Napande: Jurnal Bidan
e-ISSN 2829-8365
Volume 5 Issue 1, 2026, page 1-10
DOI: 10.33860/njb.v5i1.4323
Website: https://ojs.polkespalupress.id/index.php/njb
Publisher: Poltekkes Kemenkes Palu

Original Article

Hypertensive Disorder in Pregnancy: A Comparative Cross-Sectional Study of Maternal Characteristics in Urban and Rural Communities

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ARTICLE INFO

Article History:
Received: 2026-02-23
Accepted: 2026-02-25
Published: 2026-03-05

Keywords:

Hypertension in Pregnancy; Rural; Urban; Determining Factor;

ABSTRACT

Background: Hypertensive disorders of pregnancy remain a major contributor to maternal morbidity and mortality worldwide, affecting approximately 10% of pregnancies. Demographic and lifestyle factors play a crucial role in the development of hypertension during pregnancy, with evidence suggesting higher pregnancy-related mortality risks among women living in rural areas compared to urban settings. This study aimed to examine differences in risk factors for hypertensive disorders in pregnancy between pregnant women residing in urban and rural areas.
Method: A cross-sectional study was conducted from March to September 2025 at two community health centers, one in an urban area (Depok, West Java) and one in a rural area (Poso Regency). The study population comprised pregnant women diagnosed with hypertension after 20 weeks of gestation. A total of 66 respondents were recruited using accidental sampling. Data were collected using a questionnaire adapted from the 2023 Indonesian Health Survey (maternal health section). Statistical analysis included the Kolmogorov–Smirnov test for normality and the Mann–Whitney test for group comparisons, with a significance level of $p < 0.05$. Ethical approval was obtained before data collection.
Result: Of the 17 risk factors assessed, five showed significant differences between urban and rural respondents. These included parity ($p = 0.021$), history of chronic disease ($p = 0.021$), exposure to cigarette smoke ($p = 0.001$), physical activity ($p = 0.008$), and frequency of spicy food consumption ($p = 0.012$).
Conclusion: Significant differences in maternal characteristics associated with hypertensive disorders of pregnancy were observed between urban and rural populations. These findings highlight the need for context-specific maternal health interventions that consider local demographic and lifestyle factors to improve maternal and perinatal outcomes.

INTRODUCTION

Hypertensive disorders in pregnancy (HDP) remained one of the leading causes of maternal mortality worldwide(Nath et al., 2021). Globally, the number of pregnant women affected by HDP increased from 16.30 million in 1990 to 18.08 million in 2019. The highest burden was recorded in South Asia (3.84 million), Western Sub-Saharan Africa (3.71 million), and Eastern Sub-Saharan Africa (3.12 million) (W. Wang et al., 2021). HDP, including chronic hypertension, gestational hypertension, preeclampsia, and eclampsia, complicated approximately 10% of pregnancies and constituted a major source of both maternal and fetal morbidity and mortality (Braunthal & Brateanu, 2019). The prevalence of persistent hypertension after pregnancy was reported to be higher in developing countries than in developed nations (Mukosha et al., 2024).

In Indonesia, maternal mortality reached 3,572 cases in 2023, with HDP as the leading cause, accounting for 801 deaths (Kementerian Kesehatan RI, 2023). West Java Province reported the highest number of maternal deaths, with 678 cases largely attributed to HDP (Dinas Kesehatan Jawa Barat, 2022). Meanwhile, Central Sulawesi ranked 21st among Indonesian provinces, reporting 48 maternal deaths, also dominated by HDP (Kementerian Kesehatan RI, 2023). Hypertension in pregnancy was defined as elevated blood pressure after 20 weeks of gestation with or without proteinuria (Spadarella et al., 2021). Previous studies identified several determinant factors, including occupational risks, obesity, maternal age, low socioeconomic status, pregnancy-related anxiety, prenatal depression, polycystic ovary syndrome, family history of hypertension or diabetes mellitus, and nulliparity (Kay et al., 2021; Mathew et al., 2023; Nath et al., 2021). Other determinants were grouped into sociocultural, metabolic, and genetic factors, as well as specific maternal risks and additional contributors such as advanced maternal age and periodontitis (Ola & Suliburska, 2023).

