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COVID-19 Pandemic Impacts on Quality of Life of Diabetes Mellitus Patients

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Abstract
Background: Diabetes mellitus (DM) is a major concern in the health sector of Indonesia, with more than one million patients. During the COVID-19 pandemic, DM patients have a risk of poor quality of life due to the high potential of fatality from COVID-19 infection or access barriers to health care and nutrition. This study aimed to analyze the impact of the COVID-19 pandemic on the quality of life of patients with diabetes.
Methods: This quantitative study used a cross-sectional design. The sampling technique used was total sampling; that is, all members of the population were used as research samples. This research involved 95 patients with DM from 127 total population in Puskesmas Cilongok I. Data were collected through interviews with a guided questionnaire. The data were analyzed using univariate, bivariate, and multivariate analyses.
Results: The results of this study indicate that factors related to the quality of life of patients with DM have a pandemic economic impact (p = 0.011 and OR = 0.341), and factors that affect the quality of life of patients with DM have a pandemic economic impact (OR = 0.326). Factors related to poor diabetes patients include losting work, decreased partial or total income, and increased daily expenditure.
Conclusion: We suggest that health agencies can help patients with DM restore their quality of life after being hardly affected by the pandemic in the economic aspect by designing a sustainable program for patients with DM.

Keywords: COVID-19, Quality of Life, Diabetes Mellitus in Puskesmas Cilongok 1

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Introduction

Diabetes mellitus (DM) is a group of metabolic diseases characterized by hyperglycemia due to defects in insulin secretion, insulin action, or both. Complications that occur due to DM may include blood vessel disease, both macrovascular and microvascular, as well as nervous system or neuropathy disease. [1] According to the International Diabetes Federation (IDF) (2021), Indonesia, which is located in the Western Pacific region, is ranked fifth in the world for the prevalence of diabetes, with an estimated number of diabetics of 19.47 million adults aged 20-79 years. Basic Health Research (2018)

showed that the prevalence of diabetes based on physician diagnosis in Indonesia has reached more than 1 million patients. [2]

People living with diabetes are at risk of poor quality of life. As a lifelong disease, DM cannot be cured and will affect the patient's quality of life in terms of physical, psychological, social, and environmental health.[3] Data from the International Diabetes Federation (IDF) show that the number of diabetes sufferers in the world in 2021 will reach 537 million. This figure is predicted to continue increasing, reaching 643 million in 2030 and 783 million in 2045. According to the IDF, Indonesia is ranked fifth in the country, with the highest number of diabetes sufferers (19.5 million in 2021), and is predicted to reach 28.6 million in 2045. Judging from sex, women experience a higher comorbidity factor of diabetes mellitus (64.4%) because women tend to be more at risk of developing diabetes mellitus related to a large body mass index and menstrual cycle syndrome and during menopause, which results in easy accumulation of fat. resulting in the inhibition of glucose transport into the cells. In another study, COVID-19 patients aged 56 – 65 years had the highest comorbidity factor for diabetes mellitus (42.2%).[3] Research done in Puskesmas Pademawu, East Java, showed that 52% of DM patients have a poor quality of life.[4] A systematic review showed that factors related to poor diabetes patients include low physical exercise frequency, low glucose check frequency, presence of complications and hypertension, longer duration of diabetes, a diet with more red meat, and depression. [5]

The COVID-19 pandemic has introduced new threats to patients with DM. The latest finding in Bhakti Dharma Husada Surabaya Hospital showed that 30,3% of COVID-19 patients had DM as comorbid, and DM had the highest COVID-19 death risk.[6] There is evidence from research in China, the United States, and Italy that diabetes is a risk factor for disease progression towards critical illness, development of acute respiratory distress syndrome, need for mechanical ventilation or admission to an intensive care unit, and ultimately death.[7] Impaired T-cell function and elevated levels of interleukin-6 (IL-6) may play an important role in increasing the severity of COVID-19 in diabetics.[8]

The COVID-19 pandemic has also had many negative impacts on the lives of patients with DM. Globally, policies to reduce the spread of the virus by social distancing and lockdowns can be an additional burden for patients, as they cause an emotional impact with symptoms of anxiety, depression, eating disorders, and general stress compared to the general population.[9] SARS-CoV-2 infection in patients with diabetes may trigger higher stress conditions, with a greater release of hyperglycemic hormones such as glucocorticoids and catecholamines, leading to increased blood glucose levels and abnormal glucose variability (9,10). COVID-19 also poses challenges for the treatment of DM. The research found that 69.8% of patients in Indonesia experienced DM treatment difficulties. Difficulties included attending diabetes consultation (30.1%), access to diabetes medication (12.4%), checking blood glucose levels (9.5%), controlling diet (23.8%), and performing regular exercise (36.5%).[11] The quality of life of patients with DM may drastically change owing to the COVID-19 pandemic. COVID-19 can directly and indirectly impact the health of patients with DM, leading to a poor quality of life. This study was conducted to evaluate the impact of the COVID-19 pandemic on the quality of life of patients with DM in Puskesmas Cilongok I. Puskesmas Cilongok 1 is the largest of the most cases of Diabetes Mellitus in town. DM patients with DM in Puskesmas Cilongok 1 was 127.

