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Hypertension Incidence Trends Based on Medical Records at Gatak Community Health Center, 2021-2025

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ABSTRACT

Background: Hypertension is a non-communicable disease known as the silent killer because it causes no symptoms. Objective: To analyze hypertension incidence trends based on medical record data from 2021-2025. **Research Method:** A quantitative descriptive with an observational design, utilizing secondary data from outpatient medical records identified using ICD codes I10 and I11. Data Analysis: Descriptively and analytically using the Mann-Whitney test and Spearman rank test after normality testing showed $p<0.05$ (0.001), indicating the data were not normally distributed. **Analysis Result:** The highest hypertension cases occurred in 2024 and were dominated by new visits. The highest cases occurred among women aged 60-69 years. The highest incidence was found among housewives, laborers, private employees, and retirees. The villages with the highest cases were Blimbing, Trangsan, and Luwang. The Mann-Whitney test showed no difference in systolic pressure ($p=0.298$) by gender, but a difference in diastolic pressure ($p=0.046$). The Spearman rank test showed a negative correlation between age and hypertension category ($p=0.001$) with very weak ($r=-0.129$) to weak (r-0.236) correlation strength. **Conclusion:** Hypertension incidence is influenced by gender and age. **Recommendations:** Routine blood pressure screening through integrated health posts, a health lifestyle and tera exercise.

Keywords: Hypertension, ICD Codes, Incidence Trends, Medical Records, Demographic Characteristics,

INTRODUCTION

Community Health Center are primary healthcare facilities that serve as the frontline of healthcare delivery, providing accessible services to communities within their designated service areas. Community Health Center deliver healthcare through a range of essential programs, one of which is curative care by providing medical treatment. These services include both outpatient and inpatient care aimed at disease prevention, treatment, and the restoration of patients health conditions (1). Community Health Center play a vital role in ensuring effective and efficient healthcare services while maintaining continuous quality improvement and prioritizing patient safety. In addition, Community Health Center function as centers for health oriented community development, primary level healthcare services, and the empowerment of families and communities (2). The presence of Community Health Center contributes significantly to meeting the healthcare needs of the population by ensuring broad and equitable access to essential health services.

Based on the Regulation of the Minister of Health No. 24 of 2022, all healthcare facilities are mandated to implement electronic medical records in accordance with the provisions of the regulation by December, 31, 2023 at the latest. An Electronic Medical Record (EMR) is a system containing health records or history, such as disease history, diagnostic test results, medical cost information, interventions, treatments, and other medical data (3). Medical records serve as evidence of the professional accountability of healthcare providers in delivering patient care (4). Furthermore, they function as an effective communication tool among healthcare professionals (5).

In the digital era, medical records have become an essential data source to support clinical analysis and the development of data-driven health technologies. The utilization of medical records aims to improve the quality of technological healthcare services (6). Medical record data can be utilized as secondary data sources in health research to conduct epidemiological analyses, including monitoring specific disease trends (7). Through the analysis of medical record data, patterns of hypertension incidence can be identified based on time, gender, age, occupation, visit type, and village.

Non-communicable diseases (NCDs) constitute one of the primary health challenges in Indonesia due to their exceptionally high morbidity and mortality rates. These conditions encompass cardiovascular disease, stroke,

diabetes, cancer, chronic respiratory diseases, and hypertension. NCDs represent not only an individual health burden but also exert a substantial socioeconomic impact, including escalated healthcare expenditures, diminished work productivity, and a decline in the population's quality of life (8). Furthermore, NCDs do not exclusively affect the elderly they also manifest in younger populations, as evidenced by the occurrence of cardiovascular diseases, cancer, diabetes mellitus, and other chronic illnesses (9). The World Health Organization (WHO) estimates that these diseases account for 40 million deaths globally each year, equivalent to 70% of all-cause mortality worldwide (10).

Hypertension stands as a major risk factor driving high global mortality rates, predominantly through cardiovascular complications such as heart disease and stroke. As a prominent non-communicable disease, hypertension is defined as a systolic blood pressure exceeding 140 mmHg and a diastolic blood pressure exceeding 90 mmHg (11). Data from the 2023 Indonesian Health Survey indicate that hypertension accounts for 22.2% of disabilities (visual, auditory, and mobility impairments) among the elderly. Moreover, hypertension is frequently dubbed the "silent killer" because it can inflict severe target-organ damage before being detected. Hypertension is multifactorial, driven by genetic factors, lifestyle, behavior, dietary patterns, and physical activity (12). The risk of developing hypertension increases progressively with age, a trend attributed to physiological changes such as reduced vascular elasticity and arterial stiffness, which facilitate an elevation in blood pressure.

According to data from the World Health Organization (WHO), it is estimated that approximately 1.12 billion people worldwide suffer from hypertension, meaning that 1 in 3 individuals globally is diagnosed with the condition. The number of hypertension patients continues to grow annually; it is projected that by 2025, 1.5 billion people will be affected, with an estimated 9.5 million deaths occurring each year due to hypertension and its complications (13). According to the Indonesian National Basic Health Research, the prevalence of hypertension in Indonesia stands at 34.1%, accounting for 63,309,620 cases (14). This high prevalence indicates that the disease has reached a global epidemic status, demanding serious action and attention worldwide (15).

Based on the 2024 Central Java Health Profile, hypertension accounts for the highest proportion of all reported non-communicable diseases (NCDs) at 73.1%, with an estimated 7.985,534 individuals aged >15 years affected, representing 26.9% of the total population within that age group. The high prevalence in Indonesia poses a substantial challenge in the control and prevention of hypertension. This elevated rate is driven by diets high in salt and fat, alcohol consumption, physical inactivity, obesity, and stress. This aligns with a study (16) explaining that hypertension contributes to approximately 10.9 million deaths globally, accounting for 19.2% of all global mortality.

Hypertension data in Sukoharjo Regency reveals significant variations across sub-districts. Based on data retrieved from the Sukoharjo Regency Health Profile, the highest figures were recorded in Grogol sub-district with 36.076 cases, whereas the lowest figures were found in Bulu Sub-district with 11.422 cases. Gatak Sub-district ranks 11th out of 12 sub districts, with a total of 16.047 cases. Although Gatak does not present the highest overall numbers, the number of hypertension patients aged 20-44 years reached 219 individuals. This indicates that the younger age group requires focused attention in prevention and management efforts to ensure that public health within this demographic remains well-maintained.

