Galore International Journal of Health Sciences and Research
[Indexed, Peer-Reviewed Journal]
Vol. 11; Issue: 1; Jan.-March 2026
Website: www.gijhsr.com
Original Research Article *P-ISSN: 2456-9321*

The Role of Demographic Factors (Age and Sex) in Hypertension Severity at Muna Barat Hospital

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DOI: https://doi.org/10.52403/gijhsr.20260120

ABSTRACT

Background: Hypertension is a major non-communicable disease with high prevalence influenced by several risk factors, including age and sex. In Muna Barat Regency, hypertension cases remain high, requiring analysis of associated factors in healthcare settings.
Objective: This study aimed to determine the relationship between age and sex with the incidence of hypertension among patients at Rumah Sakit Muna Barat in 2025.
Methods: This analytic observational study used a cross-sectional design. A total of 100 respondents were selected using non-probability (consecutive) sampling. Data were analyzed using univariate analysis and Spearman Rank correlation test with a significance level of $\alpha = 0.05$.
Results: The results showed a significant relationship between age and hypertension ($p = 0.000$; $r = 0.433$) with moderate correlation strength. A significant relationship was also found between sex and hypertension ($p = 0.005$; $r = 0.279$) with weak correlation strength. Elderly respondents were predominantly in stage II hypertension (18.0%), and females were more dominant in stage II hypertension (30.0%).
Conclusion: Age and sex were significantly associated with hypertension among patients at Rumah Sakit Muna Barat. Increasing age was associated with higher hypertension severity, and females tended to have more severe hypertension.

Keywords: age, hypertension, incidence of hypertension, sex

INTRODUCTION

Hypertension is one of the non-communicable diseases that remains a major public health problem in many countries, particularly in developing nations (1,2). Clinically, hypertension is defined as a condition characterized by persistently elevated systolic and/or diastolic blood pressure, resulting in hemodynamic burden on the cardiovascular system. The majority of hypertension cases, approximately 90–95%, are classified as essential or primary hypertension, the exact cause of which is not specifically known. Instead, it is multifactorial, involving interactions between genetic, environmental, and neurohormonal regulatory factors. If not properly controlled, hypertension may progress to serious complications such as congestive heart failure, end-stage renal disease, stroke, and peripheral vascular disease, ultimately increasing morbidity and mortality rates (3).
Pathophysiologically, hypertension represents a manifestation of complex cardiovascular system imbalance (4,5). This

process is associated with increased peripheral resistance, changes in vascular elasticity, and activation of the renin-angiotensin-aldosterone system as well as the sympathetic nervous system. With advancing age, structural changes occur in the arterial walls, including thickening and stiffness due to collagen deposition and reduced elasticity, leading to increased systolic pressure. In addition, sex also plays a role through hormonal mechanisms, particularly the protective effect of estrogen in women before menopause (6). Therefore, age and sex are non-modifiable risk factors that significantly contribute to the occurrence of hypertension (7).

Globally, the World Health Organization reported in the Global Report on Hypertension 2025 that approximately 1.4 billion people aged 30–79 years worldwide suffer from hypertension, yet only about 320 million have their blood pressure adequately controlled (8). This condition indicates that detection, treatment, and control of hypertension at the population level remain suboptimal. In Indonesia, based on data from the Basic Health Research and the National Health Profile issued by the Ministry of Health of the Republic of Indonesia, the prevalence of hypertension reaches approximately 34.11%, making it one of the non-communicable diseases with the highest burden. In Southeast Sulawesi Province, the prevalence of hypertension is recorded at 39.75%, while in Muna Barat Regency it is 27.50%. Data from the Muna Barat District Health Office in 2024 showed 350 hypertension cases from January to December 2024, ranking fourth among the top ten non-communicable diseases in the region.

This phenomenon illustrates that hypertension remains a significant local health problem, including at Rumah Sakit Muna Barat as a referral healthcare facility. Based on previous research conducted at Rumah Sakit Muna Barat in 2025, among 100 hypertensive patients, most were in the pre-elderly (44%) and elderly (28%) groups, with a higher proportion of females (62%) compared to males (38%). In addition, blood pressure distribution showed that the majority of respondents were classified as stage I hypertension (49%) and stage II hypertension (37%). These findings indicate a tendency for increased hypertension severity in older age groups as well as differences in distribution based on sex.