Methods

This observational study employed a quantitative approach. This research was conducted in Puskesmas Cilongok I. Data was collected during July and August 2022. The study population included DM patients registered as members of the Program Penyakit Kronis (PROLANIS) Chronic Disease Program in Puskesmas Cilongok I. Determining the number of samples using total sampling. A total of 127 patients were registered in PROLANIS; however, only 95 patients were included in this study due to exclusion criteria such as double

data, unclear address, death, and difficulty in visiting.

The variables examined in this study included education level, employment status, current income, pre-pandemic income, marital status, duration of DM, duration of PROLANIS participation, comorbidities, DM treatment, traditional medicine consumption, frequency of blood sugar checks, frequency of hypoglycemia, quality of life, and the impact of the pandemic in the form of pandemic health, economic, and social impacts. Sociodemographics, DM status, and quality of life were measured by Indonesian translated Asian DQoL (the Asian Diabetes Quality of Life). The impact of the pandemic was measured using a self-formulated questionnaire that consisted of health, economic, and social aspects. The data were analyzed using univariate, bivariate, and multivariate analyses.

Results

Ninety-five PROLANIS members of the Cilongok 1 Community Health Center agreed to participate in this study. Most respondents had an elementary education level (60%), work (56.8%), current income below the UMR (65.3%), pre-pandemic income below the minimum wage (65.3%), and married status (85.3%), as shown in **Table 1**.

Most of the respondents had DM for more than 6 years (53.7%), followed by PROLANIS for more than 40 months (50.5%), had comorbid hypertension (58.9%), underwent a diet and oral medication (97.9%), did not consume traditional medicine/herbal medicine (62.1%), checked their sugar once a month (89.5%), and had a poor-moderate quality of life (51.4%). The assessment of one's quality of life encompasses various aspects, such as eating habits, level of physical exercise, employment prospects, capacity for physical and sexual engagement, medical conditions that DM patients face, and financial barriers to DM treatment. The results are presented in **Table 2**.

The majority of respondents had a low health impact (94.7%), high economic impact (64.2%), and high social impact (54.7%), as shown in **Table 3**.

Based on the chi-square analysis shown in **Table 4**, the variables related to DM's quality of life were the economic impact of the pandemic, with a p-value of 0.011 and an OR value of 0.341. In the logistic regression analysis, the candidate variables ($p < 0.25$) were employment, current income, pre-pandemic income, PROLANIS duration, and pandemic economic impact. Then, the authors removed one variable at a time from the multivariate modeling, and variables that changed the OR value of other variables by > 10% were excluded from the multivariate modeling.

The variables that persist in the final modeling, as shown in **Table 5**, are current income, pre-pandemic income, and the pandemic economic impact. The variable that affected the quality of life of patients is the pandemic economic impact (OR = 0.326). DM patients whose economy is highly impacted by the pandemic are at risk of 0.326 times more having a moderate-poor quality of life than those with low impact.

Table 1. Sociodemography Characteristic

Variable	Category	Frequency	Percentage
Education Level	Didn't attend school	10	10.53
	Elementary School	56	58.95
	Junior High School	10	10.53
	Senior High School	12	12.63
	Diploma/Bachelor	6	6.32
	Total	95	100
Employment	Unemployed	54	56.84
	Employed	33	34.74
	Retired	8	8.42
	Total	95	100
Current income	Below minimum wage	62	65.26
	Above minimum wage	33	34.74
	Total	95	100
Pre-pandemic income	Below minimum wage	62	65.26
	Above minimum wage	33	34.74
	Total	95	100
Marital status	Married	81	85.26
	Unmarried	14	14.74
	Total	95	100

