RESEARCH ARTICLE

Profile of Hypertensive Patients in Indonesia National Referral Hospital

Lucky Aziza Bawazir

Department of Internal Medicine, Faculty of Medicine Universitas Indonesia dr. Cipto Mangunkusumo National Hospital, Jakarta, Indonesia

Corresponding author: tyasretno77@yahoo.co.id
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Abstract

Hypertension as a prevalent chronic disease requires lifelong therapy and cost inefficiency. Nephrology and hypertension department outpatient clinic in national referral hospital is often burdened with overwhelming number of patients. This study is aimed to identify the rate of controlled blood pressure and related factors of patients in dr. Cipto Mangunkusumo National Hospital (CMNH). A cross-sectional study was conducted in CMNH. Data were obtained from medical record of patients admitted for hypertension on May to July 2018. Data reviewed include blood pressure, sociodemographic, medication history, comorbidities, and supporting examinations. Among 301 medical record of patients admitted with hypertension, 37.5% of those patients have uncontrolled hypertension. Chi-square test reveals grade II hypertension (OR: 5.46 95% CI 3.03—9.83), low adherence (OR: 2.94 95% CI 1.46—5.92), combination of 3 drugs (OR: 4.80 95% CI 1.18—19.415), CKD grade IIIa (OR: 0.33 95% CI 0.10—1.01), grade IV (OR: 0.22 95% CI 0.80—0.61), and grade V (OR: 0.25 95% CI 0.08—0.70) to be significant difference. Multivariate analysis showed that on linear regression model, grade II hypertension is an independent variable to uncontrolled blood pressure while higher eGFR is a strong predictor of controlled blood pressure.

Keywords: *Indonesia, hypertension, national referral hospital.*

Profil Pasien Hipertensi di Rumah Sakit Rujukan Nasional Indonesia

Abstrak

Hipertensi sebagai penyakit kronik membutuhkan pengobatan seumur hidup dan biaya. Klinik rawat jalan nefrologi dan hipertensi di rumah sakit rujukan nasional sering dibebani dengan jumlah pasien yang sangat banyak. Penelitian ini bertujuan untuk mengidentifikasi tekanan darah terkontrol dan faktor-faktor yang berhubungan dengan pasien di RS Pusat Rujukan Nasional dr. Cipto Mangunkusumo (RSCM). Studi cross-sectional dilakukan di RSCM dengan sumber data dari rekam medis pasien hipertensi yang datang berobat pada bulan Mei hingga Juli 2018 meliputi tekanan darah, sosiodemografi, riwayat pengobatan, komorbiditas, dan pemeriksaan penunjang. Dari 301 catatan medis pasien hipertensi, sebanyak 37,5% pasien menderita hipertensi tidak terkontrol. Uji chi-square menunjukkan perbedaan bermakna pada hipertensi derajat II (OR: 5,46 95% CI 3,03-9,83), kepatuhan rendah (OR: 2,94 95% CI 1,46-55,92), kombinasi 3 obat (OR: 4,80 95% CI 1,18—19,415), CKD derajat IIIa (OR: 0,33 95% CI 0,10-1,01), derajat IV (OR: 0,22 95% CI 0,80-0,61), dan derajat V (OR: 0,25 95% CI 0,08-0,70). Analisis multivariat menunjukkan bahwa pada model regresi linier, hipertensi derajat II merupakan variabel independen terhadap tekanan darah yang tidak terkontrol dan eGFR yang lebih tinggi merupakan prediktor kuat pada tekanan darah terkontrol.

Kata kunci: *Indonesia, hipertensi, rumah sakit rujukan nasional.*

Introduction

Hypertension is a public health issue that has high prevalence and requires lifelong therapy with comprehensive management from lifestyle promotion to medications that can extend to its complications including cardiovascular, cerebrovascular, and end stage renal disease. World Health Organization (WHO) reported that hypertension contributed to 45% and 51% of cardiovascular and stroke-related deaths.[1] In 2013, Ministry of Health of Indonesia[2] reported that in 25.8% of adults has been diagnosed with hypertension. The management of blood pressure extend from primary to tertiary health care with factors influencing the controlled rate of hypertensive patients varied from health behavior in a population to health facility.[3,4]

In Indonesia, multiple studies has been conducted in national scale. One study identifies prevalence reaching 47.8% in adult populations while meta-analysis found 58% of patients with kidney dysfunction were diagnosed with hypertension.[5] There has been limited study on factors influencing controlled rate of hypertension especially in national referral hospital where number of patients admitted are overwhelming. This study aims to find a controlled rate of hypertensive patients and factors associated with it in Indonesia national referral hospital.

