Evaluation of Drug Accuracy and Cardiac Drug Dose Accuracy in Heart Failure Patients Hospitalized in Samarinda

(*Evaluasi Ketepatan Obat Dan Dosis Obat Jantung Pada Pasien Gagal Jantung Di Instalasi Rawat Inap Rumah Sakit Samarinda*)

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ABSTRACT

Background: Heart failure is a condition where the heart is unable to pump blood to the tissues to meet the body's metabolic needs. Heart failure has a variety of therapies and drug options available, so careful consideration is needed in selecting drugs for heart failure patients. Evaluation is carried out to identify problems with the accuracy of drug use and dosage accuracy. The many types of drugs available present its their problems in the use of drugs, especially in the selection and use of drugs that are effective, correct, and safe. Inappropriate and rational use of drugs can increase morbidity and mortality. **Objectives:** To determine the accuracy of drugs and heart drug dosages in patients with heart failure at the inpatient installation of Samarinda Medika Citra Hospital. **Material and Methods:** This research is a descriptive observational study with retrospective data collection in 2022. The sample consisted of all adult heart failure inpatients who met the inclusion criteria of 60 patients. **Results:** The results of the study showed that out of 60 patients, the accuracy of therapy included 93% of the correct drug and 88% of the correct dose. The heart failure drugs used were furosemide (39%), spironolactone (19%), digoxin (18%), candesartan (15%), captopril (4%), bisoprolol (3%), and lisinopril (2%). **Conclusions:** From the research results, it was found that 93% of the drug accuracy and 88% of the drug dose accuracy in heart failure patients.

INTRODUCTION

Heart failure is a type of heart disease. Heart failure is a condition in which the heart is unable to pump blood to the tissues to meet the body's metabolic needs (forward failure). This ability can only occur with high heart-filling pressure (backward failure) or both (Nurkhalis & Adista, 2020). Heart failure is usually caused by secondary structural and/or functional abnormalities of the heart (inherited or acquired) that impair the ability of the left ventricle to fill or eject blood (Lolita & Asih, 2019). The increasing number of cases of heart failure in the world, including Asia, is caused by the increasing number of smokers, obesity, dyslipidemia, and diabetes. According to data from the Basic Health Research (Riskesdas) of the Indonesian Ministry of Health in 2018, the prevalence of heart failure in Indonesia based on a doctor's diagnosis is estimated at 1.5%, or an estimated 29,550 people, with the highest prevalence in North Kalimantan Province, with 2.2%, occupying the first position, while East Kalimantan, with 1.9%, occupied the sixth position. The prevalence of heart failure increases because patients who experience acute heart damage can progress to chronic heart failure (Riskesdas, 2019). Heart failure has a variety of therapies and drug options available, so careful consideration is needed in selecting drugs for heart failure patients. Evaluation is carried out to identify problems with the accuracy of drug use and dosage. The many types of drugs available present their own problems in the use of drugs, especially in the selection and use of drugs that are effective, correct, and safe. Improper and rational use of drugs can increase morbidity and mortality (Prabowo, 2016). Based on this background, the author is interested in researching the accuracy of drugs and heart drug dosages in heart failure patients at the Samarinda Hospital Inpatient Installation for a period of 2022.

MATERIAL AND METHODS

Materials

This research was conducted in January 2023–March 2023, with data from 2022. This research used a descriptive research design and was retrospective, using a purposive sampling method. Selecting research subjects based on inclusion and exclusion criteria. Subjects in the form of medical record of heart failure patients at the inpatient installation at Samarinda Medika Citra Hospital. The inclusion criteria include inpatients with a diagnosis of heart failure, patients aged > 50 years, patients with complete medical records, including patient identity, and drug administration data. The criteria exclusions include patients with illegible medical record data. This research had ethycal clearence with number 165/KEPK-AWS-VII-2023.

Methods

Data collection in this study used a purposive sampling method using medical record data from heart failure patients who were hospitalized at Medika Citra Samarinda Hospital and met the inclusion and exclusion criteria. This research was processed descriptively with results in the form of percentages

using Microsoft Excel. Evaluation of the percentage of suitability of therapy by referring to the Hospital Formulary, Drug Information Handbook (DIH) or online with Lexicomp Update, Indonesian Association of Cardiovascular Specialists (PERKI) 2020, and various supporting journals.

RESULTS AND DISCUSSION

Display with the system all research data in this section in the form of paragraphs, tables and figures. In this section, if there are tables and figures that require additional information, the sentences are presented briefly, clearly and easily understood.

