

Panduan Praktikum

Blok 14 Kardiovaskular

Edisi Kedua

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DEPARTEMEN FARMAKOLOGI DAN TERAPI
FAKULTAS KEDOKTERAN - UNIVERSITAS KRISTEN INDONESIA

TIM FARMAKOLOGI :

DR. Med. Abraham Simatupang, dr., M.Kes

DR. Mulyadi DS, dr.,M.Kes

Linggom Kurniaty,dr.,Sp.FK

Tjio Ie Wei dr.,Sp.FK

Hertina Silaban dr., M.Si

Romauli Lumban Tobing S.Si.,M.Farm.,Apt

Fransiska Sitompul, M.Farm., Apt

TIM PENYUSUN :

DR. Med. Abraham Simatupang, dr., M.Kes

Fransiska Sitompul, M.Farm., Apt

Linggom Kurniaty,dr.,Sp.FK

Hertina Silaban dr., M.Si

KATA PENGANTAR

Puji syukur penulis panjatkan kepada Tuhan Yang Maha Esa yang telah memberikan kelimpahan kepada kita sehingga kami dapat menyusun Modul Panduan Praktikum Blok 14 Farmakologi dan Terapi terkait Kardiovaskular untuk mahasiswa kedokteran tahun ajaran 2023/ 2024.

Modul Panduan Praktikum ini berisi tentang Golongan Obat Antihipertensi dan contohnya, tiga Panduan/ Pedoman dalam terapi hipertensi, panduan algoritma JNC 8 dalam terapi hipertensi, golongan Obat Antihipertensi sebagai tujuan pemberian monoterapi dan obat pilihan monoterapi, golongan Obat Antihipertensi sebagai tujuan pemberian kombinasi terapi antihipertensi dan obat pilihan kombinasi terapi yang tepat.

Adapun tujuan pembuatan buku ini adalah membantu mahasiswa kedokteran dalam mengerjakan setiap topik bahasan yang akan dikerjakan sesuai dengan prosedur yang baik dan benar.

Besar harapan kami, semoga buku ini dapat memberikan manfaat bagi mahasiswa kedokteran. Buku ini dinilai belum sempurna sehingga kami mengharapkan kritik dan saran yang membangun untuk perbaikan buku ini di periode selanjutnya.

Terima kasih.

Jakarta, 13 Oktober 2023

Tim Penulis

PRAKTIKUM I

ANTI HIPERTENSI

I. Tujuan

Setelah pelaksanaan praktikum mahasiswa harus dapat menjelaskan pengobatan Antihipertensi berdasarkan sasaran pengobatan.

II. Capaian Pembelajaran

Setelah pelaksanaan praktikum mahasiswa harus dapat menjelaskan :

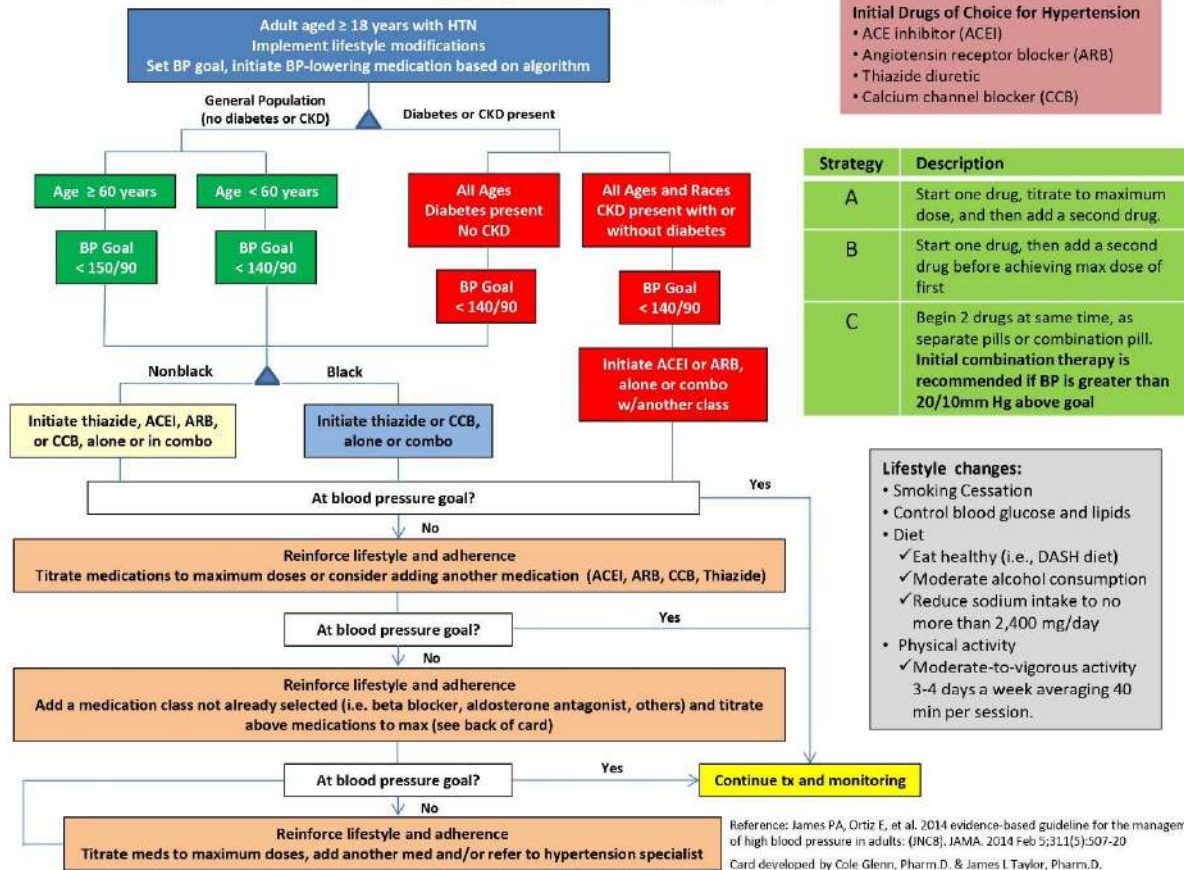
1. Golongan Obat Antihipertensi dan contohnya
2. Tiga Panduan/ Pedoman dalam terapi hipertensi
3. Panduan Algoritma JNC 8 dalam terapi hipertensi
4. Golongan Obat Antihipertensi sebagai tujuan pemberian monoterapi dan obat pilihan monoterapi
5. Golongan Obat Antihipertensi sebagai tujuan pemberian kombinasi terapi antihipertensi dan obat pilihan kombinasi terapi yang tepat

III. Topik

Telaah Jurnal dan Melihat Youtube :

1. [Pharmacology - HYPERTENSION & ANTIHYPERTENSIVES \(MADE EASY\) - YouTube](#)
2. Panduan Algoritma JNC 8 dalam terapi hipertensi
3. Jurnal 1 : Evaluation of Antihypertension Drug Prescription Pattern, Rationality, and Adherence to Joint National Committee-8 Hypertension Treatment Guidelines among Patient Attending Medicine OPD in a Tertiary Care Hospital
4. Jurnal 2 : Pola Penggunaan Obat Antihipertensi Pada Pasien Hipertensi di Instalasi Rawat Jalan Rumah Sakit
5. Jurnal 3 : Comparison of antihypertensive drug utilization in community health centre and type B teaching hospital
6. Jurnal 4 : Knowledge of hypertension and its therapy in laypeople ([Knowledge of hypertension and its therapy in lay people | Indonesian Journal of Pharmacology and Therapy \(ugm.ac.id\)](#))

JNC 8 Hypertension Guideline Algorithm



Compelling Indications	
Indication	Treatment Choice
Heart Failure	ACEI/ARB + BB + diuretic + spironolactone
Post-MI/Clinical CAD	ACEI/ARB AND BB
CAD	ACEI, BB, diuretic, CCB
Diabetes	ACEI/ARB, CCB, diuretic
CKD	ACEI/ARB
Recurrent stroke prevention	ACEI, diuretic
Pregnancy	labetolol (first line), nifedipine, methyldopa

Hypertension Treatment

Beta-1 Selective Beta-blockers – possibly safer in patients with COPD, asthma, diabetes, and peripheral vascular disease:

- metoprolol
- bisoprolol
- betaxolol
- acebutolol

Drug Class	Agents of Choice	Comments
Diuretics	HCTZ 12.5-50mg, chlorthalidone 12.5-25mg, indapamide 1.25-2.5mg triamterene 100mg K ⁺ sparing – spironolactone 25-50mg, amiloride 5-10mg, triamterene 100mg furosemide 20-80mg twice daily, torsemide 10-40mg	Monitor for hypokalemia Most SE are metabolic in nature Most effective when combined w/ ACEI Stronger clinical evidence w/chlorthalidone Spironolactone – gynecomastia and hyperkalemia Loop diuretics may be needed when GFR <40mL/min
ACEI/ARB	ACEI: lisinopril, benazepril, fosinopril and quinapril 10-40mg, ramipril 5-10mg, trandolapril 2-8mg ARB: candesartan 8-32mg, valsartan 80-320mg, losartan 50-100mg, olmesartan 20-40mg, telmisartan 20-80mg	SE: Cough (ACEI only), angioedema (more with ACEI), hyperkalemia Losartan lowers uric acid levels; candesartan may prevent migraine headaches
Beta-Blockers	metoprolol succinate 50-100mg and tartrate 50-100mg twice daily, nebivolol 5-10mg, propranolol 40-120mg twice daily, carvedilol 6.25-25mg twice daily, bisoprolol 5-10mg, labetalol 100-300mg twice daily,	Not first line agents – reserve for post-MI/CHF Cause fatigue and decreased heart rate Adversely affect glucose; mask hypoglycemic awareness
Calcium channel blockers	Dihydropyridines: amlodipine 5-10mg, nifedipine ER 30-90mg, Non-dihydropyridines: diltiazem ER 180-360 mg, verapamil 80-120mg 3 times daily or ER 240-480mg	Cause edema; dihydropyridines may be safely combined w/ B-blocker Non-dihydropyridines reduce heart rate and proteinuria
Vasodilators	hydralazine 25-100mg twice daily, minoxidil 5-10mg terazosin 1-5mg, doxazosin 1-4mg given at bedtime	Hydralazine and minoxidil may cause reflex tachycardia and fluid retention – usually require diuretic + B-blocker Alpha-blockers may cause orthostatic hypotension
Centrally-acting Agents	clonidine 0.1-0.2mg twice daily, methyldopa 250-500mg twice daily guanfacine 1-3mg	Clonidine available in weekly patch formulation for resistant hypertension

Evaluation of Antihypertensive Drug Prescription Patterns, Rationality, and Adherence to Joint National Committee-8 Hypertension Treatment Guidelines among Patients Attending Medicine OPD in a Tertiary Care Hospital

Chandra Narayan Gupta¹, Akul SK², Sugata Mahapatra³, Apala Lahiri⁴, Kausik Maji⁵, Sukanta Sen⁶

ABSTRACT

Introduction: The increasing prevalence of hypertension is attributed to population growth, ageing and behavioural risk factors, such as unhealthy diet, harmful use of alcohol, lack of physical activity, excess weight and exposure to persistent stress. The present study was conducted to study on various facets of antihypertensive drugs prescribing at present scenario at Dr B. C. Roy Hospital, Haldia, and with objectives of studying prescribing patterns and rationality of antihypertensive drugs in essential hypertension with or without specific co-morbid conditions and to check compliance of treatment as per JNC-8 hypertension treatment guidelines in the outpatients attending the Department of Medicine.

Material and Methods: Data regarding anti-HTN monotherapy and combination therapy was recorded. Evaluation for rational drug therapy by evaluating average number of drugs per prescription, fixed dose combination (FDC) prescription rate, prescription laying down importance of lifestyle management, prescription with defined anti-HTN goals, prescriptions with correct dose strength and dosage schedule was evaluated.

Results: Out of 100 hypertensive patients under evaluation 67 was males (67%) with a M:F ratio of 2.03:1. Mean SBP was slightly higher in male patients. Hypertension was classified according to JNC-8 guidelines and found 22 (22%) (Pre-hypertension/pre-HTN), 57 (57%) (Stage 1 hypertension), and 13% (stage 2 hypertension) cases. Dyslipidemia was noted much more common associated disorders among newly diagnosed hypertensive of either sex.

Conclusion: Diuretics (8%) were most widely prescribed drugs followed by ARBs (6%), ACE Inhibitors (5%) and calcium channel blockers (4%) as monotherapy. Adherence of JNC 8 guidelines among all study hypertensive participants while prescribing medications varied between 62% to 92%, with an average of 75%. None of the prescriptions mentioned ban drug formulation(s). Still 15% of the prescriptions had suggested combined drugs with debated rationality formulations.

