International Journal of Chemical and Biochemical Sciences
(ISSN 2226-9614)

Journal Home page: www.iscientific.org/Journal.html

Application of observational method to identify drug related problems in the treatment of ischemic stroke patients in inpatient installation of government public hospital

Dita Hasni[1], Muhamad Risal Tawil[2], Loso Judijanto[3], Usman Sasyari[4], Pande Ayu Naya Kasih Permatananda[5]*

[1]*Universitas Baiturrahmah, Indonesia*

[2]*Politeknik Baubau, Indonesia*

[3]*IPOSS Jakarta, Indonesia*

[4]*Universitas Muhammadiyah Tasikmalaya, Indonesia*

[4]*Lincoln University College, Malaysia*

[5]*Universitas Warmadewa, Indonesia*

Abstract

This study aims to investigate the incidence of drug-related problems (DRPs) in the treatment of ischemic stroke patients. The research design used was cross-sectional, with a population of all ischemic stroke patients. Sampling was carried out using a purposive sampling method, involving a total sample of 100 patients. We collected research data by searching the medical records of ischemic stroke patients. Data analysis was carried out using computer programs and SPSS (Statistical Package for the Social Sciences), involving the analysis of research variables using univariate and bivariate analysis. The results of the study identified types of DRPs in ischemic stroke patients, which sequentially included drug interactions (60%), indications without drugs (30%), drugs without indications (5%), too many drugs for the same disease indication (3%), inappropriate medication due to contraindications (1%), and inappropriate medication according to treatment guidelines (1%). Furthermore, research shows a relationship between comorbidities and the incidence of DRPs, although this relationship is not statistically significant. In addition, there is a significant relationship between the number of drugs prescribed and the incidence of DRPs in patients. These results show the importance of paying attention to drug management in ischemic stroke patients, especially regarding the number of drugs prescribed, to minimize the risk of DRPs and improve the quality of treatment.

Keywords: Ischemic Stroke, Drug Related Problems, Concomitant Diseases.

Full length article **Corresponding Author*, e-mail: ditahasni@fk.unbrah.ac.id

1. Introduction

Local thrombus or emboli that block the cerebral arteries cause ischemic stroke, resulting in a disturbance in brain function. A total of 90% of strokes of all types are ischemic strokes, which are caused by a blockage or obstruction in certain brain blood vessels so that the brain area supplied by these blood vessels does not get a supply of energy and oxygen, which ultimately results in the tissue of brain cells in the area being dead and no longer functioning [1]. The incidence of ischemic stroke, which continues to increase in a number of places, can cause various complications such as muscle constriction and joint stiffness, blood clots, bruising, shoulder pain, pneumonia, fatigue, and even death. In addition to problems, ischemic stroke patients may also be at risk for developing ischemic stroke due to a number of other variables. There are various categories of risk factors that contribute to the high rate of ischemic stroke. These include risk factors that are unavoidable, like genetics, age, gender, and race; risk factors that are modifiable, like high blood pressure, heart disease, diabetes, obesity, and high cholesterol; and other risk factors, like substance abuse [2]. Managing drug therapy for patients diagnosed with ischemic

