Jurnal Pharmascience, Vol. 11, No.2, October 2024, page: 215-226
ISSN-Print. 2355 – 5386
ISSN-Online. 2460-9560
http://dx.doi.org/10.20527/jps.v11i2.17182
Research Article

Comparative Effectiveness of Antihypertensive Drugs

Hendra Herman[1,2], Andi Maulana Kamri[1]*, Andi Muhriani Dahlan[3]

[1]Faculty of Pharmacy, Universitas Muslim Indonesia, Makassar, Indonesia
[2]Ibnu Sina Hospital, Makassar, Indonesia
[3]Post-Graduate Student, Faculty of Pharmacy, Universitas Muslim Indonesia, Makassar, Indonesia
Email: maulana.lolo@umi.ac.id

ABSTRAK

Hipertensi sering menjadi penyakit pada orang tua dan kadang-kadang tidak mendapat perhatian karena tingkat pemahaman tentang penyakit dan pengobatan tidak tepat. Tujuan dari studi ini adalah untuk memberikan gambaran tentang pengobatan hipertensi pada pasien rawat inap dan rawat jalan. Metode penelitian ini menggunakan metode deskripsi observasi dengan data retrospektif dengan pengambilan sampel yang berasal dari rekam medik dan resep pada periode Juni-Oktober 2022 yang diberikan untuk penderita hipertensi dengan melihat perbedaan efektivitas berdasarkan kontrol tekanan darah pasien. Populasi penelitian diambil di Pusat Kesehatan Matakali dengan 45 sampel. Hasilnya menunjukkan bahwa paling banyak menggunakan obat hipertensi adalah wanita sebanyak 33 pasien (73,3%), usia 40-59 tahun sebanyak 27 orang (60,0%), dan kelompok obat yang paling banyak digunakan adalah CCB sebanyak 39 (86,7%) jenis obat paling umum adalah amlodipin. Sementara itu, dosis amlodipin yang paling banyak digunakan adalah 5 mg (46,7%) dan kaptopril 25 mg (11,1%). Faktor risiko untuk hipertensi pasien lebih rumit, tetapi beberapa pasien tidak tahu tentang terapi target dan obat yang tepat untuk mereka. Kesimpulan dari penelitian ini adalah tidak ada perbedaan dalam efektivitas dalam menurunkan tekanan darah dari penggunaan amlodipin dan kaptopril.

Kata Kunci: Tekanan darah, Efek obat, Hipertensi, Lansia, Amlodipin

ABSTRACT

Hypertension is often a disease in the elderly and is sometimes ignored due to a lack of understanding of the disease and inappropriate treatment. The aim of this study is to provide an overview of the treatment of hypertension in hospitalized and street nursing patients. The research method uses the observational description method with retrospective data and sampling from medical records and prescription from June to October 2022 given to hypertensive patients by looking at the difference in effectiveness based on the control of the patient's blood pressure. The research population was taken

at the Matakali Health Center with 45 samples. The results showed that the most frequently used hypertensive drugs were women in 33 patients (73.3%), between the ages of 40-59 years as much as 27 patients (60.0%), and the most commonly used drug group was CCBs as much as 39 patients (86.7%). The most common drug type was amlodipine. The risk factors for hypertension patients are more complicated, but some patients do not know about target therapy and the right medication for them. There is no difference in effectiveness in lowering blood pressure between the use of amlodipine and captopril.

Keywords: Blood pressure, Drug of effect, Hypertension, Geriatric, Amlodipine

I. INTRODUCTION

Hypertension is a chronic disease with characteristics of blood pressure characteristics that tend to rise and fall, so long treatment is needed even for life (Pratiwi, 2017). Blood symptoms due to hypertension, such as dizziness, visual disturbances, and headaches, often occur when hypertension is advanced when the pressure has reached a certain significant level (Jiménez-Rodríguez *et al*., 2019).

