was 18 days. (Tolossa et al., 2021) A study in Tehran reported an average of 13.5 days. (SeyedAlinaghi et al., 2021) Meanwhile, studies in India and Italy reported average recovery times of 25 and 24 days, respectively. (Benoni et al., 2020; Pratim et al., 2020) Recovery from COVID-19 is influenced

by many factors such as nutrition, age, lifestyle, comorbidities, disease severity, family support, and other factors related to the immune system. (Putra Barus & Tehja, 2021) In this study, the participants were young and did not have severe symptoms or comorbid diseases, resulting in a good immune system and thus better recovery from COVID-19. Therefore, most respondents experienced COVID-19 recovery in ≤ 14 days.

The majority of respondents received vitamin C supplements through a doctor's prescription. In theory, obtaining vitamin C supplements through a doctor's prescription is more effective because the required dosage is clear and adjusted according to the patient's needs. (Karuniawati et al., 2023) The government itself has provided services for COVID-19 patients as a way to control the mortality rate from COVID-19. (19) Therefore, more people receive vitamin C supplements via prescription because government-supplied medications already include vitamin C supplements. (Burhan et al., 2022)

Based on the results of this study, it appears that more respondents consume vitamin C supplements in tablet form. The study by Utami et al. also found that more respondents consumed supplements in tablet form compared to vitamin-containing health drinks. Various reasons why tablet supplements are widely consumed include being easier to obtain and easy to consume by swallowing, without the need for a skilled person to administer the supplement. (Utami & Juniarsana, 2013) Vitamin C provided by the government is also available in tablet form. Thus, more respondents use it in tablet form by drinking it. Vitamin C administered via injection or injection itself carries many risks if used improperly. Administering vitamin C via injection can result in all the components being directly distributed into the bloodstream. If the syringe used is not sterile, it can impact the health of the body. Poor injection techniques can also lead to problems such as abscesses (Aisy et al., 2023; Wahidatunnur et al., 2018). Therefore, the oral use of vitamin C supplements is more common because it is safer and easier.

Based on this study, more respondents consume vitamin supplements daily. In the COVID-19 control guidelines, the recommendation for vitamin C supplement use is daily, and most distributed vitamin C supplements advise daily use. Vitamin C supplements available on the market usually have dosage instructions indicating daily use (Aisy et al., 2023; Burhan et al., 2022). Most of the study respondents have a high level of education, likely to make them more knowledgeable about the disease and what needs to be done, and more likely to follow the recommended use of vitamin C supplements. Therefore, more respondents consume vitamin C supplements every day.

The results of the bivariate analysis showed that there was no relationship between gender and the duration of COVID-19 recovery. This is consistent with research conducted by Rahmadi et al., which concluded that gender does not have a significant influence on COVID-19 recovery, but the determining factors for successful treatment are symptoms, age, length of care, and comorbidities. (Rahmadi et al., 2023) Another study conducted by Daud et al. found no relationship between age and gender with the incidence of COVID-19. This study stated that many other factors can influence COVID-19 recovery itself, such as

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age, comorbidities, family support, and the severity of COVID-19 symptoms.(Daud et al., 2022) Meanwhile, in the study by Kaso et al., it was found that male gender was significantly associated with a longer recovery time from COVID-19 infection. (Weya et al., 2020) Hidayani's study concluded that gender is related to the duration of COVID-19 recovery, with females recovering faster compared to males. (Hidayani, 2020) COVID-19 recovery itself is influenced by the immune system; the better a person's immune system, the more effectively it can fight pathogens in the body. (Hidayani, 2020) Females recover faster because they have X chromosomes and female sex hormones that play a significant role in the adaptive (specific) immune response in pathogenesis or in fighting infectious diseases like COVID-19. The immune system regulated by the X chromosome causes females to have higher CD4+ T cells compared to males, which results in better antibodies or bodily defenses in women to combat pa.(Sarvasti, 2020) However, these matters are still influenced by various factors as mentioned above. Research indicating a relationship between gender and COVID-19 recovery is still affected by age and the presence or absence of comorbidities.