The implementation of Electronic Medical Records (EMR) has created opportunities to utilize healthcare service data to support surveillance of chronic diseases, including hypertension. EMR data provides continuous clinical information, enabling the monitoring of disease trends, the evaluation of service quality, and support for evidence-based decision-making. Research by (17) indicates that the use of electronic medical records (EMR) provides a more comprehensive picture of the prevalence, control, and distribution of hypertension compared to conventional health surveys.

Research by (17) also demonstrates that analyzing Electronic Health Record (EHR) data over a 12-year period can identify changes in hypertension prevalence and blood pressure control rates, as well as disparities based on demographic characteristics. These findings indicate that the use of EHR data can support the development of more effective and targeted hypertension control programs. Similarly, the (18) developed an electronic phenotyping approach for EHR-based hypertension surveillance and showed that electronic medical record data has the potential to serve as a source for sustainable chronic disease surveillance, particularly when supported by standardized and consistent case definitions.

Although various studies have utilized electronic medical record data to identify hypertension prevalence and control, most have focused on developing case definitions, validating data, or evaluating the quality of care. Research analyzing hypertension incidence trends over several years using the "person, place, and time" epidemiological framework and combining descriptive and statistical analyses of patient characteristics at the Puskesmas level remains very limited (18). Therefore, research is needed that can utilize medical record data as a

source of epidemiological information to describe hypertension incidence trends while supporting decision-making in primary healthcare facilities.

The novelty of this study lies in its use of electronic medical record data from the Gatak Puskesmas to analyze hypertension incidence trends over a five-year period (2021–2025) based on person, place, and time, utilizing Mann–Whitney and Spearman Rank correlation analyses. This approach not only illustrates the distribution of hypertension cases but also provides data-driven evidence regarding the relationship between patient characteristics and blood pressure. The findings are expected to support the development of electronic medical record-based disease surveillance systems, enhance the utilization of health data within the field of health informatics, and serve as a foundation for formulating hypertension prevention and control strategies at the primary healthcare level.

Based on the description above, this study aims to analyze the incidence trends of hypertension using patient medical record data from 2021 to 2025. This analysis is expected to illustrate changing patterns in the number of hypertension cases, patient characteristics, and factors potentially influencing these incidence trends. According to prior research (19), trend analysis can be utilized to understand annual patient visit patterns and forecast shifts in disease patterns and case volumes. The findings are expected to serve as a valuable resource for healthcare professionals, researchers, and policymakers in designing more effective, data-driven prevention and control strategies for hypertension.

METHODS

This study is a quantitative, descriptive, and observational study utilizing secondary data. The data were obtained from outpatient medical records of hypertension patients covering the period from 2021-2025, involving a total of 3,164 patients. Data collection involved identifying patients based on ICD-10 codes: I10 for essential (primary) hypertension and I11 for hypertension with heart disease complications. The study focuses solely on describing the phenomenon without analyzing the underlying causes.

The study aims to describe hypertension cases through an epidemiological approach based on person, place, and time characteristics. Data were analyzed using both descriptive and analytical methods via SPSS to visualize disease trends and understand relationships between variables during the 2021-2025 period. The data are presented in graphs and charts to illustrate fluctuations in the number of hypertension cases within the Gatak Community Health Center service area.

Descriptive analysis was conducted to examine hypertension case trends from 2021-2025 based on gender, age, occupation, year, visit type, and village location. Analytical analysis was performed to examine the relationships between age and blood pressure systolic and diastolic as well as between gender and blood pressure systolic and diastolic.

Table 1. Hypothesis Testing

Independent Variable (Scale)	Dependent Variable (Skala)	Normality Test Results	Statistical Test
Gender (Nominal)	Systolic (Ratio)	p=0,001<0,05 (Abnormality)	Mann-Whitney Test
Gender (Nominal)	Diastolic (Ratio)	p=0,001<0,05 (Abnormality)	Mann-Whitney Test
Age (Ratio)	Systolic (Ratio)	p=0,001<0,05 (Abnormality)	Spearman Rank
Age (Ratio)	Diastolic (Ratio)	p=0,001<0,05 (Abnormality)	Spearman Rank

This study was conducted in five stages. First, a quantitative descriptive design with an observational approach was employed, utilizing secondary data from outpatient medical records spanning the years 2021–2025. Second, a total sampling technique was applied, yielding 3,164 medical records that met the inclusion criteria based on ICD-10 codes I10 (Essential Hypertension) and I11 (Hypertensive Heart Disease). The variables collected included year of visit, visit status, gender, age, occupation, village of residence, and systolic and diastolic blood pressure. Third, the collected data were checked for completeness, coded, entered, and processed using Statistical Package for the Social Sciences (SPSS). Data quality was verified before analysis to minimize recording errors. Fourth, descriptive analysis was performed to illustrate hypertension trends based on person, place, and time, while the Mann–Whitney test and Spearman Rank correlation were used to analyze differences and relationships between variables. Finally, the research findings were presented in tables and graphs to depict hypertension incidence trends throughout the study period. The research process flow can be seen in the figure below.

