

Factors Affecting The Cost Gap Between INA CBGs Tariff and Hospital Tariff for Patients with Dengue Hemorrhagic Fever in Ngawi Regional Public Hospital, East Java

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ABSTRACT

Background: Dengue Hemorrhagic Fever (DHF) has a high cost burden. Payment for hospital treatment was paid by Health insurance (BPJS) with a case based payment method in the era of the National Health Insurance. This method allowed the hospital to gain profit or loss. This study aimed to analyze the factors that influence the differences in Indonesian Cased Based Groups (INA CBGs) with the medical service costs for DHF in Dr. Soeroto hospitals, Ngawi Regency.

Subjects and Method: This study used an observational analytic study with a cross-sectional approach conducted at Dr. Soeroto Hospital, Ngawi Regency, East Java in September - October 2019. A sample of 200 subjects was selected by using simple random sampling. The dependent variable was the difference in rate. The independent variables were class of care, length of stay, age, blood transfusion, comorbidity and complications. Data analysis was using multiple linear regression with Stata 13.

Results: INA CBG rates (mean= Rp 6,120,000; SD= Rp 2,330,000) was lower than the cost of hospital treatment (mean= Rp 7,070,000; SD= Rp 4,650,000). There is a negative relationship between the difference in rates and it was statistically significant on the length of stay (b= 0.73; 95% CI= -1,131,915 to -329,501; p= <0.001), patients' age (b= 0.41; 95% CI= -707,099 to -110,293; p= 0.008), blood transfusion action (b= 0.79; 95% CI= -1,549,446 to -34,190; p= 0.041), and comorbidity (b= 1.14 ; 95% CI= -1,817,112 to -474,641; p= 0.001). While there was a statistically insignificant relationship between classes of care (b= 0.42; 95% CI = -931,443 to 82,607; p= 0.100) and complication (b= 0.34; 95% CI= -1,093,208 to 408,223; p= 0.369).

Conclusion: Difference in INA CBG rates and hospital medical service costs were affected by the class of care, length of stay, age, blood transfusion, comorbidity and complications.

Keywords: INA-CBG's rates, hospital rates, care cost, dengue hemorrhagic fever.

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BACKGROUND

Dengue Haemorrhagic Fever (DHF) is one of the diseases caused by *Aedes aegypti* and *Aedes albopictus* species. DHF is one of the public health problems in Indonesia where the number of sufferers is increasing and its spread is getting wider. The number of DHF cases in Indonesia until 3rd of February 2019 was 16,692 cases with 169 mortality. Director General of Disease Prevention and Control, Ministry of Health Republic of Indonesia Dr. Anung Sugihantono, M. Kes

reported that East Java still has the highest number of cases (Ministry of Health Republic of Indonesia, 2019). Ngawi Regency, East Java, reported DHF cases in January by 483 cases of dengue fever, in February there were 252 cases, in March there were 189 cases, in April were 80 cases and six residents of Ngawi District were declared dead due to DHF (Rasi, 2019).

DHF has a significant cost burden for the Indonesian people. The total cost of dengue fever in Indonesia in 2015 is esti-

mated to reach 5.64 T consisting of 5.25 T for inpatient care and 387.81 M for outpatient cases (Id et al., 2019). Health care costs are directly taken from the fee for service system or patients pay health care costs after getting health care and INA CBGs payment methods paid by Health insurance with payment claims.

The Social Security Organizing Agency (BPJS) is a body that organizes the National Health Insurance (JKN) for the achievement of Universal Health Coverage (UHC). The administration of JKN by BPJS is regulated in Law Number 24 of 2014. BPJS Health plays a role in collecting health care financing in primary and advanced health care providers. Funding by BPJS at hospitals based on Indonesia Case based Groups (INA CBGs) rates. The INA CBGs payment pattern is a prospective payment method, which is a health service rate that has been determined before health services are provided. The health services provided include medical and non-medical services both outpatient and inpatient services whose service rates have been determined in Minister of Health Regulation No. 76 of 2016 (Ministry of Health of the Republic of Indonesia, 2016).

The largest proportion of hospitals cooperating with Health BPJS is private hospitals at 60.45%, followed by regional government hospitals at 31.04% and central government hospitals at 8.51% (BPJS, 2017). Therefore, the hospital has many competitors. In addition, this also implies that hospitals are required to be more efficient and effective in providing medical services to patients so that they survive in the era of competition between hospital services and the current JKN era.