The results of this study's analysis found no relationship between economic level and the duration of COVID-19 recovery in early adults. These findings align with a study conducted by Saranani et al., which concluded that income is not related to the duration of COVID-19 recovery. This study concludes that income or earnings associated with occupation are not related to the duration of COVID-19 recovery because, even though patients can afford treatment during COVID-19, there are other factors, namely treatment frequency and personal motivation to recover..(Saranani Muhaimin, Setiawan Andre, 2024) Meanwhile, research by Maher et al. states that there is a relationship between income and the duration of COVID-19 recovery. (AliMaher et al., 2022) Economic level or income itself can influence the duration of COVID-19 recovery because the higher a person's income, the better the treatment to address the disease, both in terms of care and nutrition, which ultimately affects the immune system. A good immune system is one of the factors that can influence the duration of COVID-19 recovery. (AliMaher et al., 2022) In theory, someone with a good economic level usually cares more about their health, allowing them to receive treatment more quickly, unlike someone with a low economic level who usually pays less attention to health, resulting in delayed treatment which can affect their recovery. However, other factors that influence COVID-19 recovery, such as age, psychological state, and motivation to recover from COVID-19, are still needed (Daud et al., 2022; Saranani Muhaimin, Setiawan Andre, 2024).

Based on the results of the bivariate analysis, there is no relationship between economic level and the duration of COVID-19 recovery in early adults. The results of this study are consistent with the research conducted by Nuzula et al., which found no relationship between education level and the duration of recovery. Family support affects the length of time for COVID-19 recovery. (Nuzula & Oktaviana, 2022) In theory, it is said that a higher education level affects the understanding of diseases, which can potentially increase a patient's motivation to recover. Sometimes, knowing a lot about a disease can impact an

individual's psychological condition, such as causing anxiety or fear about their condition. If there is negative information about COVID-19, it can also lead to negative thoughts that may reduce immunity and affect the healing process. A person with a higher education level has better knowledge compared to someone with a lower education level, and a person with good knowledge has a greater chance of understanding the disease they are experiencing; However, it depends on how a person responds to it and also depends on their age and motivation for recovery. Differences in how individuals respond to the knowledge they have about the illness they are experiencing will ultimately affect the patient's psychology and immune system. (Weni Wulandari et al., 2022)

Based on the results of bivariate analysis, there is no relationship between the consumption of vitamin C supplements and the duration of COVID-19 recovery in early adults. This study's results are consistent with the research of Zhang et al., which found no relationship between vitamin C consumption and COVID-19 recovery. (Zhang et al., 2021) This result may occur because many other factors can influence the duration of COVID-19 recovery aside from vitamin C consumption, There are other factors such as nutrition, age, lifestyle, comorbid diseases, disease severity, family support, and other factors related to the immune system. (Putra Barus & Tehja, 2021) The immune system tends to weaken or decline with increasing age, making it more difficult for older adults to fight infections. The reduction in lung tissue elasticity with age causes older individuals to be more likely to experience more severe clinical symptoms of COVID-19, so age affects COVID-19 recovery. (Elviani et al., 2021) Comorbid diseases such as hypertension, diabetes mellitus, and chronic obstructive pulmonary disease can influence the recovery from COVID-19. The administration of certain drugs such as ACE inhibitors and Angiotensin Receptor Blockers (ARB) in patients with comorbid hypertension can increase the expression of ACE-2 and ultimately worsen COVID-19. (Elviani et al., 2021) Diabetes mellitus accompanied by COVID-19 will increase the secretion of catecholamine and glucocorticoid hormones, resulting in abnormal glucose elevation and impacting uncontrolled diabetes, cytokine inflammation, and multi-organ damage. Lifestyle habits such as regular exercise will have better effects compared to people who exercise only occasionally, as exercise stimulates the performance of antibodies and white blood cells, which can enhance the body's immune system. (Yelvi Levani et al., 2021) Lifestyle habits such as smoking will increase ACE-2 receptors, which serve as receptors for the SARS-CoV-2 virus, and ultimately worsen symptoms and affect recovery from COVID-19. (Hidayani, 2020) The immune system is one of the factors in the recovery from COVID-19, and improving immunity itself is influenced by various factors besides the use of vitamin C, including age, psychological state, and others. Psychological conditions matter because stress can lead to a decrease in lymphocyte count and natural killer activity, which are necessary to support the immune system. Therefore, although vitamin C can enhance immunity, there are many other factors that can affect a person's immune system (Behl et al., 2021; Tarigan et al., 2018; Zhang et al., 2021). The use of natural-based drugs with mechanisms that act as immunomodulators can boost the immune system,

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accelerate recovery, and reduce the symptoms experienced by patients (Natasya Cindy Edward & Meiyanti, 2023).