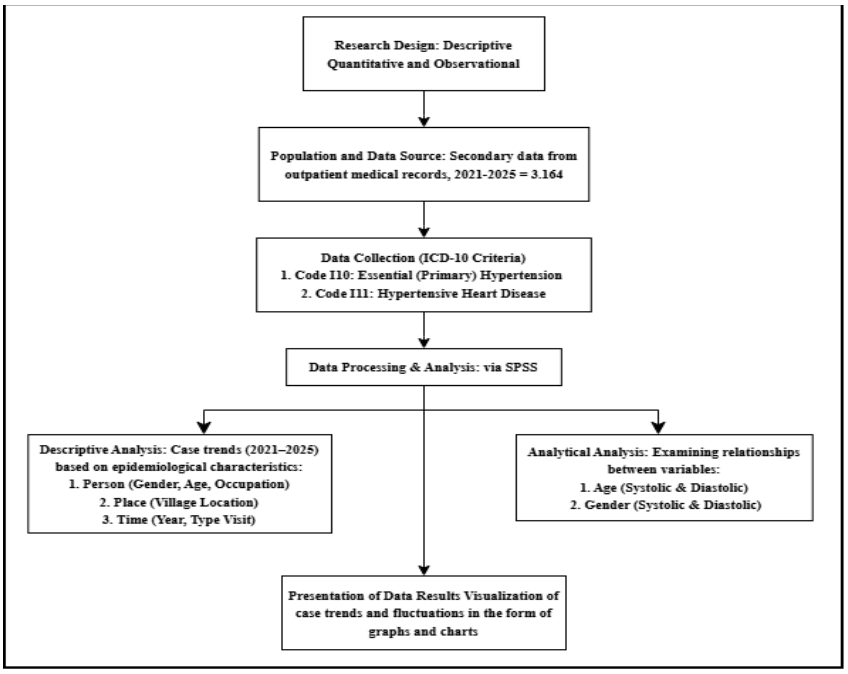

Figure 1. Research Stages Flowchart

RESULTS

Trends in Hypertension Cases by Type of Visit

Based on table 2, new visits accounted for 1.594 cases, while repeat visits totaled 1.570 cases. The highest number of new visits occurred in 2024 with 484 (30%) cases, similarly repeat visits peaked in the same year at 441 (28%) cases.

Table 2. Cases of hypertension by type of visit

Visit Status	Year					Amount (100%)
	2021 (%)	2022 (%)	2023 (%)	2024 (%)	2025 (%)	
New	225 (14%)	186 (12%)	318 (20%)	484 (30%)	381 (24%)	1.594
Old	189 (12%)	178 (11%)	354 (23%)	441 (28%)	408 (26%)	1.570
Amount	414 (13%)	364 (12%)	672 (21%)	925 (29%)	789 (25%)	3.164

Source: secondary data, 2021-2025

Based on figure 1 below, it can be concluded that the number of new and returning visits exhibits a fluctuating pattern. In 2021-2022, there was a decrease in the number of both types of visits. In 2023-2025, a significant increase was observed, with the highest value recorded for new visits in 2024. However, in 2023 and 2024, the number of new visits declined, while returning visits increased. This indicates a shift in trend patterns toward the end of the period.

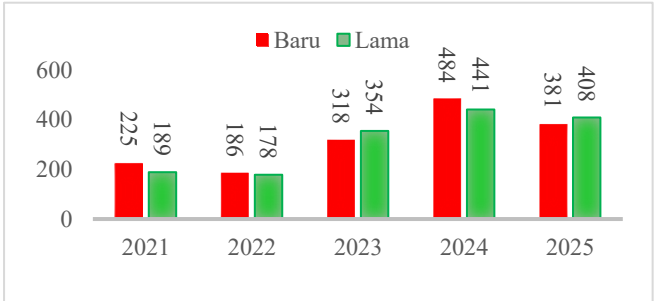

Figure 2. Graph of hypertension cases by visit type, 2021–2025
(Source: primary data)

Trends in Hypertension Incidence by Gender

Based on table 3, it can be seen that the number of hypertension cases in the female group was higher than in the male group in every year. The total number of hypertension cases recorded over the five-year period reached 3.164. Of this total, 979 cases (31%) occurred in the male group, while 2.185 cases (69%) occurred in the female group.

Table 3. Cases of hypertension by gender

Year	Gender		Amount n (%)
	Male n (%)	Female n (%)	
2021 Year	148 (36%)	266 (64%)	414 (100%)
2022 Year	124 (34%)	240 (66%)	364 (100%)
2023 Year	217 (32%)	455 (68%)	672 (100%)
2024 Year	268 (29%)	657 (71%)	925 (100%)
2025 Year	222 (28%)	567 (72%)	789 (100%)
Amount	979 (31%)	2.185 (69%)	3.164 (100%)

Source: secondary data, 2021-2025

Figure 2 shows that the number of hypertension cases among both women and men increased up to 2024. The female group reached its peak in 2024 with a total of 657 (71%) cases, while the lowest figure was recorded in 2022 with 240 (66%) cases. Among men, the number of cases peaked in 2024 at 268 (29%), whereas the lowest figure occurred in 2022 with 124 (34%) cases. This indicates that women are more susceptible to hypertension, a condition that can be influenced by various biological, hormonal, social, and health-related behavioral factors.

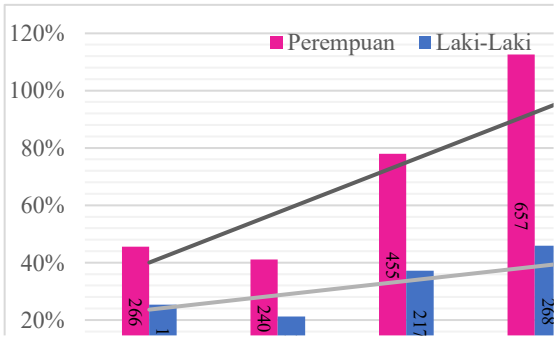

Figure 3. Graph of hypertension cases by gender, 2021–2025
(Source: primary data)

Trends in Hypertension Incidence by Age

The research results indicate that the incidence of hypertension is influenced not only by gender but also by age. As shown in Table 4, the risk of hypertension increases with age. A significant increase was observed across all age groups, with a total of 3.164 cases recorded between 2021 and 2025. This demonstrates that older age groups have a higher prevalence of hypertension compared to younger age groups.

Table 4. Cases of hypertension by age

Tahun	15-19 year n (%)	20-44 year n (%)	45-54 year n (%)	55-59 year n (%)	60-69 year n (%)	>70 year n (%)	Amount n (%)
2021 Year	0 (0%)	5 (1,2%)	23 (5,5%)	21 (5%)	223 (54%)	142 (34%)	414 (100%)
2022 Year	0 (0%)	15 (4%)	46 (13%)	41 (11%)	168 (46%)	94 (25%)	364 (100%)
2023 Year	1 (0,1%)	50 (7%)	88 (13%)	67 (10%)	274 (41%)	192 (28%)	672 (100%)
2024 Year	2 (0,2%)	76 (8%)	190 (20%)	133 (14%)	313 (34%)	211 (23%)	925 (100%)
2025 Year	1 (0,1%)	74 (9%)	207 (26%)	137 (17%)	214 (27%)	156 (20%)	789 (100%)
Amount	4 (0,1%)	220 (7%)	554 (17%)	399 (13%)	1192 (38%)	795 (25%)	3164 (100%)

Source: secondary data, 2021-2025

Based on the figure below, it can be seen that during the 2021-2025 period, the highest number of cases 1.192 (38%) occurred in the 60-69 age group, followed by the 70+ age group with 795 cases (25%). Conversely,

the lowest number of cases was found in the 15–19 age group, totaling only 4 (0.1%). These figures indicate an increase from 2021 -2024, followed by a decline in 2025.