Methods

Study Designs

This cross-sectional study was conducted in dr. Cipto Mangunkusumo National Hospital (CMNH), Jakarta. The aim of the study was to identify the prevalence and factors associated with the level of controlled and uncontrolled blood pressure on patients referred and regularly controlled in renal and hypertensive polyclinic. The study used medical record of patients referred and regularly controlled in renal and hypertensive polyclinic on May to July 2018.

This study was approved by Health Research Ethics Committee Faculty of Medicine Universitas Indonesia – CMNH. Patient consent was not required for this study and with all data were anonymized, data collection did not involve any identification and any data that can be associated with any individuals have been discarded.

The subjects include all patients ≥18 years old and diagnosed with hypertension. Subjects who had hypertension but underwent kidney transplantation were excluded. This study reviewed all medical records data that were considered to be risk factors of hypertension: sociodemographic (age, gender, religion, and educational background), health behavior (adherence), body mass index (BMI), medication history, characteristic of hypertension, complications (cardiovascular, cerebrovascular, retinopathy), comorbidities, and supporting examinations. The history of oral therapy was obtained whether the patient has consumed an anti-hypertensive drug for at least the period of one month with later classified patients into three groups. Diagnosis of cardiovascular diseases and complications was obtained through examining doctor notes and history of diagnosis in medical record.

Data Analysis

This study uses chi-square test for analysis of patients' gender, grade of hypertension, thoracic x-ray interpretation, complications, cardiovascular disease, medication adherence, duration of illness, medication history, diuretics, and laboratory values with status of controlled blood pressure. While additional post hoc bivariate analysis with status of controlled blood pressure was conducted for variables >2. In chi-square test, each variable was calculated independently with 95% confidence intervals (CI), odds ratio (OR), and $p<0.05$ indicates significance difference. Variables with $p<0.25$ were included for multivariate analysis using logistic regression model, with prevalence and number of data used adjusted according to sum of data available with laboratory values. The data analysis was performed using IBM Statistical Package for the Social Science (SPSS) Statistics software version 20.

Results

Characteristics of Hypertension

This study includes 301 medical records of patients admitted in renal and hypertension polyclinic. Most patients are male with majority in the age group of 31–60 and above 60 year-old (Table 1).

Table 1. Characteristics of Hypertensive Patients

Characteristics	Frequency
Gender	
Men	168 (55.8%)
Women	133 (44.2%)
Age	
18–30 years old	18 (6%)
31–60 years old	147 (49.2%)
>60 year old	134 (44.8%)
Marital Status	
Not married	40 (13.3%)
Married	248 (82.4%)
Widow(er)	13 (4.3%)
Highest Education Level	
Illiterate/unspecified	66 (21.9%)
Elementary School	12 (4%)
Junior High School	19 (6.3%)
Senior High School	124 (41.2%)
College	80 (26.6%)
Body Mass Index	
Underweight (<18.5 kg/m^2)	15 (5%)
Normal (18.5–22.9 kg/m^2)	155 (51.5%)
Overweight (23–24.9 kg/m^2)	82 (27.2%)
Obese (>25 kg/m^2)	49 (16.3%)
Medication Adherence	
Non-adherent	38 (12.6%)
Adherent	263 (87.4%)

Among all patients, 188 (62.5%) have controlled blood pressure while 113 (37.5%) patients have uncontrolled blood pressure. Based on JNC 2013 guidelines, 234 (77.7%) patients were classified as grade I hypertension and 67 (23.3%). Most of the patients (87.4%) have good adherence to medication and routinely control to polyclinic for regular checkup.

The data of duration of illness conducted by history taking and referral note provided in medical record, however not all patients reported date of diagnosis of hypertension. There are 196 patients who have date of diagnosis; 69.9% of them had hypertension <10 years (Table 2).