Within the five years of JKN, there have been various opinions which state that medical services with INA CBG rates are judged to have differences with hospital

medical service tariffs. Research done by Rahayuningrum et al. (2016) said similar things that the average hospital inpatient costs were lower than the average INA CBG rates. Mardhatillah et al. (2017) also stated that the mean of INA CBG reimbursement in hospitalization for chronic kidney disease was lower than the mean of hospital medical care costs. Hospitals that can reduce production costs for certain diagnostic group medical services so that the average unit cost per patient is lower than the INA CBGs rates can get benefit from the health services provided. Conversely, if the unit cost per patient is higher than the INA CBG rate, the hospital will experience losses.

Based on this background, it is important to examine whether there are differences in the actual average cost of hospitalization in hospitals and inpatient rates determined by Health BPJS. It is also important to examine the factors that influence these differences.

SUBJECTS AND METHOD

1. Study Design

This study was a quantitative study using observational analytic studies with cross-sectional approaches conducted at the Dr. Soeroto Hospital in Ngawi District, East Java in September - October 2019.

2. Population and Sample

This study used a population of inpatients JKN participants with Dengue Hemorrhagic Fever (DHF) in Dr. Soeroto Hospital in Ngawi Regency in July 2018 - July 2019. The researchers used the simple random sampling method in the selection of 200 sample subjects.

3. Study Variables

The dependent variable was the difference between the INA CBGs and the hospital inpatient service costs. The independent variables were the type of class, length of

stay, age, blood transfusion, comorbidity, and complications.

4. Operational Definition of Variables

Type of Care was a classification of inpatient classes for DHF patients at Dr. Soeroto Hospital, Ngawi Regency. The data were collected by questionnaire. The measurement scale was categorical, coded 0 for class 1 and 1 for class 2 and 3.

Length of Stay was the inpatient time of DHF patients in the day at Dr. Soeroto Hospital, Ngawi Regency. The data were obtained from medical record. The measurement scale was continuous, but it was transformed into dichotomous, coded 0 for <4 days and 1 for ≥ 4 days.

Age was the age of inpatient DHF patients in years when getting treatment at Dr. Soeroto Hospital, Ngawi Regency. The data were collected by questionnaire. The measurement scale was continuous, but it was transformed into dichotomous, coded 0 for <14 years and 1 for ≥ 14 years.

Blood transfusion was a supporting medical procedure in the form of blood transfusion obtained by inpatient DHF patients at Dr. Soeroto Hospital, Ngawi Regency. The data were obtained from medical record. The measurement scale was categorical, coded 0 for no and 1 for yes.

Comorbidity was a disease that accompanies the main diagnosis of DHF inpatients in Dr. Soeroto Hospital, Ngawi Regency. The data were obtained from medical record. The measurement scale was categorical, coded 0 for no and 1 for yes.

Complication was a disease that arises during the treatment of DHF patients in Dr. Soeroto Hospital, Ngawi Regency. The data were obtained from medical record. The measurement scale was categorical, coded 0 for no and 1 for yes.

5. Data Analysis

Univariate analysis explained the general description of research data with each study

variable presented in n, percentage, mean, standard deviation (SD), minimum, and maximum. Bivariate analysis explained the relationship of one independent variable to one dependent variable by using the Pearson correlation. Multivariate analysis explained the relationship of more than one independent variable by using the multiple linear regression test on Stata 13.

6. Research Ethics

The study protocol was approved by the Medical Research Ethics Committee of Dr. Moewardi Regional General Hospital Surakarta with number: 1.080/XI/HREC/2019.

RESULTS

1. Sample Characteristics

The highest proportion of study subjects were 110 women (55%) and the highest age range was ≥ 14 years old, namely 130 people (65%) which can be seen in table 1.

2. Univariate Analysis

Table 2 showed that class 3 was the most care for 147 (73.5%). Blood transfusion was carried out only on 11 persons (5.5%) with 27 patients (13.5%) experiencing comorbidities and 15 complications (7.5%).

Table 3 showed that the mean INA CBG rates were smaller than the mean medical service costs at Dr. Soeroto Hospital, Ngawi Regency with a difference of -0.45 or minus Rp 450,000. The minimum value of the difference between the bases of -10.71 or minus Rp 10,710,000 and a maximum value of 0.97 or Rp. 970,000. The duration of treatment was 1-9 days with an average stay of 5 days. Patients aged between 1-70 years old with an average age of 22 years old. The lowest standard deviation was the difference in rates.

