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Comparison Of Real Cost To Ina-Cbg's Of Diabetes Mellitus Type 2 Inpatient And Related Factors In Pandan Arang Boyolali Hospital.

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Abstract

Diabetes Mellitus (DM) financing regulated in Indonesia Case Base Groups (INA-CBG's) rate. Purpose of this study was to determine conformity of DM's real costs with the rate of INA-CBG's on patient with Jaminan Kesehatan Nasional (JKN) and non-JKN patients with the diagnoses of diabetes mellitus at Pandan Arang Boyolali Hospital.

This study were an observational analytic with cross sectional design and hospital perspective used. Data collection method was retrospective. Subjects were DM inpatients with or without JKN at Pandan Arang Boyolali Hospital in 2017. Data were analyzed to know total real cost of inpatients and test one sample t-test to determine differences of real cost with INA-CBG's rates and bivariate correlation test ascertain related factors to real cost.

Results of this study showed average cost for treating inpatient of diabetes mellitus on class 1, 2 and 3 were Rp.2,677,003±906,406, Rp.2,881,023±851,483 and Rp.2,323,768±802,828 respectively, there were a positive difference between the real cost and the INA-CBG's rate in 101 patients of 378,509,126. There were discrepancy between real costs and INA-CBG's rate for all treatment classes and nursing levels. Factors influenced real cost of treatment for DM are length of stay and severity level.

Keywords : Cost Analysis, Factor Analysis, Diabetes Mellitus, Real Cost, INA-CBG's.

Introduction

Diabetes mellitus is a type of chronic disease which becoming a major world health problem. The world is facing the development of an epidemic of diabetes mellitus. Various global epidemiological studies showed an increase tendency of the incidence and prevalence of diabetes in various parts of the world. Diabetes mellitus has been categorized as a global disease by the World Health Organization (WHO). Statistical data estimated that 382 million adult populations had diabetes; this number will continue to increase and reach 592 million by 2035. The widening diabetes epidemic around the world presents a potential detrimental to the development of health systems and economies in developing countries (Belma Malanda, Suvi Karuranga, Pouya Saeedi, 2019) .

Diabetes mellitus is well-known as the silent killer because this disease can attack all organs of the body and cause various kinds of complications, including visual disturbances such as cataracts, heart disease, kidney disease, sexual impotence, long-healing wounds including gangrene wound, lung infections, blood vessel disorders, and stroke. To reduce the incidence and severity of type 2 diabetes mellitus, prevention can be carried out through lifestyle modifications and medications such as oral hyperglycemic drugs and insulin (American Diabetes Association, 2014).

The results of the study conducted by Finkelstein et al., (2014) estimated that in 2020 diabetes mellitus will increase Indonesia's economic burden to exceed 1.27 billion. Health costs and the growing burden of diabetes mellitus with the severity of chronic complications which are rapidly increasing from year to year have a significant long-term negative impact on health development and national economic growth. The economic burden of diabetes should be a concern of the implementation of the National Health Insurance (JKN) in managing the problem of chronic non-communicable diseases (Finkelstein et al., 2014) .

Currently, Indonesian government has implemented the National Health Insurance Program or known as JKN. The aim of the JKN program is to reform the health sector in order to overcome problems related to public health which result in uncontrolled health costs and service quality (Eko Wahyu Basuki et al., 2016) . The Social Security Administering Body (BPJS) is a legal entity established to administer the JKN program. The implementation of the BPJS program in hospital services uses the INA-CBGs system (Indonesia Case Based Groups). The INA-CBGs system is guided by the INA-CBGs rate, namely the amount of claim payments by BPJS Kesehatan to health facilities for service packages based on disease diagnosis and procedure groupings (Kemenkes, 2014) .

Evaluation of the real economic burden (economic burden) of disease will provide a basis for the government for the long-term fiscal impact of chronic disease for economic efficiency and the development of strategies, policies or programs on the health financing system (Zhuo et al., 2013).

The economic burden of diabetes should be a concern of the implementation of the National Health Insurance (JKN) in the case of non-communicable diseases. Therefore, it is necessary to analyze the cost of diabetes mellitus.