stroke is complex due to the various risk factors that contribute to its occurrence. Patients with ischemic stroke often require a variety of drug therapies to treat symptoms and prevent further complications [2] (figure 1). However, this diversity in drug therapy also opens up opportunities for drug-related problems (DRPs) to occur. Risk factors involving the patient's health condition, such as the presence of comorbidities or other medical conditions, can complicate the selection and use of medications [4]. Interactions between drugs, indications without drugs, or even too many drugs for the same indication can be a challenge in the drug management of ischemic stroke patients. Therefore, a thorough understanding of the patient's medical history and good knowledge of drug interactions are essential [4]. Through careful monitoring and collaboration between various health professionals, including doctors, pharmacists, and nurses, it can help to identify, prevent, and treat DRPs more effectively [5]. This effort not only aims to provide appropriate and efficient drug therapy but also to improve the quality of life of patients with ischemic stroke through optimal drug management [6]. Drug-related problems (DRPs) are undesirable conditions related to drug therapy in patients that have the potential to interfere with health outcomes and can cause or potentially not achieve optimal therapeutic results. Problems related to DRPs that often occur in treatment can cause various losses for patients, both in terms of physical health and mental health, which can result in a decrease in the patient's quality of life and increase the average death rate for patients [7]. From an economic perspective, drug-related problems can also increase medical costs incurred by the patient. In pharmaceutical practice or pharmaceutical care, a pharmacist has one of the main functions, namely: identifying problems related to DRPs, both actual and potential, and preventing potential DRPs from occurring [8]. Pharmaceutical services in hospitals have a central role in supporting health services and improving the quality of life of patients. As an integral part of the health care system in hospitals, pharmaceutical services aim to provide inseparable support for the success of patient treatment. Hospital pharmacy services include the provision of high-quality pharmaceutical preparations, medical devices, and consumable medical materials [8]. In addition, pharmaceutical services in hospitals are not only limited to the aspect of providing drugs and medical equipment but also involve clinical pharmacy services designed to provide therapeutic support to patients. This pharmaceutical service does not only focus on inpatients but is also designed to be accessible to all levels of society. In this way, hospital pharmacy services are not only a place for drug distribution but also an entity that is oriented towards patient service by providing high-quality and affordable resources. Hospital pharmaceutical services can significantly contribute to achieving the hospital's main goals, namely providing quality health services and improving patient welfare [9].

A stroke is a sudden or rapid disruption of brain function caused by a disruption in the blood supply to the brain that lasts longer than twenty-four hours. A shortage of blood can lead to a number of metabolic responses in brain tissue that can harm or even kill brain cells. The loss of brain activities regulated by a particular tissue might result from tissue death in brain cells. A stroke is an abrupt stoppage of blood flow to the brain that damages brain tissue and can leave a patient paralyzed for an extended length of time [9]. To put it simply, a stroke is a brain disorder that arises from the brain's blood flow stopping because of obstruction (ischemic stroke) or bleeding (hemorrhagic stroke) [10]. The level of consciousness is a measurement of the patient's awareness and response to stimuli from the external environment. Measuring the level of consciousness consists of measuring the qualitative level of consciousness, which can be seen from the patient's medical record data, and measuring the quantitative level of consciousness using the Glasgow Coma Scale score [10]. The qualitative level of consciousness consists of several categories, namely mentis, apathy, delirium, somnolence, stupor, and coma. Compo's mentis is a state where a person is still fully conscious and can answer questions about himself and his environment. Apathy is a condition where someone is uncaring, indifferent, and reluctant to relate to other people and their environment [11]. Patients with delirium experience a decrease in consciousness along with motor chaos and a disturbed sleep-wake cycle. The patient appears restless, confused, and struggling. Somnolence is a condition where a person is sleepy and tends to fall asleep, can still be awakened by stimulation, and is able to give verbal answers but falls asleep easily again [11]. Sopor/stupor means loss of consciousness; just lying down with eyes closed, showing no reaction when awakened, unless given a painful stimulus. Coma is a condition where consciousness is lost; there is no reaction even though all external stimuli (verbal, tactile, and pain) have been given. The characteristics of coma patients are the absence of arousal and awareness of themselves and their environment [12]. The picture of a comatose patient looks like eyes closed, no talking, and no movement in response to auditory, tactile, and painful stimuli.

2. Materials and methods

This research adopts a cross-sectional design, a research approach that focuses on collecting data on independent variables, or causal factors, and dependent variables, or effect factors, at one time. The population that was the focus of this study were all patients who experienced ischemic stroke. We conducted sampling using a purposive sampling method, and in this study, we employed total sampling, involving 100 patients as samples. Data collection was carried out by searching the medical records of ischemic stroke patients. This method provides an in-depth understanding of the patient's health history, allowing researchers to identify and analyze possible drug-related problems (DRPs). Data analysis was carried out using computer programs and SPSS (Statistical Package for the Social Sciences) by applying univariate and bivariate analysis to the research variables. By employing a cross-sectional approach and the chosen sampling method, this study aims to offer a representative depiction of DRPs in ischemic stroke patients at a specific time. Computer programs will carefully and thoroughly analyze the data to provide valuable insights for improving drug management and treatment of ischemic stroke patients in the hospitals concerned. Univariate analysis describes each existing variable (free or dependent). In this study, data processing using univariate analysis included patient characteristics (gender, age, neurological function, comorbidities, and number of drugs used), drug use, and the incidence of DRPs. Bivariate analysis examines the significance between two variables believed to be related. The chi-square test was used to do a descriptive and statistical

