PICTURE OF FASTING BLOOD GLUCOSE LEVELS IN HYPERTENSION PATIENTS AT TOTO KABILA REGIONAL GENERAL HOSPITAL

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ABSTRACT

Hypertension is a chronic condition that significantly increases the risk of cardiovascular and metabolic complications. Impaired blood glucose regulation is a common complication, making fasting blood glucose (FBG) monitoring essential for early detection of metabolic disorders, particularly diabetes mellitus. Objective: This study aims to describe the profile of FBG levels among hypertensive patients at Toto Kabila Regional General Hospital. Methods: A quantitative descriptive study with a cross-sectional approach was conducted between July and August 2025. A sample of 27 hypertensive patients was selected using a purposive sampling technique. FBG levels were measured using the Point of Care Testing (POCT) method. Results: The findings revealed that out of 27 patients, 10 individuals (37%) had normal FBG levels (70–126 mg/dL), while 17 individuals (63%) exhibited abnormal levels (<70 or >126 mg/dL). The mean FBG value was 228.52 mg/dL, indicating a high prevalence of hyperglycemia in the study population. Conclusion: The majority of hypertensive patients at Toto Kabila Regional General Hospital have abnormal fasting blood glucose levels. These results provide critical baseline data for healthcare providers to implement early prevention and management strategies for metabolic complications in hypertensive patients.

Keywords: Hypertension, Fasting Blood Glucose, Toto Kabila Regional Hospital

INTRODUCTION

Hypertension, commonly recognized as high blood pressure, serves as a primary determinant for a wide spectrum of atherosclerotic cardiovascular pathologies. These complications include, but are not limited to, heart failure, stroke, and chronic kidney dysfunction. The physiological strain placed on the arterial walls by persistent high pressure initiates a cascade of vascular degradation that can lead to irreversible systemic damage.

This clinical condition significantly elevates the probability of premature mortality across global populations. Research indicates that the risk of early death is directly proportional to incremental increases in both systolic and diastolic blood pressure readings. Consequently, managing these metrics is not merely a clinical goal but a vital necessity for life extension [1].

The long-term physiological impact of persistent hypertension involves serious vascular damage to vital organs. The heart, kidneys, brain, and retina are particularly susceptible to the microvascular and macrovascular changes induced by high pressure. Without intervention, these organs may suffer from ischemia or functional failure, leading to a profound decrease in the patient's quality of life.

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Despite its severity, the urgency of treating hypertension is frequently overlooked by the general public. This is primarily because the condition is often asymptomatic, remaining hidden without obvious clinical signs for years. This deceptive nature has earned hypertension the reputation of being a "silent killer," as it quietly erodes health until a catastrophic event, such as a heart attack, occurs [1].

Global health trends reflect an alarming trajectory for this condition. According to World Health Organization (WHO) data, the global prevalence of hypertension escalated from 26.4% in 2018 to 29.2% by 2021. This rise suggests that nearly one-third of the world's adult population is grappling with the complexities of blood pressure management.

In the Indonesian context, the burden of hypertension is particularly heavy, ranking as the third leading cause of death. Accounting for approximately 6.8% of total mortality across all age groups, it follows only stroke and tuberculosis in its lethality. This data underscores the critical public health challenge facing the nation's healthcare infrastructure.

The 2023 Indonesian Health Survey (SKI) provides further evidence of this crisis, indicating that non-communicable diseases (NCDs) are the dominant cause of disability. Hypertension stands out as the largest contributor to these disabilities, representing 22.2% of the cases. This includes impairments in vision, hearing, and mobility resulting from complications of the disease.

At the regional level, Gorontalo Province faces a significant health hurdle with a hypertension prevalence rate of 29.6%. Localized data shows that Boalemo Regency and Gorontalo Regency bear the highest burdens at 32.4% and 31.4%, respectively. These figures highlight a regional epidemic that requires localized research and targeted clinical interventions.