Purpose of this study was to determine conformity of DM's real costs with the rate of INA-CBG's on patient with Jaminan Kesehatan Nasional (JKN) and non-JKN patients with the diagnoses of diabetes mellitus at Pandan Arang Boyolali Hospital in 2017.

Material and Method

This research was an observational research with analytic descriptive research design. Retrospective cross-sectional data were collected by recording the results of medical records, real hospital fees and the Case-Mix system, INA-CBG financing claims for patients with type 2 diabetes mellitus with or without comorbidities undergoing treatment at the inpatient installation of Pandan Arang Hospital Boyolali during January to December 2017. The data obtained were analyzed according to descriptive and quantitative methods. The population of this study were patients with diabetes mellitus who used medical expenses with JKN and Non-JKN as well as hospitalized at the Pandan Arang Boyolali hospital in the period of January to December 2017 with the diagnostic code INA-CBG's E-4-10-I, E-4- 10-II and E-4-10-III. The research samples used were patients with JKN and non-JKN type 2 diabetes millitus who met the inclusion criteria.

a. Inclusion Criteria

Medical record data of JKN patients diagnosed primarily with type 2 diabetes mellitus, claim files and patient medical records with diagnostic codes INA-CBG's E-4-10-I, E-4-10-II and E-4-10-III, details complete claim file costs, data for non-JKN patients who diagnosed with type 2 diabetes mellitus taken based on details of treatment costs and class of care.

b. Exclusion Criteria

Medical record data of patients who died, patients who discharge against medical advice, and incomplete patient data.

Results and Discussion

In this study, an analysis of the cost of diabetes mellitus treatment was carried out in inpatients at Pandan Arang Boyolali Regional Hospital for the period of January to December 2017. A total of 44 samples met the inclusion criteria for non-JKN patients, while 101 samples of JKN patients met the inclusion criteria.

Tabel 1. Patients' Characteristics

Characteristics	JKN Patients		Non-JKN Patients	
Age	n	%	n	%
12-25	4	3,96	-	-
26-45	6	5,94	5	11,36
46-65	67	66,33	23	52,28
>66	24	23,77	16	36,36
Gender				
Male	40	39,6%	15	34%
Female	61	60,4%	29	66%
Secondary Diagnosis				
E11.0 (diabetes mellitus)	18	40,91	30	29,71
G73.0 (amyotrophic)	2	4,55	7	6,93
G63.2 (polyneuropathy)	1	2,27	3	2,97
H36.0 (retinopathy)				
H28.0 (cataract)				
N08.3 (diabetic nephropathy)	9	20,45	14	13,86
G99.0 (autonomic nephropathy)	1	2,27	6	5,94
M14.2 (diabetic arthropathy)	2	4,55	11	10,89
M14.6 (neuropathic diabetic arthropathy)	3	6,82	15	14,85
I79.2 (peripheral angiopathy)	3	6,82	5	4,95
N08.3 + I79.2	1	2,27	3	2,97
N08.3 + G99.0	2	4,55	2	1,98
N08.3 + M14.2	1	2,27	1	0,99
N08.3 + H28.0			1	0,99
N08.3 + G73.0			1	0,99
N08.3 + M14.6	1	2,27	2	1,98