Non-communicable disease are the primary cause of high rates of death, morbidity, and disability, according to data from the World Health Organization. They are thought to be responsible for 43% of the total and 60% of deaths. The four main noncommunicable diseases that stand out are hypertension, cancer, chronic obstructive pulmonary disease (COPD), and diabetes. At this time hypertension is a health problem that requires good management because of its high morbidity and mortality (Meredith *et al*, 2020). Based on data from the Indonesian Ministry of Health in 2021, the prevalence of hypertension in Indonesia reaches 31.7% and the population is 18 years and over. About 60% of people with hypertension end up in a stroke. While the rest resulted in heart disease, kidney failure, and blindness (Newby et al, 2022). Hypertension is a degenerative disease that has become a serious problem. Hypertension is categorized as the silent disease or the silent killer because the patient does not know he has hypertension or does not know before checking his blood pressure. The incidence of hypertension increases with age. Death due to hypertension occupies the top rank compared to other causes (Rahmadeni, 2019).

The use of antihypertensive drugs is one way to treat and overcome the disease. The choice of antihypertensive is determined by the clinical condition of the patient, the degree of hypertension and the nature of the antihypertensive drug. Factors that need to be considered in the administration of antihypertensive drugs from a clinical perspective are the severity of the disease, the patient's age, the degree

of hypertension, kidney failure, impaired liver function, comorbidities, and rational use of drugs (Indonesian Ministry of Health, 2015). The irrational use of drugs is a global problem that can result in low levels of public health. Various studies conducted in both developed and developing countries over the last few years on the safe and effective use of drugs show that irrational drug use is a global phenomenon and few prescriptions are written rationally. In short, rational drug administration is very important to increase the success of therapy (Anggraini *et al.*, 2019). Puskesmas is one of the health facilities that provides health services to the community, has the authority and responsibility for maintaining public health, and playing an important role in improving the health status of the community. Therefore, the selection of the Matakali Health Center as a place of research because it is related to hypertension as a whole is the 4th major disease in the Matakali Care Health Center. The use of appropriate drugs in undergoing treatment of hypertension therapy is expected so that the desired therapeutic effect can be achieved, the use of drugs that are not in accordance with the clinical condition of the patient in addition to not reducing complaints of pain suffered also causes spending funds in vain, considering the treatment of hypertension also takes a long time (Kemenkes, 2018; WHO, 2019; Salama and Ilyas, 2018). Based on this background, researchers are interested in studying the description of the use of antihypertensive drugs in patients with hypertension at the Matakali Health Center.

II. METHOD

A. Research Design

This research is observational with study design cross sectional methods in the form of data or document studies in order to find out the description of the use of antihypertensive drugs used. This study uses the type of secondary data, which means secondary data, namely data that does not directly provide data to researchers, but can be obtained through other people or searching through documents (Burnier and Damianaki, 2023). The type of data obtained is secondary data in the form of prescription documents. patients diagnosed with hypertension in outpatients at the Matakali Health Center. This research have been register in etchical committee UMI with number UMI012203153.

B. Research Sample

Data collection was carried out retrospectively for all existing prescriptions for the period June-October 2022 and then selected based on those who met the inclusion and exclusion criteria. The

inclusion criteria were patients diagnosed with hypertension, patients diagnosed with hypertension for at least 3 months, and patients without comorbidities. The exclusion criteria were patients with not complete medical record and patients with preeclamsia. The study population was all patients with a diagnosis of hypertension who underwent outpatient treatment, the sample size in this study was 45 respondents (Kamri *et al.*, 2021).

C. Data Analyzed

The procedure of searching for data began with observation, which involved determining the number of outpatients and the availability of antihypertensive medications at the Matakali Health Centre. Following sample, the hypertensive patients were categorised according to their age, gender, blood pressure, and other vital indicators from medical record. The blood pressure data was collected after the patient was officially admitted to the hospital and after he had undergone antihypertensive therapy. The medication name, dosage, and frequency of usage are also included in the therapy profile. The independent t-test, one of the statistical tests used in this investigation, was used to analyse the data analytically. Effective analytical framework will underpin the management of blood pressure after using treatment and profile drugs in this study. The research utilised a t-test to examine the direct impact of multiple independent variables, including medication kinds, doses, and frequency, on the choice of effective hypertension treatment.