Based on the research, there appears to be uniformity in age and specific symptoms, while age and the symptoms that arise are among the factors in COVID-19 recovery. (Saranani Muhaimin, Setiawan Andre, 2024) In contrast to the research results mentioned above, a study conducted by Hemila et al. found that there was approximately a 30% reduction in symptom duration in patients with the longest-lasting symptoms, and in adults, the duration of symptoms was reduced. (Hemilä et al., 2021) The study by Heidra et al. found that the use of vitamin C in patients with moderate to severe COVID-19 may have an effect. (Hiedra et al., 2020) Based on theory, vitamin C has a significant influence on a person's immune system. Vitamin C also plays a role as an antioxidant and can protect the cells in the body while eliminating free radicals. Therefore, vitamin C has the ability to fight viruses. However, the effectiveness of vitamin C itself is influenced by various factors such as the method of administration, timing, and dosage of vitamin C itself (Behl et al., 2021; Elviani et al., 2021; Hemilä et al., 2021).

The limitation of this study is the still limited variables examined to observe the relationship with the duration of COVID-19 infection recovery. Some variables such as previous medical history, vaccination history, comorbid diseases, nutritional intake patterns, and the use of herbal medicines were not investigated in this study. Suggestions for future research include examining other factors that influence the duration of COVID-19 recovery, such as lifestyle, vaccination status, and others.

CONCLUSION

There is no significant relationship between sociodemographic characteristics (gender, economic level, and education level) and the consumption of vitamin C supplements with the duration of COVID-19 recovery in early adulthood.

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The Prevalence of Vitamin C Supplement Use and Its Perceived Effect on Covid-19 Infection Recovery Time among Young Adults

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A R T I C L E I N F O

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A B S T R A C T

Background: Young adults are a high-risk group for COVID-19 exposure due to their participation in social interaction activities. Recovery from COVID-19 is influenced by immune and nutritional factors, including vitamin C supplementation. Methods: A cross-sectional analytical observational study was conducted on 94 COVID-19 patients who recovered in Grogol Village, West Jakarta. Data were collected through questionnaires and analysed using Chi-square test in SPSS version 29. Results: Most respondents (94.7%) consumed vitamin C supplements, with tablets being the most common form (49.5%) and obtained through a doctor's prescription (50%). Most respondents recovered within ≤14 days (87.2%). Statistical analysis showed no significant association between vitamin C supplement consumption and recovery time (p-value = 0.503). Conclusion: Vitamin C supplements were not found to affect the recovery duration of adult COVID-19 patients

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INTRODUCTION

Early adulthood is a transitional period from adolescence to more advanced adulthood. This transition involves moving from a stage of constant dependence to becoming more economically independent, having the right to choose activities, and engaging in things that interest them. The changes from adolescence to adulthood are accompanied by continuous developments. According to population census data from 2020, those born between 1997 and 2012, estimated to be between 8 and 23 years old, account for about 27.94% of Indonesia's total population and fall into the Gen Z category. This indicates that almost one-third of Indonesia's population is in early adulthood (BPS, 2021). This transitional period can lead to a tendency to interact with others and go out of the house, which increases the likelihood that individuals in early adulthood are more at risk of contracting COVID-19.

Coronavirus Disease 2019 (COVID-19) is a new health problem caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (Sars-CoV-2). (Amalia & Mashabi, 2023; Susilo et al., 2020) The coronavirus is generally transmitted through respiratory droplets. COVID-19 is transmitted via droplets from a distance of less than two meters. In addition to droplets, the disease can also spread through the air with smaller particle sizes. This results in human-to-human transmission and has spread globally to various countries, causing a pandemic over several years. (Susilo et al., 2020) As of January 27, 2021, the daily development in the management of COVID-19 continues to increase, reaching around 10,974 people. The daily addition of recovered cases has increased the total number of patients declared recovered from COVID-19 to 831,330 people, or 81.2%. According to COVID-19 Analysis data, the recovery rate for ages 19 – 30 is 25% of the total. (KemenkesRI, 2020)