Table 1. Sample Characteristics

Characteristics	Cases	
	N	%
a. Gender		
Male	90	45
Female	110	55
b. Age (years old)		
< 14 years old	70	35
≥ 14 years old	130	65
n observation = 200		

Table 2. The description of study variable

Variables	n	%
1. Class of Treatment		
Class 1	16	8
Class 2	37	18.5
Class 3	147	73.5
2. Blood transfusion		
Yes	11	5.5
No	189	94.5
3. Complication		
Yes	15	7.5
No	185	92.5
4. Comorbidity		
Yes	27	13.5
No	173	86.5

Table 3. The description of study variable

Variables	N	Mean	SD	Min.	Max.
INA CBGs Costs (x Rp 1,000,000)	200	1.68	2.93	1.51	3.18
Hospital service Costs (x Rp 1,000,000)	200	2.13	1.34	0.54	13.44
Costs difference (x Rp 1,000,000)	200	-0.45	1.23	-10.71	0.97
Length of treatment (days)	200	4.88	1.46	1	12
Age (years old)	200	21.79	14.51	1	70

3. Bivariate Analysis

Table 4 showed that there was a statistically significant relationship between the difference in costs with INA CBG costs ($r = -0.28$; $p = 0.0001$), hospital medical service costs ($r = -0.97$; $p < 0.001$), length of stay ($r = -0.57$; $p < 0.001$), age ($r = -0.26$; $p = 0.002$), blood transfusion ($r = -0.41$; $p < 0.001$), comorbidity ($r = -0.52$; $p < 0.001$), complication ($r = -0.41$; $p < 0.001$).

4. Multivariate Analysis

Table 5 showed that there was a negative relationship and it was statistically significant between the difference in the rates of hospitalization for DHF cases in hospitals

and inpatients for ≥ 4 days ($b = 7.31$; $95\% \text{ CI} = -1,131,915$ to $-329,501$; $p < 0.001$), age ≥ 14 years old ($b = 4.09$; $95\% \text{ CI} = -707,099$ to $-110,293$; $p = 0.008$), blood transfusion action ($b = 7.92$; $95\% \text{ CI} = -1,549,446$ to $-34,190$; $p = 0.041$), and DHF patient's comorbidity ($b = 11.45$; $95\% \text{ CI} = -1,817,112$ to $-474,641$; $p = 0.001$). There was a negative relationship between the difference in hospitalization rates for DHF cases in hospitals with the type of class ($b = 4.24$; $95\% \text{ CI} = -931,443$ to $82,607$; $p = 0.100$) and complication ($b = 3.42$; $95\% \text{ CI} = -1,093,208$ to $408,223$; $p = 0.369$).

Table 4. The results of the bivariate analysis of the relationship between the difference in rates and a number of variables

Variables	r	p
INA CBGs Costs (x Rp 1000,000)	-0.28	0.0001
Hospital service Costs (x Rp 1000,000)	-0.97	<0.001
Inpatient classes (class 2 and 3)	-0.11	0.1273
Length of stay (≥ 4 days)	-0.57	<0.001
Age (≥ 14 years old)	-0.26	0.0002
Blood transfusion (yes)	-0.41	<0.001
Comorbidity (yes)	-0.52	<0.001
Complication (yes)	-0.41	<0.001
n observation = 200		

Table 5. The results of the multiple linear regression analysis about the relationship between the difference in INA CBG costs and the cost of hospitalization for DHF and the factors that influence them

Independent Variable	b	95% CI		p
		Lower limit	Upper limit	
Constants	1161748	565,568	1,757,927	<0.001
Inpatient classes (class 2,3)	-424,418	-931,443	82,607	0.100
Length of stay (days)	-730,708	-1,131,915	-329,501	<0.001
Age (years old)	-408,696	-707,099	-110,293	0.008
Blood transfusion (yes)	-791,818	-1,549,446	-34,190	0.041
Complication (yes)	-342,492	-1,093,208	408,223	0.369
Comorbidity (yes)	-1,145,877	-1,817,112	-474,641	0.001
n observation = 200				
Adjusted R ² = 36.4%				
p= 0.050				

DISCUSSION

1. INA CBG costs compared to the costs of inpatient medical services in DHF cases

The results of the analysis showed that INA CBG costs for inpatient DHF cases were lower than the cost of medical services at Dr. Soeroto Hospital, Ngawi Regency was shown with a negative and statistically significant relationship. Therefore, it was stated that the hospital suffered losses. Mardhatillah et al. (2017) showed a similar study result that there was a difference between the costs of INA CBGs and the costs of inpatient services in hospitals in cases of chronic kidney disease. Wulandari et al. (2019) also showed the results of study on

differences in INA CBGs costs and hospital costs in stroke cases.