analysis of the research sample data. To ascertain whether there is a relationship between two categorical variables, researchers employ the chi-square test. The test is deemed valid if the conditions are satisfied, which include cells having fewer than five expectations or no more than 20% of the total number of cells. Fisher's absolute test can be used if the outcomes don't match these criteria. To ascertain the association between comorbidities and the incidence of DRPs in patients with ischemic stroke, as well as the relationship between the number of medicines and the incidence of DRPs, we performed bivariate analysis. Data processing in this research involves several stages, including editing, coding, entry, and cleaning. The editing process involves re-checking the completeness of the data by setting inclusion and exclusion criteria; data that meets the inclusion criteria will be retained, while data that falls within the exclusion criteria will be deleted. Data errors can be corrected, and data deficiencies can be corrected by re-collecting data or by inserting data. The next stage is coding, where each piece of data is given a certain code according to its category. The purpose of coding is to simplify the process of placing data in a computer program. Researchers code the data that has been selected from the selection process using a computer program to ensure consistency and ease of analysis. The entry process involves placing data that has gone through the coding process into a table in a computer program. During this stage, the entry process neatly organizes the coded data into a format suitable for further analysis. Finally, we carry out the cleaning stage to re-check, ensure the correctness, and clean the data entered into the table from potential errors. Thus, data that has passed the cleaning process is considered ready for further analysis to support research conclusions and findings.

3. Results and Discussions

We carried out patient grouping based on gender, age, number of drugs used, neurological function, and comorbidities to identify the characteristics of ischemic stroke patients in this study. Men dominated the ischemic stroke patient population, accounting for 60%. This discovery can be explained by the fact that men have higher blood levels of the hormone testosterone, which raises LDL levels and is a major risk factor for degenerative disorders like ischemic stroke. However, after menopause, when hormonal changes take place and blood levels of estrogen drop, women's risk of stroke can also rise, potentially leading to an increased risk of atherosclerosis. In addition to gender, age was another aspect considered in this study. The results indicated that the proportion of patients with ischemic stroke was higher in specific age groups, particularly those between 56 and 65. This aligns with the understanding that the prevalence of stroke tends to rise with advancing age. Additionally, study is focused on elements of neurological function and the quantity of drug utilized. An overview of the neurological function levels and treatment patterns in patients with ischemic stroke is given by this material. As a result, the study's findings offer a thorough grasp of the traits of ischemic stroke patients, which may serve as the foundation for better medication administration and more specialized medical care. The study's ischemic stroke participants ranged widely in age from 32 to 94. The findings indicate that the age group of 56 to 65 years old has the largest percentage of ischemic stroke patients, at 40%. The age groups of 46 to 55 years old (30%), above 65 years old (25%), 36 to 45 years old (10%), and 26 to 35 years old (1%), in that order. Age-related increases in the incidence of stroke make some age ranges particularly important to monitor, especially between 56 and 65 years of age. Every ten years after the age of fifty-five, the chance of stroke can quadruple. As the human body ages, its systems, such as the cardiovascular and cerebral blood vessel functions, gradually decrease, leading to an increased risk of strokes. For instance, the blood arteries in the brain have a tendency to stiffen and lose their flexibility, particularly in the areas where the endothelium thickens in the vessel's intima. This can cause a narrowing of the lumen of blood vessels, resulting in a decrease in cerebral blood flow, which in turn can trigger an ischemic stroke. With this understanding, health services can be more targeted in efforts to prevent and manage the risk of ischemic stroke in this vulnerable age group. Based on research results, it is known that the age range of 56–65 years is the one that most often experiences ischemic stroke, because in this age range, a person experiences a lot of worry, anxiety, and fear about their fate, which can cause disruption of emotional balance and manifest in various health problems. This condition, known as post-power syndrome, can affect both physical and mental health. Post-power syndrome usually occurs in someone who experiences psychological disorders when they are about to retire. Psychological disorders or mental health problems will arise if, in old age, a person is unable to adapt well to the changes that occur in their life along with the aging process. The aging process that occurs at this age can take the form of unhappiness, stress, depression, and changes in lifestyle, which will manifest in various health problems such as diabetes mellitus, hypertension, stroke, and others.

