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Relationship between Vitamin C and Length of Hospital Stay for Covid-19 Patients with Comorbidities

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Abstract

Covid-19 patients with comorbidities, such as hypertension, diabetes, and respiratory diseases, have a higher risk for severe disease and mortality compared to patients without comorbidities. Some data shows that the administration of high dose vitamin C (1–2 g/day) can reduce the amount of the inflammatory mediators and shorten the length of hospital stay. This study aimed to determine the relationship between vitamin C administration and of length of hospital stay for Covid-19 patients with comorbidities. This study was a retrospective observational study on consecutively sampled medical record data of UNS Hospital patients from July 2020 to January 2021. A total of 78 patient medical records were included of this study. The inclusion criteria were all medical records of patients who suffered from Covid-19 with comorbidities admitted to the hospital while the exclusion criteria were medical records of patients who did not get oral or intravenous vitamin C. The chi-square bivariate test was used to determine the relationship between the administration of vitamin C and the length of hospital stay for Covid-19 patients with comorbidities. Of the 78 subjects only 52 subjects were included in the statistical analysis. Medical records were divided into two groups: group 1, that consisted of medical records of patient who received more than 1000mg Vitamin C, and group 2, who received less than 1,000mg Vitamin C. Results demonstrated that the administration of high dose vitamin C of more than 1,000 mg was not associated with the length of hospital stay (p=0.677). Thus, high dose of vitamin C is not associated with the length of hospital stay for Covid-19 patients with comorbidities, such as hypertension, diabetes, and respiratory disease.

Keywords: Covid-19 patients with comorbidities, length of hospital stay, vitamin c

Introduction

Cases of the global COVID-19 pandemic are increasing, there are 101,053,721 confirmed cases of COVID-19 in the world with 2,182,867 deaths[1]. Data in Indonesia shows that there are 1,051,795 positive cases, where this condition places Indonesia as the first largest number in Southeast Asia which death rate in 29,518 that make Indonesia as the third largest in Asia.[2]
Some Covid-19 patients have comorbid disease that make a higher severity and mortality rate than patients without comorbidities. These comorbid diseases include hypertension, diabetes mellitus (DM), and respiratory disease. Hypertension are the most severity [47.65% (95% CI: 35.04%, 60.26%)] with mortality rate [47.90% (95% CI: 40.33%, 55.48%)] when compared with all cases [14.34% (95% CI: 6.60%, 28.42%)], followed by diabetes [24.89% (95% CI: 18.80%, 32.16%))] and then respiratory disease [10.89% (95%CI: 7.57%, 15.43%).[3]

The therapy are given for supportive and depending on the signs and symptoms. Multidisciplinary collaboration are needed in order to provide the best therapy for patient outcomes. However, because the virus is a self-limiting disease, the therapeutic approach is related to improving the immune system. Nutrition is one of the supportive therapies that expected to reduce the severity and mortality of patients and also improve patient outcomes

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and quality of life.[4] Many Covid-19 patients with comorbidities show elevated levels of the inflammatory mediators such as: interleukin (IL)-6. An increase in these mediators may increase the severity of the patient.[5,6] Data show that administration of high doses of vitamin C (1–2 g/day) can reduce this mediator.[7]

A meta-analysis of 12 trials with 1,766 patients showed that administration of vitamin C reduced length of hospital stay by an average of 8%, by shortening the duration of mechanical ventilation during intensive care.[7,8] There are not many studies that exploring the relationship between vitamin C administration and length of hospital stay for Covid-19 patients who have comorbidities.

The clinical condition of COVID-19 patients with comorbid diseases is unpredictable, the more severe it is, the longer their length of hospital stay. This study aims to determine the relationship between the administration of vitamin C and the length of hospital stay for Covid-19 patients who have comorbidities.

Methods

This study was a retrospective observational study by collecting medical record data from UNS Hospital patients from July 2020 to January 2021. This study was part of research at Nutrition, Metabolism and Medicine (TRIMED) research group that explore about correlation between nutrition with outcome and also quality of life Covid-19 patient with comorbidities. Ethical approval was obtained from the Faculty of Medicine Universitas Sebelas Maret, No. 032/UN27.06.6.1/KEPK/EC/2021**.**

Medical record data was collected by several trained enumerators according to the research criteria. A total of 78 patients were included of this study, by consecutive sampling method. The inclusion criteria for this study were all patients recorded in the medical records of UNS Hospital as Covid-19 patients who had comorbidities (have one or a combination of comorbid diseases) such as hypertension, diabetes mellitus, obesity, heart disease, and respiratory disease, and the exclusion criteria were patients who did not get vitamin C both oral or intravenous. he length of hospital stay was defined as the time span of a patient from being admitted to being negative from Covid-19. The exclusion criteria were confirmed COVID-19 patients with intensive care. In this study, we use categorical variables, the administration of vitamin C was grouped into 1,000 mg dose and >1,000 mg dose, while length of hospital stay was divided into 13 days and >13 days according to the literature.[3,8] The bivariate chi-square test was used to determine the relationship between vitamin C administration and length of hospital stay.

