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COST OF ILLNESS ANALYSIS OF COVID-19 PATIENTS WITH COMORBID TYPE 2 DIABETES IN A HOSPITAL IN BANDUNG

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ABSTRAK

Penyakit Coronavirus 2019 (Covid-19) disebabkan oleh Virus SARS-COV-2 dan ditandai dengan gejala nonspesifik, termasuk gangguan pernapasan akut. Penyakit penyerta, seperti Diabetes Mellitus Tipe 2, dapat memperparah Covid-19. Penelitian ini bertujuan untuk mengevaluasi biaya terapi pasien Covid-19 dengan komorbid DM tipe 2 di rumah sakit di Bandung dari perpektif rumah sakit, serta mengidentifikasi alasan yang berkontribusi terhadap tingginya biaya pengobatan pasien Covid-19 dengan komorbid DM tipe 2. Penelitian ini merupakan penelitian non-eksperimental dengan rancangan *cross-sectional* dengan menggunakan sumber data rekam medis dan keuangan. Pasien Covid-19 dengan penyerta Diabetes Mellitus tipe 2 pada penelitian ini ditanggung oleh Jaminan Kesehatan Nasional (JKN) dimana pengambilan data pada periode Januari hingga Desember 2021. Dari 1.915 pasien, 42 pasien memenuhi kriteria inklusi dan dianalisis lebih lanjut. Rata-rata lama tinggal (LOS) adalah 11,24±4,86 hari dan biaya langsung penyakit adalah $2,139.5 (Rp. 30,487,833). Perawatan rumah sakit menyumbang 48,87% dari total biaya, diikuti oleh obat-obatan (16,48%), harga kamar tidur (14,03%), biaya laboratorium (9,56%), pemeriksaan dokter (4,6%) dan radiologi. Berdasarkan analisis korelasi Pearson, komponen LOS berpengaruh terhadap total biaya dengan nilai signifikansi kurang dari 0,05. Studi ini menyimpulkan total biaya pasien COVID-19 dengan diabetes tipe 2 adalah Rp 1.280.488.973.

Kata kunci : Covid-19, Komorbid Diabetes Mellitus Tipe , *Cost Of Illness.*

ABSTRACT

Coronavirus disease 2019 (Covid-19) is caused by the SARS-COV-2 virus and is characterized by nonspecific symptoms. Comorbidities, like Type 2 Diabetes Mellitus, can aggravate Covid-19. This study aims to evaluate the cost of illness for Covid-19 patients with comorbid type 2 D.M. at a hospital in Bandung from the hospital's perspective, as well as to identify the reasons for the high cost. This research conducts as a non-experimental cross-sectional analytical research using medical and financial records as data sources. Covid-19 in patients with concomitant type 2 Diabetes Mellitus is covered by the National Health Insurance (N.H.I) from January to December 2021. Only 42 patients from 1915 patients meet the inclusion criteria and analyze further. The average length of stay (L.O.S.) is 11,24±4,86 days, and the direct cost of illness is $2,139.5 (Rp. 30,487,833). Hospital treatment accounts for 48,87 % of the total cost,

followed by medicine (16,48%), Bed Charges (14,03%), Laboratory Costs (9,56%%), Doctor's Examination (4,6%), and radiology. Based on Pearson correlation analysis, the component L.O.S. influences the total cost with a significance value of less than 0.05. This study concludes that the total cost of Covid-19 patients with type 2 diabetes is Rp 1,280,488,973.
***Keywords**:* Covid-19, Comorbid Type 2 Diabetes Mellitus, Cost Of Illness.

INTRODUCTION

Coronavirus disease (Covid-19) was previously identified as autoimmune. The virus responsible for Covid-19 is known as SARS-Cov-2. Covid-19 is characterized by fever, cough, and shortness of breath. An incubation period from 5 to 6 days and, in severe conditions, cause mortality (Tosepu et al., 2020). Global Covid-19 cases in 2021 confirmed 225.6 million, and 4.6 million were fatalities. As of January 2022, in Indonesia, a total of 4,275,528 people were confirmed positive, with 144,192 deaths (World Health Organization, 2021).

Patients with diabetes mellitus have a high risk of the severity of COVID-19 (Reshad et al., 2021). It could be that people with high blood glucose levels have weakened immune systems, lower levels of viral clearance, metabolic activity dysfunctions, and other complications. Patients with COVID-DM have a twofold increased mortality risk (Harbuwono et al., 2020; Huang et al., 2020).