Keywords: Antihypertensive Drug Prescription Patterns, Rationality, Joint National Committee-8, Hypertension Treatment Guidelines, Patients Attending Medicine OPD

population (972 million people) has hypertension, and the prevalence is expected to increase to 29% by 2025.² HTN exerts a substantial public health burden on cardiovascular health status and healthcare systems in India. Blood pressure control is essential to prevent end-organ complications, such as stroke, myocardial infarction, heart failure, or kidney disease.³

Hypertension (HTN) is the most common condition seen in primary health care setting and leads to myocardial infarction, stroke, renal failure, and death if not detected early and treated appropriately. There are significant health and economic gains attached to early detection, adequate treatment and good control of hypertension. High blood pressure (BP) is ranked as the third most important risk factor for attributable burden of disease in south Asia (2010).⁴ In 2008, worldwide, approximately 40% of adults aged 25 and above had been diagnosed with hypertension; the number of people with the condition rose from 600 million in 1980 to 1 billion in 2008.⁵ Study had shown that HTN is directly

¹Associate Professor, Department of General Medicine, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, ²Final MBBS Student, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, ³Intern, Department of General Medicine, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, ⁴House Staff, Department of General Medicine, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, ⁵Professor & HOD, Department of General Medicine, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, ⁶Professor & HOD, Department of Pharmacology, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, India

Corresponding author: Dr. Sukanta Sen, Professor & HOD, Department of Pharmacology, ICARE Institute of Medical Sciences and Research, Banbishnupur, Purba Medinipur, Haldia, West Bengal, India

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INTRODUCTION

Hypertension is defined as a systolic blood pressure (SBP) of 140 mm Hg or more, or a diastolic blood pressure (DBP) of 90 mm Hg or more, or taking antihypertensive medication.¹ Globally, an estimated 26% of the world's

responsible for 57% of all stroke deaths and 24% of all coronary heart disease (CHD) deaths in India.⁶

According to JNC 8 recommendations the general population, initial antihypertensive treatment should include a thiazide diuretic, calcium channel blocker, ACE inhibitor, or ARB in the general non-black population or a thiazide diuretic or calcium channel blocker in the general black population.⁷ The three guidelines that have been instrumental in recent time to have implications in clinical practice in management of hypertension include:

1. ESH guidelines
2. ASH / ISH guidelines
3. JNC VIII Panel Recommendation

Although these guidelines and recommendations have been quite comprehensive there still remain some unanswered questions. The Eighth Joint National Committee (JNC 8) recently released evidence-based recommendations on treatment thresholds, goals, and medications in the management of hypertension in adults.⁷

The Joint National Committee (JNC-8) is considered the "gold standard" consensus guidelines for the management of hypertension. About goals of older individuals, a 2014 report from panel members of the Eighth Joint National Committee (JNC8) suggested that in patients aged ≥ 60 years, blood pressure should be targeted to $<150/90$ mm Hg.⁷ SPRINT trial results may eventually contribute to a revision of JNC8 recommendations, but for now most experts urge a go-slow treatment approach and continued adherence to the 2014 guidelines.⁸

To treat hypertension with or without co-morbid conditions various guidelines have been issued. Report of Eight Joint National Committee (JNC 8)⁷ and guidelines by WHO-International Society of Hypertension (WHO-ISH)⁹ are important ones. These guidelines are important tools to improve the clinical approach of the physician in the daily treatment. They are aimed to provide indications for clinical practice based on rigorous scientific evidence. However, their use in decision making in clinical practice is largely neglected by physicians.^{10,11} Patients want to be assured that HTN treatment will reduce their disease burden, while clinicians want guidance on hypertension management using the best scientific evidences. Keeping in view, the present study will be conducted to study on various facets of antihypertensive drugs prescribing at present scenario at Dr B.C. Roy Hospital, Haldia, a tertiary care teaching hospital and with objectives of studying prescribing patterns and rationality of antihypertensive drugs in essential hypertension with or without specific co-morbid conditions and to check compliance of treatment as per JNC-8 hypertension treatment guidelines in the outpatients attending the Department of Medicine.

MATERIAL AND METHODS

A cross-sectional, observational study was carried out in the Outpatient Department of Medicine, in Dr B C Roy Hospital associated with ICARE Institute of Medical Sciences & Research, Haldia, West Bengal for 3 months.

Permission from the Institutional Ethics Committee was obtained before starting research work. Subjects and their accompanying family members was interviewed by pre-structured questionnaire, and past and present prescriptions and case notes, where available, was reviewed. All decisions relating to management of the patient including drugs and investigations was taken by the treating physician only. Investigator did not interfere in the management of patient and only observed the proceedings.

Antihypertensive drugs were categorized according to the eighth report of the JNC on prevention, detection, evaluation, and treatment of high blood pressure (JNC-8).⁷ Data regarding anti-HTN mono-therapy and combination therapy was recorded. Evaluation for rational drug therapy by evaluating average number of drugs per prescription, fixed dose combination (FDC) prescription rate, prescription laying down importance of lifestyle management, prescription with defined anti-HTN goals, prescriptions with correct dose strength and dosage schedule was evaluated. Number of prescriptions mentioning duration of therapy, over prescribing, banned drug formulation, debated rationality or irrational combinations, generic, and brand names used was also captured. The prescriptions was collected by an me by clicking the picture by mobile outside the medical outpatient department and interviewing the HTN patients without the knowledge of prescriber to avoid any bias after taking verbal consent and after due administrative and Institutional Ethics Committee permission.

Inclusion criteria

1. Subjects who was suffering from essential hypertension and prescribed antihypertensive at Medicine O.P.D.
2. Patients from all age groups and both the sexes will be included
3. Hypertensive patients with co-morbidities like diabetes mellitus, ischemic heart diseases, congestive heart failure and chronic renal diseases will also be included in the study
4. Those who understood the purpose of the study and are ready to provide information regarding their health status and those who signed an informed consent document.

Exclusion criteria

1. Subjects not agreeing to participate
2. Suffering from any serious disease such as hypertensive emergencies, unstable coronary heart disease, acute myocardial infarction, acute left ventricular failure, advanced kidney or liver failure, and cerebral stroke
3. Any condition resulting in severe learning disability (e.g. brain injury) or
4. Those unable to comprehend for other reasons will be excluded from the study.

A total of 100 hypertensive patients was studied because time and facility constraints. The study was commenced after obtaining approval from institutional ethics committee and was continued for a span of 3 months in the Medicine Out-Patient Department (OPD) of Dr. B C Roy Hospital, Haldia, West Bengal. Data was analyzed at the end of study.

All statistical calculations were performed using Statistical Package for Social Science (SPSS), version 20.0. Data were expressed in *n* (%). A *P*-value of <0.05 was considered as statistically significant.

RESULTS

One hundred prescriptions were collected randomly in the duration of 3 months to assess medication adherence as per JNC 8 guidelines among Indian hypertensive patients attending Medicine OPD of a tertiary care teaching hospital, Haldia, West Bengal. The demographic and clinical characteristics were shown in Table 1. Out of 100 hypertensive patients under evaluation 67 was males (67%) with a M:F ratio of 2.03:1. Mean age among male participants was less (55.29±16.48) in comparison to female hypertensive (59.30±11.55). Mean SBP was slightly higher in male patients. Majority of the hypertensive patients in either sex was in the 40-60 yrs age group followed by age group above 60 years. The highest number of male hypertensive patients 40 (59.7%) [n=67] belonged to the age group of 40-60 years while the highest number of female hypertensive patients 17 (51.51%) [n=33] belonged to the age group of 40-60 years suggesting the earlier onset of hypertension in males than in females in this particular area where the study has been conducted (Table 1).

In male patients stage 1 HTN was observed in 55.22% followed pre-HTN (22.38%) and stage 2 HTN (13.43%).

In female participants it was observed that stage 1 HTN (60.60%) followed by pre-HTN (21.21%) and stage 2 HTN (12.12%) [Table 1]. Hypertension was classified according to JNC-8 guidelines and found 22 (22%) (Pre-hypertension/pre-HTN), 57 (57%) (Stage 1 hypertension), and 13% (stage 2 hypertension) cases. The mean systolic blood pressure was 151.8±18.68 mm Hg (males) and 150.4±16.03 mm Hg (females) (Table 1).

Diabetes mellitus (11.94%, males; 12.12%, females), other cardiovascular diseases (8.95%, males; 18.18%, females), acid peptic disease (23.88%, males; 27.27%, females), obesity (11.94%, males; 18.18%, females), and dyslipidemia (40.29%, males; 42.42%, females) are the most common co-morbidities in hypertension patients (Table 2/Fig. 1). Dyslipidemia was noted much more common associated disorders among newly diagnosed hypertensive of either sex.

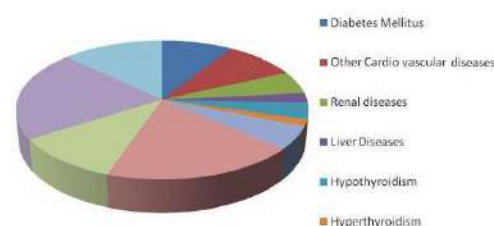


Figure-1: Co-morbid conditions among hypertensive subjects

Characteristics	Males [n=67]	Females [n=33]	P value
Age (Mean ± SD)	55.29±16.48	59.30±11.55	=0.2132
<40 years	08 (11.94%)	03 (9.09%)	= 0.6700
40-60 years	40 (59.7%)	17 (51.51%)	= 0.4390
Above 60 years	19 (28.36%)	13 (39.39%)	= 0.2686
Systolic Blood Pressure (Mean ± SD) [mm Hg]	151.8±18.68	150.4±16.03	=0.7132
Normal (<120 mmHg), n (%)	06 (8.95%)	02 (6.06%)	= 0.6181
Pre HTN (120-139 mmHg), n (%)	15 (22.38%)	07 (21.21%)	= 0.8949
Stage 1 HTN (140-159 mmHg), n (%)	37 (55.22%)	20 (60.60%)	= 0.6112
Stage 2 HTN (≥160 mmHg), n (%)	09 (13.43%)	04 (12.12%)	= 0.8554
Diastolic Blood Pressure (Mean ± SD) [mm Hg]	96.55±10.78	94.90±11.28	= 0.4801
Normal (< 80 mmHg), n (%)	05 (7.46%)	03 (9.09%)	= 0.7786
Pre IHTN (80-89 mmHg), n (%)	17 (25.37%)	05 (15.15%)	= 0.2484
Stage 1 HTN (90-99 mmHg), n (%)	37 (55.22%)	21 (63.63%)	= 0.4253
Stage 2 HTN (≥100 mmHg), n (%)	08 (11.94%)	04 (12.12%)	= 0.9793

Table-1: Baseline demographic and clinical characteristics of hypertensive patients (n=100).