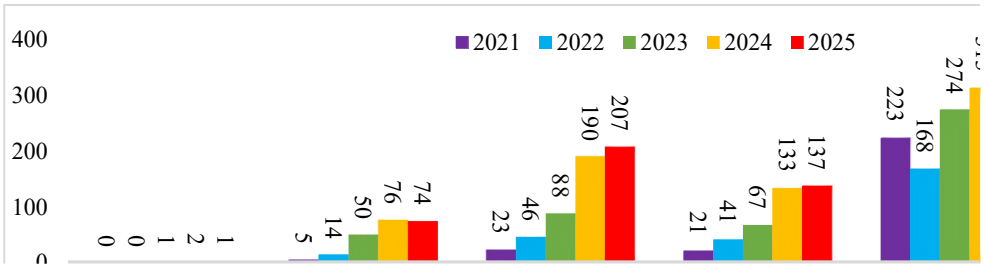

Figure 4. Graph of hypertension cases by age, 2021–2025
(Source: primary data)

Trends in Hypertension Incidence by Occupation

The research results indicate that, in addition to gender and age, occupation also influences the incidence of hypertension. Based on Table 5 below, the total number of hypertension cases from 2021-2025 reached 2.852. The highest number of cases occurred in 2024, totaling 865 (30%), while the lowest number was recorded in 2021, with 331 (12%) cases. This suggests that occupations involving strenuous physical activity can increase the risk of hypertension.

Table 5. Cases of hypertension by occupation

Occupation	Year					Amount n (%)
	2021	2022	2023	2024	2025	
Housewife	123 (31%)	102 (31%)	169 (33%)	306 (35%)	295 (39%)	995 (35%)
Self-employed	46 (12%	24 (7%)	29 (6%)	40 (5%	24 (3%)	163 (6%)
Retired	49 (13%)	30 (9%)	39 (8%)	38 (4%)	32 (4%)	188 (7%)
Laborer	72 (18%)	73 (22%)	119 (23%)	233 (27%)	189 (25%)	686 (24%)
Merchant	19 (5%)	16 (5%)	31 (6%)	29 (3%)	24 (3%)	119 (4%)
Private Sector Employe	23 (6%)	37 (11%)	54 (10%)	141 (16%)	128 (17%)	383 (13%)
Civil Servant	18 (5%)	15 (4%)	19 (4%)	27 (3%)	18 (2%)	97 (3%)
Farmer	22 (6%)	19 (6%)	23 (4%)	27 (3%)	19 (3%)	110 (4%)
Farm Laborer	7 (2%)	2 (0,6%)	12 (2%)	9 (1%)	9 (1%)	39 (1%)
Unemployed/Student	12 (3%)	13 (4%)	17 (3%)	15 (2%)	15 (3%)	72 (3%)
Amount	391 (100%)	331 (100%)	512 (100%)	865 (100%)	753 (100%)	2.852 (100%)

Source: secondary data, 2021-2025

Figure 4 shows that cases of high hypertension were found among housewives, day laborers, private-sector employees, and retirees. The housewife group recorded the highest figures over the period, with a total of 995 cases (35%). Day laborers accounted for 686 cases (24%), while private-sector employees and retirees accounted for 383 cases (13%) and 188 cases (7%), respectively.

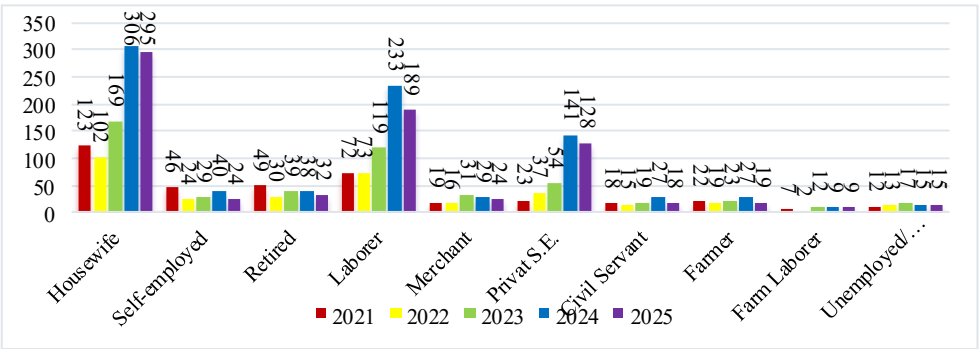

Figure 5. Graph of hypertension cases by occupation, 2021–2025
(Source: primary data)

Trends in Hypertension Incidence by Village Area

The study results indicate that a total of 3,164 cases were recorded between 2021 and 2025. The highest number of cases occurred in the 60–69 age group is 1.185 cases (37%), while the lowest number occurred in the 15–19 age group is 4 cases (1%).