III. RESULT AND DISCUSSION

The research results obtained through prescription documents, there were 142 prescriptions for patients diagnosed with hypertension, but 45 prescriptions met the inclusion criteria. In this study, the most widely used antihypertensive drugs were the calcium channel blocker group, namely amlodipine and the angiotensin converting enzyme inhibitor group, namely captopril. This study was conducted to see an overview of drug use in outpatient hypertension patients at the Matakali Health Center for the period June-October 2022. Sampling was carried out randomly according to the criteria that met the inclusion and exclusion criteria, which based on the inclusion criteria there were 45 hypertensive patients who were considered to be representative of the existing population based on the sample formula based on the incidence of hypertensive patients in Matakali Hospital and cross sectional design. Based on the characteristics of gender, it shows that female patients have more hypertension patients who suffer from hypertension the most with female sex as many as 33 patients

with a percentage of 73.3% and male as many as 12 patients with a percentage of 26.7%.

Table I. Patient characterized use of antihypertensive drugs

Var	Type	Patients (n=45)	
		Quantity	**Percentage (%)**
Sex	Woman	33	73.3
	Man	12	26.7
Age	20-60	30	66.7
	>60	15	33.3

Note: Var = variable. Source: Prescription data June-November 2022 Matakali Health Center

Based on the group of patients with hypertension, it can be seen in Table I. The results obtained showed that from the total number of patients, 45 sample were the most suffering from hypertension by gender. 33 female patients with a percentage of 73.3% and male as many as 12 patients with a percentage of 26.7%, where the results of the Table I show that female patients with an average age ranging from 20 to 60 years old the most from hypertension. This is because women's estrogen hormones are disrupted, particularly during menopause. Hypertension is higher in women as a result of hormonal changes after marriage which occurs after pregnancy and menopause. The use of hormonal contraceptives also affects women's hypertension, especially contraceptives in the form of pills. The high dose of estrogen in contraceptive pills allows estrogen to affect electrolyte metabolism which can increase peripheral pressure so that blood pressure can increase (Magvanjav *et al*, 2020). Decreased elasticity of arteries occurs in both men and women (Halim *et al*., 2015). In the results of the study shown in Table I use of antihypertensive drugs based on age most from hypertension, namely patients aged 40-59 years as many as 27 patients (60%), age >60 years as many as 15 patients (33.3%), and 20-39 years obtained 3 patients (6.7%). The productive age has caused changes in diet and lifestyle. Age is one of the risk factors that cannot be controlled. %), age 40-59 years obtained as many as 27 patients (60%), and age > 60 years as many as 15 patients. With age, blood pressure increases and hypertension often occurs in the elderly. Age has a risk factor for hypertension. The high rate of hypertension, in line with increasing age, is caused by changes in the structure of large blood vessels, so that the lumen becomes narrow and the walls of the blood vessels become stiff, resulting in an increase in blood pressure (Mahamudu *et al.*, 2017).

It was found that outpatients at the Matakali Health Center received treatment or single type of therapy (prescribed only one drug) and type of combination therapy (prescribed more than one drug), based on the type of hypertension therapy showed that from 45 patients who used the type of therapy with single drugs more compared to

the combination therapy, namely amlodipine in 39 patients (86%), captopril in 5 patients (11.1%), and the combination of amlodipine and captopril in 1 patient (2.2%).