1) Patient Characteristics

In the research, medical record data was obtained from inpatient heart failure patients at Samarinda Medika Citra Hospital for the 2022 period; 60 data patients met the inclusion and exclusion criteria for the study. Characteristic data are categorized by gender, age group, and comorbidities.

Table 1. Patient Characteristics

Characteristics	Amount	Percentage
Gender		
Man	29	48%
Woman	31	52%
Age		
51-55 Year	13	22%
56-60 Year	14	23%
>61 Year	33	55%
Comorbidity		
Congestive heart failure (CHF)	7	12%
CHF + *Hypertension*	11	18%
CHF + *Atrial fibrillation and flutter*	8	13%
CHF + *Acute renal failure*	7	12%
CHF + *Atherosclerotic heart disease*	6	10%
CHF + *Chronic obstructive pulmonary disease*	4	7%
CHF + *Dyspepsia*	4	7%
CHF + *Hypokalemia*	3	5%
CHF + *Pneumonia*	2	3%
CHF + *Anemia*	2	3%

CHF + *Coronary artery disease*	1	2%
CHF + *Chronic kidney disease + Hypertension*	1	2%
CHF + *COPD + Diabetes mellitus*	1	2%
CHF + *Pneumonia +Diabetes mellitus*		
CHF + *Chronic kidney disease + Anemia*	1	2%
CHF + *Diabetes mellitus*	1	2%

In table 1. The patient characteristics showed the results of sex, age, and also comorbidities. This study found that 29 patients (48%) had a male predominance, while 31 patients (52%) were female. This shows that women are more at risk of heart failure than men. The risk of heart failure in women increases as estrogen levels fall or decrease during menopause, which can lead to an increase in heart failure. Postmenopausal women are more susceptible to heart disease than men due to increased triglyceride levels and decreased total fat Wulandari et al, (2015). According to research findings on patient characteristics based on age, as shown in table 1, the prevalence of patients aged 51-55 years was 13 patients (22%) at the age of 56-60 years there were 14 patients (23%) and at ages> 61 years there were 33 patients (55%) The age range of 61-65 years had the highest percentage of heart failure responses, namely 60%. This is due to the fact that as you get older, your chances of developing heart failure due to decreased heart function increase Harigustian, Dewi, & Khoiriyati, (2016). Comorbidity, or the presence of more than one separate medical condition in a patient, is used to categorize patients with heart failure. According to the study findings, table 1 shows that 11 patients (18%) had comorbid hypertension and experiencing CHF with comorbid atrial fibrillation and flutter 8 patients (13%). This is due to the fact that hypertension is the most common risk factor, affecting 70% to 80% of people with heart failure. The heart can be seriously damaged by hypertension. Heart failure can be further exacerbated by hypertension because the heart cannot pump enough blood and oxygen to other important organs, which results in higher blood pressure and decreased blood flow Donsu et al, (2020). In contrast, 10-30% of people with heart failure also experience an *arrhythmia called atrial fibrillation* (AF). Because AF and heart failure both share susceptibility to one another, the former is more common than the latter. Decreased cardiac output due to the effort of the atria against ventricular erosion leads to cardiac enlargement, and AF is associated with an increased risk of secondary atrial thromboembolism in patients with heart failure.

2) Drug use patterns

Table. 2 presents patterns of cardiovascular drug use in individuals with heart failure

Therapy	Medicine name	Amount	Percentage
Single			
Loop diuretics	Furosemide	3	5%
Potassium Sparing Diuretics	Spironolactone	1	2%
Angiotensin Receptor Blockers	Candesartan	2	3%
2 combinations			
Loop diuretics + *Angiotensin Receptor Blockers*	Furosemide + Candesartan	5	8%
Loop diuretics + Digoxin	Furosemide + Digoxin	4	7%
Loop diuretics + *Angiotensin Converting Enzyme - inhibitor*	Furosemide + Captopril	3	5%
Loop diuretics + *Potassium Sparing Diuretics*	Furosemide + Spironolactone	8	13%
Digoxin + *Angiotensin Receptor Blockers*	Digoxin + Candesartan	1	2%
Loop diuretics + Beta Blocker	Furosemide + Bisoprolol	1	2%
3 Combinations			
Loop diuretics + Digoxin + *Potassium Sparing Diuretics*	Furosemide + Digoxin + Spironolactone	13	22%
Loop diuretics + *Angiotensin Receptor Blockers* + *Potassium Sparing Diuretics*	Furosemide + Candesartan + Spironolactone	8	13%
Loop diuretics + Angiotensin Receptor Blockers + Beta Bloker	Furosemide + Candesartan + Bisoprolol	2	3%
4 Combinations			
Loop diuretics + Digoxin + *Angiotensin Receptor Blockers* + *Potassium Sparing Diuretics*	Furosemide + Digoxin + Candesartan + Spironolactone	2	3%
Loop diuretics + *Potassium Sparing Diuretics* + Digoxin + *Angiotensin Converting Enzyme - inhibitor*	Furosemide + Spironolactone + Digoxin + Captopril	2	3%
Loop diuretics + *Potassium Sparing Diuretics* + Digoxin + *Angiotensin Converting Enzyme - inhibitor*	Furosemide + Digoxin + Spironolactone + Lisinopril	3	5%