Table 6. Cases of hypertension by village area

Village	Age						Amount n (%)
	15-19 year	20-44 year	45-54 year	55-59 year	60-69 year	>70 year	
Baki	0 (0%)	4 (5%)	6 (8%)	6 (8%)	46 (59%)	16 (20%)	78 (100%)
Blimbing	0 (0%)	26 (5%)	66 (14%)	39 (8%)	256 (53%)	95 (20%)	482 (100%)
Boyolali	0 (0%)	0 (0%)	0 (0%)	0 (0%)	4 (80%)	1 (20%)	5 (100%)
Geneng	1 (0%)	14 (7%)	44 (21%)	32 (15%)	63 (30%)	58 (27%)	212 (100%)
Jati	2 (2%)	10 (10%)	30 (29%)	14 (14%)	24 (23%)	23 (22%)	103 (100%)
Kagokan	0 (0%)	10 (9%)	11 (10%)	23 (21%)	41 (36%)	27 (24%)	112 (100%)
Kartasura	0 (0%)	11 (44%)	2 (8%)	2 (8%)	3 (12%)	7 (28%)	25 (100%)
Klaseman	0 (0%)	8 (5%)	9 (5%)	24 (15%)	45 (27%)	79 (48%)	165 (100%)
Klaten	0 (0%)	2 (29%)	2 (29%)	1 (13%)	0 (0%)	2 (29%)	7 (100%)
Krajan	0 (0%)	18 (9%)	33 (17%)	24 (13%)	70 (37%)	46 (24%)	191 (100%)
Lain-lain	0 (0%)	10 (23%)	10 (23%)	6 (14%)	11 (26%)	6 (14%)	43 (100%)
Luwang	0 (0%)	23 (8%)	31 (10%)	44 (14%)	127 (42%)	81 (26%)	306 (100%)
Mayang	0 (0%)	6 (4%)	36 (27%)	29 (22%)	34 (25%)	29 (22%)	134 (100%)
Sanggung	0 (0%)	8 (5%)	53 (28%)	15 (8%)	57 (30%)	55 (29%)	188 (100%)
Solo	0 (0%)	1 (25%)	1 (25%)	0 (0%)	1 (25%)	1 (25%)	4 (100%)
Sraten	0 (0%)	12 (5%)	61 (26%)	13 (5%)	91 (38%)	61 (26%)	238 (100%)
Tempel	0 (0%)	2 (2%)	14 (12%)	10 (9%)	64 (55%)	25 (22%)	115 (100%)
Trangsan	1 (0,3%)	32 (10%)	77 (23%)	52 (16%)	101 (31%)	66 (20%)	329 (100%)
Trosemi	0 (0%)	8 (7%)	24 (21%)	4 (4%)	38 (34%)	38 (34%)	112 (100%)
Wironanggan	0 (0%)	14 (6%)	36 (15%)	49 (21%)	60 (26%)	69 (30%)	228 (100%)
Wonosari	0 (0%)	0 (0%)	8 (12%)	5 (7%)	49 (71%)	7 (10%)	69 (100%)
Amount	4 (1%)	219 (7%)	554 (18%)	392 (12%)	1.185 (37%)	792 (25%)	3.164 (100%)

Source: secondary data, 2021-2025

Figure 5 below shows that the highest number of cases originated from the villages of Blimbing, Trangsan, and Luwang, with the 60–69 age group predominating. Blimbing Village recorded 256 cases (53%), Trangsan Village recorded 101 cases (31%), and Luwang Village recorded 127 cases (42%). Conversely, the lowest total case counts were found in Solo Village, with only 4 cases, and Boyolali Village, with only 5 cases.

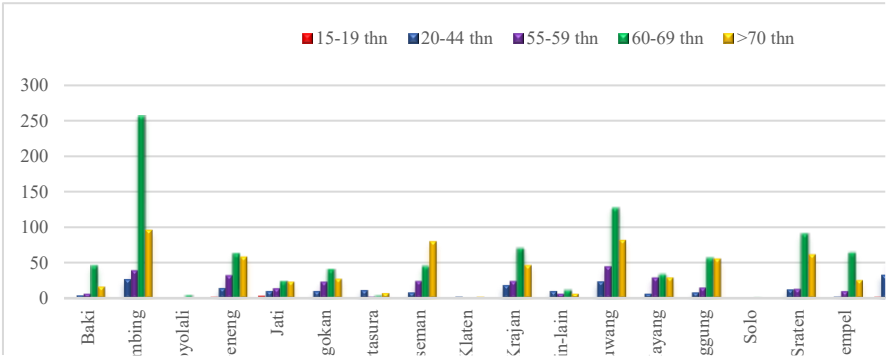

Figure 6. Graph of hypertension cases by village area, 2021–2025
(Source: primary data)

Relationship between Gender and Systolic Blood Pressure

Based on table 7, the analysis results indicate no significant difference in systolic blood pressure between males and females. The male group showed a tendency toward higher systolic blood pressure compared to the female group, evidenced by a mean difference of 1.19 points.

Table 7. Results of the test comparing gender and systolic blood pressure

Variable	n (person)	Average ± S.B	p	Information
Male	971	149.91 ± 26.88	0.298*	No difference
Female	2.159	148.72± 26.99		

* Mann-Whitney Test

Relationship between Gender and Diastolic Blood Pressure

Based on table 8, the analysis results indicate a significant association regarding diastolic blood pressure between males and females. The male group showed a tendency toward higher diastolic blood pressure values compared to the female group, evidenced by a mean difference of 0.14 points.

Table 8. Results of the test comparing gender and diastolic blood pressure

Variable	n (person)	Average ± S.B	p	Information
Male	971	87.91 ± 15.12	0.046*	Difference
Female	2.159	87.44 ± 22.48		

* Mann-Whitney Test

Correlation between Age and Systolic Pressure

Based on table 9, the Spearman rank correlation test results indicate a correlation between age and systolic blood pressure (p=0.001 < 0.05), with a correlation coefficient (r) of -0.129. This indicates a negative correlation with very weak strength.

Table 9. Results of the correlation test between age and systolic blood pressure

		Systolic Pressure	Information
Age	r	-0,129	Correlation
	p*	0,001	
	n	3.164	

* Spearman Rank

Correlation between Age and Diastolic Pressure

Based on table 10 below, the Spearman rank correlation test results indicate a correlation between age and systolic blood pressure (p=0.001 < 0.05), with a correlation coefficient (r) of -0.236. This indicates a negative correlation of weak strength.

Table 10. Results of correlation test between age and diastolic blood pressure

		Diastolic Pressure	Information
Age	r	-0,236	Correlation
	p*	0,001	
	n	3.164	

* Spearman Rank

DISCUSSION

Trends in Hypertension Cases by Type of Visit

The trends of hypertension incidence is influenced by the status of both follow-up and new visits. This indicates variations in the characteristics of patients visiting healthcare facilities. The type of visit is a crucial factor in understanding the pattern of hypertension incidence as it relates to the frequency of patient contact. Follow-up visits represent hypertensive patients returning to manage their condition, whereas new visits indicate newly diagnosed hypertension cases within that period. According to a study (20), the proportion of newly diagnosed hypertension is considerably high because blood pressure is more frequently detected during initial visits compared to follow-up visits.