The recovery rate of COVID-19 patients is greatly influenced by many factors, such as the immune system, nutrition, habits, comorbid diseases, etc. When various types of infections attack the body, the immune system plays the main role in fighting the infection. However, for immune cells to function properly, they are influenced by various factors, one of which is the use of vitamin C. (Putra Barus & Tehja, 2021) The coronavirus is a pathogen that attacks the immune system, making the body unable to fight the invading virus, but vitamin C is a substance that can enhance neutrophil migration, phagocytosis, antioxidant formation, and combat microbes..(Tegally et al., 2022) Vitamin C also plays a role in enhancing the programmed cell death of neutrophils by the body, the clearance of neutrophil debris by macrophages, and reducing neutrophil damage so that host tissues are protected and cellular immune function is maintained because there is no cell damage. This is why vitamin C can be considered as one of the treatments for COVID-19 infections and other viral infections. (Elviani et al., 2021)

Several previous studies have been conducted to examine the relationship between vitamin C consumption and the recovery duration of COVID-19 in young adults aged 18-24, with varying research results. Studies by Heidra et al. and Hemilä et al. showed that vitamin C consumption is associated with COVID-19 recovery. (Hemilä et al., 2021; Hiedra et al., 2020) However, research

conducted by Thomas et al. and Zhank et al. concluded differently, stating that vitamin C consumption was not significantly related to COVID-19 recovery.(Angraini, 2014; Zhang et al., 2021) Therefore, further research is needed to examine the relationship between vitamin C consumption and the duration of COVID-19 recovery in young adults aged 18-24 years.

METHODS

This study uses an analytical observational design, with a cross-sectional method, which aims to examine the relationship between vitamin C supplement consumption and the recovery duration of COVID-19 patients in early adulthood. The sample in this study consists of early adulthood age groups, and the research was conducted in the Grogol Pertamburan sub-district, West Jakarta province. The research sample was selected using consecutive non-random sampling. Inclusion criteria in this study include males and females aged 18-24 years, having a history of mild COVID-19 infection within approximately the past year, and willing to participate in the study by signing an informed consent form. Exclusion criteria include patients with comorbidities and COVID-19 patients who were hospitalized.

Based on sample calculations using the finite infinity sample calculation formula no = $za^2 \times p \times q / d^2$, with a recovery prevalence value of 25%, the minimum required sample size is 81 people. The total sample for this study was 94 respondents from completed questionnaires given to recovered COVID-19 patients to obtain data on subject characteristics, history of mild COVID-19 with complaints or symptoms (fever, cough, sore throat, headache, loss of smell and taste), and daily activities in Grogol, specifically in the Grogol subdistrict work area. Data analysis was carried out using the chi-square test or Fisher's exact test with a significance level of 95%, considered significant if $p < 0.05$, and not significant if $p \geq 0.05$. Statistical analysis was conducted using SPSS version 29.0. This research has received ethical approval from the Research Ethics Committee of the Faculty of Medicine, Trisakti University, No. 107/KER-FK/VII/2022.

RESULT AND DISCUSSION

This study involved 94 research respondents. The results showed that the majority of respondents were female, totaling 63 respondents (67%), with the most common income below the regional minimum wage (UMR), accounting for 58 respondents (61.7%), and the most common education level was higher education, with 92 respondents (97.9%).

Table 1. Characteristics of Respondents (n=94)

Variables	n=94	Percentage (%)
Gender		
Male	31	33.0
Female	63	67.0
Economic Level		
≥ UMR	36	38.3
≤ UMR	58	61.7
Education Level		
Low	2	2.1
High	92	97.9
Vitamin C supplement		
yes	89	94.7
No	5	5.3
Recovery Time		
≤ 14 Days	82	87.2
≥ 15 Days	12	12.8

Description: UMR: Regional Minimum Wage (Rp 4,400,000)

Table 2. Usage, Sources, And Frequency of Vitamin C Supplement Consumption

variables	n=94	Percentage (%)
The use of vitamin C supplements		
Recipe	47	50.0
Non recipe	42	44.7
Do not consume	5	5.3
Vitamin C supplement preparation		
Foof / Drink	7	1.1
Vitamin C Tablet	47	49.5
Vitamin combination	34	35.8
Do not consume	5	6.3
Frequency of vitamin C supplement consumption		
0-2 times	20	21.3
3-5 Times	20	21.3
Everyday	49	52.1
No	5	5.3