From the results of the study shown in Table III, it shows that the use of antihypertensive drugs based on the dose of the most frequently used drug is amlodipine 5 mg as many as 21 prescriptions (46.7%), then amlodipine 10 mg as many as 19 prescriptions (42.2%) and captopril 25 mg as many as 5 prescription (11,1%), where from the number of patients 45, amlodipine 5mg was the most prescribed by doctors. Table II presents the study's findings, which indicate that patients who were prescribed amlodipine for an average of 41 days experienced a decrease in blood pressure. Although the duration of drug use varied among patients, the above Table II indicates that the patient's mean systolic blood pressure decreased based on post-therapy blood pressure measurements. We can see p-value 0.053 showed no different effectiveness for using monotherapy or combination antihypertensive. As for some patients who do not experience a decrease in blood pressure after the examination, it is estimated that the lifestyle factors of hypertension sufferers are less noticed. Meanwhile, the use of captopril at the Matakali Health Center was not prescribed by doctors because most patients complained of side effects such as dizziness after taking captopril.

Table II. Use of antihypertensive drugs by type of therapy with blood pressure with t-test analytical statistic

Therapy	Dose (mg)	P-value	Patients (n=45)	
			Quantity	Percentage (%)
Monotherapy	Amlodipine	0.053	39	86.7
	Captopril		5	11.1
Combination	Captopril and Amlodipine		1	2.2
Total			45	100

Source: Prescription data June-November 2022 Matakali Health Center

Table III. Use of antihypertensive drugs by dose

Drug Type	Dose (mg)	Patients (n=45)	
		Quantity	Percentage (%)
Amlodipine	5	21	46.7
	10	19	42.2
Captopril	25	5	11.1
Total		45	100

Source: Prescription data June-November 2022 Matakali Health Center

Table IV. Independent t-test of amlodipine drug dose with Blood Pressure

Drug Type	Dose (mg)	Result	
		n (%)	p-value
Amlodipine	5	7 (58.3)	0.101
		5 (41.7)	
	10		
Total		12 (100)	

Source: Prescription data June-November 2022 Matakali Health Center

Based on Table IV, there were 12 patients whose hypertension therapy could be controlled with the percentage of patients taking amlodipine 5 mg that was 58% and amlodipine 10 mg 41.7% with normal systolic blood pressure around 90 to 120 mmHg. The results of the independent t-test test for amlodipine drug dose obtained a p value of 0.101, which means that the p value is more than 0.05, it can be concluded that the administration of amlodipine 5 mg and amlodipine 10 mg is as effective in reducing blood pressure, in other words there is no significant difference to lowering blood pressure. The results of this study are also comparable with research. which said that the effectiveness of lowering blood pressure from the combination of 2 This agent has a complementary mechanism of action equivalent to amlodipine 10 mg and amlodipine 5 mg, with some evidence of better tolerability.

Based on the results of research and existing theories, the researcher argues that there is a relationship between age and hypertension. This is because most of the respondents are old and have hypertension since the age of 30 years and above because usually the function of human organs if they are older, their function will be weak and susceptible to disease. While very few young respondents have hypertension, young people can also suffer from hypertension due to poor diet, such as frequent consumption of foods high in fat, genetic factors, obesity, stress and a lifestyle that is not good for health such as Infrequent exercise can also be a cause of hypertension at a young age.

Antihypertensive drugs does not only consist of a single antihypertensive but also consists of a combination of two antihypertensives, based on the type of hypertension therapy, it shows that from 45 patients who used this type of therapy with a single drug more than the combination therapy, namely amlodipine as many as 39 patients (86%), captopril was 5 patients (11.1%) and the combination of amlodipine + captopril was 1 patient (2.2%), this is comparable to research Adikusuma *et al.* (2015) which found that most respondents received antihypertensive drug single.