The high rate of new patient visits is driven by individuals presenting to health facilities with either uncontrolled or undiagnosed blood pressure. This substantial volume of new patients indicates that health facilities have successfully expanded their services to previously underserved populations. Improvements in service access and quality, supported by rapid and accurate information systems and administrative management, encourage public healthcare-seeking behavior (21). This condition underscores the critical role of health facilities in early prevention and detection of hypertension risks. This finding aligns with (22) which highlights that routine blood

pressure screening can enhance public awareness regarding blood pressure control and the early detection of hypertension risks.

The relatively high proportion of new visits indicates that the process of identifying hypertension cases within the Gatak Community Health Center's service area remains active. This finding can be interpreted from two perspectives. First, the rising number of new patients may reflect expanded blood pressure screening coverage, allowing individuals previously undiagnosed with hypertension to be identified through health services. Second, the high proportion of new visits could also indicate suboptimal public awareness regarding regular blood pressure checks; consequently, some patients only seek care after experiencing elevated blood pressure or the onset of clinical symptoms. Therefore, an increase in new visits does not necessarily signify a rise in the incidence of hypertension in the community; rather, it may reflect improvements in early detection, increased access to healthcare, and the effectiveness of the case-recording system within the health facility.

These findings align with research by (23), which indicates that the implementation of the BPJS digital health screening as part of early detection efforts for non-communicable diseases (NCDs) improves the identification of individuals at risk for hypertension, even though screening coverage at some puskesmas has yet to meet national targets. This suggests that the rise in the number of patients identified with hypertension may be attributed to the expanded implementation of health screenings. Consequently, an increase in detected cases does not necessarily reflect a rise in the actual incidence of hypertension within the community, it indicates that more cases are successfully being identified through health examinations.

Research by (24) also reports that the implementation of non-communicable disease NCD) screening in primary care settings contributes to increased detection of hypertension and other chronic diseases. The evaluation indicates that as screening coverage expands through the Integration of Primary Care Services, the number of cases recorded at health facilities rises, driven by a greater number of people undergoing routine blood pressure checks.

Furthermore, the use of EHRs contributes to improved detection of hypertension cases. A study by (25) demonstrated that the use of HER featuring clinical documentation and reminder tools significantly enhances the identification of hypertension diagnoses, patient documentation, and blood pressure control compared to paper-based records. Electronic systems enable healthcare providers to identify patients not previously documented as having hypertension, thereby resulting in a more comprehensive record of cases.

Trends in Hypertension Incidence by Gender

Hypertension is a chronic disease that frequently affects both men and women. Based on the study, the results indicated that the majority of hypertension patients were female, accounting for 2,185 cases (69%), while males accounted for 979 cases (31%). This proportion indicates a distinct pattern in the incidence of hypertension between sexes. Hypertension is influenced by biological factors, including hormonal variations, body structure, and cardiovascular function. Additionally, differences in healthy lifestyle behaviors such as physical activity patterns, smoking habits, alcohol consumption, and stress exposure also contribute to the incidence rate.

At a younger age, men face a higher risk of hypertension than women. However, post-menopause, the risk among women increases significantly, surpassing that of men. This shift is driven by the decline in estrogen levels, a hormone crucial for maintaining vascular health. This aligns with a previous study (26), which revealed that sex is a contributing factor to elevated blood pressure, as women entering menopause experience a reduction in estrogen levels.

According to (27), estrogen protects blood vessels by maintaining their elasticity and reducing the risk of atherosclerosis. When estrogen levels decline, Low-Density Lipoprotein (LDL) levels increase, whereas High-Density Lipoprotein (HDL) levels decrease. These changes can accelerate plaque formation in blood vessels, leading to elevated blood pressure. This pattern demonstrates that hypertension management must consider sex-specific factors, as men and women possess distinct risk profiles regarding disease progression.

The predominance of hypertension cases among women in this study is likely influenced by the age distribution of the respondents, the majority of whom fell within the 60–69 age group. In this age range, most women have entered menopause; the resulting decline in estrogen levels diminishes the protective effects on endothelial function and vascular elasticity, thereby contributing to elevated blood pressure. Beyond biological factors, women generally exhibit better health-seeking behavior than men, leading to more frequent utilization of primary healthcare services and a higher representation in medical records. These findings align with (28), who reported that the prevalence of hypertension in women increases post-menopause due to hormonal changes associated with aging. However, these results differ from the NCD Risk Factor Collaboration (29) report, which indicated a higher prevalence of hypertension among men of working age. This discrepancy is likely attributable to differences in study population characteristics; the current study was dominated by an elderly cohort, whereas the NCD-RisC study involved an adult population spanning various age groups.

Trends in Hypertension Incidence by Age

With advancing age, arterial walls undergo significant structural changes. Concurrently, the blood vessel layers become thicker, stiffer, and lose their elasticity. This causes the blood pumped from the heart to flow sub-optimally, leading to an increase in systolic pressure and a decrease in diastolic pressure. This aligns with a study (16) revealing that arteries in the body thicken and stiffen with age, resulting in a reduction and impairment of both the volume and backflow of blood that can pass through the vessels. The accumulation of collagen in the muscular layer and fatty deposits on the arterial walls can impede blood flow, potentially leading to coronary heart disease (26).

According to (30), arterial walls begin to thicken due to collagen accumulation in the muscular layer after the age of 45. This causes the blood vessels to become increasingly narrow and stiff; consequently, hypertension occurs more frequently after the age of 40, although it can manifest at a younger age. This is attributed to shifts in modern lifestyles, which are characterized by diets high in salt, fat, and processed or fast foods, combined with low levels of physical activity (31). Furthermore, excessive gadget use can lead to sleep deprivation, thereby accelerating metabolic dysfunction. This is consistent with research (32) explaining that excessive gadget use exerts negative impacts that can increase the risk of health disorders.

Age influences hypertension through the aging process, which induces physiological changes in the cardiovascular system, including reduced arterial elasticity, increased vascular stiffness, and narrowing of the blood vessel lumen. A study by (26), states that the cardiovascular system undergoes a decline in function, resulting in an increased incidence of hypertension. Most hypertension cases in the adult age group are influenced by genetic factors, although they do not always show a significant correlation with elevations in either systolic or diastolic blood pressure. However, individuals with a family history of hypertension are frequently found to have high total cholesterol levels. Consequently, this condition heightens the likelihood of developing hypertension (33).