In this study, an evaluation of neurological function on the level of consciousness of ischemic stroke patients was carried out based on medical record data. The level of consciousness was measured qualitatively, including mentis, apathy, delirium, somnolence, stupor, and coma. The measurement results show that the majority of ischemic stroke patients have a compost mentis awareness level of 85%. Furthermore, there were patients with a level of awareness of 3% of apathy, 1% of delirium, 10% of somnolence, 3% of stupor, and 1% of coma. The importance of assessing the level of consciousness lies in understanding the patient's neurological condition, which can provide clues regarding the severity and impact of an ischemic stroke. The extent of the infarction or bleeding in the brain area can also influence this patient's level of consciousness. This information can be the basis for more specific therapy planning and patient management, according to the identified level of awareness, in order to improve treatment outcomes for ischemic stroke patients. The research results revealed that 98% of ischemic stroke patients had comorbidities, while only 3% did not. The most common comorbidity in ischemic stroke patients is hypertension, accounting for 70% of the total patients. Apart from that, diabetes mellitus is also a significant comorbidity, reaching 30%. This information highlights the close relationship between ischemic stroke and the presence of comorbidities, especially hypertension and diabetes mellitus. Knowledge of comorbidities is important in designing management strategies for ischemic stroke patients because the presence of comorbidities can worsen the patient's condition and affect the response to treatment. With this understanding, health services can be more focused on

treating ischemic stroke patients by paying attention to and managing comorbidities that may worsen the patient's clinical condition. The number of drugs given to ischemic stroke patients is not only aimed at treating the indications for the disease but also to treat comorbidities and reduce the possibility of side effects. Based on the research results, it was revealed that patients received a range of drugs, ranging from 3 to 18 types. The number of drugs was then grouped into two categories: no polypharmacy (1-4 types of drugs) and polypharmacy (≥ 5 drugs). The research results showed that the majority of ischemic stroke patients fell into the polypharmacy category, with a percentage reaching 90%. This polypharmacy pattern reflects the complexity of health management in ischemic stroke patients, where treatment involves the use of multiple types of medications to treat a complex condition. Although these medications may be necessary to treat various aspects of a patient's health, polypharmacy also carries potential risks related to drug interactions and side effects. Therefore, healthcare providers need to carefully manage drugs in ischemic stroke patients, considering the benefits and risks of each medication. The results of the study revealed that in the treatment of ischemic stroke, the three types of drugs most often given to patients were citicoline, aspirin, and clopidogrel. Cyticolin, which is a compound that can support brain and nervous system function, appears to be a common choice in the management of ischemic stroke. Furthermore, aspirin, which is known as an antiplatelet drug, and clopidogrel, which also has a similar function, may be used to reduce the risk of forming blood clots that can lead to an ischemic stroke. The combination of administering these three types of drugs reflects a holistic approach to treating this disease, with a focus on managing the risk of blood clots and supporting brain function. The importance of these drugs in the management of ischemic stroke suggests efforts to optimize therapy and minimize the impact of this disease on patients.

