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Drug Utilization Analysis in Stroke Patients at Cilacap Regional Public Hospital Using the ATC/DDD Method and DU 90%

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ABSTRACT

Stroke is a serious medical condition in which the blood supply to the brain is disrupted, leading to the death of brain cells. The use of stroke medications aims to prevent and treat thromboembolism, and the increased use of stroke medications reflects the high global morbidity and mortality rates. This study aims to describe the utilization of drugs for stroke in patients treated at Cilacap Regional Public Hospital in 2022. The research method used was a descriptive study with a retrospective approach, referring to medical record data. A total of 167 samples were taken by purposive sampling, and the samples were evaluated using the ATC/DDD method and DU 90%. The results showed that the highest DDD/100 bed days value was for oral Acetylsalicylic Acid at 128124.19, and the lowest DDD/100 bed days value was for intravenous Phytomenadione at 6.73. The stroke medication included in the DU 90% was the ischemic stroke drug, oral Acetylsalicylic Acid, with a DU% value of 97.61%. The stroke medications in the 10% segment were the ischemic stroke drugs, namely oral Clopidogrel, oral Cilostazol, and oral Warfarin, as well as the hemorrhagic stroke drugs, intravenous Tranexamic Acid and intravenous Phytomenadione. The DDD per 100 bed days value for stroke medications exceeded the WHO's appropriateness criteria.

Keywords: Stroke medications, ATC/DDD, DU 90%

1. INTRODUCTION

Stroke is a serious medical condition where there is a disruption of blood flow to the brain, resulting in the death of brain cells. This cerebrovascular disease is a significant public health problem in various parts of the world (Sutin et al., 2022). Stroke is often caused by a blood clot that limits blood flow to a specific part of the brain, causing damage or death of brain cells. Stroke often has a detrimental impact on an individual's quality of life, social progress, and the economic stability of the patient's family, and can even cause an economic burden at the national level. Although stroke can occur in all age ranges, prevention and control methods are available (Imanda, 2019). According to Riskesdas data (2018), the prevalence of stroke increased from the pre-2013 level of 7% to 10.9% in Indonesia. In Central Java, the prevalence of stroke exceeds 11.8 percent (Kemenkes RI, 2018). The prevalence of stroke at Cilacap Regional Public Hospital in 2022 was 167 cases.

The purpose of using drugs in stroke patients is to prevent and treat thromboembolic events (TE). The increased use of stroke medications has been highlighted as a major contributor to high morbidity and mortality rates globally (Kirley et al., 2012; Barnes GD et al., 2017). One way to control the use of stroke medications is by conducting an assessment using the ATC/DDD method and DU 90%. The ATC method is an international standard for conducting research that allows for evaluating drug consumption, measuring the results obtained, and determining the pharmacological rationality of therapy (Sokolov A. V., and Reshetko O. V, 2021). The

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highest level of stroke drug use at Cilacap Regional Public Hospital can be determined by combining ATC/DDD with DU 90% (Mahmudah et al., 2016). This research was conducted at Cilacap Regional Public Hospital because stroke ranks among the top ten disease patterns and is the second leading cause of death in inpatients in 2022, with 39 patients. Based on the above, it is necessary to evaluate the use of stroke drugs in stroke patients using the ATC/DDD method (DDD/100 bed days) and DU 90% to determine the profile of stroke drug use in the drug segments given in stroke cases and to improve rationality and prevent thromboembolic events (TE) in treatment.

2. RESEARCH METHODS

This research was conducted at the Medical Record Installation at Cilacap Regional Public Hospital from June to August 2023 with the ethical clearance number B.LPPM-UHB/2354/10/2023. This research is a descriptive study with a quantitative approach using a cross-sectional research design. Data collection was conducted retrospectively by reviewing the medical records of adult stroke patients who received treatment at the Inpatient Installation of Cilacap Regional Public Hospital in 2022.

The inclusion criteria for this study were as follows: patients diagnosed by doctors with stroke who were hospitalized at Cilacap Regional Public Hospital from January 1 to December 30, 2022; stroke patients without complications; adult patients aged ≥ 18 years; patients with a duration of stroke medication therapy; and clear, readable, and complete medical record data including patient identity, stroke medication use profile (drug name, route, dose, frequency, duration), date of hospital admission and discharge, and laboratory examination results. The exclusion criteria included patients who did not use anticoagulant, antiplatelet, and antifibrinolytic drug therapy and patients who were not diagnosed with stroke based on ICD-10. A total of 167 samples were collected using purposive sampling, and the samples were then evaluated using the ATC/DDD method and DU 90%.