In addition to biological changes, the high number of cases among the 60–69 age group may also be influenced by increased healthcare utilization. Older adults often have comorbidities, leading them to visit healthcare facilities more frequently than younger age groups. This situation increases the likelihood of blood pressure measurements being taken and a diagnosis of hypertension being established. Therefore, the high number of cases in this older age group is driven not only by increased biological risk but also by greater opportunities for detection through healthcare services.

The results of this study align with the phenomenon of epidemiological transition occurring in Indonesia specifically, the shift in the disease burden from communicable diseases to NCDs. Rising life expectancy, urbanization, and lifestyle changes have made hypertension an increasingly common NCD, particularly among the elderly. With advancing age, the accumulation of risk factors such as unhealthy diets, physical inactivity, and the natural aging process increases the elderly's susceptibility to hypertension. These findings are supported by (34), who explain that Indonesia has entered a phase of epidemiological transition characterized by a rise in NCDs resulting from demographic, social, and lifestyle changes within the population.

Trends in Hypertension Incidence by Occupation

Hypertension can be influenced by various work-related factors. This is typically driven by high job demands, long working hours, and stressful environments. Stress induces arteriole contraction or narrowing of the arterioles, thereby increasing peripheral vascular resistance (33). This is consistent with a study (35) which revealed that stress is a factor that can exacerbate elevated blood pressure in hypertensive individuals. This exacerbation is caused by the body's physiological and psychological responses to psychosocial stress, such as mental pressure or life burdens, as well as situations that provoke emotional tension.

Workplace psychosocial exposure, such as effort-reward imbalance and intensive time pressure, influences the prevalence of hypertension among workers (36). High-pressure working environments combined with long working hours can induce chronic physiological responses, ultimately leading to occupational hypertension (37). High workloads, strenuous efforts, and demanding goals can trigger excessive stress and pressure. In line with a study (38), prolonged stress leads to an increase in heart rate and blood pressure. Consequently, this condition results in a lack of time to engage in physical activities or exercise (39).

The results indicated that housewives constituted the group with the highest prevalence of hypertension. According to research (40), the highest number of hypertension patients was found among housewives, which was attributed to a lack of exercise, busy household routines, and a high psychological burden that is difficult to manage. Another study (41) also revealed that a portion of the unemployed group had a higher probability of developing hypertension due to a lack of physical activity. These findings demonstrate that being a housewife is an occupation characterized by a high workload, parental responsibilities, and emotional stress arising from demanding role expectations.

The high prevalence of hypertension among housewives in this study was likely influenced not only by occupational factors but also by the respondents' age characteristics. A significant proportion of the housewives belonged to an older age group, which carries a higher physiological risk of hypertension due to the aging process. Consequently, age is suspected to act as a confounding factor in the relationship between occupation and the incidence of hypertension. Thus, being a housewife cannot be cited as a direct cause of hypertension; rather, the condition is more closely linked to physical activity patterns, stress levels, and socioeconomic circumstances that can influence blood pressure. These findings are supported by (42), who stated that age is a primary determinant of hypertension, whereas social and lifestyle factors contribute to hypertension risk through interactions with individual and environmental characteristics.

Thus, the results of this study indicate that employment is not a direct cause of hypertension but rather exerts an influence through various pathways, such as stress levels, physical activity patterns, and the respondents' age and hormonal characteristics. This may also explain why this study found the highest proportion of hypertension among housewives, whereas other studies have reported higher prevalence rates among formal-sector workers facing high levels of job stress. Such discrepancies are likely attributable to variations in population characteristics, age distribution, and the specific types of employment studied; consequently, interpreting the relationship between employment and hypertension requires consideration of confounding factors that may influence the findings.

Trends in Hypertension Incidence by Village Area

The incidence of hypertension is influenced by characteristics such as population size, age structure, as well as social and environmental conditions. Villages with larger populations typically present a higher number of hypertension cases, parallel with the increased potential exposure to risk factors. Furthermore, a high elderly population indicates a greater number of hypertension cases compared to other villages, corresponding to advancing age. Social and environmental conditions such as lifestyle, physical activity levels, and access to healthcare facilities also influence variations in hypertension across villages. This aligns with a study (43) stating that the number of hypertension cases in an area is influenced not only by the population size but also by environmental factors, such as the availability and accessibility of healthcare services.

Easy access to healthcare services and routine screening programs in a village tends to yield more detected cases of hypertension due to broader screening coverage. Conversely, villages with limited access to healthcare services potentially experience underdetection of hypertension cases; thus, the recorded data may not reflect the actual community burden. The accessibility of healthcare facilities significantly influences community participation in routine screening and examinations for non-communicable diseases (44). This finding is consistent with a study (45), showing that easier access to healthcare services correlates with higher coverage of controlled diseases. Accessibility enables individuals to receive prompt care, whereas limited access can result in low disease control coverage due to difficulties in reaching healthcare services.

Villages with good screening coverage, active involvement of health volunteers, and easy access to healthcare facilities tend to record a higher number of hypertension cases because more residents undergo blood pressure checks. Conversely, villages with limited access to healthcare services are prone to underdiagnosis, resulting in lower recorded case numbers, even though the actual disease burden within the community is quite high.

Relationship between Gender and Systolic Blood Pressure

Based on the data analysis using the Mann-Whitney test, a p-value of 0.298 ($p > 0.05$) was obtained. This indicates that there is no statistically significant difference in systolic blood pressure between males and females.

The absence of a difference in systolic blood pressure between men and women indicates that gender is not a dominant factor influencing systolic blood pressure in this study population. There may be other factors with a greater influence, such as age, adherence to antihypertensive medication, obesity status, comorbidities, or lifestyle. Furthermore, the predominance of female respondents in the older age group meant that the hormonal differences between men and women diminished after menopause, resulting in similar systolic blood pressure levels across both groups. This finding is supported by (46), who reported that the influence of sex on blood pressure shifts throughout the life cycle; in older age, it is driven more by the aging process and other cardiovascular risk factors than by hormonal differences.

Systolic blood pressure represents the pressure when the heart pumps blood throughout the body, which is influenced by myocardial pumping force and the large arteries. A systolic blood pressure value is considered high if it exceeds 140 mmHg (47). Males tend to exhibit higher systolic blood pressure from youth to adulthood due to greater sympathetic nervous system activity, larger muscle mass composition, and lifestyle factors such as smoking and sodium consumption (26).