Co-morbidities	Male [n=67]	Female [n=33]	Total [n=100]	Percentage (%)
Diabetes Mellitus	08 (11.94%)	04 (12.12%)	12	12
Other Cardiovascular diseases	06 (8.95%)	06 (18.18%)	12	12
Renal diseases	05 (7.46%)	02 (6.06%)	07	7
Liver Diseases	02 (2.98%)	01 (3.03%)	03	3
Hypothyroidism	03 (4.47%)	02 (6.06%)	05	5
Hyperthyroidism	02 (2.98%)	-	02	2
Lung disorders	05 (7.46%)	02 (6.06%)	07	7
Acid peptic disease	16 (23.88%)	09 (27.27%)	25	25
Obesity/overweight	08 (11.94%)	06 (18.18%)	14	14
Dyslipidemia	27 (40.29%)	14 (42.42%)	28	28
Other diseases	12 (17.91%)	05 (15.15%)	17	17

Table-2: Co-morbid conditions among hypertensive subjects

Table 3 shows the mono and combination therapies for the treatment of hypertension. As per present study, most

Treatment	No., Percentage [n=100]
Mono-therapy	29 (29%)
ACE Inhibitors (ACEIs)	5 (5%)
Angiotensin Receptor Blocker (ARBs)	6 (6%)
Diuretics	8 (8%)
Calcium Channel Blockers	4 (4%)
Beta Blockers	2 (2%)
Alpha Blockers	01 (1%)
Alpha 2 Agonists	01 (1%)
Potassium Channel Openers	-
Nitrates	02 (2%)
Two-drugs regimen	35 (35%)
Angiotensin receptor blockers + Diuretics	6 (6%)
Dihydropyridine Calcium channel blockers + β -blockers	2 (2%)
Diuretics + Calcium channel blockers	2 (2%)
ACE inhibitors + Diuretics	8 (8%)
ACE inhibitors + Dihydropyridine Calcium channel blockers	5 (5%)
Diuretics + β -blockers	2 (2%)
Diuretics + Diuretics [potassium sparing diuretics with thiazides]	2 (2%)
Calcium channel blockers + ARBs	4 (4%)
ACEIs/ARBs + β -blockers	2 (2%)
Calcium channel blockers + α -agonists	1 (1%)
Alpha Blockers + Diuretics	1 (1%)
ACEs + ARBs	0
β -blocker + central acting (clonidine)	0
β -blocker + nondihydropyridine CCB	0
Three Drugs Regimen	11 (11%)
CCBs + ACEIs/ARBs + Diuretics	5 (5%)
ARBs + Diuretic + Diuretic	2 (2%)
ACEIs/ARBs + BBs + CCBs	3 (3%)
ACEIs/ARBs + BBs + Diuretics	1 (1%)
Four Drugs Regimen	02 (2%)
Diuretics + Calcium channel blockers + β -blockers	1 (1%)
Angiotensin receptor blockers + diuretics + Calcium channel blockers	1 (1%)

Table-3: Antihypertensive medications used by hypertensive patients (males and females) in mono and combination therapies

of the physicians prescribed two-drug combination (35%) to control BP followed by monotherapy (29%), three-drug combination (11%) and four-drug combination (2%). Diuretics (8%) are most widely prescribed drugs followed by ARBs (6%), ACE Inhibitors (5%) and calcium channel blockers (4%) as monotherapy. In some cases beta blockers (2%) and alpha agonists (1%) also prescribed. Monotherapy of nitrates was also documented in 2% cases.

Two drugs regimen was prescribed in 35% of the hypertensive patients. ACE inhibitor (s) + diuretics combination (8%) was mostly used in two drug combination therapy followed by angiotensin receptor blockers + diuretics combination (6%) and ACE inhibitors + dihydropyridine calcium channel blockers (5%). There was different other combinations also prescribed in the hypertensive patients with or without co-morbidities like dihydropyridine calcium channel blockers + β -blockers (2%), calcium channel blockers + ARBs (4%), Diuretics + β -blockers (2%), ACEIs/ARBs + β -blockers (2%), diuretics + diuretics [potassium sparing diuretics with thiazides] (2%) and calcium channel blockers + alpha agonists (1%). None of the hypertensive patients was prescribed ACEs + ARBs, β -blocker + central acting (clonidine) and β -blocker + non-dihydropyridine CCB in combination [Table 3].

Three antihypertensive drugs regimen was prescribed in 11% of the hypertensive patients. Three drugs combination as an antihypertensive was mainly tried CCBs+ ACEIs/ARBs+ Diuretics (5%) followed by ACEIs/ARBs + BBs + CCBs (3%), and ARBs + Diuretic + Diuretic (2%). In few prescriptions (2%) it was also observed that four drugs regimen like ARBs+ Diuretics+ CCBs combinations (1%) also prescribed in uncontrolled hypertensive patients (Table 4). Majority of the patients were prescribed combination anti-HTN drugs with other drugs (78%) may be due to address associated co-morbidities.

Among the combination therapy olmesartan/amlodipine/HCTZ, valsartan/amlodipine/ (hydrochlorothiazide) HCTZ, candesartan/HCTZ, losartan/HCTZ, olmesartan/HCTZ, telmisartan/HCTZ, metoprolol tartrate/HCTZ, amlodipine + atenolol, amlodipine + losartan, amlodipine + enalapril, metoprolol tartrate/HCTZ, spironolactone/HCTZ, atenolol+ chlorthalidone, nebivolol + HCTZ, enalapril + HCTZ, lisinopril + HCTZ, ramipril + HCTZ e, telmisartan + HCTZ

Recommendations	Non-adherence rate (%)	Adherence rate (%)	P-Value
Recommendation 1	22%	78%	< 0.0001
Recommendation 2	35%	65%	< 0.0001
Recommendation 3	25%	75%	< 0.0001
Recommendation 4	39%	61%	= 0.0019
Recommendation 5	27%	73%	< 0.0001
Recommendation 6	08%	92%	< 0.0001
Recommendation 7	-	-	-
Recommendation 8	12%	88%	< 0.0001
Recommendation 9	24%	76%	< 0.0001
Recommendation 10	38%	62%	= 0.0019
Average	25%	75%	< 0.0001

Table-4: Adherence to JNC-8 hypertension treatment recommendations

Rationality parameters	Non-adherence rate (%)	Adherence rate (%)	P-Value
Prescription rate stressing importance of lifestyle management	12%	88%	< 0.0001
Prescription rate with defined antihypertensive goals	22%	78%	< 0.0001
Dose strength mentioned rate	-	100%	-
Dose schedule mentioned rate	-	100%	-
Ban drug formulation prescription rate	-	0%	-
Debated rationality formulation prescription rate	85%	15%	< 0.0001
Generic versus brand name prescription rate	6%	94%	< 0.0001
Fixed dose combination versus combination prescription rate	83%	17%	< 0.0001

Table-5: Evaluation of rational drug therapy

and losartan + hydrochlorothiazide were found maximally prescribed in our study population. Amlodipine+ HCTZ + telmisartan, amlodipine + HCTZ + olmesartan and amlodipine + HCTZ + telmisartan + metoprolol were the frequently prescribed triple and four drug combinations, respectively. No combination of ACEIs + ARBs was prescribed in any prescription.

A comparison of residents' adherence by specialty to each JNC 8 guideline recommendation is presented in Table 4. Adherence of JNC 8 guidelines among all study hypertensive participants while prescribing medications varied between 62% to 92%, with an average of 75%. The least adherence (61%) was to recommendation 4 and 10 to initiate pharmacologic treatment in the population aged ≥ 18 years with chronic kidney disease to lower BP to goal of less than 140/90 followed by 62% adherence if goal BP cannot be reached with 2 drugs, add and titrate a third drug from the list provided. None of the patients was prescribed ACEI and an ARB together. However, 73% of the prescriptions were adherent to recommendation 5 to initiate pharmacologic treatment in the diabetes population.

The overall rate of adherence was 06/22 (27.27%) in pre-hypertension; 92% in stage 1 hypertension; and 78% in stage 2 hypertension patients. Almost 100% adherence rate among the patients of hypertensive emergency and urgency with the JNC 8 guidelines was noticed.

The rationality of prescription pattern of anti-hypertensive was also evaluated. The average number of drugs prescribed to each patient was 4-6 (64%). About 88% prescriptions had stressed importance of lifestyle management. About 225 of the prescription did not defined antihypertensive goals. None of the prescriptions mentioned ban drug formulation(s). Still 15% of the prescriptions had suggested combined drugs with debated rationality formulations. Only 6% of the prescription mentioned generic names of medicines. FDCs were prescribed more (83%) than 17% of combined prescribed drug(s) [Table 5].

DISCUSSION

Hypertension is a chronic disease requiring lifelong treatment. This observational study analysed the prescribing pattern in hypertensive patients and its adherence with JNC 8 guidelines for the management of hypertension, attending the outpatient department of General Medicine at Dr B C Roy Hospital, Haldia, West Bengal. Choice of an antihypertensive drug

should be driven by likely benefit in an individual patient, taking into account concomitant diseases such as diabetes mellitus, problematic adverse effects of specific drugs, and cost. The overall goal of treating hypertension is to reduce hypertension associated morbidity and mortality.¹²

Out of 100 hypertensive patients in present study 67 was males (67%) with a M:F ratio of 2.03:1. Mean age among male participants was less (55.29 $\pm$ 16.48) in comparison to female hypertensive (59.30 $\pm$ 11.55). The results of this study in line with study by Romday R et al (2016)¹³ which suggests that hypertension is more prevalent in males (59.8%), compared to females (40.2%). The above pattern is analogous to studies conducted by (Jhaj et al¹⁴; Malhotra et al¹⁵; Kothari et al¹⁶; Murti et al¹⁷) in India and Jeanette Sessoms et al (2015)¹⁸ in African Americans. However the above pattern is anomalous to other studies conducted by (Tiwari et al¹⁹; Surapaneni et al²⁰) in India, Pittrow et al²¹ in Germany and Lee et al²² in China have reported higher prevalence of hypertension in females than in males. This study also reveals that hypertension is more prevalent in elderly patients belonging to age group 40-60 or more. Study conducted by Romday et al¹³ and Tiwari et al¹⁹ found most common age group 50-59 years (33.3%) followed by 60-69 years and 40-49 years (26.7%).

Present study results showed diabetes mellitus (11.94%, males; 12.12%, females), other cardiovascular diseases (8.95%, males; 18.18%, females), acid peptic disease (23.88%, males; 27.27%, females), obesity (11.94%, males; 18.18%, females), and dyslipidemia (40.29%, males; 42.42%, females) are the most common co-morbidities in hypertension patients. Dyslipidemia was noted much more common associated disorders among newly diagnosed hypertensives of either sex. Present study results fall in line of the study by Romday R et al (2016).¹³ Study done by Amira et al²³ and Kothari et al¹⁶ found 36.6% and 47.72% patients respectively were suffering with comorbid conditions. Sakthi S et al²⁴ reported diabetes mellitus (35%) as the most frequent co-morbidity followed by asthma (5%) and ischemic heart disease (1.6%). Kothari N et al, reported majority of the patients were suffering from hypertension with diabetes mellitus (37.49%) followed by other associated conditions like ischemic heart diseases (7.12%), congestive heart failure (2%), and chronic kidney diseases (1.11%).¹⁶ Pai et al reported diabetes mellitus (47.5%), ischemic heart disease (16.5%), renal diseases (7.5%) and cardiovascular

accidents (16%) as concurrent diseases in his study.²⁵

As per present study, most of the physicians prescribed two-drug combination (35%) to control BP followed by monotherapy (29%), three-drug combination (11%) and four-drug combination (2%). Diuretics (8%) are most widely prescribed drugs followed by ARBs (6%), ACE Inhibitors (5%) and calcium channel blockers (4%) as monotherapy. In some cases beta blockers (2%) and alpha agonists (1%) also prescribed. Monotherapy of nitrates was also documented in 2% cases.

Two drugs regimen was prescribed in 35% of the hypertensive patients. ACE inhibitor (s) + diuretics combination (8%) was mostly used in two drug combination therapy followed by angiotensin receptor blockers + diuretics combination (6%) and ACE inhibitors + dihydropyridine calcium channel blockers (5%). It also shows that most frequently prescribed classes of drugs are thiazides alone or in combination. Since the eighth report of Joint National Committee (JNC 8) on detection, evaluation prevention and treatment recommends the use of ACEIs, ARBs, thiazide diuretic, and CCBs alone or in combination for the management of early stage hypertension, thus suggesting that the above trend is in conformity to the recommendations of JNC 8 guidelines.²⁶ Hence this drug utilization data corroborates adherence to JNC 8 guidelines. However, the results of current study were not fully in accordance to the study of Tiwari et al as far as drug prescription rate of BBs is concerned.¹⁹ ACE inhibitors and ARBs prescription rates in their study were almost in comparison to present study. This might be because of recently gained popularity of ARBs and ACEIs. In combination therapy, a two drug combination consisting of BBs and CCBs was given to the majority of the patients like our study. The study of Dhanaraj et al recorded highest prescription rates of ACE inhibitors (59%) followed by ARBs (52%), CCBs (29%), diuretics (27%), and BBs (14%).²⁷ Thiazides were the most preferred agents used, either as monotherapy or combination therapy in hypertensive patients with or without comorbidities in accordance to our study.

Adherence of JNC 8 guidelines among all study hypertensive participants while prescribing medications varied between 62% to 92%, with an average of 75%. The least adherence (61%) was to recommendation 4 and 10 to initiate pharmacologic treatment in the population aged ≥ 18 years with chronic kidney disease to lower BP to goal of less than 140/90 followed by 62% adherence if goal BP cannot be reached with 2 drugs, add and titrate a third drug from the list provided. None of the patients was prescribed ACEI and an ARB together. However, 73% of the prescriptions were adherent to recommendation 5 to initiate pharmacologic treatment in the diabetes population.

The overall rate of adherence was 06/22 (27.27%) in pre-hypertension; 92% in stage 1 hypertension; and 78% in stage 2 hypertension patients. Almost 100% adherence rate among the patients of hypertensive emergency and urgency with the JNC 8 guidelines was noticed.

