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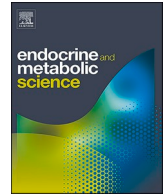
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Full length article



Clinical profile of hypertension patients in primary health Care in Cirebon Regency, Indonesia

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ABSTRACT

Introduction: Hypertension is a catastrophic non-communicable disease increasing in prevalence globally. This study aimed to assess the clinical profile of hypertensive patients in primary health care services in Cirebon Regency, Indonesia.

Method: This descriptive study employed a purposive sampling method, recruiting 97 adult patients diagnosed with essential hypertension at the Talun Community Health Center, Cirebon Regency, West Java, from November 2023 to February 2024. Patients with secondary hypertension or hypertension in pregnancy were excluded. Data were collected through questionnaires, blood pressure measurements, and analysis of blood and urine samples. The clinical profile included family history, control status of hypertension, lifestyle factors, cardiometabolic parameters, and mental health status. Lifestyle factors encompassed both dietary habits and physical activity levels. Cardiometabolic parameters included body mass index (BMI), HbA1c, lipid profile, kidney function, and electrocardiogram. Mental health status was measured using the Depression Anxiety Stress Scales (DAAS). Univariate analysis was stated in frequencies, mean, or median.

Results: The mean age of the participants was 51.33 (± 1.07) years, predominantly female (84.54 %). Subjects with a family history of hypertension were 52.58 %, and 75.3 % had uncontrolled blood pressure. Most subjects (79.17 %) engaged in light daily physical activity, while only 4.2 % reported excessive sodium intake. The average BMI was 26.04 kg/m², with 35.5 % classified as class 1 obese. Additionally, 12.4 % of subjects had diabetes mellitus, 41.2 % were prediabetic, and 80.41 % had dyslipidemia. Albuminuria was detected in 54.6 % of participants, and 7.2 % showed evidence of left ventricular hypertrophy. Regarding mental health, 37.50 % experienced anxiety, 8.33 % reported stress, and 4.17 % suffered from depression.

Conclusion: The findings indicate a significant proportion of hypertensive patients in primary health care in Cirebon Regency have uncontrolled blood pressure. Sedentary lifestyle, obesity, dyslipidemia, albuminuria, and prediabetes were prevalent among these patients. Moreover, anxiety affected more than a third of the studied subjects, highlighting the need for comprehensive management strategies for managing hypertensive patients.

Main Points

- A substantial portion of hypertensive patients in primary health care in Cirebon Regency struggle to maintain controlled blood pressure,

with many leading sedentary lifestyles and having inadequate dietary habits

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- Patients exhibit common cardiometabolic risk factors, such as obesity, dyslipidemia, prediabetes, diabetes, and impaired kidney function
- Anxiety was the most common mental health challenge among hypertensive patients.

1. Introduction

Hypertension is a non-communicable disease characterized by an increase in systolic blood pressure of 140 mmHg or higher and/or a diastolic blood pressure of 90 mmHg or higher based on two separate measurements (Unger et al., 2020). According to the World Health Organization (WHO), 1.3 billion people worldwide were diagnosed with hypertension in 2019 (World Health Organization, 2023). Southeast Asia ranks as the third-highest region globally for hypertension prevalence, with 1 in 4 men and 1 in 5 women affected (World Health Organization, 2023). In Indonesia, data from the National Basic Health Research (RISKESDAS) revealed a significant rise from 25.8 % in hypertension prevalence, 2013 to 34.11 % in 2018 (Indonesian Ministry of Health, 2013, 2018).

Hypertension emerges as a substantial global health concern, being the leading cause of cardiovascular diseases such as stroke, ischemic heart disease, and mortality (World Health Organization, 2023). It is often referred to as a silent killer since most individuals with hypertension remain unaware of their condition due to the lack of symptoms or recognizable indicators. Data from the WHO indicates that nearly 46 % of individuals with hypertension are unaware of their condition, contributing to the complications of diagnosis and management (World Health Organization, 2023). Furthermore, significant gaps persist in the diagnosis and management of hypertension, with only half of cases being diagnosed globally and the treatment reaching 4 in 10 patients worldwide (World Health Organization, 2023).

Given the substantial impact of hypertension on morbidity and mortality, it is crucial to understand the real-world situation among hypertensive patients, especially in resource-limited settings in developing countries. This study aims to explore the clinical profile of hypertensive patients in the primary health care setting in Cirebon Regency, Indonesia. Eventually, it also seeks to enhance hypertension awareness and management among frontline healthcare workers in healthcare facilities.