Determination of hospital medical service costs was an important aspect in the era of national health insurance. Local governments played an important role in determining hospital medical service rates for government-owned hospitals that have implemented financial management of regional public service agencies. The hospital cost was in accordance with the provisions of the Minister of Health Regulation of the Republic of Indonesia number 85 of 2015 concerning national hospital cost patterns (Ministry of Health of the Republic of Indonesia, 2015).

The application of INA CBG costs as a payment method made the hospitals to

calculate the cost of medical services both outpatient and inpatient more carefully to achieve maximum efficiency and cost effectiveness in the use of hospital resources. Payment of INA CBGs claims was expected to provide benefits in facilitating revenue calculations for hospitals. But the results of this study showed the opposite.

The results of the analysis found that the rate of INA CBGs was lower than the cost of medical services in the case of DHF inpatient in Dr. Soeroto Hospital, Ngawi Regency, so that the hospital suffered losses. Conversely, if the INA CBG rate was higher than the cost of medical services at the hospital, the hospital would get the benefit. Therefore, hospitals must be careful in calculating the cost of medical services in order to maintain their survival through surpluses or profits without ignoring the social functions of the hospital (Hidayat et al., 2016).

2. The relationship between age and the difference in costs between INA CBGs and the cost of hospital medical services

The results of this study indicated that the largest population of 200 patient samples was over 14 years old. The results of the data analysis showed that there was a negative relationship between the patient's age and the difference in INA CBG cost and medical services for DHF inpatient at Dr. Soeroto hospitals. This was similar to research conducted by Thai et al., (2011) which showed that older DHF patients were more likely to develop DHF symptoms from a younger age for primary and secondary infections, the proportion of patients with symptoms symptomatic among total infected individuals were <7% in patients aged less than 10 years old, and reach 8 - 11% at age 20 years old.

Age was an important modulator in DHF case. Recently, DHF cases were incre-

asing in the state of Southeast Asia, an increase in adult patients due to a decrease in the strength of infection which can be caused by various factors including variations in epidemiological, ecological and demographic dynamics (Thai et al., 2011).

DHF in adult patients was increasingly important but was very poorly studied. Atypical clinical manifestations, made the diagnosis and management of adult patients with DHF more challenging. There was an urgent need to improve current diagnostic criteria, classify disease severity and identify individual complications (Lin et al., 2017).

Hospitals need management strategies to overcome this issue because of the increased number of morbidity among adult DHF patients.

3. The relationship between class of treatment and the difference in costs between INA CBGs and the cost of hospital medical services

The results showed that the largest population of 200 patient samples using class 3 treatments were 147 patients, followed by class 2 treatments which were 37 patients and class 1 treatment were 16 patients. The results of data analysis showed that there was a negative relationship between the class of DHF patient care with the difference in INA CBG rates and the cost of inpatient DHF medical care at Dr. Soeroto Hospital. However, the relationship was not significant. Rahayuningrum et al. (2016) stated that between the class of care with the difference in INA CBG rates and hospital rates, there was a statistically insignificant relationship. The study showed that the average of patient chose class 3. Various hospitals in Indonesia have more class 3 treatment rooms than other treatment classes.

Minister of Health Regulation No. 64 of 2016 concerning Health Service Cost Standards in the Implementation of the Health Insurance Program has set rates

based on care classes including class 1, class 2, and class 3 (Ministry of Health, Republic of Indonesia, 2016). Therefore, there were differences in rates in each treatment class. The higher the class of care, the greater the nominal rate of INA CBGs in rupiah. This was in line with the inpatient room rates at the hospital, the higher the class of treatment, the higher the inpatient room rates. It was also based on the completeness of the facilities, comfort and privacy that was provided by the hospital to patients during their stay.

4. The relationship between length of stay and the difference in costs between INA CBGs and the cost of hospital medical services

The results showed the largest population of 200 patient samples received inpatient medical services for DHF cases for 12 days of treatment. The analysis showed that there was a negative relationship between the length of stay of patients with DHF cases and the difference in INA CBG rates and the cost of inpatient DHF medical care at Dr. Soeroto Hospital, and the relationship was not significant. Mardhatillah et al. (2017) and Wulandari et al. (2019) showed similar study results that were statistically significant relationship between length of stay with INA CBG rates and the cost of inpatient medical care for DHF cases. Length of Stay (LOS) or length of treatment was very individual and was influenced by the case or diagnosis of the disease and its prognosis (Almashrafi et al., 2016). The longer the LOS, the higher the operational costs incurred by the hospital, even though the INA CBG rates were permanent.