Data indicate that diabetes is one of the most prevalent comorbidities among COVID-19 patients (Chen et al., 2020; Li et al., 2021). Diabetes predisposes to a very severe disease course and increases the COVID-19 mortality rate (Kun'ain et al., 2020). Therefore, diabetes is a substantial contributor to the expense of treating COVID-19. One of the pharmacoeconomic evaluations is the Cost of Illness. It measures based on the disease's prevalence, the impact on the patient's quality of life, and financial factors, including direct and indirect costs (Jo, 2014). This study aimed to evaluate the cost of illness for Covid-19 patients with comorbid type 2 DM. at a Hospital in Bandung, as well as to identify the factors that contributed to the high cost of treating Covid-19 patients with comorbid type 2 DM.

MATERIALS AND METHOD

Materials

This study utilized the medical record and financial information of Covid-19 patients with type 2 DM. and comorbidities from January to December 2021 from R.S.U.D. Al Ihsan Bandung, West Java, Indonesia.

Methods

This study is an analytical, non-experimental study with a cross-sectional design. The data were retrospectively obtained from medical records and billing data. The scope of the cost analysis was direct medical expenses. This study was conducted from the hospital's

perspective as a healthcare provider. The inclusion criteria were patients hospitalized in 2021 with moderate to severe Covid-19 and type 2 DM.

Data Analysis

The collected data was analyzed to describe the sociodemographic data (gender and age), treatment length, and illness cost. The cost of illness is calculated using a top-down methodology by the average direct medical costs. The data was analyzed statistically using Pearson correlation.

RESULT AND DISCUSSION

The ethics and law committee, R.S.U.D, approved the study. Al-Ihsan, Indonesia, with No. 070/4079/KEPK-xxx/2022.

Table 1. Demographic Profile of Inpatient

Characteristics	Number of subjects (n=42)	Percentage (%)
Gender		
Male	28	66.66
Female	14	33.33
Age		
<30	0	0.00
31-45	5	11.90
46-59	21	50.00
>60	16	38.09

The population of Covid-19 inpatients in 2021 was 1,915 patients. Most patients were female (1099 patients, 57.38%) as contrasted to males (816 patients, 42.60%). From 1915 data of medical records, 42 data on Covid-19 inpatients matched the inclusion criteria for patient cost information.

Based on data, more male patients infected with Covid-19 and type 2 D.M. comorbidities than female patients. Diabetes may be caused by the lifestyles in which men are generally less healthy than women. It is also probably by smoking because cigarette nicotine influences insulin sensitivity (Nuraisyah, 2018).

Age was a mortality risk factor among patients with diabetes and COVID-19 (Chen et al., 2020). Based on data from Riskesdas in 2018 in West Java, the prevalence of type 2 DM patients in the 46-59 year age range is 8.97% (Kementerian Kesehatan RI, 2019). Based on this study, the results indicated that patients were predominantly between the ages of 46 and 59 (50%). People of productive age may be more likely to be infected with SARS-CoV-2, which is associated with increased mobility (Monod et al., 2021).

Table 2. Length of Stay of Inpatient

Length of stay (day)	Number of subjects (n=42)	Percentage (%)
1-7	7	16.,66
8-14	27	64.28
15-21	6	14.28
22-28	2	4.76

According to the length of hospital stays, Table II demonstrates that the average length of stay (L.O.S.) was 11.24±4.86 days. The most extended length of stay in

the group of 8-14 days, as many as 27 people (64.28%). This condition follows the recommendations for treating Covid-19 by the Indonesian Lung Doctors Association for 14 days of isolation (Burhan et al., 2022). The mean L.O.S. of patients with type 2 D.M. comorbid was 10.18±5.94 days, and for patients without comorbidity (10.47±4.7 days) (Suryaputra et al., 2022). Significantly longer L.O.S. was associated with female gender, critical or severe disease, mechanical ventilation, diabetes, and ceftriaxone administration (Alahmari et al., 2022).