Loop diuretics + Potassium Sparing Diuretics + Angiotensin Receptor Blockers + Angiotensin Converting Enzyme - inhibitor	Furosemide + Spironolactone + Candesartan + Bisoprolol	1	2%
5 Combinations			
Loop diuretics + Potassium Sparing Diuretics + Digoxin + Angiotensin Converting Enzyme - inhibitor	Furosemide + Spironolactone + Captopril + Digoxin + Candesartan	1	2%
Total		**60**	**100%**

The pattern of drug use for heart failure can be seen in table 2. It was found that the most frequently used drugs were the loop diuretic group (Furosemide) in 56 patients (39%) and in the potassium-sparing diuretic group (Spironolactone) in 28 patients (19%). This is in accordance with the management of PERKI (2020) that the diuretic drug class, which is effective for treating patient fluid retention, is the first drug given to patients with heart failure. diuretics, especially furosemide and other loop diuretics. Furosemide is usually used with potassium-sparing diuretics and potassium supplements to reduce the risk of this side effect. It is possible to mix the potassium-sparing drug furosemide and spironolactone. Spironolactone increases Na+ excretion (Cl_2 and H_2O_2) and decreases K+ secretion which is electrically increased by inhibiting aldosterone binding to cytoplasmic receptors. This prevents hypokalemia by preventing potassium from being burned (Wulandari et al., 2015).

3) Evaluation of Heart Failure Drugs

Table 3 Drug Accuracy

Drug Accuracy	Percentage
Appropriate	93%
Not exactly	7%
Total	**100%**

Table 3 showed that the correct medication was found in 56 patients (93%) and found incorrect medication in 4 people (7%). In a situation where candesartan was administered inappropriately to a heart failure patient with an ejection fraction of 45%, the drug was discovered. Candesartan is not recommended for patients with an ejection fraction of 45% because according to the 2020 PERKI literature, administration of ARBs such as candesartan is indicated for heart failure patients with an ejection fraction of 40% where if given this ARB it can cause worsening kidney function, hyperkalemia and symptomatic hypotension. Apart from that, in the example of administering digoxin to a patient with an ejection fraction of 45%, drug inaccuracies were also found. According to PERKI 2020 literature, administration of digoxin is only recommended for heart failure patients with an ejection

fraction of 40%, so patients with an ejection fraction of 45% are not eligible to receive digoxin because there is a high possibility of digoxin poisoning such as nausea, vomiting, anorexia and also impaired vision (PERKI, 2020).

Table. 4 Dosage accuracy

Dosage accuracy	Percentage
Appropriate	88%
Not exactly	12%
Total	**100%**

Table 4 shows that 53 patients (88%) received the correct dose, whereas 7 patients (12%) received the wrong dose. Dosage inaccuracies were found in cases of 0.25 mg digoxin administration 2 times a day, in addition there were cases of 0.25 mg digoxin administration 1 time 1/2 tablet a day while in the PERKI 2020 literature digoxin 0.25 mg was given 1 time a day , there were also cases of inaccuracy in the dosage of furosemide 20 mg by giving 1 time a day while in the literature the Hospital Formulary furosemide was given 3 times a day. If the drug is given less frequently or the dose is incorrect, therapy will not be effective. Conversely, poisoning can occur at larger doses or frequencies (N.Taroreh et al, 2017).

CONCLUSION

Based on research conducted on 60 heart failure patients at the Medika Citra Hospital Samarinda inpatient installation, it can be concluded that the heart failure medication used is accurate, and the results of therapy accuracy include 93% correct medication and 88% correct dose. The types of heart failure drugs used are Furosemide 39%, Spironolactone 19%, Digoxin 18%, Candesartan 15%, Captopril 4%, Bisoprolol 3%, and Lisinopril 2%.

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CONFLICT OF INTEREST

Authors declare no conflict of interest

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