Females of reproductive age possess the hormone estrogen, which plays a role in maintaining vascular elasticity and regulating blood pressure, resulting in relatively lower systolic values. However, upon entering menopause, estrogen levels decline, leading to a loss of this protective vascular effect. This is in line with a study (48) mentioning that female systolic blood pressure increases with age due to the decline in estrogen during menopause. Another study (16) stated that estrogen production decreases during menopause, thereby causing a more pronounced increase in blood pressure in females compared to males.

Relationship between Gender and Diastolic Blood Pressure

Based on the data analysis using the Mann-Whitney test, a p-value of 0.046 ($p < 0.05$) was obtained. This indicates that there is a significant difference in diastolic blood pressure between males and females.

Although statistical analysis revealed a difference in diastolic blood pressure between men and women ($p=0.046$), the difference in mean diastolic blood pressure between the two groups was relatively small; thus, this statistical significance does not necessarily reflect clinical significance. These findings indicate that a large sample size can increase the statistical power of a test, allowing even very small differences to be detected as significant. Therefore, interpreting the study results requires looking beyond p-values and considering the effect size to assess the clinical relevance of the observed differences.

Diastolic blood pressure is the pressure within the arterial vessels when the myocardium relaxes before pumping blood again. An individual is classified as having high diastolic blood pressure if the result exceeds 90 mmHg (47). Diastolic blood pressure is influenced by peripheral vascular resistance. A study by (49) revealed that blood pressure elevation is driven by cardiac output and total peripheral resistance.

Males tend to have higher diastolic blood pressure than females during adulthood, which is associated with sympathetic nervous system activity and lifestyle habits, such as smoking and dietary patterns that elevate peripheral vascular resistance. According to (50), the acute effects of smoking can increase heart rate and blood pressure through the elevation of epinephrine and norepinephrine hormones triggered by sympathetic nervous system activation.

Correlation between Age and Systolic Pressure

Based on the analysis using the Spearman rank correlation, a correlation coefficient (r) of -0.129 was obtained with a p-value of 0.001 ($p < 0.05$). This indicates that there is a statistically significant relationship between age and systolic blood pressure, characterized by a very weak and negative correlation.

These findings indicate that age is not the sole determinant of systolic blood pressure in the study population. It is possible that older patients were receiving more optimal antihypertensive therapy or undergoing regular monitoring, resulting in relatively better-controlled systolic blood pressure compared to younger age groups who had not yet received optimal treatment. Thus, the relationship between age and systolic blood pressure in this study was influenced by factors such as treatment, therapeutic adherence, and population characteristics that were not analyzed in the study.

The negative correlation implies that advancing age is not solely dependent on a systolic blood pressure increase, but is also influenced by other factors such as diet, physical activity, smoking habits, and stress. Nevertheless, systolic blood pressure generally tends to rise with age due to diminished vascular elasticity. This finding is consistent with (51), which states that individuals over 50 years old are at risk for elevated systolic pressure due to a decline in vascular elasticity.

This elevation occurs as a result of structural changes that render the arteries stiffer and less compliant. This condition leads to increased vascular resistance and amplifies systolic pressure. A study by (52) revealed that the increase in systolic pressure among older adults is caused by endothelial dysfunction and increased arterial stiffness in patients with isolated systolic hypertension.

Correlation between Age and Diastolic Pressure

Based on the analysis using the Spearman rank correlation, a correlation coefficient (r) of -0.236 was obtained with a p-value of 0.001 ($p < 0.05$). This indicates a statistically significant relationship between age and diastolic blood pressure, featuring a weak and negative correlation.

The negative correlation between age and diastolic pressure aligns with the concept of physiological vascular aging, wherein diastolic pressure tends to decline after the age of approximately 50–60 years due to increased stiffness of the large arteries. This phenomenon causes systolic pressure to rise while diastolic pressure falls, resulting in a widened pulse pressure. Consequently, although the prevalence of hypertension increases in older age, diastolic pressure does not necessarily rise with advancing age.

The negative correlation indicates that as age increases, diastolic blood pressure decreases. This is supported by (48), which states that diastolic blood pressure increases up to the age of 50 and subsequently declines in the elderly. The decline in diastolic pressure occurs due to a decrease in arteriole resistance and increased stiffness of

the blood vessels. This stiffness causes blood pressure to return to the heart more rapidly, which elevates systolic pressure but lowers diastolic pressure (53).

The relationship between age and diastolic pressure is also influenced by structural and functional vascular changes, such as atherosclerosis, decreased baroreceptor sensitivity, and reduced peripheral vascular compliance. This aligns with a study by (53). stating that atherosclerosis disrupts peripheral vascular structures and induces vascular stiffness. This stiffness is accompanied by plaque formation and narrowing that impedes blood flow, thereby increasing cardiac workload as the heart must pump blood with greater force.

CONCLUSION

The trend of hypertension incidence at the Gatak Public Health Center based on visit status was dominated by the new visit group. Based on gender, the trend of hypertension incidence at the Gatak Public Health Center was dominated by females. Based on age, the trend of hypertension incidence at the Gatak Public Health Center was dominated by the 60–69 years age group. Based on occupation, the trend of hypertension incidence at the Gatak Public Health Center was dominated by housewives, daily laborers, private employees, and retirees. Based on village area, the trend of hypertension incidence at the Gatak Public Health Center was predominantly concentrated in Blimbing, Trangsan, and Luwang villages. Based on the Mann-Whitney test analysis, the significance values (p-value) obtained were $0.298 > 0.05$ and $0.046 < 0.05$, indicating that there was no significant difference between gender and systolic blood pressure, but a significant difference existed between gender and diastolic blood pressure. Based on the Spearman rank analysis, a significance value (p-value) $0.001 < 0.005$ was obtained, with correlation coefficients of $r=-0.129$ and $r=-0.236$. This indicates a correlation between age and both systolic and diastolic blood pressure, characterized by a negative direction and a very weak to weak correlation strength.

This study has limitations as it utilized secondary medical record data from only one community health center and did not include key risk factors such as lifestyle, body mass index, smoking habits, physical activity, and diet. Therefore, future research should involve multiple health facilities and incorporate a more diverse range of risk factor variables to obtain more comprehensive evidence regarding hypertension trends and determinants. Furthermore, routine blood pressure screening, the adoption of a healthy lifestyle, and regular physical activity including Tera Exercise need to be continuously promoted as measures for the early detection and prevention of hypertension.

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