2. Materials and methods

2.1. Research participants

This study was conducted at the Talun Community Health Center from November 2023 to February 2024. A purposive sampling method was applied, and a total of 97 subjects were recruited. The inclusion criteria were adult patients aged over 18 years who were diagnosed with essential hypertension, defined as a systolic blood pressure of 140 mmHg or higher and/or diastolic pressure of 90 mmHg or higher without secondary causes. Patients with hypertensive heart disease or previously diagnosed with hypertension and those who were receiving antihypertensive therapy in 2023–2024 were included. The exclusion criteria encompassed patients with secondary hypertension and those who experienced hypertension during pregnancy. This study received ethical approval from the Health Research Ethics Committee, Faculty of Medicine, Universitas Indonesia - Cipto Mangunkusumo National Central General Hospital with the registration number of KET-972/UN2-F1/ETIK/PPM.00.02/2022.

2.2. Data Collection and research outcomes

Data was collected through questionnaires, performing blood pressure measurements, electrocardiogram (ECG) examination, and body fluid sampling involving blood and urine. The questionnaires gathered

demographic characteristics, including age, gender, and ethnicity. The clinical profile assessed in this study encompassed family history of hypertension, comorbidities, control status of hypertension, lifestyle factors, cardiometabolic parameters, and mental health status. To investigate the family history of hypertension, participants were asked about the presence of previously diagnosed hypertension among three generations of relatives, including parents, grandparents, and siblings. In this study, comorbidities were defined as previous diagnoses of diabetes mellitus. The control status of hypertension was based on blood pressure examination. A blood pressure examination was performed utilizing an Omron® HEM-7156AT blood pressure monitor. Controlled blood pressure was identified if systolic blood pressure is equal to or <140 mmHg and diastolic blood pressure is equal to or less than <90 mmHg (Unger et al., 2020).

Cardiometabolic parameters assessed in this study included anthropometric status, HbA1c, lipid profile, kidney function, urinalysis, and ECG. The anthropometric status was determined based on body mass index (BMI) and waist circumference. BMI was classified based on Asia-Pacific criteria (in kg/m²) as underweight (<18.5), normal (18.5–22.9), overweight (23.0–24.9), obese I (25.0–29.9), and obese II (>30) (World Health Organization, 2000). Waist circumference was measured at the level of the iliac crest (in cm), with abdominal obesity defined as a waist circumference of >90 cm for men and > 85 cm for women (Ross et al., 2020). The measurement of HbA1c was performed using the HPLC ion exchange method following the standards of the National Glycohemoglobin Standardization Program. HbA1c levels were interpreted as follows: normal if HbA1c <5.7 %, prediabetes if HbA1c 5.7–6.4 %, and diabetes if HbA1c >6.5 % (Soelistijo et al., 2021). Lipid profile examination includes total cholesterol, LDL, HDL, and triglyceride levels. Dyslipidaemia was defined as total cholesterol >200 mg/dl, LDL >130 mg/dl, HDL <40 mg/dl, and/or triglycerides >150 mg/dl (Aman et al., 2021). Kidney function tests comprised the measurement of urea, creatinine, estimated glomerular filtration rate (eGFR), and albuminuria. Renal dysfunction was defined as an eGFR <90 ml/min per 1.73m² and/or the presence of micro-/macroalbuminuria (Stevens et al., 2024). The electrocardiogram was performed to evaluate left ventricular hypertrophy (LVH) by using the Sokolov-Lyon criteria.

Lifestyle factors in this study include dietary patterns, physical activity, and smoking status. Dietary patterns were assessed using the multiple-pass 24-h recall method conducted over 3 consecutive days for 24 subjects. The assessment was compared against the recommended dietary allowance (RDA) according to age. Physical activity was measured using a Physical Activity Level (PAL) questionnaire administered for the same duration and number of subjects. The PAL questionnaire categorized physical activity into very light, light, moderate, and vigorous. In this study, a sedentary lifestyle was defined as subjects with very light or light activities. Smoking status was assessed based on smoking history, which was classified into not smoking, smoking and quitting smoking for >10 years, smoking 1–3 cigarettes per day, smoking 1–2 packs per day, and using electronic cigarettes.