Demographic factors also played an important role in HDP. Demography, defined as the study of population size, structure, and changes, was influenced by international migration in developed countries (World Health Organizations, 2022) and by rapid internal migration and urbanization in developing nations (Gu et al., 2021; Poston, Jr & Bouvier, 2018). Women in rural areas were reported to have a 30% higher risk of HDP compared to their urban counterparts (Cameron et al., 2022). Disparities between urban and rural areas were linked to differences in nutrition, smoking habits, physical activity, income levels, and access to health care services. Rural communities were particularly vulnerable, with higher risks of maternal death due to hypertensive complications compared with urban populations (Ford et al., 2022). According to several studies, the risk of hypertension during pregnancy, including preeclampsia and other hypertensive illnesses, is greatly influenced by social factors such as socioeconomic position, occupational stress, and access to healthcare. the social status, including factors like distance to a medical institution, lack of prenatal care, and stress at work. According to a different study, behaviorally driven routes such as smoking, exercise, or food had less direct influence on allostatic indicators than the social environment. The social environment's demographic components—such as household income and marital status—were the most significant indicators of hypertension risk (Keith & Martin, 2025; Kinshella et al., 2025).

The study aimed to examine the distribution and context of factors associated with hypertensive disorders in pregnancy across urban and rural settings. The study was expected to provide a foundation for developing a prenatal care model tailored to local demographic and cultural contexts, supporting future research and strengthening maternal health services in Indonesia.

METHODS

This study employed a quantitative cross-sectional design conducted between March and September 2025. The research was carried out at two community health centers representing distinct geographical contexts: an urban primary health care facility in Depok, West Java, and a rural primary health care facility in Poso Regency. The study population comprised pregnant women diagnosed

with hypertension in pregnancy with a gestational age of more than 20 weeks who resided in either urban or rural areas. The sample size was determined using a proportion estimation formula, resulting in a minimum of 60 participants. To account for potential non-response, an additional 10% was included, yielding a total sample of 66 respondents. Participants were recruited using an accidental sampling technique during the data collection period.

Data were collected using a structured questionnaire adapted from the 2023 Indonesian Health Survey (SKI 2023), specifically Block G on maternal health. The independent variables consisted of determinant factors associated with hypertension in pregnancy, while the dependent variable was the place of residence, classified as urban or rural. Before analysis, data normality was assessed using the Kolmogorov–Smirnov test. As the data were not normally distributed, non-parametric analysis was performed using the Mann–Whitney test, with statistical significance set at $p < 0.05$.

Ethical clearance for this study was obtained from the Health Research Ethics Committee (KEPK) of Health Polytechnic of the Ministry of Health Palu (Approval No. 002009/KEPK POLTEKKES KEMENKES PALU/2025). All participants provided informed consent before their inclusion, and confidentiality and anonymity were maintained throughout the research process in accordance with ethical research standards.

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RESULTS

The results of data processing and analysis were presented in the following table:

Table 1. Frequency Distribution of Respondents' Characteristics (n = 66)