Table 2. Hypertension Characteristics of the Patients

Characteristics	Frequency
Controlled	
Controlled	188 (62.5%)
Uncontrolled	113 (37.5%)
Grade of Hypertension	
Grade I	234 (77.7%)
Grade II	67 (22.3%)
Duration of Illness	
<10 years	137 (69.9%)
≥10 years`	59 (30.1%)
Cardiovascular Disease (CVD)	
Diagnosed with CVD	258 (85.7%)
Without CVD	43 (14.3%)
Complications	
Present	214 (71.1%)
Not present	87 (28.9%)

Medication History

Majority (62.1%) of patients received calcium channel blocker (CCB) followed by angiotensin receptors blocker/ARB (56.5%) patients. Most patients receive two combinations of anti-hypertensive (42.2%) or one drug antihypertensive (38.2%), while 44 (14.6%) patients receive three combinations of anti-hypertensive (Table 3).

Table 3. Medications Summary of Hypertensive Patients

Medications	Frequency
ACE-Inhibitor	
Yes	56 (18.6%)
No	245 (81.4%)
CCB	
Yes	187 (62.1%)
No	114 (37.9%)
Diuretic	
Yes	32 (10.6%)
No	269 (89.4%)
Beta Blocker	
Yes	51 (16.9%)
No	250 (83.1%)
Alpha Blockers	
Yes	17 (5.6%)
No	284 (94.4%)
Angiotensin Receptors Blocker	
Yes	170 (56.5%)
No	131 (43.5%)
Combination of Therapy	
No medication	15 (5.0%)
One drug medication	115 (38.2%)
Two drugs medication	127 (42.2%)
Three drugs medication	44 (14.6%)

Supporting Examinations of Hypertensive Patients

From 301 medical records of patients were featured with thoracic x-ray and radiologist interpretation; 66 (21.9%) of these patients have left ventricular hypertrophy. Among 275 patients there are 45.5% anemic patients, 8.8% patients with thrombocytopenia, 0.2% have leukopenia, and 21.2% have leukocytosis indicating current infection. Among 178 patients, there are 64 (35.6%) patients who have hypercholesterolemia. There are 66 (36.2%) patients who have abnormal/low HDL value among 182 patients. From 184 patients, 73.9% have elevated LDL, while in 164 patients with triglyceride 34.8% have hypertriglyceridemia. From 280 medical records with kidney function test, 272 of them comprised of ureum values with 35.7% have elevated ureum.

Among those 280 patients, 66.8% have elevated creatinine value.

Table 4 shows there are 12.1% of patients who are not diagnosed with CKD, while most of those patients are diagnosed with CKD stage IV (20.3%) or CKD stage II (20.3%).

Table 4. Supporting Examinations of Hypertensive Patients

Supporting Examinations	Frequency
Hemoglobin	
Anemia (<12 mg/dl)	125 (45.5%)
Normal	150 (54.5%)
Thrombocyte	
Thrombocytopenia (<150.000 mg/dl)	24 (8.8%)
Normal	251 (91.2%)
Leukocyte	
Leukocytopenia (<4000 mg/dl)	3 (0.2%)
Normal	212 (78.6%)
Leukocytosis (>10.000 mg/dl)	58 (21.2%)
Total Cholesterol	
Hypercholesterolemia (≥200 mg/dl)	64 (35.6%)
Normal	114 (64.4%)
HDL	
Low HDL (<40 mg/dl)	66 (36.2%)
Normal	116 (63.8%)
LDL	
Elevated LDL (≥100 mg/dl)	136 (73.9%)
Normal	48 (26.1%)
Triglyceride	
Elevated triglyceride (≥150 mg/dl)	57 (34.8%)
Normal	107 (65.2%)
Ureum	
Elevated ureum (>50 mg/dl)	97 (35.7%)
Normal	175 (64.3%)
Creatinine	
Elevated creatinine (>1.20 mg/dl)	187 (66.8%)
Normal	93 (33.2%)
eGFR	
Non-CKD	34 (12.1%)
CKD I	2 (0.8%)
CKD II	57 (20.3%)
CKD IIIa	33 (11.8%)
CKD IIIb	45 (16.1%)
CKD IV	57 (20.3%)
CKD V	52 (18.6%)
Thoracic X-ray	
Left ventricular hypertrophy	66 (21.9%)
Normal	235 (78.1%)

*p-value less than 0.25 to be included in multivariate analysis
**p-value less than 0.05

Determinants Controlled Status of Hypertension

For bivariate post hoc analysis of age group and educational background, this study used age of 18–30 yo and college educated as a comparative group. There was no association between gender, age, and education level with controlled status of hypertension (Table 5).