Mental health status was assessed using the validated Depression Anxiety Stress Scale (DAAS 42) in the Indonesian language. This examination was performed among 24 subjects to identify the presence of any negative emotion, including depression, anxiety, or stress. If any negative emotion was identified, its severity was subsequently measured.

2.3. Statistical analysis

Data analysis in this study used univariate analysis in the frequency and mean of data (mean value with standard deviation or median value with minimum-maximum data value). Data analysis is presented in tabular form. A chi-square test was performed to evaluate the relationship between two categorical variables.

3. Results

The demographic characteristics of the studied subjects are presented in [Table 1](#). The mean age of the subjects in this study was 51.3 (SD 1.1) years. Most of the subjects in this study were female (84.5 %). The most common ethnic groups are Javanese (73.2 %), Sundanese (15.5 %), and Javanese-Sundanese (9.3 %).

The clinical profile of the subjects included a family history of hypertension, status of diabetes mellitus, and hypertension control status as depicted in [Table 2](#). A total of 52.58 % of subjects reported a family history of hypertension. The majority (87.6 %) did not have a prior diagnosis of diabetes mellitus as a comorbidity. Additionally, nearly 90 % of the subjects admitted that they did not smoke during the study period. The median systolic blood pressure in this study was 154 mmHg, ranging from 114 to 213 mmHg, while the median diastolic pressure was 92 mmHg (range: 69–139 mmHg). Notably, over 75 % of the subjects had uncontrolled hypertension.

The dietary profile of the studied subjects is presented in [Table 3](#). This study showed that all subjects consumed food with a mean energy intake of 998.7 kcal (SD 365.2 kcal), especially carbohydrate intake with a median of 107.0 g (52.9–236.3 g) and protein intake with a mean of 38.3 g (SD 16.1). Only 4.2 % of subjects consumed excess sodium.

The physical activity profile is shown in [Table 4](#). Based on the classification of the PAL questionnaire, the majority of subjects had light activity (79.2 %), followed by very light activity (8.3 %) and moderate activity (8.3 %). Among all of them, 87.5 % of subjects were identified as having a sedentary lifestyle.

The cardiometabolic profile of the subjects, as presented in [Table 5](#), included anthropometric status, HbA1c, lipid profile, kidney function, urinalysis, and ECG findings. The median height was 152 cm (range: 145–178 cm), with a mean weight of 63.04 kg (SD 1 kg). Most of the subjects were classified as obese 1 (35.1 %) with a mean BMI of 26.0 kg/m² (SD 4.0 kg/m²). The relationship between BMI and hypertension was evaluated, showing that obese patients were more likely to have hypertension (OR = 1.63, *p* = 0.48). However, this relationship needs to be confirmed in a larger population, as this study's lack of statistical significance may be due to the small sample size. The average waist circumference was 93.0 cm for men and 90.0 cm for women. Abdominal obesity was observed in 39.2 % of the subjects, with a higher proportion in females than in males (40.2 % vs. 30.0 %). Diabetes mellitus was present in 12 % of the subjects, while prediabetes was more prevalent (41.2 %). The most common features of dyslipidemia were increased LDL (80.4 %), followed by increased total cholesterol (62.8 %), and hypertriglyceridemia (47.4 %). Renal dysfunction was detected in 21.7 % of subjects based on eGFR criteria and was more prevalent when assessed by albuminuria criteria (54.6 %). Additionally, the feature of LVH was identified in <10 %.

BMI = body mass index; ECG = electrocardiogram; eGFR = estimated glomerular filtration rate; HbA1c = hemoglobin A1c; HDL = high-density lipoprotein; LDL = low-density lipoprotein; LVH = left ventricular hypertrophy.

Table 1
Baseline characteristics.

Variable	Frequency	Percentage
Age (years)		
18–59	75	77.3
>60	22	22.7
Sex		
Female	82	84.5
Male	15	15.5
Ethnicity		
Acehnese	1	1.0
Javanese	71	73.2
Java-Sundanese	9	9.3
Sumatran	1	1.0
Sundanese	15	15.5

Table 2

The profile of family history, comorbidity, smoking status, and control status of hypertension.

Variable	Frequency	Percentage
Family history of hypertension		
No	46	47.4
Yes	51	52.6
Status of diabetes mellitus		
No	85	87.6
Yes	12	12.4
Smoking		
No	87	89.7
Yes (Stopped >10 years)	2	2.1
Yes (1–3 sticks daily)	2	2.1
Yes (1–2 packs daily)	5	5.2
Electronic Cigarette/Vape	1	1.0
Control status of hypertension		
Uncontrolled	73	75.3
Controlled	24	24.7

Table 3

Profile of dietary intake (*n* = 24).

