Original Article

COST-EFFECTIVENESS ANALYSIS OF TREATMENT IN GASTROESOPHAGEAL REFLUX DISEASE INPATIENT PATIENTS IN BANDUNG, INDONESIA

RIANI TANJUNG[1] , YULIA WARDATI[2] , YUYUN YULIANINGSIH[2], IDA ERNA WIDYAWATI[2], RESMI MUSTARICHIE[3] , NYI MEKAR SAPTARINI[3]*

[1]Department of Accounting, Universitas Logistik dan Bisnis Internasional, Bandung-40151 West Java, Indonesia. [2]Department of Pharmacy, Faculty of Mathematics and Natural Sciences, Al Ghifari University, Bandung-40293, West Java, Indonesia. [3]Department of Pharmaceutical Analysis and Medicinal Chemistry, Faculty of Pharmacy, Universitas Padjadjaran-45363, West Java, Indonesia
*Corresponding author: Nyi Mekar Saptarini; *Email: nyi.mekar@unpad.ac.id

ABSTRACT

Objective: This study aimed to analyze the cost-effectiveness of the GERD treatment management strategy for class II inpatient patients at a police hospital in Bandung, Indonesia.

Methods: This study was retrospective, using medical record data collection techniques for 103 patients of the Social Security Administrator for Health (Badan Penyelenggara Jaminan Sosial, BPJS), from January 2017 to July 2019. The pharmacoeconomic method was Cost-Effectiveness Analysis. The medicines being compared were omeprazole injection and pantoprazole injection. The outcome parameter was the length of stay (LOS). The perspective was a hospital with a direct cost component. This study uses a 5% discounting rate due to differences in years.

Results: The results showed that the patient majority was female (76%) and the largest age group was>40 y (53%). There was a significant difference in LOS and total cost between omeprazole and pantoprazole (p-value<0.050) using the Mann-Whitney test. The cost-effectiveness ratio showed that omeprazole has a higher value than pantoprazole.

Conclusion: Therapy using pantoprazole was more cost-effective than omeprazole.

Keywords: BPJS, GERD, LOS, Omeprazole, Pantoprazole

INTRODUCTION

The pathology of Gastroesophageal Reflux Disease (GERD) is an imbalance between aggressive and defensive factors. Aggressive factors are stomach acid, pepsin, bile acid reflux, and trypsin. Defensive factors include hypotension of the lower esophageal sphincter (LES), transient lower esophageal sphincter relaxations (TLESR), impaired saliva production, and impaired esophageal peristalsis. GERD is a major problem of disruption in quality of life and daily activities [1, 2]. It was reported that the GERD prevalence, based on a study in 2009, predicted by almost 3% of the Indonesian population, with which increasing from 5.7% in 1997 to 25.18% in 2002 at Cipto Mangunkusumo Hospital, Jakarta, Indonesia. GERD prevalence increases due to lifestyle changes that can increase GERD risk factors, such as smoking and obesity [3]. The GERD prevalence in Indonesia reached 27.4% in 2015 [4]. However, recent data show that the prevalence is increasing. According to data from a hospital in Bandung, the prevalence of cases of digestive system disorders has increased from year to year and is in fourth place in hospitalization [5].

An increase in GERD cases makes health services have limited resources and funds while needs continue to increase. These limitations force priority selection of health technology, i.e. medicines, human resources (especially experts), time, facilities, and equipment as efficient as possible, according to the priority scale that is made objectively [6]. Omeprazole can be used for gastritis [7]; pantoprazole and omeprazole have been studied in Stress-Related Mucosal Disease (SRMD), which is associated with the emergence of acute erosive gastritis [8]. This study aimed to analyze the cost-effectiveness of the GERD treatment management strategy for class II inpatient patients at a police hospital in Bandung, Indonesia. This study compared omeprazole with pantoprazole for GERD treatment. It was a retrospective study using medical record data collection techniques for patients of the Social Security Administrator for Health (Badan Penyelenggara Jaminan Sosial, BPJS), from January 2017 to July 2019.