Cyticolin is a complex organic molecule consisting of choline. Choline undergoes trimethylation, resulting in a nitrogen base. Choline participates in three main metabolic pathways: phosphorylcholine for phospholipid synthesis, acetylcholine synthesis, and betaine oxidation, which releases methyl groups. By boosting the synthesis of phosphatidylcholine, an essential component of cell membranes, particularly in the brain, it functions as a neuroprotectant medication at the neuronal level to repair or prevent damage to cell membranes. The enhancement of cell membrane function will be impacted by an increase in phosphatidylcholine synthesis, and this could ultimately lead to cell repair. The choline present in citicoline is also a precursor of acetylcholine, which is an important neurotransmitter for cognitive function. One more thing that chyticolin does is lower the activity of the phospholipase enzyme. This stops the production of arachidonic acid and increases the production of cardiolopine, which is an important part of the mitochondrial membrane. Apart from that, citicoline also increases the production of glutathione, which is an endogenous brain antioxidant against free radicals. And at the vascular level, citicoline plays a role in increasing cerebral blood flow, increasing oxygen consumption, and reducing vascular resistance. The next most common drug for ischemic stroke is the antiplatelet group, namely aspirin and clopidogrel. Antiplatelet drugs work by reducing platelet aggregation, which can inhibit thrombus formation in the arterial circulation. Aspirin can stop the enzyme cyclooxygenase (COX) from working. COX changes arachidonic acid into prostaglandin H2, prostaglandin E2, and thromboxane A2. Aspirin works by stopping the enzyme cyclooxygenase (COX) from doing its job. This stops COX-I platelets from working and stops TXA platelets from doing their job, so no platelets form. The way clopidogrel works is by blocking the ADP receptor with platelet receptors and turning on the glycoprotein GPIIb/IIIa complex. This stops platelets from working and blood from clotting.

Patients with ischemic stroke are also prescribed other drugs to manage comorbidities. Another drug most often used is amlodipine. Amlodipine is a class of calcium channel blocker (CCB) drugs that provides pharmacological effects as an antihypertensive agent. The mechanism of action of amlodipine is to inhibit calcium ions from entering the vascularization of smooth muscle and heart muscle so that it can reduce blood pressure. The next most frequently given drug is simvastatin. Simvastatin is a statin-class antihyperlipidemic drug. Statins function to lower LDL cholesterol and also have the effect of increasing HDL cholesterol and reducing triglycerides. Statins inhibit an enzyme known as 3-hydroxy-3-methylglutaryl coenzyme (HMG CoA) reductase. This enzyme primarily aids in the liver's production of cholesterol. When it comes to lowering LDL cholesterol, these statin medications outperform other antihyperlipidemic medications; however, they are less successful in lowering triglycerides than fibrates. In this study, the PCNE (Pharmaceutical Care Network Europe) V8.01 guide which includes categories for causes and prescriptions is used to identify drug-related problems (DRPs). Drug selection, drug dosage form, dose selection, and duration of treatment divide the prescribing group. In terms of drug selection, this study looked at drugs that weren't right for the patient based on treatment guidelines, drugs that weren't right because they had side effects, drugs that weren't supposed to be used, side effects that weren't supposed to be used, drug interactions, therapeutic group duplication, inappropriate active drug substances, and too many drugs being prescribed for the same disease. The results showed that the most frequent DRPs were drug interactions at 60%, followed by indications without drugs at 30%, drugs without indications at 5%, too many drugs prescribed for the same disease indication at 3%, inappropriate medication due to contraindications at 1%, and inappropriate medication according to treatment guidelines at 1%. These findings provide a clear picture of the types of DRPs that predominate in ischemic stroke patients in the prescribing context. With this understanding, healthcare providers can implement corrective and remedial measures to enhance the quality of patient treatment and mitigate the risk of potential DRPs. Seven aspects are focused on in the category of drug selection in this study: inappropriate drugs according to treatment guidelines, inappropriate drugs due to contraindications, drugs without indications, indications without drugs, drug interactions, duplication of therapeutic groups or inappropriate active drug substances, and too many drugs prescribed for the same disease indication. Problems related to inappropriate drug selection according to treatment guidelines are seen in ischemic stroke patients with indications of high blood pressure (≥160/100 mmHg) but who are only given antihypertensive drug monotherapy.

Meanwhile, similar problems were seen in ischemic stroke patients with HBA1C values > 9.0% who were only given metformin therapy in the management of type 2 diabetes.