Hypertension is now categorized as a permanent risk factor that significantly increases the likelihood of developing diabetes mellitus. The core link between these two metabolic giants is insulin resistance, which serves as a primary driver of elevated blood sugar levels [2][3]. This synergy of diseases creates a complex clinical profile for patients.

Recent evidence suggests that the relationship between these conditions begins much earlier than previously thought. Metabolic markers, such as the Triglyceride-Glucose (TyG) index, show a positive correlation with blood pressure levels [4]. This suggests that metabolic dysfunction and insulin resistance can occur even when blood pressure elevations are still considered modest.

The correlation between Fasting Blood Glucose (FBG) and hypertension is inherently bidirectional. Uncontrolled glucose levels can trigger hypertension through mechanisms like increased renal sodium reabsorption and the activation of the Renin-Angiotensin-Aldosterone System (RAAS) [5]. Simultaneously, elevated FBG levels have been shown to independently predict the onset of new hypertension cases [6].

In Indonesia, the intersection of these diseases is evident in the high prevalence of Isolated Systolic Hypertension (ISH) among

diabetic patients, which is recorded at 17.5% [7]. This statistic highlights the critical need for integrated monitoring systems that track both blood pressure and glucose metabolism concurrently to prevent synergistic organ damage.

For patients diagnosed with hypertension who do not yet have a history of diabetes, examining FBG levels is a vital preventive measure. Early screening allows for the identification of insulin resistance and prediabetes, which are often the precursors to full-blown Type 2 Diabetes [5]. This proactive approach is essential for preventing the "double burden" of comorbid metabolic diseases.

In the Gorontalo region, hypertension consistently remains among the top ten morbidities, yet specific baseline data regarding the metabolic profiles of these patients remains scarce. There is a pressing need to map the glucose characteristics of hypertensive sufferers to understand the local risk landscape and improve health literacy among the vulnerable population.

Consequently, this study, titled "Description of Fasting Blood Glucose Levels in Hypertension Patients in Gorontalo," is initiated to fill this knowledge gap. By adopting a descriptive design, the research aims to provide essential baseline data that supports the early identification of metabolic complications. Ultimately, this will facilitate more precise clinical management and better health outcomes for the community.

RESEARCH METHODS

This study employed a quantitative approach with a descriptive design to provide an overview of fasting blood glucose (FBG) levels among hypertensive patients at Toto Kabila Regional General Hospital. The research was conducted from July 22 to August 25, 2025.

The study population comprised 296 patients, from which a sample of 27 respondents was selected using a purposive sampling technique based on specific inclusion and exclusion criteria. Data were gathered through observation and laboratory examinations using the Point of Care Testing (POCT) method, ensuring strict adherence to standardized pre-analytical, analytical, and post-analytical procedures.

In accordance with the descriptive nature of this study, the analysis focused on a single primary variable: fasting blood glucose levels in patients with a clinical history of hypertension. Data were analyzed using descriptive statistics to determine the frequency distribution, mean values, and percentage of glucose level categories (normal vs. abnormal) within the sample.

RESEARCH RESULT

The results of the study conducted at Toto Kabila Regional General Hospital regarding fasting blood glucose (FBG) levels in hypertensive patients are presented below:

1. Distribution of FBG Levels Based on Demographic Characteristics

Table 1. Frequency Distribution of FBG Levels by Age Group

Age (Years)	Fasting Blood Glucose				Amount	
	Normal		Abnormal			
	n	%	n	%	n	%
40–49	4	14.8	5	18.5	9	33.3
50–59	2	7.4	6	22.2	8	29.6
60–69	4	14.8	6	22.2	10	37.1
Total	10	37.0	17	63.0	27	100.0

(Source: Primary Data, 2025)

Based on the research results presented in Table 1, the distribution of fasting blood glucose (FBG) profiles among hypertensive patients at Toto Kabila Regional General Hospital is categorized by age group. In the 40–49 age range, there were a total of 9 respondents (33.3%) participating in this

study. Within this group, 4 respondents (14.8%) had blood glucose levels within normal limits, while 5 respondents (18.5%) exhibited abnormal blood glucose levels.