Table 2. DM Status

Variable	Category	Frequency	Percentage
DM duration (years)	<6	44	46.3
	≥6	51	53.7
	Total	95	100
PROLANIS duration (months)	<40	47	49.5
	≥40	48	50.5
	Total	95	100
Comorbidities	Hypertension	56	58.9
	High cholesterol	23	24.2
	Gout	25	26.3
	Heart disease	4	4.2
	Vision problem	30	31.6
	Nerve disease	53	55.8
	Erectyle disfunction/impotence	2	2.1
	Vaginal infection/itching	9	9.5
	Low sex drive	1	1.1
	Periphelar vascular disease	16	16.8
	Endocrine disease	5	5.3
	Kidney disease	5	5.3
	Other disease	18	18.9
Treatment	Diet therapy	93	97.9
	Oral drugs	93	97.9
	Insulin	2	2.1
Herb/Traditional medicine consumption	Yes	36	37.9
	No	59	62.1
	Total	95	100
Blood sugar testing frequency	Once a week	3	3.2
	Twice a week	5	5.3
	Once a month	85	89.5
	Not checking since 5 month ago	1	1.1
	Not checking since last year	1	1.1
	Total	95	100
Hipoglikemia frequency	Never	49	51.6
	Once/several times in a month	18	18.9
	Once a week	9	9.5
	2-3 times a week	14	14.7
	Everyday	5	5.3
	Total	95	100
Quality of Life (QOL)	Poor-Moderate	49	51.4
	Good-Excellent	46	48.4
	Total	95	100

Table 3. COVID-19 Pandemic Impacts

Variable	Category	Frequency	Percentage
Health impact	Low	90	94.7
	High	5	5.3
	Total	95	100
Economical impact	Low	34	35.8
	High	61	64.2
	Total	95	100
Social impact	Low	43	45.3
	High	52	54.7
	Total	95	100
Pre-pandemic income	Below minimum wage	62	65.3
	Above minimum wage	33	34.7
	Total	95	100
Marital status	Married	81	85.5
	Unmarried	14	14.7
	Total	95	100

Table 4. Cross Tabulation and Bivariat Analysis

Variable	QOL				Total %	OR	95% CI		p
	Poor-moderate		Good-excellent						
	n	%	n	%			Lower Limit	Upper Limit	
Education Level									
Didn't attent school-elementary school	35	52.2	32	47.8	100	1.094	0.675	1.615	0.842
Junior high school-bachelor	14	50	14	50	100				
Total n	49		46						
Employment									
Unemployed	27	50	27	50	100				
Employed	18	54.5	15	45.5	100	-	-	-	0.178
Retired	4	50	4	50	100				
Total n	49		46						
Current income									
Below minimum wage	33	53.2	29	46.8	100				
Above minimum wage	16	48.5	17	51.5	100	1.209	0.72	1.674	0.194
Total n	49		46						
Pre-pandemic income									
Below minimum wage	31	50	31	50	100				
Above minimum wage	18	51.6	15	48.4	100	0.833	0.615	1.366	0.178
Total n	49		46						
Marital status									
Married	44	54.3	37	45.7	100	2.141	0.733	3.158	1.655
Unmarried	5	35.7	9	64.3	100				
Total n	49		46						
DM duration									
<6	25	56.8	19	43.2	100	1.48	0.658	3.332	0.343
≥6	24	47.1	27	52.9	100				
Total n	49		46						
PROLANIS duration									
<40	28	59.6	19	40.4	100	1.895	0.195	2.027	0.123
≥40	21	43.8	27	56.2	100				
Total n	49		46						
Health impact									
Low	47	52.5	43	47.8	100	0.595	0.438	3.889	0.942
High	2	40	3	60	100				
Total n	49		46						
Variable	**QOL**				**Total %**	**OR**	**95% CI**		**p**
	Poor-moderate		**Good-excellent**						
	n	**%**	**n**	**%**			**n**	**%**	
Economical impact									
Low									
High	16	37.2	27	62.8	100	0.341	0.378	0.910	0.011
	33	63.5	19	36.5	100				
Total n	49		46						
Social impact									
Low	16	47.1	18	52.9	100	0.754	0.569	1.33	0.510
High	33	53.2	28	48.8	100				
Total n	49		46						

Table 5. Logistic Regression Analysis Final Model of DM Patient Quality of Life Determinant

Variables	β	Exp (B)	95% CI for Exp(B)		Sig. (p-value)
			Lower	Upper	
Current Income	1.668	5.299	.563	49.893	0.145
Pre-pandemic income	-1.798	0.166	.017	1.609	0.121
Pandemic income impact	-1.122	0.326	.138	.768	0.010