Vo et al. (2017) stated that the cost of hospitalization for DHF cases in Vietnam was increased from US \$ 3,700 in 2013 to US \$ 5,500 in 2014 and exceeded US \$ 10,000 in 2015. In 2013, the cost of hospital admission per day was 17.9% of direct

medical costs, and contributed 27.8% of direct medical costs in 2015. Pham et al. (2016) stated that 50.2% of the total cost of DHF cases in hospitals was inpatient costs.

5. The relationship between blood transfusion action and the difference in costs between INA CBGs and the cost of hospital medical services

The results showed the largest population of 200 samples of patients who received blood transfusion were 11 inpatients with DHF cases. The results of the data analysis showed that there was a negative relationship between the blood transfusion action of DHF patients with the difference in INA CBG rates and the cost of medical care for DHF inpatient at Dr. Soeroto Hospital and the relationship was significant. Panmei et al. (2019) stated that only 14% of children DHF patients and 20% of adults patients with DHF needed blood transfusions in hospitals.

According to WHO data in 2015, health services for DHF cases contributed a significant cost burden. The annual economic burden of controlling DHF in Southeast Asia during the decade of 2001 - 2010 was US \$ 950,000,000 (US \$ 610,000,000 to US \$ 1,384,000,000) or around US \$ 1.65 per capita (US \$ 1.06 to US \$ 2.41) (Shepard et al., 2013). DHF also has a significant cost burden for the people of Indonesia. The total DHF cost burden in Indonesia in 2015 was estimated to reach 5.64 T consisting of 5.25 T for inpatient care and 387.81 M for outpatient cases (Id et al., 2019).

6. The relationship between comorbidity and the difference in costs between INA CBGs and the cost of hospital medical services

The results showed that the largest population of 200 samples of patients suffering from DHF accompanied by comorbidities of 27 inpatients with DHF cases. The results of

the data analysis showed that there was a negative relationship between the patients comorbidity with DHF cases and the difference in INA CBG rates and the cost of medical care for DHF inpatient at Dr. Soeroto Hospital and the relationship was significant. Aljunid and Jadoo (2018) stated that a longer hospital stay accompanied by major complications and comorbidities have the greatest influence on the total inpatient pharmacy cost. Some of the variability in costs seemed obvious, if patients have complications, they would stay in the hospital longer or for comorbidities with higher costs of care. Nelson et al. (2016) stated that patients with greater comorbidities had higher hospital costs of \$ 2,000.

Pooransingh et al. (2016) stated that comorbidities that occurred in patients with DHF were caused by comorbidities such as diabetes and hypertension. This was also similar to the DHF case in Dr. Soeroto Hospital, Ngawi Regency which found that diabetes was a accompanying disease of DHF patients. Tran et al. (2018) stated that DHF hospitalized patients with comorbidities and who experienced a longer duration of illness, had higher hospital medical service costs.

7. The relationship between complication and the difference in costs between INA CBGs and the cost of hospital medical services

The results showed the largest population of 200 samples of patients suffering from DHF accompanied by complications of 15 inpatients with DHF cases. The results of the data analysis showed that there was a negative relationship between the complications of DHF patients and the difference in INA CBG rates and the cost of medical care for DHF inpatient at Dr. Soeroto Hospital, but the relationship was not significant. Research in Malaysia done by Aljunid and Jadoo (2018) showed that longer period of hospitalization

accompanied by complication has the greatest effect on the total inpatient pharmacy cost. Patients with conditions such as diabetes mellitus, pregnancy, obesity, kidney failure, elderly, and chronic hemolytic anemia have a higher risk of DHF complications. This group of patients needed to be admitted to the hospital for observation. Procedures for actions for high morbidity, reducing complications, and reducing length of stay can help hospitals to deal with ever-increasing financial pressures while improving the quality of care.

In conclusion, Dr. Soeroto Hospital in Ngawi regency provided additional money to cover the difference in cost with INA-CBG cost. Factors related to fare differences were length of stay, age, blood transfusion and comorbidity. The authors suggested the hospitals to improve the quality of medical services to reduce patient's comorbidity so that it can reduce patient's length of stay. This was an attempt by the hospital to minimize the financial deficit of DHF patients.

AUTHOR CONTRIBUTIONS

Betty Nurizky Ariwardani as the main author has a role to collect related articles, conduct study, analyze data, and write research scripts. Bhisma Murti conducted data analysis and represented the results of data analysis. Didik Gunawan Tamtomo provided material advice for research discussion material on INA-CBGs and hospital rates.

CONFLICT OF INTEREST

There was no conflict of interest.

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