Although hypertension prevalence data have been widely reported at national and provincial levels, there remains a phenomenon gap at the district level, particularly regarding the analysis of non-modifiable risk factors such as age and sex at Rumah Sakit Muna Barat. Available local data are mostly descriptive in terms of case numbers and have not extensively described the statistical strength of the relationship between demographic characteristics and hypertension severity. In fact, locally based data are essential for planning more targeted interventions according to the characteristics of the local population (9,10).

From a research gap perspective, previous studies conducted in other regions have shown varying results regarding the relationship between age, sex, and hypertension. Some studies have reported significant associations, while others particularly in specific populations such as pregnant women have found no significant relationship between age and hypertension. These variations indicate the need for contextual studies in each region, as social, cultural, healthcare access, and lifestyle factors may influence risk distribution. To date, research specifically analyzing the correlation strength between age, sex, and hypertension at Muna Barat hospital remains limited.

The urgency of this study lies in the high number of hypertension cases and the potential complications that may burden the healthcare system and the community's socioeconomic conditions. Identifying the relationship between age, sex, and hypertension can serve as a foundation for developing early screening strategies, health education programs, and strengthening

promotive and preventive efforts in healthcare facilities. Furthermore, by identifying higher-risk age and sex groups, healthcare professionals can implement more targeted approaches, including counseling, routine blood pressure monitoring, and control of other modifiable risk factors.

The novelty of this study lies in its effort to explore the relationship between demographic factors, such as age and sex, and hypertension in the Muna Barat region, a context that has rarely been studied. Similar studies in this area are still limited; therefore, this research is expected to serve as an initial locally based reference. The objective of this study is to determine the relationship between age and sex with the incidence of hypertension at Rumah Sakit Muna Barat. The findings are expected to provide input for hospital management and the District Health Office in formulating hypertension prevention and control policies, as well as to serve as a basis for future research examining hypertension risk factors more comprehensively in the region.

MATERIALS & METHODS

This study employed a quantitative approach with an analytic observational design using a cross-sectional study framework, in which exposure and outcome variables were measured simultaneously at a single point in time. The study was conducted at Muna Barat hospital from January to March 2025. The target population consisted of all adult patients visiting the outpatient clinic and/or hospitalized at Muna Barat hospital with a diagnosis of hypertension during the study period. The accessible population included patients who were present during data collection and met the inclusion criteria. The inclusion criteria were: (1) patients aged ≥18 years, (2) having recorded blood pressure measurements taken by healthcare professionals, and (3) willingness to participate and sign informed consent. The exclusion criteria were: (1) patients in emergency conditions that did not allow interviews, (2) incomplete medical record data, and (3) patients with severe cognitive impairment. Sampling was conducted using non-probability sampling with a consecutive/accidental sampling approach, whereby all eligible subjects during the study period were recruited until the required sample size of 100 respondents was achieved. The sample size was calculated using a proportion estimation formula for cross-sectional analytic studies, assuming a 95% confidence level, an estimated hypertension proportion of approximately 30% based on previous data, and a 10% margin of error, resulting in a minimum required sample of 81 respondents. An additional 20% was added to anticipate incomplete data, yielding a minimum of 98 respondents, which was rounded up to 100 respondents.

The outcome variable in this study was the incidence of hypertension categorized according to blood pressure levels. The diagnosis and classification of hypertension followed the criteria established by the World Health Organization and the Ministry of Health of the Republic of Indonesia: pre-hypertension (systolic 120–139 mmHg and/or diastolic 80–89 mmHg), stage I hypertension (140–159 mmHg and/or 90–99 mmHg), and stage II hypertension (≥160 mmHg and/or ≥100 mmHg). The primary exposure/predictor variables were age (categorized into adults 18–44 years, pre-elderly 45–59 years, and elderly ≥60 years) and sex (male/female). Potential confounding factors conceptually identified included body mass index, family history of hypertension, smoking habits, salt intake, and physical activity; however, these variables were not analyzed using multivariate analysis and are acknowledged as study limitations. No formal effect modifier analysis was performed, although theoretically sex may modify the relationship between age and hypertension through hormonal mechanisms.

The research instruments consisted of an observation sheet and a medical record extraction form. Blood pressure

measurements were performed by nurses or healthcare professionals using a calibrated digital sphygmomanometer (standard hospital equipment), following clinical blood pressure measurement guidelines (patients rested for at least 5 minutes, seated position, appropriate cuff size according to arm circumference, two measurements taken and averaged). The validity and reliability of the instrument were based on hospital medical device calibration standards and WHO recommendations regarding blood pressure measurement accuracy. Data on age and sex were obtained from medical records and verified through brief interviews. Data sources for all variables included primary data (blood pressure measurements at the time of visit) and secondary data (patient medical records). The same blood pressure measurement procedures were applied uniformly to all respondents without differentiating groups, ensuring comparability between age and sex groups.