3. RESULTS AND DISCUSSION

3.1 Patient characteristics based on gender

Patient characteristics based on gender were divided into two categories: male and female. The results of patient characteristics can be seen in Table 3.1.

Table 3.1 Patient characteristics based on gender

Gender	Number	Percentage (%)
Male	83	49.70
Female	84	50.30
Total	167	100.00

Based on Table 3.1, it was found that there were 83 male patients (49.70%) and 84 female patients (50.30%). According to the table above, it was observed that the highest number of patients receiving stroke medication therapy, with a slight difference, were female. Stroke can occur in both men and women. Women have a lifetime stroke risk of about 4% higher than men (Sabrina J.G.C. Welten et al., 2021). This may be due to female-specific risk factors such as age at menopause. Several studies have reported that early menopause increases the risk of cardiovascular disease (Femke Atsma et al., 2016) and other conditions such as hypertension, which is one of the main risk factors for heart disorders. In addition, hypertension can lead to kidney failure or cerebrovascular disease, resulting in high treatment costs (Sunarti, 2020), which is generally caused by a decrease in endogenous estrogen after menopause. During this period, estrogen levels decrease, affecting the functioning of the body, including the circulatory system. Estrogen acts as a chemical that dilates blood vessels, and when its production decreases, it can cause vasoconstriction, potentially increasing blood pressure (Ahmad and Oparil, 2017).

3.2 Patient characteristics based on age

Based on the table below, patient characteristics according to age were divided into three groups: adult, elderly, and advanced elderly. The results of patient characteristics based on age can be seen in Table 3.2.

Table 3.2 Patient characteristics based on age at Cilacap Regional Public Hospital in 2022

Age	Number	Percentage (%)
Age	19	11.28
Elderly	78	46.71
Advanced Elderly	70	41.92
Total	167	100.00

According to Table 3.2, it was found that there were 19 adult patients (11.28%), 78 elderly patients (46.71%), and 70 advanced elderly patients (41.92%). Based on the data in the table, it can be concluded that the majority of patients receiving stroke treatment therapy at Cilacap Regional Public Hospital in 2022 were elderly, with 78 individuals (46.71%). The elderly age group is the most common among stroke victims (Pinzon, R., & Asanti, 2010). In the elderly population, the most common cause of stroke is systemic diseases such as hypertension, hypercholesterolemia, and diabetes mellitus. In the 45-64 age group, each 20 mmHg increase in systolic pressure or 10 mmHg increase in diastolic pressure doubles the risk of stroke (Meschia et al., 2014). In the elderly population, the causes of stroke are often related to unhealthy lifestyles that have been practiced since adolescence and have continued consistently, ultimately leading to various chronic diseases, including heart disease. This occurs because the elderly are more susceptible to hypertension and other disease complications. According to several studies, the risk of stroke increases with age, so the older a person is, the greater the likelihood of having a stroke. This is evidenced by Feigin et al., 2022, who stated that 62% of stroke patients are aged <70 years, and only 16% are aged 15-49 years.

3.3 Calculation of stroke medication use at Cilacap Regional Public Hospital using the ATC/DDD method and DU 90%.

Table 3.3 Calculation of Stroke Medication Use at Cilacap Regional General Hospital Using the ATC/DDD Method and DU 90%

No	ATC Code	Stroke Medication Name	Dosage Strength (mg)	Total DDD	DDD/100 bed-days	DU 90%	DU Segment
1	B02AA02	Acetylsalicylic Acid po	80	0.001	128124.19	97.61%	90%
2	B01AC04	Clopidogrel po	75	0.075	2490.30	1.90%	10%
3	B01AC23	Cilostazol po	100	0.2	407.50	0.41%	10%
4	B02AA03	Warfarin po	2	0.0075	59.68	0.05%	10%
5	B02AA02	Tranexamic Acid i.v	500	2	37.19	0.03%	10%