Drugs are often used in combination to achieve a preferred therapeutic goal or to treat coexisting diseases. Because of

the risk related to concomitant use of drugs, co-medication has become a general concern and an important concept in term of prescribing appropriateness. Some combinations may result in undesired pharmacodynamic or pharmacokinetic interactions, resulting in under-treatment or harmful effects. The consequences of drug-drug interactions (DDIs) can range from no untoward effects at all, to drug-related mortality.^{28,29}

Strengths and Limitations of the Study

Our study supports the usefulness of the awareness to an adherence model and affords valuable information on the implementation of an important guideline in India. This study had some limitations also. Data were collected from only one institution, therefore population is relatively homogenous. Due to small sample size, variability and vagueness should be noted as limitations. A larger sample size would produce more detailed, robust, and explanatory assessments. Large studies involving heterogeneous population are required. Secondly, the study was conducted during only the summer months and over a short duration. Extending the study period and expanding the study to include fall or winter months may provide input for comparison to determine if seasons impact BP control.

Despite these limitations, the strength of the data collected is such that it revealed several important aspects of the antihypertensive drug utilization pattern and adherence of these drugs to JNC-VIII guidelines in different co-morbid conditions.

CONCLUSION

Present results reveals that antihypertensive medication adherence to JNC-8 recommendations is suboptimal. Therefore, physicians should follow JNC-8 guidelines to improve the patients care because suboptimal adherence leads to adverse clinical outcomes. In conclusion, present study demonstrated that physicians are not completely adhering to standard guidelines while treating hypertension with co-morbid conditions.

Despite evidence-based recommendations by JNC 8, provider adherence in AAs has room for improvement. Provider pharmacologic choices and lifestyle modification recommendations are major components to blood pressure control in this population. Thiazide diuretics are recommended as initial monotherapy and in combination therapy for Indian hypertensive patients. ACEIs, ARBs and CCBs are recommended as an acceptable alternative to thiazide diuretics. Prescribers have demonstrated a preference in prescribing ACEIs and ARBs in monotherapy. Adherence rates to JNC 8 were adequate in Stage 1, hypertensive emergency and urgency and inadequate in case of pre-HT and Stage 2 HT. BBs were under prescribed as this is not in the first line drug for initial management of hypertension. Polypharmacy, FDCs, debated rationality anti-HT combinations prescribing, were some of the common pharmacologically considered irrationality noticed in present study.

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Pola Penggunaan Obat Antihipertensi Pada Pasien Hipertensi di Instalasi Rawat Jalan Rumah Sakit

Umi Khairiyah¹, Muhammad Akib Yuswar^{1*}, Nera Umilia Purwanti¹

¹Jurusan Farmasi, Fakultas Kedokteran, Universitas Tanjungpura,
Jl. Prof. Dr. H. Hadari Nawawi, Pontianak, Kalimantan Barat, 78124, Indonesia

* Penulis Korespondensi. Email: akib.yuswar@pharm.untan.ac.id

ABSTRAK

Hipertensi adalah keadaan seseorang yang mengalami peningkatan tekanan darah di atas normal, yaitu tekanan darah sistolik ≥ 140 mmHg dan atau tekanan darah diastolik ≥ 90 mmHg. Tujuan penelitian ini adalah mengetahui pola penggunaan obat antihipertensi pada pasien hipertensi di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie Pontianak tahun 2020. Metode yang digunakan adalah metode observasional deskriptif dengan rancangan *cross sectional*. Pengumpulan data dilakukan secara retrospektif melalui penelusuran data rekam medis dan data resep pasien periode Januari- Desember 2020. Hasil penelitian menunjukkan bahwa karakteristik pasien berdasarkan usia yang paling banyak menderita hipertensi berada pada rentang usia 56-65 tahun, jenis kelamin yang paling banyak adalah perempuan, serta pasien hipertensi paling banyak menderita hipertensi *stage 2*. Obat antihipertensi tunggal yang paling banyak digunakan adalah amlodipine dengan persentase sebesar 50%, obat antihipertensi kombinasi terbanyak adalah kombinasi amlodipine dan candesartan sebesar 58,06%. Kesimpulan pada penelitian ini adalah obat antihipertensi yang paling banyak diresepkan sebagai antihipertensi tunggal yaitu amlodipine dan sebagai antihipertensi kombinasi yaitu amlodipine dan candesartan.

Kata Kunci:

Amlodipine, Hipertensi, Pola Penggunaan, Rumah Sakit

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ABSTRACT

Hypertension is a condition of a person experiencing an increase in blood pressure above normal, namely systolic blood pressure 140 mmHg and or diastolic blood pressure 90 mmHg. The purpose of this study was to determine the pattern of use of antihypertensive drugs in hypertensive patients in the outpatient installation of RSUD Sultan Syarif Mohamad Alkadrie Pontianak in 2020. The method used was descriptive observational method with a cross sectional design. Data collection was carried out retrospectively through searching medical record data and patient prescription data for the period January-December 2020. The results showed that the characteristics of patients based on age who suffered the most from hypertension were in the age range of 56-65 years, the sex being the most female, and most hypertensive patients suffer from stage 2 hypertension. The most widely used single antihypertensive drug is amlodipine with a percentage of 50%, the most combined antihypertensive drug is a combination of amlodipine and candesartan at 58.06%. The conclusion of this study is that the most widely prescribed antihypertensive drug as a single antihypertensive is amlodipine and as a combination antihypertensive drug, namely amlodipine and candesartan.

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Keywords:

Amlodipine, Hypertension, Usage Pattern, Hospital

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1. Pendahuluan

Hipertensi adalah keadaan seseorang yang mengalami peningkatan tekanan darah di atas normal, yaitu tekanan darah sistolik ≥ 140 mmHg dan atau tekanan darah diastolik ≥ 90 mmHg. Hipertensi merupakan “*silent killer*” yang dikenal sebagai penyakit kardiovaskular yang sangat umum [1]. Hipertensi adalah salah satu faktor utama penyebab kematian nomor satu di dunia [2].

Riset Kesehatan Dasar (Riskesdas) menyebutkan bahwa kejadian hipertensi di Indonesia pada tahun 2018 meningkat dibandingkan tahun 2013. Prevalensi kejadian hipertensi menurut Riskesdas pada tahun 2018 yang didapat dari hasil pengukuran tekanan darah pada masyarakat Indonesia yang berusia 18 tahun keatas sebesar 34,1 %. Prevalensi tersebut lebih tinggi dibandingkan pada tahun 2013 yang menyentuh angka prevalensi 25,8% [2]. Riskesdas provinsi Kalimantan Barat menyebutkan bahwa prevalensi hipertensi berdasarkan hasil pengukuran pada penduduk umur ≥ 18 tahun di Kota Pontianak pada tahun 2018 sebesar 32,82% [3].

Pengobatan hipertensi bertujuan menurunkan mortalitas dan morbiditas yang berhubungan dengan kerusakan organ target seperti gagal jantung, penyakit jantung koroner, atau penyakit ginjal kronik. Terapi farmakologi dapat berupa obat antihipertensi tunggal atau kombinasi. Obat antihipertensi kombinasi diperlukan jika antihipertensi tunggal belum mampu mengendalikan target tekanan darah yang diinginkan. Obat antihipertensi yang dikenal secara umum yaitu diuretik, ACE inhibitor, Angiotensin Reseptor Bloker, Canal Calcium Bloker, dan Beta Bloker [4].

Menurut penelitian yang dilakukan oleh Rahmat dkk didapatkan obat antihipertensi yang paling sering diresepkan terhadap pasien hipertensi rawat jalan di RSAU dr. M. Salamun adalah bisoprolol [5]. Menurut penelitian yang dilakukan oleh Tuloli dkk menyatakan bahwa obat antihipertensi terbanyak yang diresepkan pada pasien rawat jalan Puskesmas Tilamuta adalah amlodipine [2]. Penelitian yang dilakukan oleh Syuhada dkk menyatakan bahwa obat antihipertensi yang paling sering diresepkan di apotek rawat jalan Rumah Sakit “X” Tarakan adalah candesartan 16 mg [6].

Berdasarkan latar belakang tersebut, maka peneliti tertarik untuk melakukan penelitian tentang Pola Penggunaan Obat Antihipertensi pada Pasien Hipertensi di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie. Penelitian ini bertujuan untuk mengetahui pola penggunaan obat antihipertensi pada pasien hipertensi di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie Pontianak pada tahun 2020.

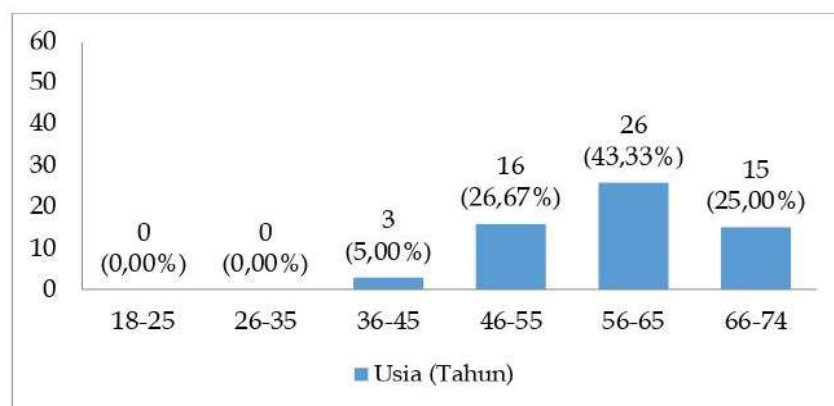
2. Metode

Metode yang digunakan pada penelitian ini adalah metode observasional deskriptif dengan rancangan *cross sectional*. Pengumpulan data dilakukan secara retrospektif melalui penelusuran data rekam medis dan resep pasien hipertensi di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie periode Januari- Desember 2020. Populasi pada penelitian ini adalah seluruh data rekam medis dan data resep pasien hipertensi yang berobat di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie periode Januari- Desember 2020. Sampel dipilih dengan menggunakan teknik *purposive sampling*. Kriteria inklusi pada penelitian ini yaitu data rekam medis pasien yang terdiagnosis hipertensi, pasien berusia 18-74 tahun, serta pasien yang menerima

obat antihipertensi. Sampel yang memenuhi kriteria inklusi sebanyak 60 pasien. Data hasil penelitian diolah kedalam program *Microsoft Excel* untuk mendapatkan jumlah dan persentasenya.

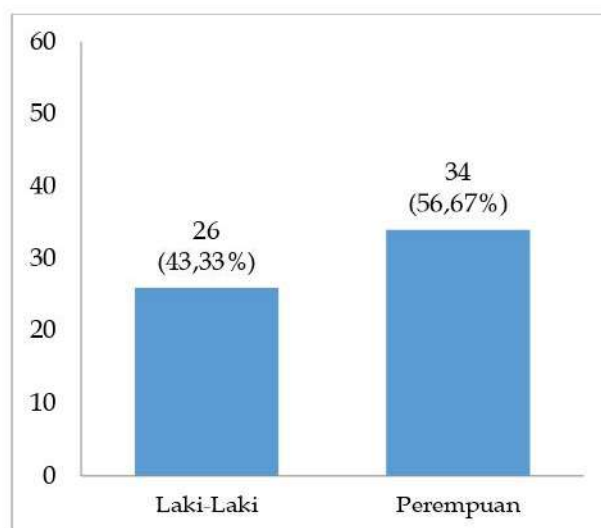
3. Hasil dan Pembahasan

Penelitian ini dilakukan terhadap 60 pasien hipertensi di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie tahun 2020 yang telah memenuhi kriteria inklusi. Terdapat pasien yang memiliki jumlah kunjungan lebih dari 1 kali kunjungan sehingga didapatkan total seluruh resep dari 60 pasien yaitu sebanyak 67 resep. Berikut disajikan data karakteristik pasien berdasarkan usia, jenis kelamin dan tekanan darah:



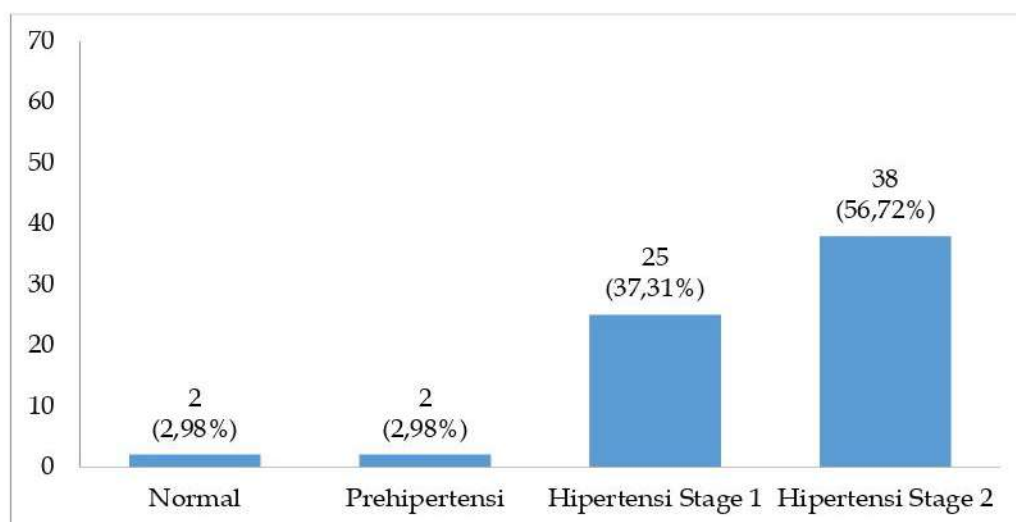
Gambar 1. Karakteristik pasien berdasarkan usia

Hasil penelitian karakteristik pasien berdasarkan usia pada gambar 1 menunjukkan bahwa usia yang paling banyak menderita hipertensi pada penelitian ini yaitu pada rentang usia 56-65 tahun sebanyak 26 pasien (43,33%). Hasil ini sejalan dengan penelitian yang dilakukan oleh Taslim dkk, dimana usia yang paling banyak mengalami hipertensi berada pada rentang usia 56-65 tahun [7]. Hasil ini berbeda dengan penelitian yang dilakukan oleh Risna dkk, dimana usia paling banyak menderita hipertensi berada pada kelompok usia >65 tahun [8]. Semakin lanjut usia seseorang maka akan semakin tinggi tekanan darahnya karena beberapa faktor seperti elastisitas pembuluh darah yang berkurang, fungsi ginjal sebagai penyeimbang tekanan darah akan menurun [9]. Hipertensi biasanya terjadi pada usia yang lebih tua [10].



Gambar 2. Karakteristik pasien berdasarkan jenis kelamin

Karakteristik pasien berdasarkan jenis kelamin menunjukkan bahwa jenis kelamin terbanyak yang terlibat pada penelitian ini adalah pasien berjenis kelamin perempuan yaitu sebanyak 34 pasien (56,67%) (Gambar 2). Hasil ini sejalan dengan penelitian yang dilakukan oleh Farida dkk, dimana kejadian hipertensi paling banyak terjadi pada pasien berjenis kelamin perempuan. Hipertensi pada perempuan memiliki prevalensi lebih tinggi ini dapat dikaitkan dengan proses menopause[1]. Perempuan yang sudah menopause dapat dipengaruhi oleh turunnya hormon estrogen. Penurunan hormon estrogen ini akan mempengaruhi naiknya tekanan darah melalui aktivasi sistem renin-angiotensin dan sistem saraf pusat [11].



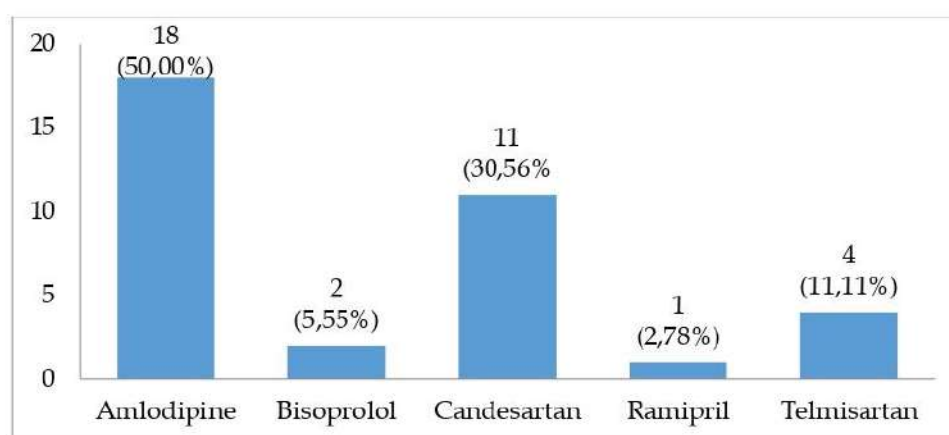
Gambar 3. Karakteristik pasien berdasarkan tekanan darah

Karakteristik pasien berdasarkan tekanan darah pada gambar 3 menunjukkan bahwa pasien hipertensi paling banyak menderita hipertensi stage 2 yaitu sebesar 38 kunjungan(56,72%) dari total 67 kunjungan. Hasil ini sejalan dengan penelitian yang dilakukan oleh Nilansari dkk, bahwa pasien hipertensi paling banyak menderita

hipertensi stadium 2 [4]. Penerapan gaya hidup sehat sangat penting bagi setiap orang untuk mencegah tekanan darah tinggi dan merupakan bagian penting dalam menangani hipertensi [12].

Pola Penggunaan Obat Antihipertensi

Hasil penelitian didapatkan bahwa obat antihipertensi yang diresepkan di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie tahun 2020 diresepkan secara tunggal dan kombinasi. Jumlah resep yang dianalisis dari 60 subyek penelitian didapatkan sebanyak 67 resep, terdiri dari 36 resep yang memuat obat antihipertensi tunggal dan 31 resep yang memuat obat antihipertensi kombinasi. Berikut distribusi pola penggunaan obat antihipertensi yang diresepkan secara tunggal dan kombinasi.



Gambar 4. Distribusi penggunaan obat antihipertensi tunggal

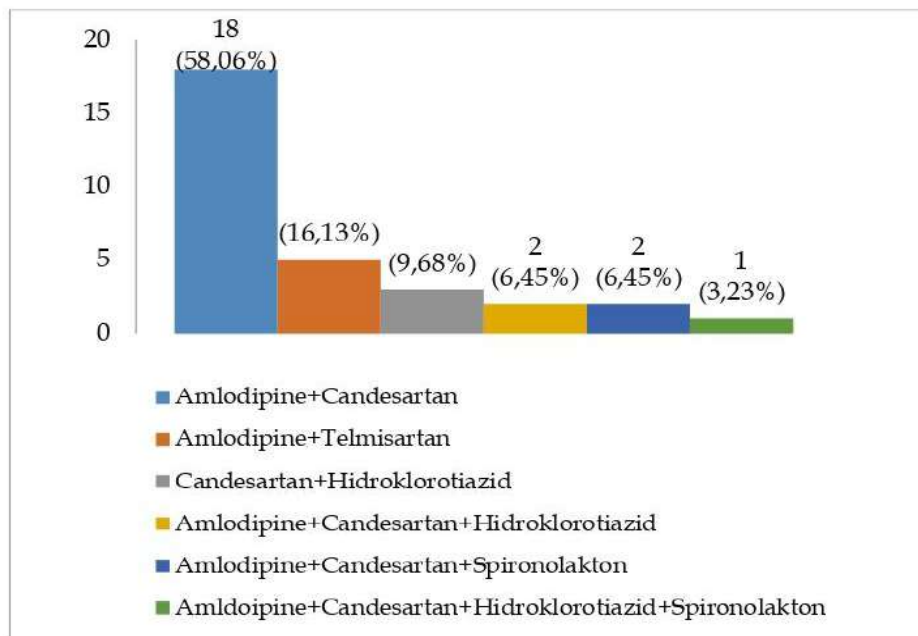
Hasil penelitian menunjukkan bahwa obat tunggal yang paling banyak diresepkan di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie Pontianak pada tahun 2020 yaitu amlodipine (Gambar 4). Hasil ini sejalan dengan penelitian yang dilakukan oleh Risna dkk, dimana obat yang paling banyak diresepkan adalah amlodipine. Amlodipine merupakan golongan CCB kelas dihidropiridin [8]. Hasil penelitian ini berbeda dengan penelitian yang dilakukan oleh Rahmat dkk, dimana obat antihipertensi yang paling sering diresepkan adalah bisoprolol [5].

Amlodipine bekerja dengan menghambat masuknya kalsium kedalam sel otot polos dan pembuluh darah dan sel-sel miokard, hal ini menyebabkan penurunan resistensi pembuluh darah perifer. Dosis amlodipine sebagai obat antihipertensi adalah sebesar 5 mg/hari dengan dosis maksimum sebesar 10 mg/hari. Edema perifer merupakan efek samping yang sering terjadi dalam penggunaan amlodipine. Amlodipine dapat digunakan dan direkomendasikan sebagai terapi inisiasi dan pemeliharaan pengobatan antihipertensi baik monoterapi maupun kombinasi dengan obat lain [13].

Penggunaan terapi obat antihipertensi terbanyak setelah amlodipin adalah candesartan yang berasal dari golongan ARB. Obat antihipertensi golongan ARB yang juga diresepkan adalah telmisartan. ARB memiliki mekanisme kerja dengan menghambat pengikatan senyawa yang memiliki efek menyempitkan pembuluh darah

yang disebut dengan Angiotensi II. Ikatan Angiotensin II ini dihambat ke reseptor sehingga pembuluh darah akan melebar dan aliran darah lebih lancar dan tekanan darah menurun [5]. Golongan ARB dapat diberikan sebagai alternatif untuk pasien yang tidak dapat mentoleransi ACE I seperti munculnya batuk kering [4].

Terapi antihipertensi yang juga diresepkan adalah bisoprolol. Bisoprolol adalah jenis obat antihipertensi yang termasuk kedalam golongan Beta Blocker. Beta blocker bekerja melalui mekanisme penghambatan reseptor beta adrenergik pada beberapa organ seperti jantung, pembuluh darah perifer, bronkus, pankreas dan hati [14]. Bisoprolol diabsorpsi secara baik dan tidak dipengaruhi oleh makanan dengan bioavailabilitas obat yang mencapai 80% setelah dikonsumsi [15]. Obat antihipertensi yang juga diresepkan pada penelitian ini adalah ramipril yang merupakan antihipertensi golongan ACE I. ACE I mempunyai efek kardioprotektif yang signifikan dan memiliki peran penting dalam menghambat proses penyakit kardiovaskular [16]. ACE I memiliki peran dalam mencegah mortalitas pasien yang memiliki resiko tinggi komplikasi jantung. ACE I memiliki efek samping yang paling khas yaitu batuk kering dan angioedema [17].



Gambar 5. Distribusi penggunaan obat antihipertensi kombinasi

Distribusi penggunaan obat antihipertensi kombinasi menunjukkan bahwa kombinasi obat antihipertensi yang paling sering diresepkan adalah kombinasi amlodipine dan candesartan yaitu sebanyak 18 resep (58,06%) (Gambar 5). Hasil ini sejalan dengan penelitian yang dilakukan oleh Hadidi dkk yang menyatakan bahwa kombinasi 2 obat yaitu amlodipine dan candesartan merupakan kombinasi terbanyak yang diresepkan [18]. Hasil ini berbeda dengan penelitian yang dilakukan oleh Risna dkk, dimana kombinasi obat yang paling banyak diresepkan adalah kombinasi amlodipine dan furosemide [8].

Terapi dengan kombinasi obat dapat menurunkan tekanan darah lebih besar dengan efek samping yang minimal. Kombinasi antihipertensi dengan dosis rendah lebih efektif mengurangi timbulnya efek samping dibandingkan menggunakan antihipertensi tunggal dengan dosis yang tinggi [4]. Penggunaan obat tunggal dengan dosis adekuat gagal mencapai tekanan darah target dan mengontrol nilai tekanan darah maka penambahan obat kedua dari kelas yang berbeda harus dilakukan [19]. Pengobatan politerapi dipilih apabila perubahan gaya hidup yang disertai dengan pengobatan monoterapi tidak mampu menurunkan tekanan darah pada pasien [4].

Obat antihipertensi kombinasi terbanyak pada penelitian ini adalah kombinasi amlodipine (CCB) dan candesartan (ARB). CCB dan ARB dapat mempercepat penurunan tekanan darah pada pasien hipertensi geriatri, mengurangi morbiditas dan mortalitas karena penyakit komplikasi sedang sebagai kardioprotektif selama penurunan tekanan darah [18]. Kombinasi 2 obat yang juga diresepkan adalah candesartan (ARB) dan hidroklorotiazid (diuretik), dimana pada kombinasi ini terjadi ekresi air dan sodium oleh diuretik tiazid yang akan dikompensasikan oleh RAAS sehingga akan membatasi efektivitas tiazid, kerja diuretik akan optimal karena adanya agen penghambat RAAS ini [17]. Diuretik tiazid memiliki mekanisme kerja dengan cara menurunkan resistensi pembuluh darah perifer dalam jangka yang panjang sementara mengurangi volume sirkulasi darah dalam jangka pendek dengan cara menghambat Na reabsorpsi oleh tubulus distal [4].