MATERIALS AND METHODS

Subjects

The study was approved by the Health Research Ethics Committee of Dr. Hasan Sadikin Hospital, Bandung, Indonesia, and was conducted according to an approved method. The medical records of class II inpatient GERD patients were collected in the period January 2017 to July 2019 at the Police Hospital in Bandung, Indonesia. Inclusion criterias were patients who were diagnosed with GERD, patients receiving omeprazole and pantoprazole injection for therapy, class II BPJS inpatient patients with complete medical records, and early teens patient, i.e. 12 y old [9]. Exclusion criterias were patients with incomplete medical records and patient is less than 12 y old.

Outcome determination

The outcome parameter was the length of stay (LOS), i.e. the patient is declared discharged in terms of the disappearance of the initial symptoms when the patient is diagnosed with GERD. Factors that affect LOS can be in the form of patient characteristics, clinical conditions, medical procedures, patient management in the room, and hospital administration issues.

Determination of perspective and cost components

The perspective will determine the cost component in this study, i.e. hospital perspective. The cost components studied were direct costs incurred by the hospital, i.e. registration, emergency room, doctor visits, room cost, full care, laboratories, medicines, and other costs.

Pharmacoeconomic analysis

The cost of health interventions was measured in monetary units of Indonesian rupiah (IDR) and the results of interventions in units or health indicators, both clinical and non-clinical (non-monetary). Data were used to calculate the cost-effectiveness ratio (CER) and make the cost-effectiveness table [7].

Statistical analysis

The results were presented as the mean±standard deviation. Data were collected for statistical analysis using the Kolmogorov–Smirnov test followed by the Mann–Whitney test [7].

RESULTS AND DISCUSSION

There were more women with GERD, i.e. 78 patients (76%) out of a total of 103 patients (table 1). This has several possibilities due to lifestyle, environmental, social, and medicine consumption. Hormonal differences in males and females are one of the things that affect the high incidence in women. This result was following the results of a study by Schulze and Christensen (1977) and Jacobson *et al.* (2008), that the hormones estrogen and progesterone in women significantly reduce the pressure on the esophageal valve muscles, which can cause GERD. Recent studies have shown a high prevalence of GERD in housewives; this is related to the lifestyle of housewives who lack physical activity. This is a high risk of obesity. Obesity can

cause an increase in intragastric pressure, thus triggering GERD [2]. The majority of GERD patients occur in the age group of more than 40 y old, i.e. 53% (table 1). This result was following data in the Scientific Journal of Pharmaceutical Development and Medical Application Medicinus, which states that the incidence of GERD is high at the age of more than 40 y old [12]. The adult and elderly age groups are a risk factor for someone experiencing GERD, physiological changes in the esophagus with increasing age are also factors that play a role in increasing the incidence of GERD. The thing that is related to physiological changes with increasing age is the decreased production of salivary bicarbonate, thereby increasing exposure to acid reflux in the esophagus due to slow acid clearance. Another study showed that increased exposure to reflux acid reduced the length of the abdominal esophageal valve muscles and reduced esophageal mortality. An increased proportion of abnormal peristalsis and delayed clearance of reflux acid from the esophagus has been reported in the elderly and those with severe GERD [13].

Table 1: Distribution of GERD patients by age and gender

Age (years old)	Omeprazole		Pantoprazole		Percentage	
	Patient	%	Patient	%	Patient	%
12-25	5	12	9	14	14	14
26-40	13	33	21	33	34	33
>40	22	55	33	53	55	53
Total	40	100	63	100	103	100
Gender						
Male	10	25	15	24	25	24
Female	30	75	48	76	78	76
Total	40	100	63	100	103	100

The efficacy of antisecretory medicines in treating reflux esophagitis depends on the strength and duration of acid suppression over 24 h, and the duration of treatment [14, 15]. Proton pump inhibitors (PPIs) therapy is effective for acid-related symptoms. Omeprazole and pantoprazole are effective for symptomatic relief within 1 w in patients with endoscopically proven esophagitis [16, 17].

The outcome value was observed from LOS, the LOS of GERD patients with omeprazole (5.5±0.5 d) was longer than that with pantoprazole (3.5±0.5 d). This showed that pantoprazole therapy was more effective due to shorter LOS and a faster healing period. So, the patient was allowed to be discharged by the doctor, marked by the condition of the patient who has improved and without early symptoms such as heartburn and burning sensation. Pantoprazole belongs to the third generation of PPIs. These types of drugs have fewer side effects. This is in line with a study on reflux esophagitis, which stated that pantoprazole can be used without dose adjustment in patients with organ dysfunction and has a lower potential for interactions with other medicines [8]. Omeprazole and pantoprazole

are used in GERD treatment due to are the most frequently used drugs [5], according to the World Gastroenterology Organization [4].

