



**COST OF ILLNESS ANALYSIS AND THE IMPACT OF JKN UTILIZATION ON PATIENTS WITH TYPE 2 DIABETES MELLITUS**

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**ABSTRACT**

Globally, diabetes is a major public health problem in developing countries due to its chronic nature, rapidly increasing prevalence, complications, and need for long-term care. Cost of Illness aims to estimate the impact of a particular disease in terms of quality of life and economic costs. Objective: This study aims to determine the cost of illness and the impact of JKN utilization in reducing the economic burden on patients with type 2 diabetes mellitus based on the perspective of outpatients at Puskesmas Talun Kenas. Method: This study is a type of quantitative research with a comparative approach. The sampling technique used purposive sampling technique, using the Lemeshow formula so that 100 samples were obtained. Results: The results showed that the total Cost Of Illness for one treatment visit using JKN was IDR 2,990,000 with an average of IDR 45,303. While the total Cost Of Illness for type 2 diabetes mellitus sufferers who seek treatment in general is IDR 3,805,000, - with an average value of IDR 111,911, - for one treatment visit. The results of the t-test obtained the value of the two groups had a significant difference in COI, namely  $p = 0.0$ . Conclusions: the total cost of illness of type 2 diabetes mellitus patients who seek treatment using JKN is significantly smaller than that of type 2 diabetes mellitus patients who seek treatment with independent payment. So that the utilization of JKN has an impact on reducing the economic burden of patients with type 2 diabetes mellitus at Puskesmas Talun Kenas.

Keywords: cost of illness; JKN utilization; type 2 diabetes mellitus

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**INTRODUCTION**

Globally, diabetes is one of the most common non-communicable diseases and is a major public health problem in developing countries due to its chronic nature, increasing prevalence, causing complications, and requiring prolonged treatment (Afroz et al., 2019). Diabetes mellitus disease is widely suffered by people as a result of chronic fat, protein, and carbohydrate metabolism disorders (Supriyadi et al., 2021). Of the total population with diabetes mellitus in the world, 90-95% is dominated by type 2 DM. According to WHO (2019), type 2 diabetes mellitus is a chronic disease identified by high blood sugar levels that occur because the body cannot use the insulin produced effectively.

According to the International Diabetes Federation in 2021, the global prevalence of type 2 diabetes mellitus reached 537 million people (10.5%) with an age range of 20-79 years, and it is estimated that by 2045 it will continue to increase to 783 million people (12.2%). The three major regions with the highest diabetes rates are the Middle East-North Africa (16.2%), North America-Caribbean (14.0%), and Southeast Asia (8.7%) (Rizki et al., 2023). The prevalence

of Diabetes Mellitus globally continues to increase from year to year and Indonesia is no exception (Arfania et al., 2023).

The repercussions of the diabetes epidemic are widespread throughout Indonesia, a nation with a sizable population (Renaldi et al., 2023). In Southeast Asia, Indonesia has the fifth-highest prevalence of diabetes mellitus. With a proportion of 6.7%, diabetes mellitus is the third leading cause of mortality in Indonesia, behind heart disease (12.9%) and stroke (21.1%) (Resti & Cahyati, 2022). According to the 2013 Basic Health Research (Riskesdas) data, the prevalence of diabetes mellitus (DM) in Indonesia was 1.5%; however, the 2018 Riskesdas results showed a 0.5% increase to 2.0% (Riskesdas, 2018). One of the Indonesian provinces, North Sumatera, is placed 12th with a 1.4%, or around 55,351, prevalence of type 2 diabetes mellitus (Rizki et al., 2023).

Based on the results of the study, diabetes causes significant disability to reduce the quality of life and death, which places a huge economic burden on society and governments around the world (Ganasegeran et al., 2020). The large cost burden of diabetes treatment includes the cost of its complications. Similar economic losses are also reported in other parts of the world including Asia and Europe (Oyewole et al., 2023). The high cost of managing type 2 diabetes mellitus is a challenge for healthcare systems in low- and middle-income countries that have limited infrastructure to detect and manage the disease (Alzaid et al., 2020). Cost of Illness studies aim to estimate the impact of a particular disease in terms of quality of life and economic costs. Analysis of cost of illness data can be useful for other pharmaco-economic analyses, as well as to describe the cost of a disease that will be studied further. The results of the study can be widely used in policy decision-making. Nowadays, economic evaluation has become an important component in the field of health care and is crucial in the decision-making process. The results of disease burden studies can provide important information to guide priority setting in health services (Janssen et al., 2020).