Table 5. The Association between Uncontrolled and Controlled Blood Pressure with Sociodemographic Factor

Sociodemographic Factor	Blood Pressure		p	OR (95% CI)
	Uncontrolled	Controlled		
Gender				
Men	63 (20.9%)	105 (34.9%)	0.987	1.00 (0.62—1.60)
Women	83 (27.6%)	50 (16.6%)		
Age				
18–30 years old	6 (2%)	12 (4%)		
31–60 years old	92 (30.8%)	55 (18.4%)	0.735	1.19 (0.42—3.36)
>60 year old	51 (17.1%)	83 (27.7%)	0.697	1.22 (0.43—3.47)
Education				
Illiterate/unspecified	29 (9.6%)	37 (12.3%)	0.270	0.68 (0.35—1.34)
Elementary School	6 (2%)	6 (2%)	0.315	0.53 (0.15—1.82)
Junior High School	6 (2%)	13 (4.3%)	0.778	1.16 (0.40—3.40)
Senior High School	44 (14.6%)	80 (26.6%)	0.944	0.97 (0.54—1.76)
College	28 (9.3%)	52 (17.3%)		
Body Mass Index				
Underweight	5 (1.7%)	10 (3.3%)	0.648	1.29 (0.42—3.98)
Normal	61 (20.3%)	94 (31.2%)		
Overweight	30 (10%)	52 (17.3%)	0.677	0.88 (0.51—1.54)
Obese	17 (5.7%)	32 (10.6%)	0.558	0.81 (0.41—1.60)
Grade of Hypertension				
Grade I	67 (22.3%)	167 (55.5%)		
Grade II	46 (15.3%)	21 (7%)	<0.01**	5.46 (3.03—9.83)
Complications				
Complicated	90 (29.9%)	124 (41.2%)	0.11*	0.49 (0.28—0.85)
Non complication	23 (7.6%)	64 (21.3%)		
Cardiovascular Disease				
Diagnosed	165 (54.8%)	93 (30.9%)	0.234*	1.54 (0.80—2.95)
Without	23 (7.6%)	20 (6.6%)		
Medication Adherence				
Non-adherent	90 (29.9%)	173 (57.5%)	<0.01**	2.94 (1.46—5.92)
Adherent	23 (7.6%)	15 (5%)		
Duration of Illness				
≥10 years	49 (25.0%)	88 (44.9%)	0.83	1.06 (0.56-2.01)
<10 year	22 (11.2%)	37 (18.9%)		
Combination of therapy				
No Medication	3 (1%)	12 (4%)		
1 drug medication	36 (12%)	79 (26.2%)	0.369	1.82 (0.48—6.58)
2 drugs medication	50 (16.6%)	77 (25.6%)	0.142	2.59 (0.69—9.66)
3 drugs medication	24 (8%)	20 (6.6%)	0.020**	4.80 (1.18—19.415)

The post hoc analysis of BMI using normal BMI as comparative group found there is no association between abnormal BMI and controlled blood pressure. Bivariate analysis of grading of hypertension and adherence found association with controlled status of blood pressure ($p<0.05$). Complications, diagnosed with cardiovascular diseases and duration of illness have no association. In medication history, patients received 3 combinations of anti-hypertensive therapy have association ($p=0.020$) with uncontrolled blood pressure (Table 6).