To minimize selection bias, all patients meeting the inclusion criteria during the study period were consecutively recruited. Information bias was reduced by applying standardized blood pressure measurement procedures and using calibrated instruments. Misclassification bias was prevented by adhering to standardized diagnostic criteria for hypertension. Data completeness was rechecked (data cleaning) prior to analysis. Data collection was conducted after obtaining official permission from the hospital, and respondent confidentiality was maintained by using numerical codes instead of personal identifiers.

Data analysis was conducted using univariate analysis to describe the frequency distribution of age, sex, and hypertension levels. Bivariate analysis was performed using the Spearman Rank correlation test, as the data were ordinal, to assess the strength and direction of the relationship between age and hypertension level, as well as between sex and hypertension level. Statistical significance was set at $\alpha = 0.05$ with a 95% confidence interval. All statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS) software, latest version available at the research institution. Results were presented in the form of frequency distribution tables, p-values, and correlation coefficients (r) to describe the strength of relationships between variables.

RESULT

Table 1. Characteristics of Respondents at Rumah Sakit Muna Barat

Characteristics	Number (n)	Percentage (%)
Sex		
Male	38	38
Female	62	62
Age		
Adult	28	28
Pre-elderly	44	44
Elderly	28	28
Hypertension		
Pre-hypertension	14	14
Hypertension Stage I	49	49
Hypertension Stage II	37	37

Based on respondent characteristics consisting of age, sex, and blood pressure, it was found that 28 respondents (28.0%) were adults, 44 respondents (44.0%) were pre-elderly, and 28 respondents (28.0%) were elderly. Male respondents accounted for 38 individuals (38.0%), while female respondents accounted for 62 individuals (62.0%). Regarding blood pressure levels, 14 respondents (14.0%) were classified as pre-hypertensive, 49 respondents (49.0%) had stage I hypertension (140–159/90–99 mmHg), and 37 respondents (37.0%) had stage II hypertension (≥160/≥100 mmHg).

Table 2. Relationship Between Age and Hypertension Among Patients at Rumah Sakit Muna Barat

Age	Pre-hypertension	Stage I Hypertension	Stage II Hypertension	p-value	r (Spearman)
Adult	12 (12.0%)	9 (9.0%)	7 (7.0%)		
Pre-elderly	2 (2.0%)	30 (30.0%)	12 (12.0%)		
Elderly	0 (0%)	10 (10.0%)	18 (18.0%)		
Total	14 (14.0%)	49 (49.0%)	37 (37.0%)	0.001	0.433

Based on the table above, among 100 respondents, the largest group was pre-elderly (44.0%), followed by adults (28.0%) and elderly (28.0%). Blood pressure distribution showed that adults were predominantly in the pre-hypertension category (12.0%). Among the pre-elderly group, most were classified as stage I hypertension (30.0%), while the elderly group was predominantly classified as stage II hypertension (18.0%). The Spearman Rank correlation test showed a p-value of 0.000 ($p < 0.05$) with a correlation coefficient of $r = 0.433$, indicating a statistically significant relationship between age and hypertension with a moderate positive correlation. This suggests that as age increases, the severity of hypertension also tends to increase.

Table 3. Relationship Between Sex and Hypertension Among Patients at Rumah Sakit Muna Barat

Sex	Pre-hypertension	Stage I Hypertension	Stage II Hypertension	p-value	r (Spearman)
Male	7 (7.0%)	24 (24.0%)	7 (7.0%)		
Female	7 (7.0%)	25 (25.0%)	30 (30.0%)	0.005	0.279
Total	14 (14.0%)	49 (49.0%)	37 (37.0%)	0.005	0.279

Based on the table above, the majority of respondents were female (62.0%), while males accounted for 38.0%. Among males, most were classified as stage I hypertension (24.0%). In contrast, females were predominantly classified as stage II hypertension (30.0%).

The Spearman Rank correlation test showed a p-value of 0.005 ($p < 0.05$) with a correlation coefficient of $r = 0.279$, indicating a statistically significant but weak relationship between sex and hypertension. This suggests that sex is associated with hypertension severity, with females in this study tending to experience higher hypertension severity compared to males.