Discussion

This study shows that most type 2 DM patients in the Cilongok I Community Health Centre area had a poor to moderate quality of life (51.4%). The aspects of quality of life that are still not good include the following: 58.91% of patients feel that they enjoy eating less than they did before having diabetes, 40% of patients felt that they were weaker or more tired as a result of their diabetes, and 30.5% of patients felt that they forgot things frequently. The factor associated with the quality of life of patients with type 2 DM was the economic impact of the pandemic, with a p-value of 0.011. DM patients whose economy is highly impacted by the pandemic are at risk of 0.326 times more having a moderate-poor quality of life than those with low impact. Indicators of Common Odds Values for the Lower and Upper Bounds of the OR are indicated, respectively: At least 0.138 times and up to 0.768 times more likely to have a negative quality of life are DM patients residing in high pandemic economies. The unrelated factors were educational level (p = 0.842), employment status (p = 0.178), current income (p = 0.194), income before the pandemic (p = 0.178), marital status (p = 1.655), duration of DM (p = 0.343), duration of PROLANIS membership (p = 0.123), health impact of the pandemic (p = 0.942), and social impact of the pandemic (p = 0.510). The factor that affects the quality of life of patients with DM is the economic impact of the pandemic, with a p-value = 0.026 and an OR of 0.326.

Education level and DM duration

This study shows that there is no significant relationship between education and the quality of life of patients with type 2 DM, and between the length of time suffering from type 2 DM and quality of life. This is in line with Nafiah and Fibriana (2021), who state that there is no relationship between education level and the quality of life of people with diabetes mellitus during the COVID-19 pandemic. In this study, both diabetics who had a high or low level of education did not affect respondents' ability to control their condition, such as obeying and taking medication.[12] However, this is not in line with previous findings that showed the influence of various factors, both characteristics and DM status, on the quality of life of patients with DM. In the Tunggakjati Puskesmas area, West Karawang District, a person with better education is more mature towards changing himself. This results in an increase in accepting external influences that are more positive, objective, and open to various types of information, including health information.[13] Regarding the length of suffering from DM, this study is in line with research by Pranata, Nugraha, & Handayani (2022) that found no relationship between the length of suffering from DM and the quality of life of patients.[14] Conversely, a previous study showed that the length of DM can be related to the number of complications suffered by patients with DM, which can affect the quality of life of patients with DM. Long-term suffering from type 2 DM can lead to feelings of complete recovery and long-term suffering from their health conditions. Patients perform routine therapy at least once a month, which can substantially affect the patient's mood or anxiety, both short and long-term (14,15)

Employment Status

No significant relationship was found between employment status and quality of life in type 2 DM patients. Arda et al. (2020) showed that there is a relationship between employment status and the quality of life of patients with DM. Respondents who have a working status, such as civil servants, private employees, entrepreneurs, or farmers, will engage in a lot of physical activity outside the home. In contrast, respondents with non-working status spend most of their time indoors and tend to engage in less physical activity. Lack of physical activity causes metabolism in the body to not work properly, and blood sugar levels rise.[16] This is why respondents who work have a higher QoL.

Marital Status

Marital status was not associated with quality of life in patients with type 2 DM in this study. Research by Zuzetta, Pudiarifanti, & Sayuti (2022) explains that marital status affects the quality of life of DM patients. Family support received by diabetics, especially support from a partner, will make diabetics feel comfortable, valued, and have a better outlook on life. Family support is the strongest indicator that has a positive impact on self-care in patients with diabetes mellitus. Diabetes mellitus can cause psychosocial effects, such as depression, which can cause patients to show negative traits during diabetes mellitus control. Family emotional support can take the forms of sympathy, empathy, love, trust, and appreciation. Marital status affects the health of patients with diabetes mellitus because the form of attention from a partner increases self-care for patients with type 2 diabetes mellitus, which can minimize the risk of complications.[16]

PROLANIS participation

There was no significant relationship between PROLANIS score and quality of life in patients with type 2 DM. This finding is in contrast to previous research that showed a significant relationship between patient activity in PROLANIS at the Puskesmas Kedungwuni 2 and their quality of life.[17] In this process, PROLANIS becomes a service for DM type 2 patients to monitor their blood sugar levels and general health, as well as to receive counselling or education about disease management and diet. In this process, PROLANIS becomes a service for DM type 2sufferers to monitor their blood sugar and general health and obtain counselling or education about disease management and diet. The hope is that the more active they are in PROLANIS activities, the more positive their impact on their quality of life. Patients can obtain social support from others by sharing their experiences. This fosters feelings of safety and comfort, which can increase self-care and the motivation to manage the disease. This condition also plays a role in preventing stress onset in patients with type 2 DM.

Income Factor

More than half of the respondents had incomes below the minimum wage both currently and before the COVID-19 pandemic. This is in line with research by Wabula and Fitriasari (2022), which states that the income of respondents with Type 2 DM in the Piru Health Centre Working Area is mostly below the UMP. Low family income can affect the ability of family members to conduct health checks for family members.[18] As a result, it can lead to a lack of adequate healthcare for sufferers in dealing with their illness.