Based on the JNC 7 guidelines, the use of a single antihypertensive drug is generally given to patients with grade 1 hypertension, where the TDS ranges from 140-159 mmHg and the TDD ranges from 90-99. On the other hand, the use of combination antihypertensives is generally given to patients with grade 2 hypertension who have a blood pressure of 160 mmHg and a blood pressure of 100 mmHg. The results of the study show that the average patient has a TDS of 162 mmHg before using antihypertensive drugs and a TDS after using hypertension drugs, which is 140 mmHg which is the results of this study are not comparable with the statement according to JNC. The use of therapy using a combination of 2 antihypertensive drugs is recommended for patients who have very high blood pressure. it values that are far from the target values, when the blood pressure is more than 20/10 mmHg above the target blood pressure, treatment with two classes of drugs should be considered (Untari *et al.*, 2018).

Antihypertensive drugs based on the dose of the most frequently used drug was amlodipine mg with 21 prescriptions (46.7%), then amlodipine 10 mg with 19 prescriptions (42.2%) and captopril 25 mg with 5 prescriptions (11.1%).). Treatment of hypertension should be tailored to the patient's condition. Now there are antihypertensive drugs that are the best and there are also antihypertensive drugs that are not good. What is available is the most suitable antihypertensive drug, the results of this study are comparable to research conducted (Lisni *et al.*, 2020) Treatment of hypertension begins with the lowest dose for each type of hypertension and is increased if the therapeutic effect is still lacking and if blood pressure is still not achieved combination therapy can be given. From the results of prescribing research The most common is the CCB group, namely amlodipine. This single prescription was recommended by JNC 8 which recommends CCBs for hypertension therapy (Lisni *et al*., 2020).

The use of antihypertensive drugs used, that amlodipine can lower blood pressure which can be seen from the difference in patient blood pressure, this is in line with research before. Hypertension drugs consist of several types, including amlodipine which is a calcium channel blocker (CCB) group. The effect of amlodipine is as a peripheral arterial vasodilator which causes a decrease in vascular resistance which in turn lowers blood pressure (Septina *et al.*, 2014). The use of captopril drugs is not found more complete data because the data in the patient's medical record and patient prescriptions are not included, according to the results of the researcher's direct interview with one of the doctors at the

Puskesmas that the use of captopril is rarely given to patients because of side effects that arise in patients such as dizziness that is felt then medication captopril is an ACE inhibitor that has a captopril mechanism of action works by inhibiting the action of ACE, thereby converting angiotensin I to angiotensin II in the blood, blood vessels, kidneys, heart, adrenal glands and brain become blocked. This inhibition causes vasodilation and decreased aldosterone secretion, resulting in sodium and potassium being secreted by the kidneys (Mayasari, 2020). The mechanism of dizziness is not clearly known, but captopril is actually used as a prophylactic for dizziness through inhibition of the renin-angiotensin system, alteration of sympathetic nervous activity, increased prostacyclin synthesis, inhibition of the degradation of bradykinin, enkephalin and P.18. The theory is different from the results of this study in which up to half of the total respondents in the study experienced dizziness, possibly because the respondent in this study could not distinguish dizziness due to side effects captopril or dizziness due to the symptoms of hypertension itself. Another possibility is that the respondent experiences dizziness due to hypotension due to: use of captopril (Diatmika *et al.*, 2018) Based on research results, that the most commonly prescribed antihypertensive drugs at the eye care clinic, namely amlodipine compared to captopril although the side effects of captopril are more often complained of in patients with who suffer from hypertension at the Matakali Health Center.

Based on the consumption of drugs in the independent t-test noted that the calcium channel blocker class of drugs, namely amlodipine 5 mg and 10 mg, became the main drug of choice in the treatment of hypertension, which has the mechanism of action of amlodipine as an antihypertensive by blocking calcium channels, causing smooth muscle relaxation. which can cause a decrease in blood pressure (Nugrahaeni and Hidayat, 2021). In the independent test results table (Table IV), it was found that the use of amlodipine drug doses did not have a significant difference, the results of this study were comparable to research (Kamri *et al*., 2021). Effects of using a combination of amlodipine 5 mg and valsartan 80 mg or antihypertensive drugs amlodipine 10 mg and valsartan 80 mg showed that there was no significant difference in lowering blood pressure Ischemic Stroke patients (Nadjamuddin *et al.,* 2021; Kamri *et al*., 2021).