Hasil penelitian juga menunjukkan bahwa terdapat kombinasi yang terdiri dari 3 dan 4 obat antihipertensi. Kombinasi 3 obat antihipertensi yang diresepkan adalah amlodipine, candesartan dan hidroklorotiazid, serta kombinasi amlodipine, candesartan dan spironolakton. Kombinasi 4 obat antihipertensi yang diresepkan yaitu kombinasi amlodipine, candesartan, hidroklorotiazid dan spironolakton. Kebanyakan obat antihipertensi lain dapat menimbulkan retensi natrium dan air, hal ini diatasi dengan pemberian diuretik bersamaan [20]. Obat diuretik dan senyawa turunannya memiliki efek antihipertensi jika digunakan sebagai antihipertensi tunggal serta obat ini akan meningkatkan khasiat hampir semua obat antihipertensi lainnya [21].

4. Kesimpulan

Kesimpulan pada penelitian ini adalah obat antihipertensi yang paling banyak diresepkan di instalasi rawat jalan RSUD Sultan Syarif Mohamad Alkadrie tahun 2020 sebagai antihipertensi tunggal adalah amlodipine dan antihipertensi kombinasi adalah amlodipine dan candesartan.

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Comparison of antihypertensive drug utilization in community health centre and type B teaching hospital

Tromphin Sitorus¹, Abraham Simatupang²

¹Faculty of Medicine, Universitas Kristen Indonesia, Jakarta

²Department of Pharmacology and Therapy – Faculty of Medicine, Universitas Kristen Indonesia

*Corresponding Author: abraham.simatupang@uki.ac.id

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ABSTRACT

Antihypertensive medicine is one of the many complex factors contributing to the sustained rise in hypertension prevalence, which remains a global health concern. The Social Security Agency on Health, or Badan Penyelenggara Jaminan Sosial (BPJS) Kesehatan, in Indonesia is an integrated healthcare system that provides universal healthcare to its citizens. This retrospective cross-sectional study examined the use of antihypertensive medications covered by BPJS between January and December 2021 at the Rawabuntu Primary Health Centre and the Universitas Kristen Indonesia (UKI) type B public hospital. The necessary data was extracted from the medical files of 192 hypertensive patients. The patients' characteristics were analysed descriptively. The rationality of antihypertensive medication use was evaluated in accordance with Association of Indonesian Hypertension Physicians-approved guidelines. The majority of patients in both categories were female (52.1 percent at the Rawabuntu Primary Health Centre and 60 percent at the teaching facility). In both healthcare facilities, the correct indication, patient, and dosage were administered 100 percent of the time, according to this study. While only 66.7% and 85.4% of patients at the Rawabuntu Primary Health Centre and UKI hospital received the correct drug category, respectively. The rational use of antihypertensive medications was substantially lower at the Primary Health Centre than it was at the UKI Hospital ($p = 0.001$).

Keyword: hypertension, antihypertensive drugs, primary health centres, type B teaching hospital

ABSTRAK

Hipertensi masih merupakan masalah kesehatan global karena prevalensinya yang terus meningkat sebagai akibat masalah kompleks, diantaranya yaitu penggunaan obat. Indonesia telah memiliki sistem kesehatan terintegrasi yang dikenal sebagai Badan Penyelenggara Jaminan Sosial (BPJS) Kesehatan. Penelitian retrospektif *cross sectional* ini membandingkan penggunaan antihipertensi di Puskesmas Rawabuntu dan Rumah Sakit Umum (RSU) Universitas Kristen Indonesia (UKI) (termasuk kategori rumah sakit pendidikan tipe B) dengan merekrut data yang diperlukan dari rekam medik pasien hipertensi ($n=192$) periode Januari 2021 sampai Desember 2021. Karakteristik pasien dianalisis secara deskriptif. Kerasionalan penggunaan antihipertensi dianalisis berdasarkan *guidelines* yang disetujui oleh Perhimpunan Dokter Hipertensi Indonesia. Umumnya pasien pada kedua kelompok tersebut adalah perempuan (Puskesmas Rawabuntu: 52,1% dan RSU UKI: 60,4%). Hasil penelitian menunjukkan, dalam kriteria tepat indikasi, tepat pasien, dan tepat dosis baik di puskesmas maupun di rumah sakit memiliki capaian yang sempurna (100%). Sedangkan, dalam kriteria tepat obat, berturut turut sebanyak 66,7% dan 85,4% pasien mendapatkan obat yang tepat di Puskesmas Rawabuntu dan di RSU UKI. Penggunaan antihipertensi yang rasional secara signifikan lebih rendah di Puskesmas Rawabuntu dibandingkan dengan rumah sakit UKI ($p<0,05$).

Keyword: hipertensi, obat antihipertensi, puskesmas, rumah sakit pendidikan



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1. Introduction

Hypertension is defined as a diagnosis when a person's systolic blood pressure is ≥ 140 mm Hg and/or diastolic blood pressure is ≥ 90 mmHg at rest/while calm after two measurements taken five minutes apart. This diagnosis should not be made in a single visit. The diagnosis of hypertension is confirmed in two to three visits separated by one to four weeks. If the patient's blood pressure is 180/110 mmHg and there is evidence of cardiovascular disease, a diagnosis can be made in a single visit [1]. Globally, around 3.5 billion adults have suboptimal systolic blood pressure, with 874 million having a systolic blood pressure 140 mmHg. Therefore, one in four adults has hypertension [2]. Using measurements of the population aged 18 years, the prevalence of hypertension in Indonesia was 34.1%, with a total of 63,309,620 cases and a mortality rate of 427,218 according to the 2018 Riskesdas [3].

The incidence of hypertension in an individual is influenced by both genetic and lifestyle factors. Age, gender, and family history are genetic factors, while alcohol consumption, smoking, and inactivity are lifestyle factors [4]. Reducing alcohol and salt intake, ceasing smoking, engaging in regular aerobic physical activity, rectifying obesity, and consuming fresh fruits and vegetables are the primary lifestyle modifications that determine the best outcomes for hypertension prevention and treatment [5].

The incidence of hypertension in an individual is influenced by both genetic and lifestyle factors. Age, gender, and family history are genetic factors, while alcohol consumption, smoking, and inactivity are lifestyle factors [4]. Reducing alcohol and salt intake, ceasing smoking, engaging in regular aerobic physical activity, rectifying obesity, and consuming fresh fruits and vegetables are the primary lifestyle modifications that determine the best outcomes for hypertension prevention and treatment [5].

Management of hypertension necessitates effective regulation. BPJS is responsible for administering health insurance programmes within Indonesia's integrated healthcare system. Law number 40 of 2004 on the National Social Security System stipulates that health insurance is provided nationally based on the principles of social insurance and equity, with the goal of ensuring that participants receive the benefits of health maintenance and protection to meet their fundamental health needs. One of the diseases covered by BPJS Kesehatan is hypertension. Depending on the severity of their condition, participants may be referred to secondary/tertiary institutions [6] after receiving care at primary health care facilities. Nonetheless, the use of antihypertensive medications among hypertensive patients admitted to public health centres and hospitals is frequently compared. Therefore, the author is interested in comparing the use of antihypertensive medications in public health centres and teaching hospitals of type B.

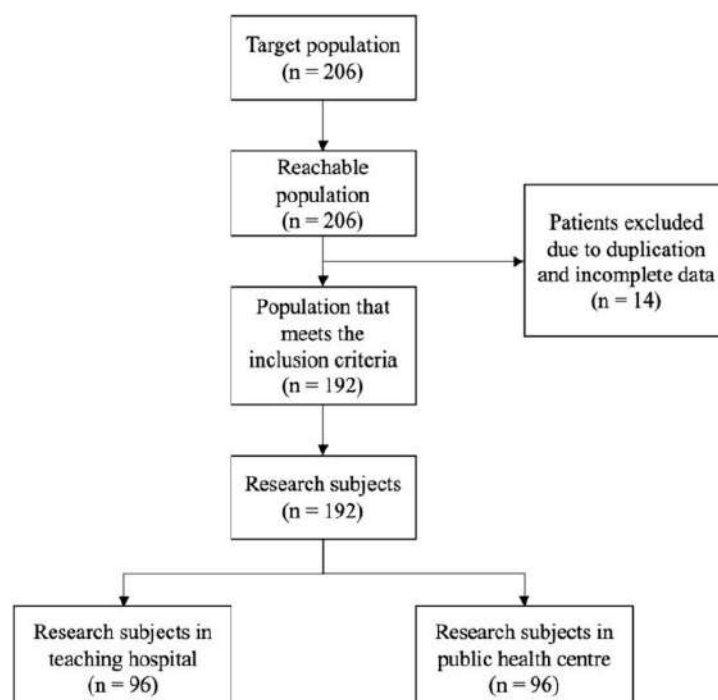


Figure 1. Flow Chart for Selection of Study Population

2. Method

This non-experimental retrospective cross-sectional study collected the necessary data from the medical records of hypertensive patients (n=96) at the Rawabuntu Public Health Centre and UKI public hospital between January 2021 and December 2021. The patients' characteristics were descriptively analysed. 2019 guidelines approved by the Association of Indonesian Hypertension Physicians (Perhimpunan Dokter Hipertensi Indonesia/PERHI) governed the comparison of antihypertensive drug use [7]. The analysis of drug rationality was based on the appropriate indication, patient, substance, and dose. Right indication is derived from the entire sample, which was then filtered based on two criteria: diagnosis of hypertension using PERHI 2019 criteria and treatment with anti-hypertensive medication. Right drug refers to the appropriateness of anti-hypertensive medication administration based on the therapeutic line class, variety, and combination of pharmaceuticals for hypertensive patients. The appropriate patient was selected based on the data of the appropriate medications; there should be no contraindications based on the comorbidities instrument and the administered anti-hypertensive drugs. According to the recommended dosage range, the data on the drug's suitability for use were used to determine the appropriate dosage. Chi-square analysis was used to compare the rationales for antihypertensive medication use among hypertensive patients admitted to both health centres.

3. Results and Discussion

From January 2021 to December 2021, a total of 206 hypertension-diagnosed patients' medical records were obtained. Due to duplicate and incomplete data, fourteen patients were excluded from this research sample, leaving 192 patients who met the inclusion criteria (Fig.).

Table 1 lists the characteristics of the patients. The majority of the patients were within the age range of 51-65 years old in both the public health centre and the teaching hospital (n=44; 45.8% and n=40; 41.7%), and most were female (public health centre: 52.1% and teaching hospital: 60.4%). In the study conducted in the public health centre, the majority of patients did not have any comorbidities (56.3%), while in the teaching hospital, the majority had comorbidities (80.2%). The majority of respondents in the public health centre and teaching hospital had stage 1 hypertension, accounting for 64.6% and 62.5%, respectively. In addition, the majority of patients (teaching hospital: 72.9%; public health centre: 96.9%) used calcium channel blockers and based on the distribution of medication, monotherapy was the majority to patients admitted to the public health centre and teaching hospital.

Table 1. Characteristics of the Hypertensive Patients

Characteristics	n (%)	
	Rawabuntu Health Centre	UKI Hospital
Age (in years):		
21-35	5 (5.2)	0 (0)
36-50	24 (25.0)	17 (17.7)
51-65	44 (45.8)	40 (41.7)
>65	23 (24.0)	39 (40.6)
Gender:		
Male	46 (47.9)	38 (39.6)
Female	50 (52.1)	58 (60.4)
Comorbidities:		
Presence	42 (43.8)	77 (80.2)
Absence	54 (56.3)	19 (19.8)
Hypertension Stage:		
Stage 1	62 (64.6)	60 (62.5)
Stage 2	34 (35.4)	36 (37.5)
Antihypertensive Drugs:		
Angiotensin-Converting- Enzyme Inhibitors (ACEIs)	4 (4.2)	6 (6.3)
Angiotensin Receptors Blockers (ARBs)	0 (0)	49 (51.0)
Calcium Channel Blockers (CCBs)	93 (96.9)	70 (72.9)
Beta Blockers (BBs)	0 (0)	4 (4.1)
Diuretics	1 (1)	2 (2.0)
Distribution of Medication:		
Monotherapy	94 (97.9)	65 (67.7)
Combination of 2 Drugs	2 (2.1)	29 (30.2)
Combination of 3 Drugs	0 (0)	2 (2.1)

Table 2 lists the pattern of antihypertensive drug use. The majority of patients who received monotherapy were given amlodipine (public health centre: 91.8% and teaching hospital: 41.7%). Meanwhile, the combination of two drugs

in the public health centre used amlodipine and HCT (1%) and amlodipine and captopril (1%). On the other hand, the combination of two drugs in the teaching hospital mostly used amlodipine and candesartan (18.8%). Patients at the public health centre did not receive the three-drug combinations, but in the teaching hospital, amlodipine, spironolactone, and lisinopril (1% each) and amlodipine, candesartan, and spironolactone (1% each) were administered.