Economic Impact

The economic impact of the COVID-19 pandemic was the only variable significantly related to the quality of life of patients with type 2 DM in this study. The Indonesian government has implemented various policies to deal with the COVID-19 pandemic. These existing policies directly have a positive impact, but indirectly can also have a negative impact, one of which we currently know is the decline in economic growth in Indonesia. The impact on the economic sector in Indonesia as a result of this pandemic includes layoffs, the occurrence of PMI Manufacturing Indonesia, a decrease in imports, an increase in prices (inflation) and there are also losses in the tourism sector which caused a decrease in occupancy.[19]

The COVID-19 pandemic has led to low investor sentiment towards the market, which in turn has brought the market to a negative trend. Strategic measures related to fiscal and monetary factors are needed to provide economic stimulus. As the COVID-19 pandemic develops, the market fluctuates in a negative direction. In addition, the slowdown in the global economy, especially Indonesia's export activities to China, has a significant impact on the Indonesian economy. This is based on a sensitivity analysis, which shows that the current slowdown in the global economy has a significant impact on Indonesia's economic growth.[20] The covid-19 pandemic caused a decrease in income and increased anxiety and depression in DM patients.[21] Socioeconomic level has an impact on the quality of life of patients with DM. During the Covid pandemic, many

patients with DM were laid off from work, while expenses increased. For example, they have to spend money to buy multivitamins, herbal medicines, and herbal medicines.

Social Impact

This study showed that social impact does not have a significant relationship with the quality of life of patients with type 2 DM. One of the social impacts of the COVID-19 pandemic is an increase in poverty, where the increase in poverty is higher in areas with a high number of near-poor and vulnerable families. The rapid and widespread spread of the COVID-19 pandemic has resulted in significant changes to all aspects of people's lives.[22] The COVID-19 psychological pandemic has rapidly 'spread' fear, anxiety, and panic worldwide. There are several psychological dynamics of the COVID-19 pandemic that are of concern from a social psychology perspective, namely, information processing and cognition bias, changes in emotions and behavior, as well as social influence and conformity. These psychological dynamics cannot be separated from the interactions between personal characteristics (personality, values, knowledge), situations (culture, norms, religion), and government policies in dealing with the COVID-19 pandemic.[23] To overcome the spread of COVID-19, various regions have implemented social distancing and restriction policies. Participants felt various consequences from the implementation of these policies, ranging from the economic aspect, in this case the difficulty of fulfilling basic needs, to the deterioration of social relations that had been felt by some people.[24] Social distancing also causes them to rarely socialize with the environment, which makes them bored and has an impact on their psychology.

Health Impact

The impact of individual health services and care had no significant relationship with the quality of life of patients with type 2 DM during the COVID-19 pandemic. The health impact of the COVID-19 pandemic on people with DM is not very significant.[25] explained that there are internal barriers consisting of lack of physical activity, unhealthy diet, lack of knowledge about diabetes, lack of frequency of blood glucose monitoring, economic problems, and emotional problems in DM patients during COVID-19. The external barriers were access to health services and access to diabetes medicines. However, healthcare facilities are trying to improve the fulfilment of diabetes self-management during the pandemic through the modification of diabetes self-management. In addition, the use of innovations such as PROLANIS to provide health services and information during the pandemic is very useful.

The limitation of this study is that the patients were in a hurry to complete the interview because several patients were referred for further examination.

Conclusion

Most respondents had incomes below the regional minimum wage, had suffered from type 2 diabetes mellitus for 6 years, and had comorbid hypertension. Most respondents had a poor to moderate quality of life. Covid-19 has a low impact on the health of DM sufferers but has a high impact on socio-economic outcomes. The results of the analysis showed that there was no significant relationship between any independent variables and the quality of life of patients with type 2 DM. It is hoped that the Cilongok I Community Health Center will continue to implement PROLANIS as the main milestone in the treatment of patients with DM. Many patients with DM have been assisted in the treatment and care of DM following PROLANIS. In addition, BPJS Health, which collaborates with Community Health Centers in implementing PROLANIS, can provide a sustainable program that can relieve socio-economic problems through empowerment programs.

Ethics approval

This study was approved by the Health Research Ethics Commission (KEPK) of the Faculty of Health Sciences Jenderal Soedirman University (approval number 794/EC/KEPK/VI/2022).

Availability of data and materials

Available

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Author Contribution

EV and SM conducted data analysis and interpretation of the research results. AFAM and WLR prepared the manuscript. All authors have read and approved the final manuscript.

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