IV. CONCLUSION

Based on the results of the research it can be concluded that the female gender and the age of the patient are 40- 59 years

of age suffer from hypertension. There is no difference in effectiveness to lowering blood pressure from the use of amlodipine and captopril. Beside that, amlodipine 5 mg and 10 mg not showed different for reduce blood pressure.

CONFLICT OF INTEREST

Author declared no conflict of interest in this research.

ACKNOWLEDGEMENT

Thank you for district Polewali Mandar and support from Universitas Muslim Indonesia.

REFERENCES

Adikusuma, W., Qiyaam, N., & Yuliana, F. (2015). Kepatuhan Penggunaan Obat Antihipertensi di Puskesmas Pagesangan Mataram. *Jurnal Pharmascience*, *2*(2), 56-62. http://dx.doi.org/10.20527/jps.v2i2.5823

Anggraini, T. D., Kusuma, E. W., & Diandari, D. (2017). Pengaruh Rasionalitas Penggunaan Antihipertensi dengan Standart Guideline JNC 8 Terhadap Keberhasilan Terapi Hipertensi di RS Panti Waluyo Surakarta. *Jurnal Farmasi (Journal of Pharmacy)*, *6*(1), 6-9. https://doi.org/10.37013/jf.v6i1.39

Burnier, M., & Damianaki, A. (2023). Hypertension as Cardiovascular Risk Factor in Chronic Kidney Disease. *Circulation research*, *132*(8), 1050–1063. https://doi.org/10.1161/CIRCRESAHA.122.321762.

Diatmika, I., Artini, G., & Ernawati, D. (2018). Profil efek samping kaptopril pada pasien hipertensi di Puskesmas Denpasar Timur I periode Oktober 2017. *E-Jurnal Medika Udayana*, *7*(5), 221-225. http://ojs.unud.ac.id/index.php/eum

Halim, MC, Andrajati, R. and Supardi, S. (2015) Risks of ACEi use on the incidence of dry cough in hypertension patients at Cengkareng Hospital and Tarakan Hospital DKI Jakarta", Indonesian Pharmaceutical Journal, 5(2), pp. 113–122. http://doi.org/10.22435/jki.v5i2.4406.113-122.

Indonesian Ministry of Health (2015) Technical Guidebook for the Discovery and Management of Hypertension, Physical Review D.

Jiménez-Rodríguez, D., Conesa-Garcerán, M., & Belmonte-García, T. (2019). Evaluation of the effect of relaxation therapy in patients with arterial hypertension. Evaluación del efecto de la terapia de relajación en pacientes con hipertensión arterial. *Enfermeria clinica (English Edition)*, *29*(3), 178–185. https://doi.org/10.1016/j.enfcli.2018.07.005

Kamri, A.M., Kosman, R., Dahlan, A.M., (2021), Analisis Efektivitas Biaya Penggunaan Amlodipin Dibandingkan Kaptopril Pada Pasien Hipertensi Di Rsud Majene. 2021;6(2):262–71. https://doi.org/10.36387/jiis.v6i2.718

Kementerian Kesehatan Republik Indonesia. (2018). *Profil kesehatan Indonesia tahun 2018*. Jakarta: Kementerian Kesehatan Republik Indonesia.

Lisni, I., Nurisma Oktavia, Y. and Iskandar, D. (2020) „Kajian Kerasionalan Peresepan Obat Antihipertensi Di Salah Satu Puskesmas, Kota Bandung", *Jurnal Ilmiah Farmako Bahari*, 11(1), p. 1. doi:

10.52434/jfb.v11i1.695. http://dx.doi.org/10.52434/jfb.v11i1.695

Magvanjav, O., Cooper-Dehoff, R. M., McDonough, C. W., Gong, Y., Hogan, W. R., & Johnson, J. A. (2020). Combination Antihypertensive Therapy Prescribing and Blood Pressure Control in a Real-World Setting. *American journal of hypertension*, *33*(4), 316–324. https://doi.org/10.1093/ajh/hpz196