Note: (po) = per oral, i.v = intravenous

Based on the data in Table 3.3, the total DDD value in this study was 131263.45 DDD per 100 bed-days, meaning that, on average, patients received 131263.45 DDD of stroke medication per day for 100 days. According to the DDD calculation, it can be concluded that the amount of stroke medication use according to the ATC/DDD technique shows that acetylsalicylic acid po had the highest value in 2022, with 128124.19 DDD per 100 bed-days. The number of patients who received acetylsalicylic acid po was 12, so each patient received an average of about 0.001 grams of acetylsalicylic acid po per day. The use of oral acetylsalicylic acid po can reduce mortality rates and increase cost efficiency in stroke

patients compared to patients who do not receive oral acetylsalicylic acid (Jiang et al., 2019 Additionally, acetylsalicylic acid po is a recommended drug for secondary prevention after transient ischemic attack (TIA) and can reduce the incidence of long-term and recurrent stroke by 13% (Rothwell et al., 2016). Acetylsalicylic acid po works by inhibiting COX-1, where platelet inactivation occurs in COX-1, and inhibiting the platelet function of TXA, thus preventing platelet formation (Fagan, S. C. & Hess, 2019). According to a study by Mohamed Mansour Manan et al., 2022, acetylsalicylic acid po was the most widely used antiplatelet, with 8.5 DDD. The difference in mean DDD was statistically significant in relation to age group and race. This is consistent with the findings of a study by Ahmed et al., 2020, which found a difference in the prescription of antiplatelet agents between different genders and ages. The study reported that acetylsalicylic acid po was prescribed mainly for patients over 50 years of age, and generally, most male patients received antiplatelet agents (Ahmed, N. J, 2020). On the other hand, the use of phytomenadione i.v had the lowest DDD value per 100 bed-days, at 1.04 DDD. The use of phytomenadione i.v at Cilacap Regional Public Hospital was the lowest. The high and low DDD values are influenced by the amount (g) of stroke medication used, which is determined by the number of doses used by patients during hospitalization. If the dose given is excessive, the DDD value will tend to be higher than the standard DDD value that has been set (WHO, 2013). Additionally, it is influenced by the number of inpatients, with 4 patients receiving phytomenadione i.v.

Based on Table 3.3, it is shown that the DDD/100 bed-days for six categories of stroke medications exceeded the WHO limits. Excessive use of stroke medications can increase the DDD value determined by the amount of stroke medication administered (WHO, 2019). The high use of stroke medications can lead to NVAF (Nonvalvular Atrial Fibrillation), representing one of the most common causes related to stroke, affecting approximately 30 million patients worldwide with an estimated annual increase of hundreds of thousands of patients (Kirchhof et al., 2016). Additionally, venous TE is estimated to increase to an annual incidence of 10 million cases (Di Nisio M et al., 2016).

The DU 90% method is a method of grouping drugs that fall into the 90% usage segment. This method can be used if it is used simultaneously with the ATC/DDD method. The assessment of drugs that fall into the 90% segment aims to emphasize that segment in terms of evaluation, usage control, and procurement planning (Mahmudah et al., 2016). The DU 90% profile is obtained by dividing the DDD/100 bed-days value of a stroke medication by the total DDD/100 bed-days of all stroke medications used in stroke patients at Cilacap Regional Public Hospital during the period of January-December 2022, then multiplying the result by 100%. Then, the percentage of stroke medication use is accumulated and sorted from the highest to the lowest percentage. Stroke medications included in the DU 90% segment are stroke medications that cover 90% of the accumulated usage.

Based on Table 3.3, the stroke medication included in the DU 90% segment is Acetylsalicylic Acid po, with a percentage of (97.61%). Stroke medications that fall into the 10% segment are Clopidogrel po (1.90%), Cilostazol po (0.41%), Warfarin po (0.05%), Tranexamic Acid i.v (0.03%), and Phytomenadione i.v (0.01%). Stroke medications included in the 90% segment indicate that those stroke medications are the most widely used, while the lowest usage level is in the 10% group (WHO, 2015).

CONCLUSION

The evaluation of stroke medications using the ATC/DDD method has led to the following conclusions. The research results demonstrated that the DDD/100 bed-days value for the six types of stroke medications surpassed the standard DDD established by the WHO. The assessment of stroke medication use revealed that Acetylsalicylic Acid po was included in the DU 90% segment, while Clopidogrel po, Cilostazol po, Warfarin po,

Tranexamic Acid i.v, and Phytomenadione i.v fell into the 10% segment.

RECOMMEDATIONS

Based on the research results, several suggestions can be offered. First, additional research using qualitative evaluation methods is needed to support the results of this study to obtain more comprehensive evaluation results. Second, similar research should be conducted in different locations to compare the amount of stroke medication use in other regions, which can provide additional information for the selection of stroke medications.

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