Table 2. The Pattern of Antihypertensive Drug Usage

Medication Usage	n (%)	
	Rawabuntu Health Centre	UKI Hospital
Monotherapy:		
Amlodipine	91 (94.8)	40 (41.7)
Candesartan		22 (22.9)
Ramipril		1 (1)
Captopril	3 (3.1)	2 (2.1)
Irbesartan		1 (1)
Combination of 2 Drugs:		
Amlodipine & HCT	1 (1)	1 (1)
Amlodipine & Captopril	1 (1)	
Amlodipine & Candesartan		18 (18.8)
Amlodipine & Ramipril		1 (1)
Amlodipine & Irbesartan		1 (1)
Candesartan & HCT		2 (2.1)
Bisoprolol & Ramipril		1 (1)
Candesartan & Bisoprolol		2 (2.1)
Candesartan & Captopril		1 (1)
Bisoprolol & Irbesartan		1 (1)
Combination of 3 Drugs:		
Amlodipine & Spironolactone & Lisinopril		1 (1)
Amlodipine & Spironolactone & Candesartan		1 (1)

In the evaluation of drug administration and accuracy, an assessment was carried out as shown in Table 3. In terms of right indication, right patient, and right dose criteria, both in the public health centre and the hospital achieved perfect results (100%). However, in term of right drug criteria, 66.7% of the patients received the right drug in the public health centre, and 85.4% in the hospital, which represents rational drug use. The accuracy of drug use in this study fell short in the right drug component. The chi-square analysis comparing the accuracy of drugs use in public health centre and teaching hospital is shown in Table 4. It is shown that the accuracy of antihypertensive drug use was better in the hospital compared to the public health centre (85.4% vs 66.7%; $p=0.002$).

Table 3. Accuracy of Antihypertensive Drug Usage and Administration

Criteria	n (%)	
	Rawabuntu Health Centre	UKI Hospital
Right Indication	96 (100)	96 (100)
Right Drug	64 (66.7)	82 (85.4)
Right Patient	96 (100)	96 (100)
Right Dosage	96 (100)	96 (100)
Drug Usage Rationality	66.7 %	85.4 %

The majority of the patients were within the age range of 51-65 years old in both the public health centre and teaching hospital ($n=44$; 45.8% and $n=40$; 41.7%), and most were female (public health centre: 52.1% and teaching hospital: 60.4%) as shown in Table 1. This finding was in line with a prior study conducted at the Teaching Hospital (Universitas Kristen Indonesia Public Hospital) in 2020 by Lemauck et al., which revealed that women aged 55 to 64 had the highest prevalence of hypertension [8]. This is due to the fact that blood vessels go through a series of physiological changes in that age range that reduce its elasticity, resulting in a decreasing ability to adapt to the body's hemodynamic conditions [9]. It is also possible that the study's findings about the increased prevalence of hypertension in women are related to the area's predominately female population distribution.

In the public health centre and teaching hospital, respectively, 97.9% and 67.7% of respondents got therapy with monotherapy distribution as shown in Table 2. Amlodipine was given to the vast majority of patients who got monotherapy. According to the PERHI guidelines in 2019, monotherapy is indicated for three conditions of hypertension, including hypertension with systolic blood pressure (SBP) <150 mmHg which is still classified as grade 1 with low risk, patients with blood pressure from normal to high but at high risk, and patients who are frail or elderly (≥ 80 years). Monotherapy is the most commonly chosen pattern, which can be due to several factors, including

improving medication adherence, can be prescribed by general practitioners, and a wide range of indications for its use [10]. However, it is advised to begin therapy with a combination of two medications, per the 2019 PERHI guidelines. Two drugs can be combined to function on various routes, which improves the effectiveness of lowering blood pressure [11]. For hypertension that is resistant to a combination of two drugs, a combination of three drugs is advised. The three medications used in this study's combination are also in compliance with the PERHI 2019 guidelines, which urge using ACEi (lisinopril) or ARB (candesartan) along with CCB (amlodipine) and diuretics (spironolactone).

Table 4. Right Drug Comparison in Public Health Centre and Teaching Hospital

		Right Drug				p
		Accurate		Inaccurate		
		n	%	n	%	
Location	Rawabuntu Health Centre	64	66.7	32	33.3%	0.002
	UKI Hospital	82	85.4	14	14.6	
Total		146	76.1	46	23.9	

In the evaluation of drug administration and accuracy, an assessment was carried out as shown in Table 3. In terms of right indication, right patient, and right dose criteria, both in the public health centre and the hospital achieved perfect results (100%). The right indication shows that all subjects have met the criteria for receiving antihypertensive therapy and having their hypertension diagnosed according to the PERHI 2019 criteria. Right patient indicates that all subjects have met the criteria, thus there shouldn't be any contraindications based on the specified disease and antihypertensive drug instruments. The term right dose indicates that the medicine has been administered to all participants within the recommended dose range. In contrast, 66.7% of patients in the health center and 85.4% of patients in the hospital received the right drugs according to the right drug criteria, demonstrating rational drug use. This study's accuracy of drug use identified a lack of the right drug component. This is consistent with the 2015 study by Hendarti et al. that demonstrated the inaccuracy of hypertension drugs at the Ciputat Public Health Center [12]. Also, these findings support a 2019 study conducted at the Anutapura Hospital by Alaydrus et al. that exposed the inaccuracy of hypertension administration of drugs [13].

The chi-square analysis comparing the accuracy of drugs use in public health centre and teaching hospital is shown in Table 4 shows that the accuracy of drug use is better in hospital compared to public health centre (85.4% vs 66.7%; $p=0.002$). While individuals with hypertension that is higher than grade one continue to get monotherapy, the inaccuracy of hypertension drug administration in public health centre may be caused by a lack of accuracy in determining the degree of hypertension in patients. On the other hand, mistakes in choosing the drug combinations administered in patients who require drug combinations led to incorrect hypertension drug administration in hospitals. The selection of drug combinations should be tailored to specific patients, for example, beta-blockers should be used in people who have a history of cardiac problems, diuretics should not be given to those who have gout arthritis, and pregnant women shouldn't take ACEi and ARB medications.

The low accuracy of drug usage in the public health centre cannot be separated from the individual factors of the community and the factors from the healthcare provider itself. The geographic location of healthcare providers may have an impact on how well the public health center can deliver healthcare services to the surrounding communities in terms of information, resources, and staff. As a result, healthcare workers are less aware of the situation and less able to give patients the best care possible to assist their development. Ultimately, this is represented as the low accuracy of the use of antihypertensive drugs in the area of the public health centre [14]. In addition to the facility and demographic factors discussed earlier, this can also be influenced by efforts to improve the quality of health services represented by periodic evaluations. Hospitals tend to have more complex monitoring and evaluation mechanisms than primary health centers, thus providing an opportunity to improve the quality of health services in a more holistic manner. Inpatient treatment is an option for hospital patients as well, allowing for more controlled medication administration [15].

4. Conclusion

The rational drug use of antihypertensive drugs in Rawabuntu Public Health Centre was lower (66.7%) compared to that in UKI hospital with a value of 85.4%. Monitoring and analyzing the barriers that affect the rationality of hypertension drug use in both institutions need to be continued. It is necessary to further study the discrepancy in drug use between Rawabuntu Public Health Centre and the UKI Public Hospital. In this approach, the standard of healthcare, particularly in the treatment of hypertension, can be improved in the future.

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6. Conflict of Interest

Competing interests: No relevant disclosures.

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Knowledge of hypertension and its therapy in laypeople

Abraham Simatupang*, Fransiska Sitompul, Linggom Kurniaty, Mulyadi Djojaputro, Romauli Lumbantobing, Hertina Silaban

Department of Pharmacology and Therapy, Faculty of Medicine, Universitas Kristen Indonesia

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ABSTRACT

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Hypertension is one of the non-communicable diseases that is becoming a global health problem. Hypertension can be identified by systolic blood pressure of 140 mmHg and diastolic 90 mmHg. Uncontrolled hypertension can lead to complications such as stroke, ischemic heart disease, heart attack, heart failure, kidney failure, blindness, etc. According to Basic Health Research 2018 (*Riset Kesehatan Dasar 2018/Riskesdas 2018*) the prevalence of hypertension for >18 years old was 8.4%, and through measurements taken in health care facilities by 34.1%. Prevalence in the city was 34.4%, in the village was 33.7%, while according to gender 31.3% for male and 36.9% for female. The study aimed to find out the knowledge and awareness of laypeople on hypertension and its therapy. This was a cross-sectional online study with 11 questions. Respondents were recruited from social media groups. The results showed 500 respondents (62.8 % female and 37.2 % male) involved in this study. The most common age range was 21-40 years (36.2 %), followed by 41-55 years (38.2%), and the least was 56-65 years old (18.4%). Seventy-two percent of respondents did not have hypertension, and 9% said they did not know. Fifty-three percent of respondents knew about the value of high blood pressure, and 89% of the respondents said hypertension should be treated regularly. The most hypertension complications answered by respondents were stroke (40%), heart attack (26%), and heart failure (16%). Amlodipine was the most mentioned by the respondents, and the second was ACE-inhibitor. However, omeprazole and omega-3 were also mentioned as anti-hypertension. Genetics and a high salt diet were risk factors that many respondents chose. In conclusion, the respondents have a good understanding of hypertension. Information related to behaviour is needed to discontinue the increasing prevalence.

ABSTRAK

Hipertensi adalah salah satu penyakit tidak menular yang semakin menjadi masalah global. Hipertensi ditandai dengan tekanan darah sistolik 140 mmHg dan diastolik 90 mmHg. Hipertensi yang tidak terkontrol memberi dampak komplikasi ke semua organ dengan berbagai penyakit dan kondisi yang menyebabkan seperti stroke, penyakit jantung iskemik, serangan jantung, gagal jantung, gagal ginjal, kebutaan, dan lain-lain. Menurut Riset Kesehatan Dasar 2018 prevalensi hipertensi untuk usia >18 tahun adalah 8,4%. Menurut pengukuran yang dilakukan di fasilitas pelayanan kesehatan sebesar 34,1%. Prevalensi di kota adalah 34,4%, di desa itu 33,7%, sedangkan menurut jenis kelamin laki-laki 31,3% dan perempuan 36,9%. Tujuan penelitian untuk mengetahui pengetahuan dan kesadaran orang awam tentang hipertensi. Penelitian potong lintang ini dilakukan secara daring dengan mengajukan 11 pertanyaan terhadap responden dari group media sosial. Sebanyak 500 responden (62,8% perempuan, 37,2% pria), dengan kisaran umur terbanyak 41-55 tahun (36,2%), 21-40 tahun (38,2%), dan 56-65 tahun (18,4%) terlibat dalam penelitian. Sebanyak 69% responden tidak menderita hipertensi, sedangkan 21% menderita hipertensi dan 10% menyatakan tidak tahu. Sebanyak 53% responden (213 orang) tahu kriteria tekanan darah tinggi dan 89% responden tahu hipertensi harus diobati teratur. Komplikasi terbanyak menurut responden adalah stroke (40%), serangan jantung (26%) dan gagal jantung (16%). Amlodipin terbanyak disebut oleh responden sebagai antihipertensi, kedua adalah ACE-inhibitor. Masih ada yang menyebutkan omeprazole dan omega-3 sebagai antihipertensi. Faktor genetik dan diet tinggi garam merupakan etiologi dan faktor risiko yang banyak dipilih responden. Dapat disimpulkan responden memiliki pemahaman tentang hipertensi yang cukup baik. Perlu informasi terkait perilaku agar prevalensi hipertensi tidak terus meningkat.