Furthermore, observations of the 50–59 age group showed a composition of 8 respondents (29.6%). Data analysis for this group revealed that the majority of patients had abnormal blood glucose levels, specifically 6 respondents (22.2%). In contrast, only 2 respondents (7.4%) maintained normal blood glucose levels despite having a clinical history of hypertension.

The 60–69 age group represented the largest respondent population in this study, reaching 10 individuals (37.1%). The distribution pattern of blood glucose in this elderly group showed a trend similar to the previous age category, where the number of patients with abnormal glucose levels predominated, totaling 6 individuals (22.2%), while the remaining 4 individuals (14.8%) were classified as normal.

Cumulatively, out of the total 27 respondents (100%) examined, the prevalence of glucose metabolism disorders among hypertensive patients at the research site was found to be significantly high. The data indicates that 17 respondents (63.0%) fell into the abnormal category, which far exceeded the number of respondents with normal blood glucose levels, who numbered only 10 individuals (37.0%).

The demographic data suggests a visual correlation between advancing age and vulnerability to glucose imbalance. The highest accumulation of abnormal cases was found in the 50–69 age range, with a total of 12 patients. These findings emphasize that hypertensive patients at Toto Kabila Regional General Hospital, particularly in the older age groups, face a significant risk of metabolic complications, necessitating routine blood glucose monitoring.

Table 2. Fasting Blood Glucose Level Frequency Data Classified by Gender

Gender	Fasting Blood Glucose				Amount	
	Normal		Abnormal			
	n	%	n	%	n	%
Male	5	18.5	10	37.1	15	55.6
Female	5	18.5	7	25.9	12	44.4
Total	10	37.0	17	63.0	27	100.0

(*Source:* Primary Data, 2025)

Based on the data presented in Table 2, the demographic characteristics of the study indicate that the majority of the respondents were male, totaling 15 individuals (55.6%), while the female group consisted of 12 individuals (44.4%).

Further analysis of fasting blood glucose (FBG) profiles reveals specific disparities between genders. In the male group, 10 respondents (37.1%) were identified as having abnormal FBG levels, while 5 respondents (18.5%) were within the normal range.

Similarly, in the female group, incidents of abnormal glucose levels were found in 7 respondents (25.9%), while 5 respondents (18.5%) exhibited normal levels. These figures show that while both genders face metabolic risks, the frequency of abnormal glucose levels in this specific sample is higher among men.

In aggregate, the majority of the study participants 17 individuals (63.0%) were identified as having abnormal fasting blood glucose levels. In contrast, the normal group consisted of only 10 individuals (37.0%).

These findings confirm that abnormal fasting blood glucose levels among hypertensive patients at Toto Kabila Regional General Hospital are more prevalent in male respondents than in female respondents. This trend suggests a significant need for gender-specific health

monitoring regarding metabolic complications associated with hypertension.

2. Quantitative Results of Fasting Blood Glucose Level Measurements

The quantitative analysis of this study focuses on the categorization and statistical distribution of fasting blood glucose (FBG) levels among the sampled hypertensive patients. By evaluating these parameters, the study provides a clear picture of the metabolic status of the participants, specifically identifying the prevalence of hyperglycemia within this clinical group.

The following table summarizes the frequency distribution of FBG categories observed during the data collection period at Toto Kabila Regional General Hospital.

Table 3. Overview of FBG Level Categories

Blood Glucose Criteria	Amount	%
Normal (70–126 mg/dL)	10	37.0
Abnormal (<70 or >126 mg/dL)	17	63.0
Total	27	100.0

(*Source*: Primary Data, 2025)

Table 3 outlines the frequency distribution of FBG test results among the 27 hypertensive patients. The data reveals that 10 respondents (37.0%) maintained normal FBG levels within the 70–126 mg/dL range. In contrast, the majority of the participants, totaling 17 respondents (63.0%), exhibited abnormal FBG levels, with all cases in this category falling into the hyperglycemic range.