According to the literature, managing type 2 diabetes with an HBA1C value > 9.0% that is not accompanied by symptoms should involve combining two drugs, and if the target is not reached within 3 months, adding a third drug. In cases of type 2 diabetes with an HBA1C value > 9.0% accompanied by symptoms, insulin therapy and other drugs are considered more appropriate. These results highlight how crucial it is to evaluate recommended courses of care and provide personalized drug regimens based on patient requirements in order to optimize treatment outcomes and lower the incidence of drug-related problems (DRPs) in patients with ischemic stroke. The medication is inappropriate since giving aspirin to patients who have had an ischemic stroke can have contraindications. Aspirin is classified as a non-steroidal anti-inflammatory medicine (NSAID) under the non-selective COX-1 inhibitor family. It functions as an agonist of platelet aggregation. While aspirin is used to treat hypertension, it can also harden artery walls, reduce blood vessel stiffness and hemostasis, and produce other side effects. Its primary goal is to prevent the clinical signs of cardiovascular disease. Therefore, there is a danger of bleeding while using aspirin for hypertension medication at higher dosages. Patients with ischemic stroke were treated with medication; however, with administration of ceftriaxone, atorvastatin, or simvastatin, no signs of illness were observed in these patients. Within the statin class, atorvastatin and simvastatin are hypolipidemic medications that decrease LDL cholesterol, raise HDL cholesterol, and drop triglycerides. The coenzyme 3-hydroxy-3-methylglutaryl (HMG CoA) reductase enzyme is one method that statins function. This enzyme is primarily involved in the hepatic production of cholesterol. You can find out the status of individuals who exhibit signs of hyperlipidemia by analyzing the findings of laboratory tests, such as tests for direct LDL cholesterol, HDL cholesterol, total cholesterol, and triglycerides. Overuse of atorvastatin and simvastatin without prescribed guidance can raise the risk of adverse medication reactions and harm to liver cells. The next drug, without indication, occurs when administering ceftriaxone. Ceftriaxone is a third-generation cephalosporin antibiotic. Cephalosporin is a broad-spectrum beta-lactam that works by inhibiting the synthesis of microbial cell walls to treat various bacterial infections. Excessive use of antibiotics without certain indications can cause resistance to certain bacteria. Ischemic stroke patients who received ceftriaxone therapy in this study did not have any indications or examination results that necessitated antibiotic treatment. Indications without medication are patients who experience indications but do not receive medication. The most common indication without medication was found to be leukocytosis. Leukocytosis occurs when the number of leukocytes or white blood cells exceeds the normal value for age.