Component and total cost based on the parameters that have been determined showed no different components, except for medicines (table 2). This was because the patients in this study were uniform, i.e. class II BPJS inpatient patients. The unit price for pantoprazole injection was cheaper than omeprazole injection (table 2). This was because the raw material for pantoprazole was cheaper, so the price was more affordable. The unit cost in this study was the cost claimed by the hospital to BPJS insurance for each day during class II BPJS care. This was also regulated in Minister of Health Regulation No. 28 of 2014 concerning guidelines for the implementation of the national health insurance program. The non-capacity rates are the amount of claim payments by BPJS-health to health facilities based on the type and amount of health services provided. Health facilities submit claims every month regularly, i.e. no later than the 10th of the following month, unless capitation does not need to be claimed by health facilities [18].

Table 2: Components and total costs

Component costs	Omeprazole (IDR)	Pantoprazole (IDR)
Registration	15,000	15,000
Medicine	88,000	54,000
Emergency room	65,000	65,000
Room cost	170,000	170,000
Doctor visits	75,000	75,000
Full Care	150,000	150,000
Laboratories	275,000	275,000
Other costs	100,000	100,000

Table 3: Total cost components after the discounting process

Average cost of treatment in	Omeprazole (IDR)	Pantoprazole (IDR)
2017	4,213,222 (9 patients)	2,782,643 (14 patients)
2018 (Discounting)	3,704,127 (15 patients)	2,560,952 (23 patients)
2019 (Discounting^2)	3,450,624 (16 patients)	2,423,757 (26 patients)
Total average	3,717,272	2,553,597

This study was conducted at the time range of collecting patient data for more than one year, so it was necessary to calculate value adjustments (table 3). This value adjustment was carried out with a correction factor called discounting, which is based on the inflation rate, both what has occurred (retrospective) and what was expected (prospective). This correction factor can be used to adjust past and future values to the current value. The calculation of the discounting value in the second year is expressed as 5% or divided into 1.05 regardless of the inflation rate [6]. The results of calculating the average total cost after adjusting the values for omeprazole were greater than for pantoprazole (table 4). CER calculations showed that pantoprazole treatment requires a higher cost but has a shorter LOS, compared to omeprazole, which requires a lower cost but has a longer LOS (table 5).

Table 4: Calculation of cost-effectiveness ratio (CER)

Treatment	Average cost of treatment (IDR)	LOS (days)	CER (IDR)
Omeprazole	3,717,272	5.5	688,384
Pantoprazole	2,553,597	3.5	709,333

There were two comparisons between the effectiveness of GERD treatment therapy and the cost-effectiveness of treatment (table 5). After being analyzed with the cost-effectiveness column, it can be seen that there was no need to calculate Incremental Cost Effectiveness Ratio (ICER) from the two comparisons because the two comparisons were entered in column C (dominance). The column C showed that not need to be considered as an alternative therapy because, with lower effectiveness and higher costs, it will be a consideration in choosing an effective therapy. The column G (dominant) was confirmed to be an option in alternative treatment because of higher effectiveness and lower costs. It was an option major and of interest in the treatment of GERD. Mann-Whitney non-parametric and parametric statistical analysis of LOS showed that there was a significant difference between omeprazole and pantoprazole, i.e. $p = 3.2 \times 10^{-3}$ and 4.1×10^{-4}, respectively. This study was a retrospective study using medical records and financial data, so there was no data on the pharmacist's role in making decisions about the selected medicine.

Table 5: Cost-effectiveness table

Cost-effectiveness	Lower cost	Same cost	Higher cost
Lower effectiveness	A	B	C Omeprazole to Pantoprazole
Same effectiveness	D	E	F
Higher effectiveness	G Pantoprazole to Omeprazole	H	I

CONCLUSION

Therapy using pantoprazole was more cost-effective than omeprazole due to faster recovery and shorter LOS.

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AUTHORS CONTRIBUTIONS

Conceptualization: RM; methodology: YW, YY; investigation: ISW; data curation: YW, RT; writing of original draft preparation: RT, YY; review and editing: YW, NMS; supervision: RM. All authors have read and agreed to the published version of the article.

CONFLICT OF INTERESTS

Declared none

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