Characteristics	rural (n=30)		urban (n=30)	
	n	%	n	%
Parity				
Primiparous	9	30.0	18	60.0
Multiparous	21	70.0	12	40.0
Education level				
Elementary school	2	6.7	1	3.3
Junior high school	3	10.0	9	30.0
Senior high school	18	60.0	14	46.7
Associate degree	0	0.0	2	6.7
Bachelor's degree	7	23.3	4	13.3
Occupation				
Homemaker	24	80.0	28	93.4
Contract employee	4	13.3	0	0.0
Government employee	2	6.7	0	0.0
Employee	0	0.0	1	3.3
Private Sector	0	0.0	1	3.3
Income				
Below minimum wage	22	73.3	27	90.0
At or above minimum wage	8	26.7	3	10.0
Family history of hypertension				
Yes	11	36.7	10	33.3
No	19	63.3	20	66.7
History of chronic illness				
Yes	9	30.0	2	6.7
No	21	70.0	28	93.3
Fruit Consumption				
Never	1	3.3	5	16.7
Ever	29	96.7	25	83.3

Characteristics	rural (n=30)		urban (n=30)	
	n	%	n	%
Vegetable consumption				
Never	2	6.7	3	10.0
Ever	28	93.3	27	90.0
Smoking history				
Never smoked	2	6.7	2	6.7
Ever smoked	28	93.3	28	93.3
Smoking exposure				
Daily exposure to cigarette smoke	17	56.7	5	16.7
No exposure	13	43.3	25	83.3
Physical activity				
Rarely (≤ 3 times/week)	18	60.0	27	90.0
Frequently (> 3 times/week)	12	40.0	3	10.0
Nutrition				
Sweet food consumption				
Rarely (≤ 4 times/week)	7	23.3	8	26.7
Frequently (> 4 times/week)	23	76.7	22	73.3
Salty food consumption				
Rarely (≤ 4 times/week)	24	80.0	23	76.7
Frequently (> 4 times/week)	6	20.0	7	23.3
Fatty food consumption				
Rarely (≤ 4 times/week)	21	70.0	21	70.0
Frequently (> 4 times/week)	9	30.0	9	30.0
Grilled food consumption				
Rarely (≤ 4 times/week)	27	90.0	30	100.0
Frequently (> 4 times/week)	3	10.0	0	0.0
Seasoning-rich food consumption				
Rarely (≤ 4 times/week)	1	3.3	8	26.7
Frequently (> 4 times/week)	29	96.7	22	73.3
Junk food consumption				
Rarely (≤ 4 times/week)	21	70.0	20	66.7
Frequently (> 4 times/week)	9	30.0	10	33.3

Based on Table 1, a total of 60 respondents were included in this study, evenly distributed between urban and rural settings. The urban respondents were recruited from Depok, while the rural respondents were from Poso Regency. Among women residing in rural areas, the majority were multiparous, had completed senior high school education, were predominantly homemakers, and reported household incomes below the regional minimum wage. Most rural respondents reported no family history of hypertension or chronic disease, regularly consumed fruits and vegetables, and had never smoked; however, more than half were exposed to secondhand smoke daily. Physical activity levels were generally low, and dietary patterns indicated frequent consumption of sweet and seasoning-rich (spicy) foods, with relatively infrequent intake of salty, fatty, grilled, and junk foods.

In contrast, respondents living in urban areas were predominantly primiparous and shared a similar educational profile, with most having completed senior high school. The majority were also homemakers and reported incomes below the regional minimum wage. Similar to rural respondents, most urban women reported no family history of hypertension or chronic illness. While overall dietary patterns were broadly comparable between the two groups, urban respondents tended to report slightly lower fruit consumption and a higher prevalence of unhealthy dietary behaviors. In addition, physical activity levels among urban respondents were generally lower than those observed in the rural group

Table 2. Frequency Distribution of Determinant Factors of Hypertension in Pregnancy by Place of Residence (Urban and Rural)