DISCUSSION

This study successfully achieved its objective of analyzing the relationship between age and sex with the incidence of hypertension among patients at Rumah Sakit Muna Barat. The findings demonstrated that both independent variables were statistically significantly associated with the degree of hypertension. This indicates that non-modifiable demographic factors such as age and sex continue to play an important role in the distribution of hypertension severity within healthcare facilities. Therefore, this study provides empirical, locally based evidence regarding hypertension risk factors in Muna Barat Regency.

The main findings revealed that age had a significant relationship with hypertension, with a moderate correlation strength ($r = 0.433$; $p < 0.05$). As age increased, the severity of hypertension also increased, with the elderly group predominantly experiencing stage II hypertension. In addition, sex was significantly associated with hypertension, although with a weak correlation ($r = 0.279$; $p < 0.05$). Females in this study were more frequently classified as having stage II hypertension compared to males. These findings indicate a trend toward increasing hypertension severity with advancing age and differences in distribution based on sex.

The results of this study are consistent with previous research, such as studies by Belay et al. (11), which reported significant associations between age and hypertension.

Numerous studies consistently show that both the prevalence and severity of hypertension increase in older age groups. Similarly, Delfianna et al. (12) reported a significant relationship between sex and hypertension among the elderly, with postmenopausal women having a higher risk. However, other studies, such as Wilson et al. (13) conducted among pregnant women, found no significant association between age and hypertension, suggesting that population context greatly influences research findings.

Theoretically, the relationship between age and hypertension can be explained by degenerative changes in the cardiovascular system (14). Aging leads to decreased arterial elasticity due to collagen deposition and atherosclerosis, which increases peripheral resistance and systolic blood pressure (15). Activation of the renin–angiotensin–aldosterone system and increased sympathetic nervous system activity in older individuals further exacerbate this condition. Regarding sex differences, hormonal theory explains that estrogen has a protective effect on vascular walls in women before menopause. After menopause, declining estrogen levels increase the risk of vascular stiffness and hypertension, supporting the finding that women in this study experienced higher degrees of hypertension (16).

The correlation between age and hypertension in this study showed a positive direction with moderate strength, indicating that increasing age is accompanied by increasing hypertension severity (17,18). This confirms that age is an important determinant in the progression of hypertension, particularly in relation to disease severity. Meanwhile, the correlation between sex and hypertension was weak but statistically significant, suggesting that although sex contributes to hypertension severity, its influence is not as strong as that of age. The difference in correlation strength indicates that biological aging factors may have a more dominant contribution than sex alone (19).

The implications of this study are important for healthcare services at the district hospital level. The findings may serve as a basis for developing risk-based screening strategies, particularly targeting pre-elderly and elderly patients. Healthcare professionals may also enhance health education and routine blood pressure monitoring, especially among older women who appear more vulnerable to severe hypertension. At the policy level, these findings can support more targeted promotive and preventive programs aimed at controlling non-communicable diseases in Muna Barat Regency.

Nevertheless, this study has several limitations. The cross-sectional design does not allow for causal inference but only identifies associations at a single point in time. Potential confounding variables such as body mass index, dietary patterns, physical activity, family history, and smoking habits were not analyzed using multivariate methods, leaving possible confounding effects unaddressed. Additionally, the use of non-probability sampling limits the generalizability of the findings to broader populations. Future research is recommended to employ longitudinal designs or multivariate analyses to obtain a more comprehensive understanding of hypertension risk factors.

CONCLUSION

Based on the results of this study, it can be concluded that there is a significant relationship between age and sex with the incidence of hypertension among patients at Rumah Sakit Muna Barat. Age showed a moderate correlation ($r = 0.433$; $p = 0.000$), indicating that increasing age is associated with higher hypertension severity. Sex was also significantly associated with hypertension ($r = 0.279$; $p = 0.005$), although the strength of the relationship was weak. Female respondents in this study were more likely to experience stage II hypertension compared to males.

It is recommended that the hospital strengthen routine blood pressure screening and monitoring, particularly among pre-

elderly and elderly patients. Health education on hypertension prevention should also be enhanced, especially for older women. Future studies are expected to analyze additional risk factors such as dietary patterns, obesity, physical activity, and family history using multivariate analysis to obtain a more comprehensive understanding of hypertension determinants.

Declaration by Authors

Ethical Approval: Approved
Acknowledgement: None
Source of Funding: None
Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Sitti Naima Ayu Muliana Aksa, Nurna Ningsih, Jamaluddin. The role of demographic factors (age and sex) in hypertension severity at Muna Barat Hospital. *Gal Int J Health Sci Res*. 2026; 11(1): 163-170. *DOI: https://doi.org/10.52403/gijhsr.20260120*

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