Mahamudu, YS, Citraningtyas, G. and Rotinsulu, H. (2017) Primary Hypertension Patients In the Outpatient Installation of Luwuk Hospital for the Period January – March 2016", Primary Hypertension Patients in the Outpatient Installation of Luwuk Hospital for the Period January – March 2016, 6(3), pp. 1–9.35. https://doi.org/10.35799/pha.6.2017.16418

Mayasari, S. (2020) Analysis Of The Used Of Captopril Drug With Blood Pressure Of Hypertension Patients", Journal of Health dr. Soebandi, 8(2), pp. 123–127. https://doi.org/10.36858/jkds.v8i2.225

Meredith, A. H., Schmelz, A. N., Dawkins, E., & Carter, A. (2020). Group education program for hypertension control. *Journal of clinical hypertension (Greenwich, Conn.)*, *22*(11), 2146–2151. https://doi.org/10.1111/jch.14022

Nadjamuddin, M., Manggau, MA and Kaelan, C. (2021) Effect of using Combination of Amlodipine and Valsartan Antihypertensives in Ischemic Stroke Patients at RSUP Dr. Wahidin Sudirohusodo Makassar, Journal of Science and Health, 3(3), pp. 437–442. https://doi.org/10.25026/jsk.v3i3.358.

Newby, D., Winchester, L., Sproviero, W., Fernandes, M., Ghose, U., Lyall, D., Launer, L. J., & Nevado-Holgado, A. J. (2022). The relationship between isolated hypertension with brain volumes in UK Biobank. *Brain and behavior*, *12*(5), e2525. https://doi.org/10.1002/brb3.2525.

Nugrahaeni, T. Putri and Hidayat, L. (2021) Risk of Side Effects of Edema on the Use of Amlodipine (CCBs) as Antihypertensives: Literature Review | Journal of Education Tambusai", Stikes Muhamadiyah Wonosobo, 5, p. 11348. https://jptam.org/index.php/jptam/article/view/3080.

Pratiwi, D. (2017) Overview of Hypertension Patient Knowledge of Hypertension Disease and Antihypertensive Drugs of Ace-Inhibitor and Diuretic Group", JOPS (Journal Of Pharmacy and Science), 1(1), pp. 40–48. https://doi.org/10.36341/jops.v1i1.375.36.

Rahmadeni, AS, . LF and . NH (2019) Relationship of Stress with Hypertension Incidence in the Work Area of Sei Pancur Health Center Batam City in 2018", Mandiri Sehat Journal, 14(1), pp. 1–8. https://doi.org/10.33761/jsm.v14i1.78.

Salama, N., & Ilyas, Y. (2018). Efektivitas Puskesmas Duren Sawit Sebagai Gatekeeper Dalam Penanganan Pasien Hipertensi Peserta Jaminan Kesehatan Nasuinal Tahun 2016. *Jurnal Kebijakan Kesehatan Indonesia*, *07*(03), 121–125. https://doi.org/10.22146/jkki.18051

Septina, F., Sitam, S. and Epsilawati, L. (2014) Analysis Of Antegonion Index And Mental Index On Hypertension Subject Using Amlodipine Using Panoramic Radiograph Evaluation, Paper Knowledge. Toward a Media History of Documents, 4(1), pp. 284–292. http://dx.doi.org/10.21776/ub.eprodenta.2020.004.01.4

Untari, EK et al. (2018) Evaluation of the Rationality of Antihypertensive Drug Use at the Siantan Hilir Health Center, Pontianak City in 2015", Pharmaceutical Sciences and Research, 5(1), pp. 32–39. https://doi.org/10.7454/psr.v5i1.3870.

World Health Organization. (2019). *Hypertension care in primary health settings: Lessons from Indonesia*. Geneva: World Health Organization.