Variables	Residence	N	Mean rank	P value
Parity	Rural	30	35.00	0.021
	Urban	30	26.00	
Education level	Rural	30	32.82	0.261
	Urban	30	28.18	
Occupation	Rural	30	32.30	0.176
	Urban	30	28.70	
Household income	Rural	30	33.00	0.098
	Urban	30	28.00	
Family history of hypertension	Rural	30	30.00	0.788
	Urban	30	31.00	
History of chronic disease	Rural	30	27.00	0.021
	Urban	30	34.00	
Fruit consumption	Rural	30	32.50	0.088
	Urban	30	28.50	
Vegetable consumption	Rural	30	31.00	0.643
	Urban	30	30.00	
Smoking history	Rural	30	30.50	1.000
	Urban	30	30.50	
Exposure to cigarette smoke	Rural	30	24.50	0.001
	Urban	30	36.50	
Physical activity level	Rural	30	35.00	0.008
	Urban	30	26.00	
Sweet food consumption	Rural	30	31.00	0.767
	Urban	30	30.00	
Salty food consumption	Rural	30	30.00	0.756
	Urban	30	31.00	
Fatty food consumption	Rural	30	30.50	1.000
	Urban	30	30.50	
Grilled food consumption	Rural	30	32.00	0.078
	Urban	30	29.00	
Seasoning-rich food consumption	Rural	30	34.00	0.012
	Urban	30	27.00	
Junk food consumption	Rural	30	30.00	0.783
	Urban	30	31.00	

Table 2 presents the distribution of determinant factors of hypertension in pregnancy based on place of residence. The Mann–Whitney test results showed that out of 17 risk factors analyzed, five factors differed significantly between urban and rural respondents. Parity was significantly higher among rural respondents (mean rank = 35.00) compared to urban respondents (mean rank = 26.00; $p = 0.021$). Conversely, a history of chronic disease was more prevalent among urban respondents, who demonstrated a higher mean rank (34.00) than their rural counterparts (27.00; $p = 0.021$). Exposure to cigarette smoke also showed a significant difference ($p = 0.001$), with urban respondents

reporting higher exposure (mean rank = 36.50) compared to rural respondents (24.50). Physical activity significantly differed as well, with rural respondents exhibiting higher activity levels (mean rank = 35.00) than urban respondents (26.00; p = 0.008). Finally, the frequency of consuming spicy foods was significantly higher among rural respondents (mean rank = 34.00) compared to urban respondents (27.00; p = 0.012).

DISCUSSION

The findings of this study showed that maternal characteristics of hypertension in pregnancy differed between respondents residing in urban and rural areas. These differences occurred due to limited access to education and health services, cultural changes, and variations in social support (Bedaso et al., 2021; Behboudi-Gandevani et al., 2022; Boutib et al., 2023). The maternal characteristics that significantly differed between urban and rural respondents included parity, history of chronic disease, exposure to cigarette smoke, physical activity, and frequency of consuming spicy foods. Similarly, another study explained that pregnant women with a history of hypertension had a significantly higher risk of developing preeclampsia–eclampsia compared to those without such a history (Amir Reski, Azizah Nur. Fujiko, Masita. Handayani, 2024). Moreover, exposure to cigarette smoke was significantly associated with an increased risk of hypertension in pregnancy, with passive smoking also contributing to this risk (Rizkiana et al., 2019). Physical activity emerged as another influential factor, with recent evidence suggesting that regular moderate-intensity exercise, such as aerobics, promoted maternal cardiovascular health. Physically active pregnant women had a lower risk of hypertensive disorders, including gestational hypertension (Barakat et al., 2023; Heljezović et al., 2025). Furthermore, this study found that the frequency of spicy food consumption was associated with the occurrence of hypertension in pregnancy. This finding was supported by (H. Wang et al., 2021) who stated that the frequency of spicy food intake was negatively associated with blood pressure.