Leukocytosis is the body's normal response to infection or inflammation. Leukocytosis occurs when the body is infected with a foreign object or experiences internal bleeding. Stroke is an indication of a disease that often causes leukocytosis and usually has a worse prognosis and outcome, both before the attack and during treatment in the stroke unit. The next most common indication without medication is hyperglycemia. Hyperglycemia is a condition where blood glucose levels increase beyond normal values. Hyperglycemia, which results in impaired blood sugar tolerance if you have experienced a first stroke, will contribute to worsening the risk of cardiovascular disease and tends to lead to recurrent strokes. Drug interactions are an important event for patients who receive drug therapy from more than five types of drugs, or polypharmacy. Drug interactions in stroke patients are classified based on severity into 3 categories, namely, minor, moderate, and major. Based on the research results, the most frequent level of severity of drug interactions is in the moderate drug interaction category. A moderate drug interaction is a drug interaction that can cause changes or worsen the patient's clinical status. The most common moderate drug interactions that occur are when used together with clopidogrel and amlodipine. Cytochrome P450 (CYP) and esterase metabolize clopidogrel into its main metabolite. The metabolism of clopidogrel 2-oxo and the production of active thiols have been linked to a number of isoforms. Amlodipine has been demonstrated to inactivate these enzymes in vitro, albeit with an enzymatic inhibition coefficient (Ki) that is higher than what is seen in plasma during clinical use. Based on existing evidence, the current therapeutic practices with clopidogrel and amlodipine do not require revision. The next largest category is major drug interactions. A major drug interaction is a drug interaction that has a major effect on endangering lives or results in permanent damage that can threaten the patient's life, so efforts are needed to prevent major interactions from occurring. Aspirin and ketorolac often cause major drug interactions when used together with other drugs. NSAIDs, or non-steroidal anti-inflammatory medicines, include aspirin and ketorolac. By blocking the cyclooxygenase (COX) enzyme, NSAIDs function. The COX-1 enzyme, which promotes prostaglandin production to protect the stomach mucosa, and the COX-2 enzyme, which promotes prostaglandin synthesis to contribute to pain and inflammation, are the two different forms of COX. Aspirin works completely and stops platelets from making thromboxane A2 in a way that can't be undone. It does this by stopping COX from working against platelets. Unlike aspirin, NSAIDs are reversible platelet inhibitors, causing partial and intermittent inhibition of thromboxane A259 platelets. Based on the information contained in the ketorolac prescription, the use of ketorolac with other non-steroidal anti-inflammatory agents (NSAIDs) or aspirin is contraindicated due to the risk of additive or synergistic NSAID toxicity, which can cause gastrointestinal bleeding, kidney dysfunction, and others. The last category of severity of drug interactions is minor drug interactions. Minor drug interactions are drug interactions that generally only cause or provide mild effects to the patient. The effects may or may not be felt by the patient, but they can influence the results of therapy, although not significantly. The most frequent minor drug interaction that occurs is the joint use of amlodipine and ketorolac. The mechanism of drug interaction between amlodipine and ketorolac is unknown. According to the study, patients who had ischemic stroke and used antiplatelet medications like clopidogrel and aspirin had an increased frequency of prescriptions for the same illness. To lower the chance of a recurrent stroke, doctors prescribe this antiplatelet medication to every patient who is diagnosed with ischemic stroke for the first time.

Figure 1: schema of ischemic stroke, Adapted from American Ischemic Stroke Associations [3]

Although the use of antiplatelets is a standard approach in the management of ischemic stroke patients, it should be noted that administering too many drugs in this class can pose a risk of drug-related problems (DRPs), such as drug interactions or unwanted side effects. Therefore, healthcare providers must carefully select and dose antiplatelet drugs, taking into account the benefits and associated risks, to ensure effective treatment and maintain optimal balance in managing ischemic stroke patients.A P value (significance) of 1.000 was found based on the findings of the bivariate study between comorbidities and the incidence of drug-related problems (DRPs). Comorbidities and the incidence of DRPs were associated, however the significance of this finding was lower than anticipated. To put it another way, while comorbidities may be linked to a higher risk of DRPs, this link cannot be deemed statistically significant. In the meantime, a p-value of 0.03 was found in the bivariate analysis comparing the quantity of medications with the occurrence of DRPs. These findings suggest a strong correlation between patient medication use and the risk of DRPs. Consequently, a patient's chance of developing DRPs is significantly correlated with the quantity of prescription drugs they are prescribed. These results suggest that in order to lower the risk of DRPs, patients taking higher doses of medication require extra consideration when it comes to drug management.

4. Conclusions

Drug interactions account for 60% of drug-related problems (DRPs), with indications without drugs coming in second (30%), drugs without indications (5%), too many drugs for the same disease indication (3%), inappropriate drugs because of contraindications (1%), and inappropriate drugs based on treatment guidelines (1%). These findings are supported by the results and discussion. In addition, though not statistically significant, this study demonstrates a correlation between comorbidities and the occurrence of DRPs. This indicates that while comorbidities cannot be regarded as the primary cause of DRPs, they do seem to increase the likelihood of occurring in patients with ischemic stroke. Additionally, the study's findings demonstrated a connection between patients' drug consumption and the prevalence of DRPs. This shows that the more drugs consumed by ischemic stroke patients, the higher the risk of drug-related problems. Thus, understanding the types of DRPs that predominate in ischemic stroke patients, as well as the factors that contribute to the occurrence of DRPs, may provide a basis for improvements in patient drug management, including stricter monitoring of drug interactions and the implementation of appropriate treatment guidelines. more precise. In order to improve the quality of treatment for ischemic stroke patients, several suggestions can be made. First, the writing of patient medical record data needs to be improved by ensuring that all information related to patient identity, primary and secondary diagnoses, drug therapy, and drug use profiles is filled in and written completely, clearly, and systematically. It is important to ensure that necessary information regarding patient treatment can be accessed easily and accurately. Furthermore, the importance of good collaboration and cooperation between medical personnel, including doctors, pharmacists, nurses, and other medical personnel, needs to be emphasized. This close collaboration between various parties will support more effective and efficient drug management for ischemic stroke patients. With the various knowledge and expertise possessed by each profession, good collaboration can help identify, prevent, and treat drug-related problems (DRPs) more effectively, so that patients can receive safe and optimal treatment therapy. By implementing these suggestions, it is hoped that the drug management of ischemic stroke patients can be improved overall.