Table 3. Direct medical costs analysis

Variable	Total cost (Rp)	Average cost per patient (Rp)
Direct cost		
Bed Charges	179,750,000	4,279,762
Hospital Treatment	625,827,533	14,900,656
Doctor's Examination	58,920,000	1,402,875
Medicine	211,042,372	5,024,818
Radiology	7,350,000	183,750
Laboratory Cost	122,510,000	2,916,905
Miscellaneous cost	67,189,068	1,679,727
Administration	7,900,000	188,095
Total COI	1,280,488,973	
COI/day	113,992,506	

Based on data in table III, the average direct cost for COVID-19 patients requiring I.C.U. Admission is $2,139.5 (IDR: 30.487.833), and it is almost similar to expenses in Turkey ($2924) (Gedik, 2020), India ($3192.06) (Reddy et al., 2021) and Iran ($3755) (Darab et al., 2021), but significantly less than South Africa ($7316) (Cleary et al., 2021) and Saudi Arabia ($21,178) (Khan et al., 2020). The United States had the highest costs for these patients, ranging from $95,546 for non-ventilated patients to $301,331 for ventilated patients (Fusco et al., 2021).

The largest expense were hospital care and facilities, and medications. To treat Covid-19 patients with type 2 D.M., several pieces of equipment and the services of health professionals were needed, such as personal protection equipment (P.P.E.), breathing tube chamber for airvo, oxygen, infusion injection, infusion pump, monitor per day (I.C.U.), glucose test, draw blood, and inserting of D.C. and UP catheters in patients. Breathing tube chambers for arvo and P.P.E. were used to treat. Covid-19 patients have a significant impact on the cost of treatment. This data is similar to Darab *et al.* (2021). The most expensive items were hospital medications and disposables, bed charges, equipment costs, biosafety protection equipment (P.P.E.), and pathology and radiological testing (Reddy et al., 2021). Patients with diabetes and sepsis require a high-flow nasal cannula

(H.F.N.C.), noninvasive ventilation (N.I.V.), and mechanical ventilation (MV) for treatment. It also gives impacts the high cost of treatment. The cost of medicines is affected by the high cost. Poor glycemic control of the patient is associated with an increased I.C.U. Admission and a prolonged hospital stay (Bain et al., 2021). COVID-19 sample collection, diagnosis, and contact tracing in low-income countries were expensive (Yigezu et al., 2022). Laboratory costs are also expensive. It consists of costs for the Covid-19 antibody rapid test, independent PCR swab, blood gas analysis, complete electrolyte checks, HbA1C, urea and creatinine, fasting glucose, and complete hematology. The increase in laboratory cost didn't include independent PCR swabs of the patient. According to the Decree of the Indonesian Minister of Health No. 104/2020 concerning the Determination of Novel Coronavirus Infection as a disease that can cause outbreaks and efforts to prevent it, all costs associated with treating Covid-19 patients in Indonesia are still borne by the state through the Ministry of Health (Kementerian Kesehatan Republik Indonesia, 2020).

As previously stated, the data were analyzed statistically using the Pearson correlation test. A normality test was conducted to determine whether the data came from a normally distributed population. The Kolmogorov-Smirnov test was utilized to determine the normality test with the Lilliefors correction. The Kolmogorov-Smirnov normality test requires a normal curve if the significance value exceeds the maximum error limit of 0.05. Based on 0.052, which is greater than 0.05. Thus, it can be concluded that the residual variance is normally distributed so that it can be continued with the correlation test with the Pearson correlation test. Based on the results of the Pearson correlation test, it is stated that only the L.O.S. variable has a relationship with Total Cost.

Meanwhile, Sex and Age have no relationship with Total Cost because the significance value obtained is greater than 0.05. So the longer the patient's L.O.S. is hospitalized will also affect the total real cost (Manawan et al., 2019). According to studies

on COVID-19 patients, the comparatively high cost is a function of hospitals and I.C.U. Length of stay, which is supported by these findings. The cost was substantially linked to the admission waiting period. L.O.S. may be a result that patients who present late recover more slowly, resulting in higher costs (Reddy et al., 2021).

CONCLUSION

The cost of illness for Covid-19 patients with Comorbid D.M. type 2 at a hospital in Bandung in the 2021 period is Rp. 1,280,488,973. This is the total cost of bed charges, hospital treatment, doctor's examination, medicine, radiology, laboratory, administration, and other costs. The major cost is the cost of hospitalization (48.87%) of the total cost.

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