Table 6. The Association between Uncontrolled and Controlled Blood Pressure with Supporting Examinations

Supporting Examinations	Blood Pressure		p	OR (95% CI)
	Uncontrolled	Controlled		
Thoracic X-ray				
LVH	27 (9%)	39 (13%)	0.523	0.83 (0.47—1.45)
Normal	86 (28.6%)	149 (49.5%)		
Total Cholesterol				
Hypercholesterolemia (≥200 mg/dl)	42 (23.6%)	72 (40.4%)	0.93	1.02 (0.54—1.93)
Normal	24 (13.5%)	40 (22.5%)		
HDL				
Low HDL (<40 mg/dl)	29 (15.9%)	37 (20.3%)	0.13*	0.62 (0.33—1.15)
Normal	38 (20.9%)	78 (42.9%)		
LDL				
Elevated LDL (≥100 mg/dl)	16 (8.7%)	32 (17.4%)	0.67	1.16 (0.58—2.328)
Normal	86 (46.7%)	50 (27.2%)		
Triglyceride				
Elevated triglyceride (≥150 mg/dl)	34 (20.7%)	73 (44.5%)	0.18*	1.56 (0.80—3.03)
Normal	24 (14.6%)	33 (20.1%)		
Creatinine				
Elevated creatinine	80 (28.6%)	107 (38.2%)	0.02**	2.41 (1.37—4.22)
Normal	22 (7.9%)	71 (25.4%)		
Ureum				
Elevated ureum	54 (19.9%)	43 (15.8%)	0.043**	1.69 (1.01—2.82)
Normal	119 (43.8%)	56 (20.6%)		
Hemoglobin				
Anemia	50 (18.2%)	75 (27.3%)	0.362	0.79 (0.48—1.30)
Normal	52 (18.9%)	98 (35.6%)		
Thrombocyte				
Thrombocytopenia	8 (2.9%)	16 (5.8%)	0.690	1.19 (0.49—2.90)
Normal	94 (34.2%)	157 (57.1%)		
Leukocyte				
Leukocytosis	20 (7.3%)	38 (13.9%)	0.697	0.88 (0.48—1.62)
Leukopenia	2 (0.7)	1 (0.4%)	0.297	0.29 (0.27—3.32)
Normal	79 (28.9%)	133 (48.7%)		
eGFR				
Non-CKD	6 (2.1%)	28 (10)		
CKD I	1 (0.4%)	1 (0.4)	0.261	0.21 (0.01—3.92)
CKD II	14 (5%)	43 (15.4)	0.441	0.65 (0.22—1.91)
CKD IIIa	13 (4.6%)	20 (7.1%)	0.048**	0.33 (0.10—1.01)
CKD IIIb	16 (5.7%)	29 (10.4%)	0.079	0.38 (0.13—1.13)
CKD IV	28 (10%)	29 (10.4%)	<0.01**	0.22 (0.08—0.61)
CKD V	24 (8.6%)	28 (10%)	<0.01**	0.25 (0.08—0.70)

*p-value less than 0.25 to be included in multivariate analysis
**p-value less than 0.05

In the analysis of supporting examination including laboratory examination available with exclusion of medical record with incomplete data. There is no association on routine blood examination (hemoglobin, thrombocyte, and leukocyte) and lipid profile (total cholesterol, HDL level, LDL level, and triglyceride) with controlled blood pressure. Kidney function test based on ureum, creatinine, and eGFR had association between elevated creatinine, elevated ureum, and CKD stage IIIa/IV/V with blood pressure. Further analysis with linear regression model reveals grade II hypertension and eGFR value were associated with regulation of blood pressure and higher eGFR shown protective effect (Table 7).

Table 7. Multivariate Analysis of Variables

Variables	Coefficient β	p
Hypertension grade II	0.36	<0.001
Hypertension with complications	-0.02	0.751
Cardiovascular disease	0.03	0.696
Combination of 3 drugs	-0.06	0.517
Low HDL	0.09	0.181
Hypertriglyceridemia	-0.04	0.960
Elevated creatinine	-0.01	0.840
Elevated ureum	0.01	0.804
eGFR	-0.002	0.029*

Discussion

Controlled and Uncontrolled Blood Pressure

Renal and hypertension polyclinic of is one of the polyclinic with the most patients throughout the day reaching to 70–80 and peaked into 100 patients in the busiest day. The result in this study is conflicted with several studies where uncontrolled blood pressure was found in majority of the cases such as in Kenya[6] and Uganda[7] with proportion of respectively 43.4% and 26.7% of controlled blood pressure. However, this finding should be noted that most patients that are included in this study has been regularly registered in the hospital and it is similar to a study conducted in Ethiopia university referral hospital[8] where after sixth visit, the proportion of controlled blood pressure increased to 51.4% among total patients.