To provide a deeper statistical insight, the FBG concentrations were also analyzed through descriptive parameters, including the minimum and maximum values, as well as the average levels found across the entire sample, as presented in the table below.

Table 4. Summary of Descriptive Statistical Parameters of FBG Concentration

Variables	n	Min	Max	Mean	Std.
FBG (mg/dL)	27	97	356	228.52	76.810

(*Source*: Primary Research Data, 2025)

The descriptive statistical parameters in Table 4 show significant variation across the sample. The recorded FBG values ranged from a minimum of 97 mg/dL to a maximum of 356 mg/dL, with a mean value of 228.52 mg/dL and a standard deviation of 76.810. This high average, which significantly exceeds the normal threshold, underscores a prevalent trend of hyperglycemia and suggests that hypertensive patients in this study are at high risk for further metabolic complications.

DISCUSSION

To begin this study, respondents from the patient rooms of Toto Kabila Bone Bolango Regional Hospital were interviewed and observed. This descriptive study utilized purposive sampling to facilitate the selection process, resulting in twenty-seven hypertensive patients who met the predetermined inclusion criteria. Each participant underwent fasting blood glucose (FBG) testing to evaluate their metabolic profile in relation to their hypertensive condition.

1. Fasting Blood Glucose Levels Based on Age

In the etiology of hypertension, age is categorized as a crucial non-modifiable risk factor. The aging process naturally induces a series of physiological alterations in the cardiovascular system. Manifestations of these degenerative changes include a degradation of blood vessel distensibility (elasticity), hypertrophy of the arterial wall structure, and an escalation in arterial rigidity. These changes result in increased peripheral resistance, ultimately leading to higher blood pressure in the elderly population [8]. Furthermore, aging is associated with decreased kidney function and shifts in the autonomic nervous system,

specifically increased sympathetic activity, which triggers chronic vasoconstriction [9].

Based on age stratification, the FBG profiles of hypertensive participants in this study showed distinct variations. In the middle-aged group (40–49 years), 9 respondents (33.3%) were recorded, with 4 individuals (14.8%) having normal levels and 5 individuals (18.5%) exhibiting abnormal levels. The trend of abnormalities was more pronounced in the older groups. In the 50–59 age range, 6 out of 8 participants (22.2%) were identified with abnormal glucose levels. Similarly, in the 60–69 age group, which comprised the largest sample of 10 respondents, the majority (6 respondents or 22.2%) experienced glucose abnormalities.

Overall, out of the 27 respondents, the incidence of abnormal fasting blood glucose was dominant, covering 17 individuals (63%), compared to the normal group of 10 individuals (37%). These data indicate that the prevalence of glucose abnormalities is significantly high across all age segments, particularly in those over 50 years. This finding correlates with studies by Rahman et al. (2023) and Putri et al. (2021), which validated that elderly hypertensive patients have a higher susceptibility to insulin resistance and hyperglycemia [10][11]. This consistency is also evident when compared with Sujani (2024), highlighting the comorbid risk of hypertension and metabolic dysfunction in individuals aged 60 and above [12].

2. Analysis of Fasting Blood Glucose Levels Viewed from the Gender Aspect

Gender is a significant biological determinant in mapping the risk and epidemiological patterns of hypertension. Generally, men are more susceptible to hypertension from young to middle age, while women see a spike in prevalence after menopause [9]. In this study of 27 participants, the composition was dominated by males (15 individuals or 55.6%) compared to females (12 individuals or 44.4%). Specific analysis of FBG profiles revealed disparities; in the male group, 10 respondents (37.1%) had abnormal levels, whereas, in the female group, 7 respondents (25.9%) showed abnormalities.