Variables	Mean (SD)/Median (min-max)	Frequency (%)	
		Deficient	Over
Energy (kcal)	998.7 (365.2)	24 (100)	0 (0)
Protein (g)	38.3 (16.1)	24 (100)	0 (0)
Fat (g)	42.5 (20.9)	16 (66.7)	8 (33.3)
Carbohydrate (g)*	107.0 (52.9–236.3)	24 (100)	0 (0)
Sodium (mg)	574.6 (414.1)	23 (95.8)	1 (4.2)
PUFA (g)*	6.2 (1.8–29.8)	0 (0)	24 (100)
Cholesterol (mg)	158.8 (111.7)	22 (91.7)	2 (8.3)
Vitamin A (mg)*	268.8 (35.7–3312.5)	18 (75.0)	6 (25.0)
Carotene (mg)*	0.0 (0.0–4.3)	24 (100)	0 (0)
Vitamin E (mg)*	2.2 (0.6–11.5)	24 (100)	0 (0)
Vitamin B1 (mg)*	0.3 (0.1–1.2)	23 (95.8)	1 (4.2)
Vitamin B2 (mg)*	0.4 (0.2–1.2)	24 (100)	0 (0)
Vitamin B6 (mg)*	0.5 (0.2–2.1)	23 (95.8)	1 (4.2)
Vitamin C (mg)*	18.2 (1.3–147.2)	21 (87.5)	3 (12.5)
Potassium (mg)*	804.75 (484.9–7116.9)	22 (91.7)	2 (8.3)
Calcium (mg)*	179.6 (51.8–834.9)	24 (100)	0 (0)
Magnesium (mg)*	127.7 (74.4–813.0)	21 (87.5)	3 (12.5)
Phosphorus (mg)	395.7 (125.1–1300.5)	22 (91.7)	2 (8.3)
Iron (mg)	4.2 (1.6–29.8)	22 (91.7)	2 (8.3)
Zinc (mg)	3.3 (0.9–10.0)	24 (100)	0 (0)

PUFA: Polyunsaturated fatty acid.

Table 4

The profile of physical activity (*n* = 24).

Variable	Frequency	Percentage
Physical activity		
Very Light	2	8,3
Light	19	79,2
Moderate	2	8,3
Vigorous	1	4,2

The mental health status in this study is shown in [Table 6](#). Anxiety ranked the highest issue in this study (37.5 %), followed by stress (8.4 %), and depression (4.17 %). There were no subjects who experienced very severe or severe depression, anxiety, and stress in this study.

4. Discussion

This study assessed the clinical profile of patients with hypertension at the Talun Community Health Center, Cirebon Regency, Indonesia. The results indicated that the majority of individuals with hypertension were women, with the largest age group being 18–60 years. The findings on age and gender distribution of hypertension varied across studies. Similarly, [Sulistiawati et al. \(2020\)](#) reported that the majority of

Table 5
The profile of cardiometabolic parameter.

Variable	Mean (SD) / Median (Min-Max)	Frequency	Percentage
Body mass index (BMI)	26.0 (4,0)		
Underweight		4	4.1
Normal		15	15.5
Overweight		13	13.4
Obese I		34	35.1
Obese II		31	31.9
Waist Circumference (Male)			
Abdominal obesity		5	30.0
Normal		10	70.0
Waist Circumference (Female)			
Abdominal obesity		33	40.2
Normal		49	59.8
HbA1c*	5.6 (4.7–11.2)		
Diabetes		12	12.4
Prediabetes		40	41.2
Normal		45	46.4
Lipid Profile			
Total cholesterol	222.5 (4.1)		
Dyslipidaemia		61	62.8
Normal		36	37.2
LDL	143.7 (3.4)		
Dyslipidaemia		78	80.4
Normal		19	19.6
HDL	57 (10.9)		
Dyslipidaemia		6	6.2
Normal		91	93.8
Triglyceride	159.7 (66.9)		
Dyslipidaemia		46	47.4
Normal		51	52.6
eGFR	78.4 (2.1)		
Renal dysfunction		21	21.7
Normal		76	78.3
Albuminuria			
Yes		53	54.6
No		44	45.4
ECG			
LVH		7	7.2
No LVH		90	92.8

* Median (min-max).