The Ministry of Health through the National Health Insurance (JKN) program seeks to reduce the risks that people will bear, due to out-of-pocket health costs. Ensuring that every individual has access to high-quality healthcare is the primary goal of the healthcare system. However, cash expenditure, also known as Out of Pocket (OOP), remains the largest source of health financing in many low- and middle-income countries, and there is a need for health system safeguards to protect households from the burden of high health expenditure (Situmeang & Hidayat, 2018). Based on a preliminary survey conducted by researchers at the Talun Kenas Health Center, Deli Serdang Regency, North Sumatra, there were 763 people with type 2 Diabetes Mellitus during 2023. There are 660 patients with DM who seek treatment using BPJS, and as many as 103 patients with DM still seek treatment in general and have to pay out of their own pockets because they have not become JKN participants. Diabetes patients who seek treatment out of pocket mention the total costs incurred range from Rp. 50,000 - Rp. 200,000, these costs become an economic burden for patients and their families. Based on the initial survey conducted, a cost of disease analysis needs to be carried out in the Talun Kenas Health Center work area to determine the impact of JKN in reducing the economic burden of patients with type 2 diabetes mellitus. This analysis aims to determine the cost of illness and the impact of JKN utilization on patients with type 2 diabetes mellitus based on the perspective of outpatients in the Talun Kenas Puskesmas work area.

## **METHOD**

This research is a type of quantitative research with a comparative approach. The research was conducted at the Talun Kenas Health Center, Deli Serdang Regency, North Sumatra.

With the research time is March 2024. In this study, the population of type 2 Diabetes Mellitus patients registered and outpatient treatment at the Talun Kenas Health Center in 2023 was 703 people. The sampling technique used purposive sampling technique. The sample was taken using the Lemeshow formula (1997), so that 100 samples were obtained. In this study, the samples used were grouped into 2 based on the payment system, namely patients with type 2 diabetes mellitus who received treatment using JKN and patients with type 2 diabetes mellitus who received general treatment with private payment (out of pocket).

Independent variables consist of direct medical costs, direct non-medical costs, indirect costs, and total cost of illness. The dependent variable is the impact of JKN utilization. Cost variables were measured based on the perspective of patients with type 2 diabetes mellitus in outpatient services at the Talun Kenas Health Center. The data collection method was conducted through interviews using a questionnaire. The data analysis performed was univariate analysis for descriptive data presentation and bivariate analysis with a T-test to see the comparison of the total cost of illness incurred between patients with type 2 diabetes mellitus who use JKN and seek treatment in general.

## RESULTS

Table 1.  
Distribution of Respondent Characteristics

Variable	Category	f	%
Gender	Man	32	32.0
	Woman	68	68.0
Age	34-55	71	71.0
	56-78	29	29.0
Last education	SD	5	5.0
	SMP	39	39.0
	SMA/SMK	55	55.0
	College	1	1.0
Work	Doesn't work	52	52.0
	Farmer	16	16.0
	Laborer	18	18.0
	Other	14	14.0
JKN membership	Yes	66	66.0
	No	34	34.0

Table 1, it is known that the results of the distribution of respondents based on the characteristics of outpatient type 2 Diabetes Mellitus patients in the Talun Kenas Health Center working area of Deli Serdang Regency are mostly female as many as 68 respondents (68.0%) with ages between 34-55 years (71.0%), and the last education taken was at the SMA / SMK level as many as 55 respondents (55.0%). The majority of the employment status of patients with type 2 diabetes mellitus is not working as many as 52 respondents (52.0%) with JKN membership as many as 66 respondents (66.0%).

Table 2 shows that the total direct medical costs incurred by patients with type 2 diabetes mellitus in the Talun Kenas Health Center working area using JKN amounted to IDR 140,000, - with an average amount per patient of IDR 2,121, - for one treatment visit. While the total direct medical costs incurred by patients with type 2 Diabetes Mellitus for one treatment visit with independent payment amounted to IDR 1,680,000, - and the average amount per patient was IDR 49,411.