The results in Table 1 show that out of 94 early adult respondents, most consumed vitamin C, which amounted to 89 respondents (94.7%), and early adults who recovered in less than 14 days amounted to 82 respondents (87.2%). The source of vitamin C intake was mostly obtained through doctor prescriptions, totaling 47 respondents (50%). Based on the dosage form, the most commonly consumed form was tablets, with 47 respondents (49.5%), and all respondents who consumed vitamin C supplements did so orally, with none

using injectable forms. The majority of the vitamin C user group took this supplementation daily, amounting to 49 respondents (52.1%). (Table 2)

Table 3. The Relationship Between Sociodemographic Characteristics and Vitamin C Supplement Consumption with the Duration of COVID-19 Recovery

Variables	Recovery Time for COVID-19				Total (%)	p
	≤ 14 Days		≥ 15 Days			
	N	%	N	%		
Gender						
Male	25	80.64	6	13.36	31 (100)	0.201
Female	57	90.47	6	9.53	63 (100)	
Economic Level						
≥ UMR	29	80.55	7	19.45	36 (100)	0.202
≤ UMR	53	91.37	5	8.63	58 (100)	
Education Level						
Low	2	100	0	0	2 (100)	1.000*
High	80	86.95	12	13.05	92 (100)	
Vitamin C						
yes	78	87.64	11	12.36	89 (100)	0.503*
No	4	80	1	20	5 (100)	

* = *fisher Test*

In Table 3 above, it can be seen that among female respondents who experienced COVID-19, 90.47% required less than 14 days to recover, which is higher compared to males at 80.64% (p=0.201). Based on the chi-square test results showing p > 0.05, there is no significant relationship between gender and the duration of COVID-19 recovery in early adulthood.

In Table 3 above, it can be seen that among female respondents who experienced COVID-19, 90.47% required less than 14 days to recover, which is higher compared to males at 80.64% (p=0.201). Based on the chi-square test results showing p > 0.05, there is no significant relationship between gender and the duration of COVID-19 recovery in early adulthood.

In Table 3 above, it can also be seen that among patients who consumed vitamin C while experiencing COVID-19, 87.64% required less than 14 days to recover, which is higher than those who did not consume vitamin C, at 80% (p=0.503). Based on the Fisher's test results, p>0.05, meaning there is no relationship between the consumption of vitamin C supplements and the duration of COVID-19 recovery in young adults.

Based on the results of this study, more respondents recovered within ≤ 14 days. Similar results were also obtained from a study in Ethiopia, where the average recovery time was 11 days. (Kassie et al., 2023) However, this differs from another study in Ethiopia on patients receiving care at WURH, where the average recovery time was 18 days. (Tolossa et al., 2021) A study in Tehran reported an average of 13.5 days. (SeyedAlinaghi et al., 2021) Meanwhile, studies in India and Italy reported average recovery times of 25 and 24 days, respectively. (Benoni et al., 2020; Pratim et al., 2020) Recovery from COVID-19 is influenced

by many factors such as nutrition, age, lifestyle, comorbidities, disease severity, family support, and other factors related to the immune system. (Putra Barus & Tehja, 2021) In this study, the participants were young and did not have severe symptoms or comorbid diseases, resulting in a good immune system and thus better recovery from COVID-19. Therefore, most respondents experienced COVID-19 recovery in ≤ 14 days.

The majority of respondents received vitamin C supplements through a doctor's prescription. In theory, obtaining vitamin C supplements through a doctor's prescription is more effective because the required dosage is clear and adjusted according to the patient's needs. (Karuniawati et al., 2023) The government itself has provided services for COVID-19 patients as a way to control the mortality rate from COVID-19. (19) Therefore, more people receive vitamin C supplements via prescription because government-supplied medications already include vitamin C supplements. (Burhan et al., 2022)

Based on the results of this study, it appears that more respondents consume vitamin C supplements in tablet form. The study by Utami et al. also found that more respondents consumed supplements in tablet form compared to vitamin-containing health drinks. Various reasons why tablet supplements are widely consumed include being easier to obtain and easy to consume by swallowing, without the need for a skilled person to administer the supplement. (Utami & Juniarsana, 2013) Vitamin C provided by the government is also available in tablet form. Thus, more respondents use it in tablet form by drinking it. Vitamin C administered via injection or injection itself carries many risks if used improperly. Administering vitamin C via injection can result in all the components being directly distributed into the bloodstream. If the syringe used is not sterile, it can impact the health of the body. Poor injection techniques can also lead to problems such as abscesses (Aisy et al., 2023; Wahidatunnur et al., 2018). Therefore, the oral use of vitamin C supplements is more common because it is safer and easier.