Table 6
The profile of mental health status ($n = 24$).

Variable	Frequency	Percentage
Depression		
Normal	23	95,8
Mild	1	4,2
Moderate	0	0
Severe	0	0
Very Severe	0	0
Anxiety		
Normal	15	62,5
Mild	5	20,8
Moderate	3	12,5
Severe	1	4,2
Very Severe	0	0
Stress		
Normal	22	91,6
Mild	1	4,2
Moderate	1	4,2
Severe	0	0

hypertensive patients at a community health center in Surabaya in 2018 were women (76.9 %). In contrast, [Bawazir \(2019\)](#) observed that the majority of hypertensive patients at national referral hospitals in Indonesia were men (55.8 %). Furthermore, the IBERICAN study reported a slightly higher proportion of male hypertensive patients compared to females (50.5 % vs. 49.5 %) in primary health care in Spain

([Prieto-Díaz et al., 2023](#)). Regarding age, studies consistently showed a dominance of patients aged >60 years. These observed variations in age and gender distribution may be attributed to differences in research settings and the scope of the study.

A family history of hypertension, recognized as an unmodified risk factor, was observed in more than half of the patients in this study. Supporting our results, [KC et al. \(2023\)](#) reported that 30.97 % of hypertensive patients in tertiary hospitals in Nepal had a family history of hypertension. Furthermore, several studies have demonstrated that a family history of hypertension is associated with an early onset of hypertension (age < 50 years) and uncontrolled blood pressure. ([Belayachi et al., 2024](#); [Kunnas and Nikkari, 2023](#)).

Approximately three-quarters of hypertensive patients in this study had uncontrolled blood pressure, aligning with the finding of [Sulistiawati et al. \(2020\)](#), who reported that nearly 7 out of 10 patients with hypertension at community health centers in Surabaya failed to achieve target blood pressure levels. Similarly, [Belayachi et al., 2024](#) showed that 73 % of hypertensive patients in primary health facilities in Morocco had uncontrolled hypertension. In contrast, a lower proportion of uncontrolled hypertension (37.5 %) was reported at national referral hospitals in Indonesia ([Bawazir, 2019](#)). Consistent with the aforementioned studies, this research was conducted in primary healthcare settings, highlighting the need to strengthen hypertension management services comprehensively, focusing on health promotion, prevention, and treatment. In addition, enhancing public education about hypertension in primary healthcare is urgently needed.

Dietary patterns were reported in this study to estimate the proportion of at-risk dietary behaviors among patients with hypertension. Only 4.2 % of patients consumed excess sodium, contrasting previous research conducted by [Belayachi et al. \(2024\)](#) and [Sulistiawati et al. \(2020\)](#), who reported significantly higher proportions (36.5 % and 25.0 %, respectively). These differences may be attributed to variations in dietary intake assessment methods.

A sedentary lifestyle was more prevalent among over 80 % of hypertensive patients in this study. [Belayachi et al. \(2024\)](#) and [Sulistiawati et al. \(2020\)](#) reported that the majority of patients (64.8 % and 63.5 %) rarely engaged in adequate or regular physical exercise. Meta-analyses have indicated that a sedentary lifestyle elevates the risk of hypertension by 1.3 to 2.5 times ([Ahadiyati et al., 2020](#); [Ewunie et al., 2022](#)). Moreover, sedentary lifestyle is associated with an increased mortality rate among hypertensive patients ([Ge et al., 2024](#)). This underscores the urgent need to enhance patient education and compliance regarding physical activity in primary health care settings.

Approximately eight of the 10 patients in this study had a BMI above normal, with obesity affecting over 60 %. Nearly 4 out of 10 hypertensive patients were identified with abdominal obesity, with a higher proportion in women. Aligning our findings, [Belayachi et al. \(2024\)](#) reported similar results in Morocco. Obesity and being overweight in hypertension were associated with uncontrolled blood pressure, possibly due to increased sympathetic activity causing vasoconstriction and decreased renal perfusion, which activate the renin-angiotensin system, leading to sodium retention and water reabsorption ([Grassi, 2004](#)). Eventually, that condition is associated with increased blood pressure.