Table 2.  
Direct Medical Costs

Cost Type	Category	n	Minimum (Rupiah)	Maximum (Rupiah)	Total (Rupiah)	Mean (Rupiah)	Std Deviasi
Diagnostic Tests/ Laboratory	JKN	66	0	0	0	0	0
	Umum	34	20.000	20.000	680.000	20.000	0
Pharmaceutical Drugs	JKN	66	0	0	0	0	0
	Umum	34	20.000	20.000	680.000	20.000	0
Buy Your Own Medicine	JKN	66	20.000	100.000	140.000	2.121,21	12711,612
	Umum	34	20.000	200.000	320.000	9.411,76	37894,685
Total Direct Medical Costs	JKN	66	20.000	100.000	140.000	2.121,21	12711,612
	Umum	34	60.000	240.000	1.680.000	49.411,76	37894,685

Table 3.  
Non-Medical Direct Costs

Cost Type	Category	n	Minimum (Rupiah)	Maximum (Rupiah)	Total (Rupiah)	Mean (Rupiah)	Std Deviasi
Transportation costs	JKN	66	10.000	50.000	1.200.000	18.181,82	5726,884
	Umum	34	10.000	30.000	625.000	18.382,35	4559,470

Table 3, it is known that the total direct non-medical costs incurred by patients with type 2 diabetes mellitus in one treatment visit using JKN is IDR 1,200,000, - with an average amount per patient of IDR 18,181. And the total direct non-medical costs incurred by patients with type 2 diabetes mellitus who seek general treatment amounted to IDR 625,000, - with an average amount per patient of IDR 18,382, - per one treatment visit.

Table 4.  
Indirect Costs

Cost Type	Category	n	Minimum (Rupiah)	Maximum (Rupiah)	Total (Rupiah)	Mean (Rupiah)	Std Deviasi
Lost Patient Income	JKN	66	0	100.000	1.550.000	23.484,85	41342,562
	Umum	34	0	100.000	1.450.000	42.647,06	46273,811
Lost Income of the Patient's Family	JKN	66	0	100.000	100.000	1.515,15	12309,149
	Umum	34	0	50.000	50.000	1.470,59	8574,929
Total Indirect Costs	JKN	66	0	200.000	1.650.000	25.000,00	44071,620
	Umum	34	0	150.000	1.500.000	44.117,65	45667,948

Table 4 shows the total indirect costs incurred by patients with type 2 diabetes mellitus in the Talun Kenas Health Center working area using JKN of IDR 1,650,000, with an average amount of IDR 25,000 per patient. And the total indirect costs incurred by patients with type 2 diabetes mellitus who seek general treatment amounted to IDR 1,500,000, - with an average amount per patient of IDR 44,117.

Table 5.  
Comparison of Total Costs of Disease for Type 2 Diabetes Mellitus Patients

Cost type	JKN participants (n=66)	General patient (n=34)	P value (<0.05)
Direct cost	Rp 140.000	Rp 1.680.000	
Non-Medical Direct Costs	Rp 1.200.000	Rp 625.000	
Biaya Tidak Langsung	Rp 1.650.000	Rp 1.500.000	
Total Cost Of Illness	Rp 2.990.000	Rp 3.805.000	0.00
Average Cost Of Illness	Rp 45.303,03	Rp 111.911,76	

Table 5, it is known that the total Cost Of Illness of patients with type 2 diabetes mellitus in the Talun Kenas Health Center working area for one treatment visit using JKN is IDR 2,990,000 with an average of IDR 45,303. While the total Cost Of Illness of type 2 diabetes mellitus sufferers who seek treatment in general is IDR 3,805,000, - with an average value of IDR 111,911, - for one treatment visit. Based on the results of the t-test, the value of the two groups has a significant difference in COI, namely  $p = 0.00$  (significance value  $p < 0.05$ ), so it is known that the total Cost Of Illness of type 2 Diabetes Mellitus patients who seek treatment using JKN is significantly smaller than that of type 2 Diabetes Mellitus patients who seek treatment with independent payment.

## **DISCUSSION**

The high prevalence of diabetes will affect the increasing prevalence of obesity, population aging, population growth, urbanization and lack of physical activity. The annual cost of diabetes is mainly related to direct costs (e.g. medication, hospitalization, laboratory tests, etc.) and indirect costs (e.g. loss of productivity due to disability, premature death, etc.) (Afroz et al., 2019). Type 2 diabetes mellitus requires lifelong health services for disease management and to prevent complications. So that the treatment certainly requires considerable service costs (Anggriani et al., 2018). Differences exist between people in high-income countries and middle- and low-income countries in their access to insurance. People in low-income countries still lack access to health insurance and publicly available medical services. This leads them to incur higher out-of-pocket health costs. In addition, some people with diabetes and their families also bear almost all the expenses due to diabetes treatment (Afroz et al., 2019). Cost of Illness analysis aims to provide useful information for decision-making in distributing limited resources or desired facilities. Individuals, communities, and governments must allocate resources to health services and also to meet other basic needs. Accounting for diabetes-related costs is becoming increasingly important as the prevalence of this disorder increases day by day (Butt et al., 2022).