*corresponding author: abrahamsimatupang10@gmail.com

INTRODUCTION

Hypertension is one of the non-communicable diseases and its prevalence tends to rise steadily. Approximately 1.13 billion people worldwide have hypertension, and approximately 700 million people are untreated. Currently, the global prevalence for men is 31.9 (30.3–33.5) and for women is 30.1 (28.5–31.6), respectively,¹ while in Indonesia is 34.1.² Interestingly the increasing of the prevalence is higher in lower-income and middle-income countries compared to high-income countries. The rate of disability and death due to hypertension is also high, due to the cardiovascular diseases. The world's biggest killer is ischaemic heart disease, it is responsible for 16% of the world's total deaths. Since 2000, the largest increase in deaths has been for this disease, rising by more than 2 million to 8.9 million deaths in 2019. Stroke is the second leading causes of death and responsible for approximately 11% of total deaths. Type 2 diabetes mellitus (T2-DM) is also considered an important risk factor that could aggravate and accelerate complications in the target-organs.³ Most of these problems are due to changes in lifestyle.^{3,4}

Various drugs are available for the treatment of hypertension in which ACE-inhibitors are in the first line drug. Since hypertension is a chronic disease that can be controlled by medicaments, therefore adherence could be also an important issue to be considered.^{5,6} The aim of the

study was to observe the knowledge and awareness of laypeople on hypertension and its therapy.

MATERIALS AND METHODS

Subjects and design

This was a cross-sectional descriptive-analytical study that focused on the knowledge and awareness of laypeople on hypertension and its therapy. An online-questionnaire with 11 questions regarding the awareness and knowledge of hypertension and its treatment was developed in Microsoft Form (MS Form) and distributed through social media (WhatsApp) with a snow-ball approach.

Data analysis

The missing data get excluded and then transferred into SPSS ver. 25. The data were presented as frequency or mean $\pm$ standard deviation (SD) and then analysed using non-parametric statistics.

RESULTS

TABLE 1 shows that the most common range of the 500 respondents was the range 21-55 years old (246 respondents), while the respondents with hypertension were mostly in the age range of 41-60 years (86 respondents). As much as 66% (330) of respondents had higher education and most of them were undergraduate with female was higher than male (TABLE 2 and 3).

TABLE 1. Age distribution of respondents and distribution of respondents with hypertension

Age-period (years)	Number (%)		Hypertension*
	Female	Male	
< 20	4	4	1
21-40	131	50	7
41-55	115	76	43
56-60	54	45	43
61-70	8	6	7
>70	2	5	3
Total	314 (62.8)	186 (36.2)	104 (20.8)

*Femal = 48; male 56; **Mann-Whitney U test: 0.001; KS-test: 0.021

TABLE 2. Educational background of respondents

Education	n	Female (n)	Male (n)
Primary	7	4	3
Secondary	94	56	38
Diploma	71	53	18
Undergraduate	237	151	86
Graduate	77	44	33
Post-graduate	14	6	8
Total	500	314	186

TABLE 3. Respondents' answers on the right classification of hypertension (JNC 8: $\geq 140/\geq 90$ mmHg)

Gender	Right answer [n (%)]	Wrong answer [n (%)]	Total
Female	161 (52.9)	149 (47.1)	310
Male	109 (59.0)	76 (41)	185

*Chi square-test, $p=0.043$.

FIGURE 1 shows the answer of the respondent to the question of whether hypertension needs regular treatment. Respondents were also asked concerning medicine to be used for hypertension

treatment, the aetiology and risk-factors of hypertension and complications due to uncontrolled hypertension. The results are shown in FIGURE 2 - 4.

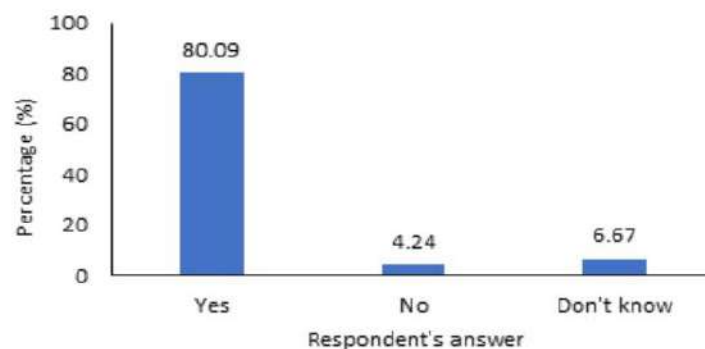


FIGURE 1. Respondent's answer on whether hypertension need a regular treatment

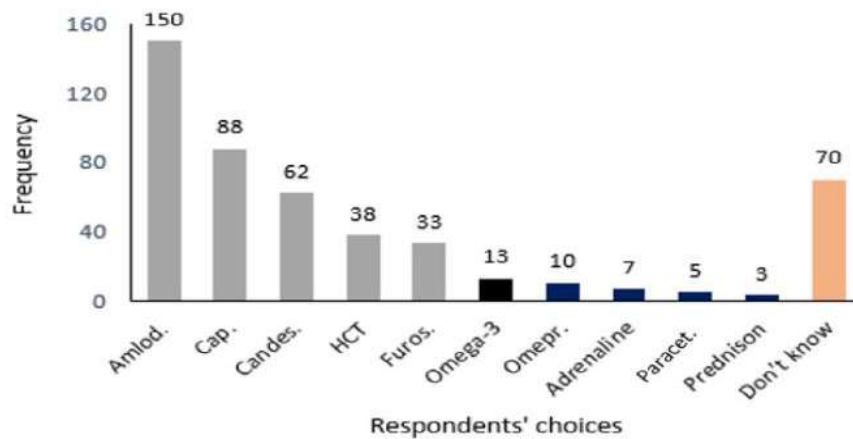


FIGURE 2. Respondents' choices on a question which of the following substances are for hypertension. Abbreviations: Amlod=amlodipine, Cap.=captopril, Candes.=candesartan, HCT=hydrochlorotiazide, Furos.=furosemide, Omepr.=omeprazole, Paracet.=paracetamol

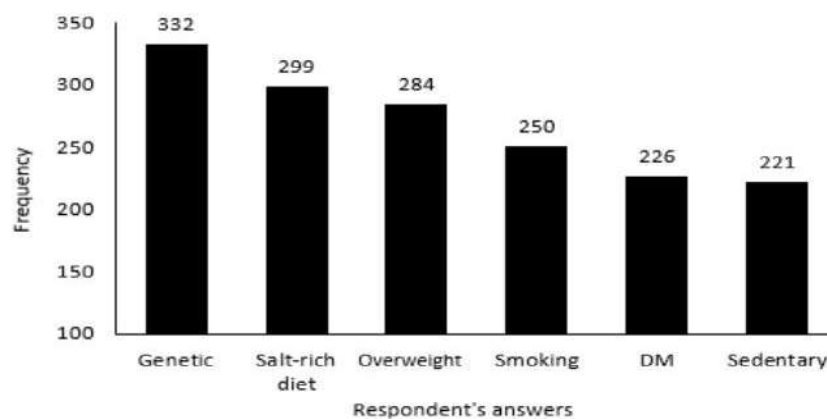


FIGURE 3. Respondents' answers on the aetiology and risk-factors of hypertension

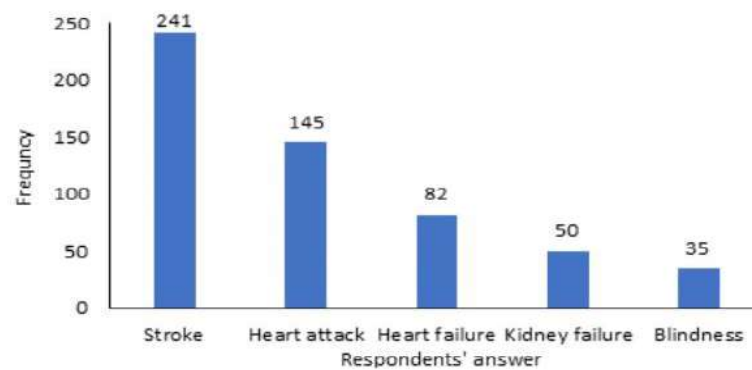


FIGURE 4. Respondents' answers to the question of complications that can arise due to uncontrolled hypertension

Thirty-two respondents from 50 out of 104 respondents who have hypertension answered that they take medicine regularly and 16 respondents did not take medicine regularly and

two respondents took no medicine at all. Responses of respondents who had hypertension to the factors that make hypertension closely controlled can be seen in TABLE 4.

TABLE 4. Respondents' answers to factors that can reduce hypertension

Answer	Physical exercise [n (%)]	Taking medicine regularly [n (%)]	Salt intake restriction [n (%)]	Stop smoking [n (%)]	Reduce weight [n (%)]	Reduce stress [n (%)]	Mean $\pm$ SD [n (%)]
Yes	97(93)	96(92)	96(92)	94(90)	99(95)	102(98)	93.3 $\pm$ 2.8
No	4(3.8)	6(5.7)	5(4.8)	6(5.7)	3(3.0)	2(2.0)	4.2 $\pm$ 1.5
Not know	3(3.2)	2(4.3)	3(3.2)	4(4.3)	2(2.0)	0(0)	2.3 $\pm$ 1.4

DISCUSSION

In comparison to our study, Jongen *et al.*⁸ using a mixed method approach, studied hypertension in rural community, South Africa, found that 74.3% of respondents have intermediate knowledge of hypertension, 14% good and only 11.8% poor knowledge, respectively. In addition, poverty was recognized as a major susceptibility in the community that limits choice for acquiring healthy lifestyles. It is also known that mean systolic blood pressure is highest in lower- and middle-income countries, and it has been increasing over years.^{9,10} As it is shown in TABLE 4, we concluded that our respondents' knowledge on some issues of hypertension such as the importance of salt restriction, taking medicine regularly, and physical exercise are quite high (93.3 $\pm$ 2.8).

In terms of determining the limits of hypertension blood pressure (TABLE 3), male respondents know better than female respondents ($p=0.043$). This could be based on proportionally more male respondents have a higher education background than female respondents.

Therapy for hypertension

Rational therapy should be applied in any disease, likewise for hypertension treatment. Guidelines

are used as instructions for doctors so that therapy can be given rationally.¹¹ Initial therapy for mild hypertension is non-pharmacological treatment and monotherapy, and combination therapy will be given if it does not work. The class of hypertension drugs contained in all guidelines are diuretics, angiotensin converting enzyme-inhibitors (ACE-i), angiotensin receptor blockers (ARBs), β -blockers, α -blockers, and spironolactone. These drugs can be given alone or in combination depending on the diagnosis and progressivity of the disease.^{12,13} We asked the respondents which anti-hypertensive drugs do they know, and the answers result was amlodipine was the most answer (highest score), then successively captopril, candesartan, furosemide, HCT, etc. However, some respondents also ticked omega-3, omeprazole, paracetamol, prednisone, and even adrenaline as anti-hypertensive agents (FIGURE 2).

Risk factors and complication of hypertension

Genetic status and lifestyles such as high salt intake, overweight, T2DMT, smoking, and sedentary are known risk factors for hypertension.⁴ FIGURE 3 and 4 shows that most of the respondents the knew risk factors and complications of uncontrolled hypertension. This was also

found by Pirasath *et al.*¹⁴ and Malik *et al.*¹⁵ in hypertension patients. According to Mendelian randomization study high-density lipoprotein cholesterol, triglycerides, BMI, alcohol dependence, insomnia, and educational level as causal risk factors for hypertension.¹⁶ This implies that these modifiable risk factors are important targets in the prevention of hypertension. However, our respondents were not entirely hypertensive patients, therefore, their knowledge of hypertension risk factors is quite high. This can be seen in TABLE 4 since most of the respondents' answers to these questions answered with "yes" were around 93.3 ± 2.8 . The internet may have helped them to obtain the knowledge that they have regarding hypertension risk.¹²

Respondents with hypertension

There were 104 respondents out of 500 who have hypertension, and TABLE 4 showed that the respondents understood the factors that can reduce hypertension. This knowledge is useful to maintain therapeutic adherence to both non-pharmacotherapy and pharmacotherapy. Studies in patients with hypertension also reported that their respondents had knowledge of important hypertension factors and practice for blood pressure control.^{14,15} However, in practice they did not make efforts to get their hypertension under control, such as low levels of drug adherence, not checking weight regularly, not reducing salt intake, and not measuring blood pressure regularly. Although 104 of our 500 respondents were hypertensive patients, our respondents were not inpatients so we could not access their data from the clinic, primary health care center (*Puskesmas*), or hospital.

CONCLUSION

It can be concluded that the respondent's knowledge of hypertension, risk factors, complications that may occur due to hypertension, and treatment

is quite adequate. However, this can happen because 66% of the respondents have a higher education background, therefore it is necessary to conduct research on target respondents who have primary and secondary education.

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