G99.0 + I79.2	1	2,27	

Patient characteristics (Table 1) showed that the gender distribution of female was greater than male, 60.4% in JKN patients and 66% in non-JKN patients. The results of this study were in accordance with research conducted by Masni (2013)[7] at RSD dr. Soebandi Jember, where the number of female patients with diabetes mellitus was greater, namely 66.7% compared to male 33.3%. According to Mauvais-Jarvis, (2017) women are more at risk of developing diabetes because physically women had a greater chance of increasing the body mass index. Monthly cycle syndrome (premenstrual syndrome) and post-menopause which made the distribution of body fat easily accumulate due to this hormonal process, so that women were at risk of suffering from type 2 diabetes mellitus. This is in line with Hein et al., (2018) that showed that the incidence of diabetes in women was higher than men. According to age criteria, it is known that the most age group suffering from type 2 diabetes mellitus was 46-65 years, or 66.33% of JKN patients and 52.28% of non-JKN patients. The most diabetes sufferers were in the age range of 40 - 59 years and 80% of diabetes mellitus patients in this age group were in developing countries such as Indonesia. However, it is possible that people less than 45 years old can suffer from diabetes (Yosmar et al., 2018). The results of this study are in line with those reported by Asosiation, (2013) Over 45 years was a risk factor for diabetes mellitus. This is caused by poor lifestyle such as unhealthy diet, lack of exercise and lack of rest. With increasing age, the risk of developing diabetes mellitus increases due to decreased glucose tolerance associated with reduced sensitivity of peripheral cells to the effects of insulin (Asosiation, 2013) . Over 45 years was a risk factor for diabetes mellitus. This is caused by poor lifestyle such as unhealthy diet, lack of exercise and lack of rest. With increasing age, the risk of developing diabetes mellitus increases due to decreased glucose tolerance associated with reduced sensitivity of peripheral cells to the effects of insulin (Wahyuni et al., 2012).

Patients with type 2 diabetes are mostly followed by comorbidities and complications which included in the secondary diagnosis. Generally, DM patients who hospitalized are accompanied by various comorbidities and complications which may arise due to uncontrolled blood sugar levels for a long time. The global epidemic of prediabetes and diabetes has led to complications. The most common complication is neuropathy. It is distal symmetric polyneuropathy or known as neuropathic diabetes which occurs mostly in diabetics. Neuropathic diabetic is a sensory loss that starts distally and is characterized by the onset of pain (Feldman et al., 2019). The results showed that most patients with type 2 diabetes were followed by comorbidities and complications which included in the secondary diagnosis. Based on the study, the number of secondary diagnoses experienced by many patients was 1 and 2 secondary diagnoses. Most of the patients with type 2 diabetes mellitus had at least one complication (Zheng et al., 2018).

Generally, DM patients who hospitalized are accompanied by various comorbidities and complications that can arise due to uncontrolled blood sugar levels for a long time (Wahyuni et al., 2012). Increased mortality and morbidity of diabetes mellitus patients is caused by the presence of various macrovascular and microvascular complications that develop during diabetes mellitus, especially if glucose control is poor. At the macrovascular level, DM patients tend to experience hypertension and systemic heart disease more easily. Tissue damage at the microvascular level is a major factor in the progression to diabetic nephropathy and neuropathy (Asosiation, 2013).

Table 2. Length of Stay Distribution Characteristics of JKN and Non-JKN Patients 2017

Type	Characteristics	n	(%)
Non JKN	1-4 days	26	59,09
	5-8 days	15	34,09
	> 8	3	6,82
Type	**Characteristics**	**n**	**(%)**
JKN	1-4 days	68	67,32
	5-8 days	32	31,69
	> 8	1	0,99

Based on table 2, it shows that the number of non-JKN patients with an average length of treatment of 1 to 4 days was greater, namely 26 patients (59.09%) than the length of treatment for 5-8 days as many as 15 patients (34.09%) and more than 8 days as many as 3 patients (6.82%). From the average length of stay of the diabetes samples, it can be said that diabetes without a secondary diagnosis or with comorbids occur an average of 1 to 4 days. This is because the average patient with diabetes mellitus treated at Pandan Arang Boyolali Hospital was patients without a secondary diagnosis. Length of Stay (LOS) is an important indicator in determining the success of therapy for diabetes mellitus patients. LOS is also related to the cost of care incurred by the patient. The shorter the time the patient is hospitalized, the more effective and efficient the service from the hospital is (Salim et al., 2019) . Predictor factors that influence LOS are patient characteristics, clinical condition, medical action, patient management and hospital administration problems (Lubis & Susilawati, 2018).