In rural areas, maternal characteristics of hypertension in pregnancy included parity, physical activity, and frequency of spicy food consumption. This aligned with the study of (Sariyani et al., 2020), which reported a significant correlation between parity and patriarchal culture with contraceptive needs among eligible women in Gadungan Village, Selemadeg Timur District, Tabanan, Bali, Indonesia. In addition, healthcare services and access to sports facilities were limited in rural areas (Marcen et al., 2022), leading to physical activity being primarily driven by occupational demands (Haru Pradani et al., 2025). Cultural context also shaped dietary practices. Recent evidence suggests that reducing spicy food intake could be a strategy for weight management (Xiong et al., 2025) Conversely, in urban areas, the maternal characteristics of hypertension in pregnancy were a history of chronic disease and exposure to cigarette smoke. These findings were largely influenced by urban lifestyles, such as psychological distress, higher body mass index (BMI), frequent eating out, and sedentary behavior (Luo & Wang, 2022). Another study indicated that older adults in urban settings were at higher risk of chronic diseases compared to those in rural areas due to economic disparities, social stress, and environmental factors (Xin et al., 2025; Zhang & Zhang, 2024). Exposure to cigarette smoke remained a major issue in urban areas, influenced by sociodemographic variables, community characteristics, and the enforcement of tobacco control policies (Denney et al., 2022; Sharma & Goel, 2022).

The implications of this study highlighted that healthcare providers should adapt service delivery to local community characteristics, including place of residence, cultural norms, values, and common practices, to facilitate greater acceptance of health interventions. This study also served as a reflection for health workers, helping them understand that similar health problems may arise from different contributing factors depending on the living environment. This study had several strengths compared to previous research. It applied a quantitative approach using the Mann–Whitney test, which provided empirical evidence of differences in determinant factors of hypertension in

pregnancy across urban and rural settings. This enabled more measurable outcomes than purely descriptive analyses. The study also emphasized a health problem that contributed substantially to maternal mortality, namely, hypertension in pregnancy, making its findings a strong advocacy tool for healthcare providers and local health authorities.

However, this study was not without limitations. During data collection, respondents' questionnaire responses did not always reflect their actual perspectives due to differences in perception, interpretation, and honesty. Additionally, standardizing enumerators' understanding of operational definitions in the questionnaires took time, as harmonization between urban and rural enumerators was conducted via Zoom, which was occasionally disrupted by network issues and required multiple sessions.

Future research was expected to broaden the scope by incorporating additional variables, such as healthcare facilities and access, across both urban and rural areas. These variables were essential for a more comprehensive understanding of the factors contributing to hypertension in pregnancy. Moreover, future studies could focus on developing appropriate interventions for policymakers at the local level and for frontline healthcare workers, such as midwives and related practitioners.

CONCLUSION

This study showed that pregnant women with hypertension in urban and rural areas had significantly different distributions of a number of maternal variables. Across residential settings, there was statistically significant heterogeneity in parity, history of chronic illness, cigarette smoke exposure, physical activity, and consumption of spicy foods. These results suggest that the pattern of associated factors in pregnancy-related hypertension diseases may be influenced by the contextual environment.

Nonetheless, a number of methodological restrictions need to be taken into account. Causal inference cannot be made because of the cross-sectional design. Generalizability is limited by a small sample size and the use of accidental sampling. Furthermore, the lack of multivariate analysis implies that possible confounding factors were not managed. Consequently, it is better to view the results as associative rather than causative.

These results emphasize how crucial it is to include demographic and contextual factors in maternal health plans, especially when tackling urban-rural inequities. Additional analytical research using larger samples and multivariable modeling should inform tailored interventions.

Author's Contribution Statement: Putri Mulia Sakti: Conceptualization, Methodology, Data Curation, Formal Analysis. **Febti Kuswanti**: Investigation, Visualization, Original Draft Preparation. **Khuzaifah**: Supervision, Project Administration, Resources. **Siti Jumhati**: Validation, Writing – Review & Editing, Corresponding Author. **Sundari Fatimah**: Software, Data Entry, Writing – Original Draft.

Conflict of Interest: The authors declare no conflict of interest associated with this research.

Funding Source: This study was financially supported by the Health Polytechnic of the Ministry of Health, Palu.

Acknowledgments: The author would like to thank all parties involved in the completion of this research.

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