Based on this study, more respondents consume vitamin supplements daily. In the COVID-19 control guidelines, the recommendation for vitamin C supplement use is daily, and most distributed vitamin C supplements advise daily use. Vitamin C supplements available on the market usually have dosage instructions indicating daily use (Aisy et al., 2023; Burhan et al., 2022). Most of the study respondents have a high level of education, likely to make them more knowledgeable about the disease and what needs to be done, and more likely to follow the recommended use of vitamin C supplements. Therefore, more respondents consume vitamin C supplements every day.

The results of the bivariate analysis showed that there was no relationship between gender and the duration of COVID-19 recovery. This is consistent with research conducted by Rahmadi et al., which concluded that gender does not have a significant influence on COVID-19 recovery, but the determining factors for successful treatment are symptoms, age, length of care, and comorbidities. (Rahmadi et al., 2023) Another study conducted by Daud et al. found no relationship between age and gender with the incidence of COVID-19. This study stated that many other factors can influence COVID-19 recovery itself, such as

age, comorbidities, family support, and the severity of COVID-19 symptoms.(Daud et al., 2022) Meanwhile, in the study by Kaso et al., it was found that male gender was significantly associated with a longer recovery time from COVID-19 infection. (Weya et al., 2020) Hidayani's study concluded that gender is related to the duration of COVID-19 recovery, with females recovering faster compared to males. (Hidayani, 2020) COVID-19 recovery itself is influenced by the immune system; the better a person's immune system, the more effectively it can fight pathogens in the body. (Hidayani, 2020) Females recover faster because they have X chromosomes and female sex hormones that play a significant role in the adaptive (specific) immune response in pathogenesis or in fighting infectious diseases like COVID-19. The immune system regulated by the X chromosome causes females to have higher CD4+ T cells compared to males, which results in better antibodies or bodily defenses in women to combat pa.(Sarvasti, 2020) However, these matters are still influenced by various factors as mentioned above. Research indicating a relationship between gender and COVID-19 recovery is still affected by age and the presence or absence of comorbidities.

The results of this study's analysis found no relationship between economic level and the duration of COVID-19 recovery in early adults. These findings align with a study conducted by Saranani et al., which concluded that income is not related to the duration of COVID-19 recovery. This study concludes that income or earnings associated with occupation are not related to the duration of COVID-19 recovery because, even though patients can afford treatment during COVID-19, there are other factors, namely treatment frequency and personal motivation to recover..(Saranani Muhaimin, Setiawan Andre, 2024) Meanwhile, research by Maher et al. states that there is a relationship between income and the duration of COVID-19 recovery. (AliMaher et al., 2022) Economic level or income itself can influence the duration of COVID-19 recovery because the higher a person's income, the better the treatment to address the disease, both in terms of care and nutrition, which ultimately affects the immune system. A good immune system is one of the factors that can influence the duration of COVID-19 recovery. (AliMaher et al., 2022) In theory, someone with a good economic level usually cares more about their health, allowing them to receive treatment more quickly, unlike someone with a low economic level who usually pays less attention to health, resulting in delayed treatment which can affect their recovery. However, other factors that influence COVID-19 recovery, such as age, psychological state, and motivation to recover from COVID-19, are still needed (Daud et al., 2022; Saranani Muhaimin, Setiawan Andre, 2024).

Based on the results of the bivariate analysis, there is no relationship between economic level and the duration of COVID-19 recovery in early adults. The results of this study are consistent with the research conducted by Nuzula et al., which found no relationship between education level and the duration of recovery. Family support affects the length of time for COVID-19 recovery. (Nuzula & Oktaviana, 2022) In theory, it is said that a higher education level affects the understanding of diseases, which can potentially increase a patient's motivation to recover. Sometimes, knowing a lot about a disease can impact an

individual's psychological condition, such as causing anxiety or fear about their condition. If there is negative information about COVID-19, it can also lead to negative thoughts that may reduce immunity and affect the healing process. A person with a higher education level has better knowledge compared to someone with a lower education level, and a person with good knowledge has a greater chance of understanding the disease they are experiencing; However, it depends on how a person responds to it and also depends on their age and motivation for recovery. Differences in how individuals respond to the knowledge they have about the illness they are experiencing will ultimately affect the patient's psychology and immune system. (Weni Wulandari et al., 2022)