### **Direct Medical Costs**

Direct medical costs are patient expenses that are directly related to patient treatment in obtaining health care services and products. In this case, direct medical costs incurred by patients with type 2 diabetes mellitus to obtain health services include the cost of diagnostic or laboratory tests, consultations, and the cost of pharmaceutical drugs obtained from health facilities. In direct medical costs, patients who are JKN participants no longer pay for diagnostic or laboratory tests and also the cost of pharmaceutical drugs prescribed by doctors. However, some patients with type 2 diabetes mellitus who are JKN participants still have to take drugs that are not covered by BPJS and must buy independently. Direct medical costs incurred by patients with diabetes mellitus who seek treatment in general are dominantly higher than patients who use JKN. The results showed the cost of diagnostic or laboratory tests totaling Rp 680,000, with the average patient spending Rp 20,000 for one visit. This cost is similar to the cost of pharmaceutical drugs prescribed by a doctor with a total of IDR 680,000, with the average patient spending IDR 20,000 to get the medicine prescribed by the doctor. Meanwhile, the cost of self-purchased drugs is lower, totaling IDR 320,000 with an average of IDR 9,411 per patient. It can be concluded that drug costs are the highest component in direct medical costs. In line with research conducted in Bangladesh which shows that the cost component of drugs is the largest contributor (60.7%), so that direct costs have the largest portion (90.5%) of the overall cost of the disease (Afroz et al., 2019).

Total direct medical costs are the second largest contributor to the cost of illness for patients with type 2 diabetes mellitus in the Talun Kenas Health Center working area. In JKN patients,

the total direct medical costs amounted to Rp140,000, - with an average of Rp. 2,121 per patient. Patients with type 2 diabetes mellitus who seek treatment generally provide a total direct medical cost of Rp. 1,680,000, - with an average of Rp. 49,411, - per patient. It can also be seen that there is a significant difference in the average direct medical costs between patients with type 2 diabetes mellitus who seek treatment using JKN and those who seek treatment in general.

### **Direct Non-Medical Costs**

The components of direct non-medical treatment costs spent by patients with type 2 diabetes mellitus were calculated in this study from the patient's point of view. Patients' expenses that are directly related to treating their illness and discomfort, but not immediately tied to the purchase of medical supplies or services, are referred to as direct non-medical costs. Travel and lunch expenses incurred en route to the hospital are considered direct non-medical costs (Afroz et al., 2018). Non-medical direct costs are calculated based on patient transportation costs from home to health facilities. The results of this study indicate that the total non-medical direct costs incurred by patients with type 2 diabetes mellitus in one treatment visit using JKN amounted to IDR 1,200,000, - with an average amount per patient of IDR 18,181. And the total direct non-medical costs incurred by patients with type 2 diabetes mellitus who seek general treatment amounted to IDR 625,000, - with an average amount per patient of IDR 18,382, - per one treatment visit.

### **Indirect Costs**

According to the Indonesian Ministry of Health (2013), indirect costs are costs incurred by patients due to loss of productivity due to their illness. In this study, the indirect costs incurred by type 2 diabetes mellitus patients for diabetes treatment are the amount of income lost due to loss of productivity due to their illness. Indirect costs include the opportunity cost of lost productive time by patients and their caregivers due to illness, disability, or premature death (Afroz et al., 2018). In this study, total indirect costs accounted for the largest share of total disease costs. Based on the perspective of JKN patients, total indirect costs amounted to IDR 1,650,000, with an average per patient of IDR 25,000 per month. Whereas in general patients, the total indirect costs amounted to IDR 1,500,000, with an average per patient of IDR 44,117 per month. The large indirect cost burden is caused by the loss of patient income due to decreased productivity of patients with type 2 diabetes mellitus. In addition, family income wasted due to accompanying patients during treatment is also an indirect cost burden.

### **Total Cost Of Illness And The Impact Of JKN Utilization**

Comparative measurement of the cost of illness incurred for type 2 diabetes mellitus based on the acquisition of a significance value of  $p=0.00$  ( $<0.05$ ) based on table 5, it can be concluded that there is a significant difference in the total cost of illness between patients with type 2 diabetes mellitus who seek treatment using JKN and those who seek treatment in general. Patients with type 2 diabetes mellitus must bear the economic costs of their disease, including the costs incurred due to illness. Improving the quality of life of patients with type 2 diabetes mellitus is a common goal of treatment. Short-term goals are to eliminate DM complaints, improve quality of life, and reduce the risk of acute complications. Long-term goals are to prevent and halt the progression of microangiopathic and macroangiopathic complications. The ultimate goal of management is to reduce DM morbidity and mortality (Soelistijo, 2021). Although management can be achieved through patient awareness to undergo regular health check-ups, type 2 diabetes can cause huge costs to households.