Real cost compatibility with INA-CBG rates

Table 3.The difference between total real costs and INA CBG rates for classes 1,2 and 3 at severity level I / II / III at RSUD Pandan Arang Boyolali in 2017

Class	Category	N	Total Real Cost (Rp)	Total INA-CBGs Rates (Rp)	Difference (Rp)
1	E-4-10-I	9	16.481.701	46.267.200	29.785.499
	E-4-10-II	16	38.573.062	114.932.800	76.359.738
	E-4-10-III	14	49.348.351	124.822.600	75.474.249
2	E-4-10-II	12	27.034.770	73.885.200	46.850.430
3	E-4-10-I	14	16.770.430	51.408.000	34.637.570
	E-4-10-II	18	32.584.700	87.225.300	54.640.600
	E-4-10-III	18	41.134.960	101.896.000	60.761.040

Based on the results obtained in Table 3, there was a difference between the real costs and the INA-CBG rates, while the differences obtained at each severity level were positive, where the INA-CBG's rate was greater than the real cost. The largest total difference at the second severity level was Rp. 76,359,738, -. The high cost difference happened because at the severity level II it had 16 episodes of treatment. This occured because the condition of patients with severity II tended to require lower medical costs and a shorter length of stay than patients with severity level III who had a more complex condition. A very large difference was found in class 1 severity level II / III reaching a difference of Rp. 76,359,738, - and Rp. 75,474,249, -. The difference was due to the use of the average cost of type 2 diabetes mellitus class 1 severity level II of Rp. 2,410,816 and the level of severity III Rp. 3,524,882. At Pandan Arang Boyolali Hospital, patients who come to the hospital with diabetes mellitus and during inpatient care occurr complications, then the treatment will be more widely used compared to diabetes drugs. The INA-CBGs package will automatically move according to the rate which requires the most widely used treatment. Meanwhile, the smallest difference at the first level of severity was Rp. 29,785,499, - this happenned because the first severity level had 9 episodes of treatment. This indicated that the patient's condition with severity III required more medical costs and a longer length of stay, so that the costs incurred were more and resulted in less cost difference. Salim et al., (2019) stated that there was a significant difference in the average LOS between diabetes mellitus patients who experienced complications and did not experience complications. The difference in LOS affected the costs incurred by patients in undergoing treatment in the hospital. There was a big difference in the cost of therapy for type 2 diabetes mellitus patients and its complications which affected by the different types of complications, the number of episodes of patient visits, and the different use of drugs for each complication group(Kusuma et al., 2019).

This study shows a positive difference between real costs and INA-CBG's rates. This can be caused by the conformity of medical procedures with standard procedures so that they have an efficient and effective impact on patients and hospitals. The difference is an advantage for the hospital because it has been sucessfully efficient. The results of this study are consistent with what Sari, (2014) who stated that the positive difference between real costs and INA-CBG's rates proved that there was an effort to save on service financing for both hospitals and patients.

Tabel 4.The comparison between average real costs and INA-CBG rates for classes 1, 2 and 3 at the I / II / III severity level of Pandan Arang Hospital, Boyolali in 2017

Class	Level of care	Cost	Average (Rp)	Min (Rp)	Max (Rp)	*p*
1	E-4-10-I	Real cost	1.831.300	1.010.315	2.949.902	0.000
		INA CBGs Cost	5.140.800			
	E-4-10-II	Real Cost	2.410.816	1.594.440	3.359.498	0.000
		INA CBGs Cost	7.183.300			
	E-4-10-III	Real Cost	3.524.882	2.529.622	4.791.366	0.000
		INA CBGs Cost	8.915.900			
2	E-4-10-II	Cost Real	2.252.897	1.653.970	3.724.285	0.000
		INA CBGs Cost	6.157,100			
3	E-4-10-I	Real Cost	1.197.887	705.760	1.543.379	0.000
		INA CBGs Cost	3.672.000			
	E-4-10-II	Real Cost	1.810.261	1.200.681	2.834.460	0.000
		INA CBGs Cost	5.130..900			
	E-4-10-III	Real Cost	2.285.275	1.195.902	3.186.447	0.000
		INA CBGs Cost	6.368.500			

The INA-CBGs rates package provided was over the average real cost of hospitalization. This was beneficial for the hospital because it had succeeded in providing therapy to patients effectively and efficiently. The remaining claims obtained by the hospital could be used to cover or cross-subsidize patients whose total real costs exceeded the cost

of the INA-CBGs package and as revenue for the hospital itself. The results of this study were in line with Sari, (2014) which stated that the average real cost of the I / II / III severity level is lower than the INA-CBG package.