Based on the results of bivariate analysis, there is no relationship between the consumption of vitamin C supplements and the duration of COVID-19 recovery in early adults. This study's results are consistent with the research of Zhang et al., which found no relationship between vitamin C consumption and COVID-19 recovery. (Zhang et al., 2021) This result may occur because many other factors can influence the duration of COVID-19 recovery aside from vitamin C consumption, There are other factors such as nutrition, age, lifestyle, comorbid diseases, disease severity, family support, and other factors related to the immune system. (Putra Barus & Tehja, 2021) The immune system tends to weaken or decline with increasing age, making it more difficult for older adults to fight infections. The reduction in lung tissue elasticity with age causes older individuals to be more likely to experience more severe clinical symptoms of COVID-19, so age affects COVID-19 recovery. (Elviani et al., 2021) Comorbid diseases such as hypertension, diabetes mellitus, and chronic obstructive pulmonary disease can influence the recovery from COVID-19. The administration of certain drugs such as ACE inhibitors and Angiotensin Receptor Blockers (ARB) in patients with comorbid hypertension can increase the expression of ACE-2 and ultimately worsen COVID-19. (Elviani et al., 2021) Diabetes mellitus accompanied by COVID-19 will increase the secretion of catecholamine and glucocorticoid hormones, resulting in abnormal glucose elevation and impacting uncontrolled diabetes, cytokine inflammation, and multi-organ damage. Lifestyle habits such as regular exercise will have better effects compared to people who exercise only occasionally, as exercise stimulates the performance of antibodies and white blood cells, which can enhance the body's immune system. (Yelvi Levani et al., 2021) Lifestyle habits such as smoking will increase ACE-2 receptors, which serve as receptors for the SARS-CoV-2 virus, and ultimately worsen symptoms and affect recovery from COVID-19. (Hidayani, 2020) The immune system is one of the factors in the recovery from COVID-19, and improving immunity itself is influenced by various factors besides the use of vitamin C, including age, psychological state, and others. Psychological conditions matter because stress can lead to a decrease in lymphocyte count and natural killer activity, which are necessary to support the immune system. Therefore, although vitamin C can enhance immunity, there are many other factors that can affect a person's immune system (Behl et al., 2021; Tarigan et al., 2018; Zhang et al., 2021). The use of natural-based drugs with mechanisms that act as immunomodulators can boost the immune system,

accelerate recovery, and reduce the symptoms experienced by patients (Natasya Cindy Edward & Meiyanti, 2023).

Based on the research, there appears to be uniformity in age and specific symptoms, while age and the symptoms that arise are among the factors in COVID-19 recovery. (Saranani Muhaimin, Setiawan Andre, 2024) In contrast to the research results mentioned above, a study conducted by Hemila et al. found that there was approximately a 30% reduction in symptom duration in patients with the longest-lasting symptoms, and in adults, the duration of symptoms was reduced. (Hemilä et al., 2021) The study by Heidra et al. found that the use of vitamin C in patients with moderate to severe COVID-19 may have an effect. (Hiedra et al., 2020) Based on theory, vitamin C has a significant influence on a person's immune system. Vitamin C also plays a role as an antioxidant and can protect the cells in the body while eliminating free radicals. Therefore, vitamin C has the ability to fight viruses. However, the effectiveness of vitamin C itself is influenced by various factors such as the method of administration, timing, and dosage of vitamin C itself (Behl et al., 2021; Elviani et al., 2021; Hemilä et al., 2021).

The limitation of this study is the still limited variables examined to observe the relationship with the duration of COVID-19 infection recovery. Some variables such as previous medical history, vaccination history, comorbid diseases, nutritional intake patterns, and the use of herbal medicines were not investigated in this study. Suggestions for future research include examining other factors that influence the duration of COVID-19 recovery, such as lifestyle, vaccination status, and others.

CONCLUSION

There is no significant relationship between sociodemographic characteristics (gender, economic level, and education level) and the consumption of vitamin C supplements with the duration of COVID-19 recovery in early adulthood.

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