For this reason, JKN ownership greatly contributes to reducing the cost burden of type 2 diabetes mellitus and also eliminates disparities in health services, especially in the lower middle-income community (Sinurat et al., 2023). In this study, the JKN program had a positive impact on participants by covering direct medical costs. The cost of diagnostic/laboratory tests and pharmaceutical drugs are costs covered by the National Health Insurance. The difference in total cost of illness between patients with type 2 diabetes mellitus who incur their own costs (IDR 3,805,000) and JKN users (IDR 2,990,000) is IDR 815,000. Therefore, this study found that JKN utilization can reduce direct medical costs and reduce the economic burden of patients and their families due to type 2 diabetes mellitus. The present study's findings are consistent with those of Solida's (2022) investigation, which indicates a noteworthy distinction in the mean overall expenses related to hypertension between patients who receive JKN and those who bear independent charges. This difference contributes to a 97.8% reduction in the family's financial burden, particularly with regard to direct medical costs (Solida et al., 2022). Similar results were observed in a study on diabetes mellitus patients in Sampit City; 45 respondents who utilized BPJS while seeking treatment reported a one-year reduction in treatment expenses, which ranged from IDR 480,000 to IDR 1,500,000 per patient (Etika et al., 2020).

Utilization of the National Health Insurance for patients with type 2 diabetes mellitus is very helpful for patients to routinely obtain treatment in order to accelerate healing and avoid complications so as to reduce costs incurred. High JKN utilization has not been caused by a high level of participation (Noerjoedianto & Subandi, 2021). This was found in the study, where there were still patients with type 2 diabetes mellitus who had JKN but did not use it and chose to seek treatment out of pocket. Based on the results of brief interviews and observations, some of the causes of patients not having or utilizing the National Health Insurance are that the majority of respondents still have a negative perception of the JKN program. Socioeconomic factors and individual perceptions play an important role in health screening measures and health insurance ownership in the community (Melinda et al., 2020). In this case, patients who seek out-of-pocket treatment assume that even though they are treated using JKN, they will receive less service, unlike when they seek treatment with independent payments. This was obtained based on several patient experiences and also information obtained or heard from the closest people regarding the differences in services received when becoming JKN patients with general patients being one of the reasons respondents were reluctant to register in the JKN program. So that this causes there are still people with type 2 diabetes mellitus who have not become participants in the JKN program and also do not take advantage of it. Perceptions about JKN are very important because with a good perception, the public's view of the JKN program will encourage the public to participate in the JKN program (Asrinawaty & Mahmudah, 2021). According to Kusumaningrum (2018), community perception is one of the factors associated with community participation in JKN (Kusumaningrum & Azinar, 2018). And some respondents mentioned that they already have the comfort of seeking treatment with a personal doctor who suits them.

In addition, based on the characteristics of the respondents, the majority of jobs are informal jobs which do not have cooperation ties with BPJS Kesehatan so that respondents do not have health insurance. The income earned from uncertain employment is one of the factors, where respondents prefer to fulfill their daily household needs. The better a person's level of employment, the higher the participation in JKN utilization (Hasmayanti, 2021). Thus, it is hoped that the Government and BPJS will further educate the public about the benefits of

JKN to maintain the health and economic integrity of households, especially to reduce the economic burden caused by type 2 diabetes mellitus.

## CONCLUSION

The Talun Kenas Health Center's cost of illness analysis for patients diagnosed with type 2 diabetes mellitus shows that indirect costs which stem from lost patient productivity make up the largest portion of the overall cost of illness, followed by direct medical costs, which come in second, and non-medical direct costs. The total cost of illness for one treatment visit using JKN is IDR 2,990,000, - with an average per patient of IDR 45,303. Meanwhile, the total cost of illness for type 2 diabetes mellitus sufferers who seek general treatment is IDR 3,805,000, with an average of IDR 111,911 per patient for one treatment visit. The value of the two groups has a significant difference, namely  $p = 0.00$  (significance value  $p < 0.05$ ), so it is known that the total cost of illness of type 2 Diabetes Mellitus patients who seek treatment using JKN is significantly smaller than that of type 2 Diabetes Mellitus patients who seek treatment with independent payment. So that the utilization of JKN has an impact on reducing the economic burden of patients with type 2 diabetes mellitus at Puskesmas Talun Kenas.

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