These findings highlight that FBG abnormalities were more prevalent in male subjects in this cohort. This phenomenon can be explained by physiological mechanisms where the distribution pattern of adipose tissue particularly abdominal fat in men is strongly correlated with increased insulin resistance. Meanwhile, premenopausal women often benefit from the protective effects of estrogen. The results are strengthened by previous studies from Parameswari (2023) and Sujani (2024), which confirmed high hyperglycemia prevalence in males [5][12]. Rahman et al. (2023) also noted that abdominal fat accumulation in men exacerbates insulin resistance, directly contributing to elevated FBG levels [10].

3. Evaluation of Fasting Blood Glucose Levels in Hypertension Patients

Fasting blood glucose serves as a crucial indicator of the body's basal metabolic status. This procedure requires an eight-hour fast to ensure the data represents glucose homeostasis, which is regulated by insulin efficiency and carbohydrate metabolism [13]. Hypertension, the "silent killer," is characterized by persistent elevation of arterial blood pressure (≥140/90 mmHg), leading to fatal complications like stroke and kidney failure [14]. The pathophysiological link between these two conditions involves endothelial dysfunction; chronic hypertension damages vascular structures, decreasing insulin sensitivity and inhibiting glucose uptake [15].

Empirical data from this study found that 17 individuals (63%) showed abnormal FBG levels (hyperglycemia), while 10

respondents (37%) were within the normal range. These statistics indicate a very close association between hypertension and the dysregulation of glucose metabolism. Research by Wang et al. (2022) reported that the interaction between hypertension and insulin resistance significantly increases diabetes risk [3]. Furthermore, the average FBG level found in this study was 228.52 mg/dL, with values reaching as high as 356 mg/dL. This mean value is well above the normal threshold, indicating severe hyperglycemia in most patients.

According to Parameswari (2023), there is a significant relationship between FBG levels and hypertension (p value = 0.006), where insulin resistance stimulates the sympathetic nervous system and strengthens sodium reabsorption by the kidneys, further increasing blood pressure [12]. Mechanistically, hyperinsulinemia triggers the renin-angiotensin-aldosterone system (RAAS), leading to fluid retention and vasoconstriction. Chronic hyperglycemia also triggers the formation of Advanced Glycation End Products (AGEs), which damage blood vessel walls and reduce nitric oxide production, resulting in endothelial dysfunction and vessel stiffness [16].

The results of this study have important implications for public health. The discovery of high FBG levels in 63% of hypertensive patients at Toto Kabila Regional Hospital demonstrates the urgent need for routine blood glucose screening, even for those not yet diagnosed with diabetes. This is a crucial step for early detection of metabolic complications. These findings underscore the necessity of a holistic management strategy that integrates blood pressure regulation with lifestyle interventions, including dietary modification and increased physical activity, to prevent the progression of cardiovascular and metabolic diseases.

CONCLUSION

Based on the research and data analysis conducted at the Laboratory Installation of Toto Kabila Regional General Hospital regarding the profile of Fasting Blood Glucose (FBG) levels in hypertensive patients, the following conclusions are drawn:

1. Distribution of Blood Glucose Categories: The majority of hypertensive patients in this study exhibit dysregulated glucose metabolism. Out of the 27 subjects observed, 17 respondents (63.0%) were identified as having abnormal FBG levels (hyperglycemia), while only 10 respondents (37.0%) fell within the normal physiological range.
2. Quantitative Statistical Profiles: The study found a significantly high average FBG value of 228.52 mg/dL, which is well above the standard threshold for normal fasting glucose. The recorded values showed wide variation, with a minimum of 97 mg/dL and a maximum reaching 356 mg/dL, indicating that many hypertensive patients are living with undiagnosed or poorly managed severe hyperglycemia.
3. Demographic Patterns: The prevalence of abnormal FBG levels is most dominant in the older age groups (50–69 years) and is more frequently observed in male respondents compared to females. This suggests that age-related physiological degradation and gender-specific metabolic factors contribute to the coexistence of hypertension and impaired glucose regulation.

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