References

[1] D.Z. Aleksic, S.M. Jankovic, M.N. Mlosavljevic, G.L. Toncev, S.D. Miletic Drakulic, S.M. Stefanovic. (2019). Potential drug-drug interactions in acute ischemic stroke patients at the Neurological

Intensive Care Unit. Open Medicine. 14(1): 813-826.

[2] P.A.N.K. Permatananda, I.G.S. Pandit. (2023). Characteristic of Orange Peel Waste-Based on Eco Enzyme at Different Fermentation Duration. Jurnal Penelitian Pendidikan IPA. 9(6), 4289-4293.

[3] https://www.stroke.org/en/about-stroke/types-of-stroke/ischemic-stroke-clots

[4] P.A.N.K. Permatananda, E. Kristin, D. Endharti , R. T. Pinzon, I.K. Sumada. (2018). Adverse event of antiepileptic drugs: a cross sectional study. In MATEC Web of Conferences. (Vol. 197, p. 07004). EDP Sciences.

[5] D. Handayani, D. Dominica. (2019). Description of Drug Related Problems (DRP's) in the Management of Hemorrhagic Stroke and Non-Hemorrhagic Stroke Patients at Dr M Yunus Regional Hospital, Bengkulu. Journal Farm Dan Ilmu Kefarmasian Indonesia. 5(1): 36. doi:10.20473/jfiki.v5i12018.36-44.

[6] I. Riani. (2023). The impact of hyperglycemia on the survival of stroke sufferers. Journal Kedokter Trisakti , 22(3):97-105.

[7] J.F. Andry, G.D. Rembulan, E.L. Salim, E. Fatmawati, H. Tannady. (2023). Big Data Analytics in Healthcare: COVID-19 Indonesia Clustering. Journal of Population Therapeutics and Clinical Pharmacology. 30(4), 290-300.

[8] V. Kanagala, A. Anusha, B. Rao, S. Challa, K. Nalla, R. Gadde. (2016). A Study of Medication-Related Problems in Stroke Patients: A Need for Pharmaceutical Care. Journal of Research in Pharmacy Practice. 5(3): 222. doi:10.4103/2279-042X.185750

[9] R. Abdul, Suyanto. (2016). Post-Power Syndrome and Changes in Social Behavior of Retired Teachers. Psympathic. Jurnal Ilmiah Psikologi . 3(1): 77-94.

[10] J.F. Andry, H. Tannady, G.D. Rembulan, A. Rianto. (2022). The importance of big data for healthcare and its usage in clinical statistics of cardiovascular disease. Journal of Population Therapeutics and Clinical Pharmacology. 29(04), 107-115.

[11] J. Tandi, D.S. Waruwu, A. Martina. (2018). Study of the Use of Antihypertensives in Stroke Patients in the Inpatient Installation of RSU Anutapura Palu in 2017. Indonesian Journal of Clinical Pharmacy. 7(4): 260. doi:10.15416/ijcp.2018.7.4.260

[12] P.A.N.K. Permatananda, P.I.B. Apsari, S. Harkitasari. (2019). Medication adherence and quality of life among epilepsy patients: A cross sectional study. International Journal of Research–Granthaalayah. 7(3), 1-10.