Demographic Background of Study Population

This study found that the proportions of individuals in term of age and gender are slightly dominated by adult men with following large number of elder patients. Demographically the population in this study is educated with more than half of population is graduated from senior high school or college educated. These descriptive findings of population demographic can be varied, in studies conducted in Uganda and Kenya national referral hospital most of the individuals in study population are female and elderly.[7,8]

Overweight and Obesity

Weight and BMI as modifiable risk factor for occurrence of several non-communicable diseases including hypertension has been ubiquitous in many studies (a study by Tuan et al[9] assessing relationship between BMI and hypertension in Asian ethnicities with Indonesian included). The study found that each increase in unit of BMI is associated with increased hypertension prevalence ratio of 8% in women and 12% in men. In addition, multiple studies concluded that the prevalence of prehypertension and hypertension is high among adult population with overweight and obese BMI.[10,11]

In the perspective of controlled vs uncontrolled blood pressure, the finding in this study was contrast to multiple studies. Liang et al[11] reported blood pressure control failure rate was higher in patients with elevated BMI (gender and age were adjusted). A study in Ethiopia that was mentioned before also found obesity play a significant factor in controlling blood pressure. However, study conducted by Saito et al[12] found that when dividing population to different group based on BMI there was no significant difference except in intensity or combination of therapy given in patients with elevated BMI was stronger than patients with lower BMI. This finding should also be noted that there are small number of patients included in this study have underweight BMI in which malnutrition factor might be influenced by low socioeconomic background often found in national referral hospital across developing countries. BMI should also not be considered to be vital in this study population, where cofounding factors such as cardiovascular disease and CKD were prevalent and fluid overload that create bias on measuring weight and BMI might occurred throughout study population.

Grade of Hypertension

Unexpected result can be found where majority of patients that regularly admitted to national referral hospital have grade I hypertension (77.7%). There were very few studies analyzing the grade of hypertension, however similar result was found in Zimbabwe study[13] where the proportion of study population has grade I hypertension. The used of guidelines should also be noted when comparing this result of grading, several studies in different countries used different guidelines in diagnosis of hypertension. In previously mentioned study in Zimbabwe, the author used British Society of hypertension and multiple studies previously mentioned in this study also used different guidelines differ than JNC 8. This should be an important note presented in this study because of changing and differences in grading of hypertension in each guideline, majority of patients in study population might fall in different grade of hypertension resulting in different intensity of given treatment.

Grade of hypertension is found to be statistically significant in regulation of blood pressure. This finding was supported by Rowan et al[14] study where patients with grade II hypertension and/or systolic blood pressure >160 are unlikely to reach blood pressure

goal. This study does not restrict variables that might cofounded this analysis since patients with grade II hypertension might be influenced by complications such as CKD and cardiovascular diseases.

Adherence

Majority of patients included in this study had hypertension less than 10 years (69.9%) and have good adherence with scheduled date of checkup and anti-hypertensive drugs. The association between adherence and controlled blood pressure has been observed in multiple studies. Piercefield et al[15] concluded that when the proportion of overall majority of adherence to anti-hypertensive is high the rate of controlled blood pressure is also high. This result is not always consistent with another study, a cross-sectional study found that adherence does not always play a key role in achieving target blood pressure. Confounding factors such as comorbidities and complications play bigger role while also found that patients who were diagnosed with multi-morbidities have lower adherence.[16]

Comorbidities

National referral hospital as a tertiary level of hospital receiving patients from all over countries has higher possibility in having patients with complicated disease, as shown in the result with majority of patients have complications and diagnosed with cardiovascular disease; 71.1% and 85.7% respectively. Even though there is no association between these two variables, there are greater number of uncontrolled blood pressure in patients who were diagnosed with cardiovascular disease. Evidence shows multiple variables influencing control of blood pressure in patients with cardiovascular disease includes the use of more than one anti-hypertensive drugs and lipid profiles.[17] The observational PREseAP study[18] found that 52% of patients receiving anti-hypertensive medication with complications have poor control of blood pressure due to factors like obesity and increased age that play bigger role in the regulation of blood pressure.