Table 5. Comparison between the average real costs of JKN and non-JKN patients at Pandan Arang Hospital, Boyolali in 2017

Type of Payment	Average (Rp)	±SD	Min (Rp)	Max (Rp)	*P*
Class 1					
JKN	2.677.003	906.406	1.010.315	4.791.366	0,102
Non JKN	3.301.001	1.589.700	1.419.904	8.976.332	
Class 2					
JKN	2.881.023	851.483	1.653.970	3.724.285	0,810
Non JKN	2.597.435	736.575	1.310.853	3.993.891	
Class 3					
JKN	2.323.768	802.828	705.760	3.186.447	0.000
Non JKN	2.841.569	2.889.817	990.030	10.593.021	

The treatment performed on JKN and non-JKN patients whose costs differ lied in the medical action including the cost of doctor's visit and the treatment given. The costs incurred were higher than JKN patients. In addition, there were also differences in the costs of drugs and medical devices incurred by non-JKN patients, where the costs were higher than those of JKN patients.

This happened because in non-JKN patients, the choice of drugs from doctors was more diverse than those of JKN patients whose drug selection was only limited to drugs included in BPJS claims. The results of this study were in line with Islam & Rusdi, (2014) the cost of inpatient treatment for diabetes mellitus patients was greater for non-JKN patients compared to JKN patients.

Factors Affecting Real Costs

Table 6.The results of the bivariate correlation analysis of factors affecting the real cost of inpatient diabetes mellitus treatment at Pandan Arang Hospital, Boyolali, 2107

Factor	N	r	*P*
Age		0.152	0.129
Secondary Diagnosis		-0.047	0.640
Severity	101	0.600	0.000
LOS (*Length of Stay*)		0.352	0.000
Gender		0.018	0.855

Based on table 6, it is known that the factors that had a significant relationship were the severity level and LOS (Length of Stay). From the table above, it is obtained the severity level with a value of p = 0.000 and r = 0.600, which meant that there was a significant relationship between severity and real costs. The relationship between severity level and real cost was moderate, by showing a correlation value of 0.600. This was because the higher the severity of the patient, the longer the treatment needed. Therefore, more patients recieved treatment in terms of supporting examinations, drug costs, medical treatment costs, and patient hospitalization costs. Overall, the services provided increased the total real cost received by patients (Labovitz et al., 2016).

At LOS (Length of Stay) the value of p = 0.000 and r = 0.352 meant that there was a significant relationship between secondary diagnoses and real costs. The relationship between LOS (Length of Stay) was weak, as indicated by the correlation value close to 0.352. This is in line with research conducted by Juaella (2013)[21] which stated that LOS (Length of Stay) had a significant value (p = 0.000). This means that the longer LOS (Length of Stay), the more medical treatment performed; the more medicines needed to overcome the disease, the more supporting examinations costs, drug costs and accommodation costs. Therefore as a whole it will increase the total real cost.

Conclusion

1) The average real cost of type 2 diabetes mellitus based on the perspective of Pandan Arang Boyolali Regional Hospital for JKN class 1,2,3 patients is Rp. 2,677,003, Rp. 2,881,023, Rp. 2,323,768 respectively, while for non-JKN patients class 1,2,3 it was Rp. 3,301,001, Rp. 2,597,435, Rp. 2,841,569 respectively.
2) For the real cost with the INA-CBG rate, there is a difference in the total cost of inpatient JKN patients, which is significantly different in 101 samples, where the real cost in class 1 level I / II / III is Rp. 1,831,300,

Rp. 2,410,816, Rp. 3,524,882 repsectively, while in class 1, the second level of severity was Rp. 2,252,897, and in class 3 the I / II / III severity level is Rp. 1,197,887, Rp. 1,810,261, Rp. 2,285,275 respectively. This difference shows a positive difference where the total real cost is lower than the INA-CBG rate. Meanwhile, for non-JKN with 44 samples, the average real cost in classes 1, 2, 3 is Rp. 3,301,001, Rp. 2,597,435, Rp. 2,841,569 respectively.

3) Factors affecting the real cost are LOS and the severity of type 2 diabetes mellitus coded INA-CBG's E-4-10.

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