Results

The characteristics of the subjects showed that 110 confirmed Covid-19 patients with moderate, severe and critical symptoms. After adjusting for the inclusion and exclusion criteria, there were 78 Covid-19 patients who had comorbidities such as: DM, hypertension, kidney disease, asthma, hypertension heart disease and others. These patients were not only receive daily nutrition from the nutrition installation but also received vitamin C supplementation both orally and intravenously with a dose range of 500–2,000 mg per day.

Table 1 described about the characteristics of the subjects. Based on gender, Data showed that the same prevalence between men and women. Based on comorbid diseases, diabetes were the highest (29%) and followed hypertension (6%), hypertensive heart disease (1%), and asthma comorbid. Almost the patient had a combination of comorbid diseases of more than 1 type (64%). Almost the supplementation of vitamin C was given intravenously (56%), followed by orally (10%), and 18% was no data on vitamin C administration.

Table 2 showed that the association between

Tabel 1 Characteristics of Subjects

Variables	Amount (n=78)	Persentage (%)
Gender		
Male	39	50
Female	39	50
Comorbidities		
Diabetes	23	29
Hipertension	5	6
Hearth disease	2	1
Ashtma	1	
Combination	47	64
Vitamin C		
Oral	8	10
Intravenous	56	72
N/A	14	18

Tabel 2 Chi-Square Test For Vitamin C and the Length of Hospital Stay

Length of Hospital Stay (days)	Dosage of Vitamin C		Amount	P Value
	≤1,000 mg	>1,000 mg		
≤13	18	9	27	
>13	18	7	25	p=0.677
Total	36	16	52	

two categorical variables, the dose of vitamin C was not related to the length of hospital stay because of statistically not significant (p =0.677).

Discussion

Table 1 showed that the characteristics of the subjects. The proportion by gender between women and men was the same. This result was different from the other study that males were more easy affected Covid-19 infection than females.[9] The results of this study are different from these results, it may be possible because of differences in research subjects. In Jin's 2020 study, the research subjects were all Covid-19 patients, both without co-morbidities and with co-morbidities, while this study was focused on co-morbid patients. The most subject were diabetes, and the others were hypertension, asthma. This was in accordance with the study which showed that many Covid-19 patients with diabetes were hospitalized because of their severity and morbidity, although another studies that showed hypertension was the highest comorbid.[3,10]

In this study, there was no significant difference between the administration of vitamin C which had been grouped into 1,000 mg dose and >1,000 mg dose with the length of hospital stay of the patient. This result was different from the study that high doses of vitamin C could reduce proinflammatory cytokines in Covid-19 patients.[7,8] These pro-inflammatory cytokines could worsen the patient's condition, thus prolonging the patient's treatment. Many factors influence pro-inflammatory cytokines, especially in comorbid patients. Research showed that DM patients with poor blood sugar control could decrease the immune system and increase inflammation.[11] In this study, there was no difference between controlled/ good management comorbid patients with not controlled, and this study not calculate the variety of initial condition when they was first admitted, whether their condition was mild or severe.

Studies showed that the Covid-19 patients with hypertensive had more severe inflammation and organ damage than in the non-hypertensive patient. This chronic disease may lead to a weakened innate immune response, and increase the risk of plaque rupture and thrombosis because of inflammatory response syndrome.[12] Although this study did not calculate the subgroup patient with hypertension, but there are study that show hypertension did not affect the outcome of COVID-19.[13]

This study has other several limitations. This study did not calculate the daily intake of vitamin C obtained from the food consumed, so it was not known the total vitamin C obtained by the patient. This study did not classify comorbid diseases under control and uncontrolled comorbid conditions, so that the variety initial conditions of these patients were not calculate.

There was no relationship between the administration of vitamin C and the length of hospital stay for Covid-19 patients who have comorbidities.

Further researcsh are needed, such as using a larger sample size, homogeneity of research subjects, analysis of patient severity from clinical and laboratory parameters and also analysis of patient daily intake.

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