Medication History

Majority of patients admitted in CMNH received CCB (62.1%) followed by ARB (56.5%) and most patients received one anti-hypertensive (38.2%) and combination of two anti-hypertensive drugs (42.2%). Patients who received combination of three drugs were associated with uncontrolled blood pressure. The results of anti-hypertensive drugs used in previous studies similar, in Uganda[8] for example the most commonly prescribed anti-hypertensive is ACE-I/ARB and CCB, in Cameroon it is CCB followed by ACE-I. In developed countries, the results are also similar in a study conducted in Alabama, USA where the most commonly prescribed is ACE-I followed by CCB.[19]

Previous studies conducted has been conflicted when comparing the use of amlodipine (CCB), multiple trials found that in lowering blood pressure; CCB is not superior compared to ACE-I and combination of other drugs. Previous study reviewing multiple clinical trials in comparing amlodipine and other drugs found that amlodipine alone might not show superiority in controlling blood pressure, but combination involving amlodipine (CCB) shown to be effective in reducing hospitalization and organ protection therefore reducing the risk of other adverse events complicating control of blood pressure.[20]

In combination of therapy, several clinical trials that have been previously mentioned before found that combination of two drugs are effective. In CANDIA trial, combination of ARB and diuretic are effective in maintaining blood pressure as well as high adherence in patients resulting in long-term control of blood pressure.[21] Yet when combination of more than two or notably consumption of three anti-hypertensive drugs were given, the benefit is diminished in maintaining blood pressure and low adherence is reported.[18] The availability of anti-hypertensive is often one of the reason of referral to secondary and tertiary hospital due to limitation in provision of drugs including extended anti-hypertensive drugs.

Supporting Examinations

This study faces limitations in evaluating laboratory values due to incomplete data presented in medical record. Abnormal complete blood examination and lipid profile was not significant in controlling blood pressure. This data shown to be conflicted compared to previous study. Gebrie et al[22] reported that patients with uncontrolled blood pressure have higher median of total cholesterol and LDL. In addition, when gender is adjusted there are associations between elevated total cholesterol in males and triglyceride in female with uncontrolled blood pressure while highlighted the increased of all lipid profile beyond cut-off value in hypertensive patients especially in uncontrolled blood pressure. The study found the trend of lipid profile featured in included patients to be difficult to associate due to limitations in number of included medical records featuring laboratory values as well as weakness in CMNH registry.

Majority of patients included in this study are diagnosed with CKD with only 34 patients (12.1%) are free from CKD. Bivariate analysis found that separated elevated ureum, elevated creatinine, and CKD stage IIIa, IV, and V to be significantly associated with uncontrolled blood pressure, while further analysis of linear regression found that higher eGFR shows protective effect to controlled blood pressure. This study result is in concordance with a previous prospective multicenter study that studied patients with CKD and type 2 diabetes mellitus. This previous study described fewer proportion of only 14.3% patients reached blood pressure of <130/80 mmHg and after 2 years follow up the number increase up to 38.8% patients reached blood pressure <140/90 mmHg. The goals of maintaining blood pressure in patients with CKD have been featured in guidelines including JNC 8 and KDIGO, however challenges still observed in multiple cases of CKD. A review of guidelines in maintaining blood pressure among patients with CKD mentioned that study with large population of CKD found no difference in incidence of mortality when comparing controlled and uncontrolled blood pressure.[23,24]

Conclusion

There are greater proportion of hypertensive patients with controlled blood pressure and patients with grade I hypertension while also highlighting the majority of patients in this study are diagnosed with cardiovascular diseases, CKD, or other complications. This finding is aimed to help regulate the overwhelming number of patients admitted in nephrology and hypertensive department outpatient clinic of Indonesia referral hospital, by recommending that patients who can conduct regular control of hypertension who do not need diuretics, hemodialysis, and grade II hypertension can be referred to primary to secondary health.

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