This study identified the distribution of diabetes and prediabetes based on HbA1c criteria among hypertensive patients. [Belayachi et al. \(2024\)](#) and [Sulistiawati et al., 2020](#) reported higher diabetes proportions (38.6 % & 35.2 %, respectively) compared to the present study (12.4 %). ([Tsimihodimos et al., 2018](#)) highlighted co-prediction between hypertension and diabetes. Our study emphasized that hypertension is a predictor of future diabetes and significantly increases diabetes incidence. The coexistence of hypertension and diabetes also escalates the risk of other metabolic disorders, such as abdominal obesity, hyperinsulinemia, and dyslipidemia. Furthermore, [Yildiz et al. \(2020\)](#) reported that diabetes contributes synergistically to the burden of cardiovascular-related complications, including micro- and

macrovasculopathy and all-cause mortality. This study also found that 4 out of 10 hypertensive patients were prediabetic. Budiastutik et al. (2022) reported a 3.2-fold increased risk of prediabetes among hypertensive individuals in an urban population in Pontianak, Indonesia. In addition, the coexistence of hypertension and prediabetes is reported to have a 2.2 times risk of cardiovascular death.

Dyslipidaemia was prevalent among hypertensive patients in this study, whereas Belayachi et al. (2024) and Sulistiawati et al. (2020) reported lower proportions (50.5 % and 5.9 %, respectively). Cheng et al. (2022) found that dyslipidemia was associated with an increased prevalence of hypertension. The coexistence of hypertension and dyslipidemia serves as a significant risk factor for cardiovascular disease with the main pathology at the level of the vascular endothelium (Dalal et al., 2012). The interaction of hypertension and dyslipidemia also exacerbated oxidative stress levels, endothelial dysfunction, and worsening atherosclerosis, thereby increasing the risk of cardiovascular events.

Albuminuria was detected in half of the patients in this study, consistent with the findings by Poudel et al. (2012) in the Nepalese population. Meta-analysis suggests that the median prevalence of albuminuria among hypertension is 21.8 % with concomitant rise in systolic blood pressure (Shin et al., 2021). Regardless of the presence of diabetes mellitus as comorbidity, albuminuria is a precursor for kidney disorders and a predictor of end-stage renal disease, cardiovascular disease, and mortality in hypertensive patients (Viazzi and Pontremoli, 2014). However, the screening rate for albuminuria among hypertensive patients remains low (4.1 %) in clinical practice (Shin et al., 2021). This highlights the need to enhance albuminuria screening to detect chronic kidney disease early and initiate appropriate cardiorenovascular management.

Mental health disorders were also examined in this study, revealing that anxiety was the most frequent (37.5 %), followed by stress (8.4 %) and depression (4.2 %). These findings align with a study by Idaiani et al. (2016) based on data from the (Indonesian National Basic Health Research 2013), which revealed an anxiety prevalence of 34.4 % among hypertensive patients. Several meta-analyses have confirmed a positive relationship between hypertension and anxiety (Lim et al., 2021; Pan et al., 2015). The coexistence of hypertension and anxiety may be linked to mechanisms involving IL-6-associated inflammation, IL-17-induced reduction in nitric oxide, and reactive oxygen species that contribute to endothelial and synaptic dysfunction and dysbiosis (Qiu et al., 2023). This funding underpins the importance of mental health screening in hypertensive patients for enabling comprehensive management.

5. Conclusion

Hypertension patients in Cirebon Regency, Indonesia, are more likely to be aged >60 years, with three-quarters of patients uncontrolled. Most of the hypertensive patients in this study had a sedentary lifestyle and a poor cardiometabolic profile, including obesity, dyslipidemia, albuminuria, and prediabetes. There is a need to strengthen hypertension services, including promotive and preventive efforts in primary health care.

CRedit authorship contribution statement

Tiar Masykuroh Pratamawati: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Ahmad Fariz Malvi Zamzam Zein:** Supervision, Investigation, Formal analysis. **Uswatun Khasanah:** Writing – original draft, Investigation, Formal analysis, Data curation. **Donny Nauphar:** Writing – review & editing, Validation, Supervision, Formal analysis, Data curation. **Vincentius S.W. Budhyanto:** Supervision, Funding acquisition. **Idrus Alwi:** Writing – review & editing, Supervision, Formal analysis, Conceptualization. **Asmarinah:** Writing – review & editing, Supervision, Investigation, Conceptualization.

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Declaration of competing interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Data availability

The data supporting this study's findings are available on request from the corresponding author, ASM, or TMP.

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