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Gender Differences In Hypertension Prevalence And Associated Factors Among Community-Dwelling Elderly: A Cross-Sectional Study

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Abstract:
Background: *Hypertension is a prevalent health issue among the elderly, significantly affecting cardiovascular health and overall well-being. This study aims to assess the prevalence of hypertension among community-dwelling elderly individuals in Thai Nguyen City, Vietnam, and identify associated factors.*
Materials and Methods: *A cross-sectional study was conducted from January 2023 to April 2024, involving 901 elderly participants aged 60 years and older. Participants were randomly selected from residential communities and assessed through face-to-face interviews. Hypertension was defined as a systolic blood pressure of ≥140 mmHg and/or diastolic blood pressure of ≥90 mmHg. Data on demographic characteristics, BMI, and physical activity levels were collected and analyzed using Chi-square tests and bivariate logistic regression.*
Results: *Among the 901 participants, 36.7% were male and 63.3% were female, with 68.2% aged 65 or older. The overall prevalence of hypertension was 58.9%, higher in males (65.3%) than females (55.3%). Logistic regression analysis indicated that individuals aged 65 and older (OR = 1.961; p = 0.001) and those with a BMI of 23 or higher (OR = 1.402; p = 0.014) had an increased likelihood of hypertension. Females had a lower risk compared to males (OR = 0.658; p = 0.003). Additionally, abdominal obesity significantly increased the likelihood of hypertension in males (OR = 2.882; p = 0.014).*
Conclusion: *This study highlights a high prevalence of hypertension in the elderly population, emphasizing the need for targeted interventions focusing on age, BMI, and waist circumference to improve health outcomes and mitigate the impact of hypertension on healthcare systems*
Key Word: *Hypertension, Body Mass Index, Waist Circumference, Elderly*

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I. Introduction

Hypertension is a leading risk factor for cardiovascular diseases, stroke, and other serious health complications, particularly among the elderly population. As societies age, understanding the prevalence and determinants of hypertension becomes increasingly critical for public health strategies and healthcare interventions[1]. The World Health Organization (WHO) highlights that hypertension affects nearly one in three adults globally, with a significantly higher prevalence in older adults. This demographic transition poses significant challenges for healthcare systems, necessitating a focused examination of hypertension within community-dwelling elderly populations[2].

Elderly individuals, defined as those aged 60 years and older, often face multiple health challenges, including increased susceptibility to hypertension due to age-related physiological changes, comorbidities, and lifestyle factors. Various studies have identified a range of associated factors contributing to hypertension in this population, including age, gender, body mass index (BMI), waist circumference, physical activity levels, and

socioeconomic status.[3] Notably, age is a well-established risk factor, with older adults exhibiting heightened blood pressure levels due to vascular stiffness and other age-related changes.

In addition, gender differences in hypertension prevalence have been reported, with men typically experiencing higher rates than women, although this trend may change post-menopause[4]. Obesity, particularly abdominal obesity as indicated by waist circumference, has also been linked to an increased risk of hypertension.[5] Understanding these associated factors is essential for developing targeted interventions and preventive measures.

This cross-sectional study aims to assess the prevalence of hypertension among community-dwelling elderly individuals in Thai Nguyen City, Vietnam, and to identify the associated factors influencing hypertension in this population, with a focus on gender differences. By exploring these relationships, the study seeks to contribute valuable insights that can inform public health initiatives and enhance the management of hypertension among elderly individuals.

II. Material And Methods

A cross-sectional study was conducted from January 2023 to April 2024, focusing on community-dwelling elderly individuals aged 60 to 85 who were capable of responding to a questionnaire. Participants were recruited from residential communities in Thai Nguyen City, Vietnam. Trained research assistants contacted and invited eligible elders to participate in the survey, which involved face-to-face interviews conducted after obtaining informed consent.

Study Design: Cross-sectional study

Study Location: Residential communities in Thai Nguyen City, Vietnam

Study Duration: January 2023 to April 2024

Sample Size: 901 patients

Subjects & selection method:

- Random selection of units at the commune or ward level ensured a cumulative sample of at least 900 elderly individuals.
- The sampling method represented both urban areas near the city center and rural areas farther away.
- Eligible elderly individuals in these selected areas were conveniently sampled for data collection.

Inclusion criteria:

- Elderly individuals aged 60 years and older who can communicate effectively.
- Patients who voluntarily agreed to participate in the study.

Exclusion criteria:

- Elderly individuals with psychiatric disorders who are uncooperative.
- Elderly individuals diagnosed with cognitive impairment due to Alzheimer's disease or vascular dementia in the past.

Procedure methodology

After obtaining written informed consent, a well-designed questionnaire was administered to collect data from the recruited participants.

Hypertension

Patients diagnosed with hypertension were defined as having a persistent elevation in office systolic blood pressure (BP) of ≥140 mmHg and/or diastolic BP of ≥90 mmHg. This diagnosis is consistent with a 24-hour ambulatory blood pressure monitoring (ABPM) average of ≥130/80 mmHg or a home blood pressure monitoring (HBPM) average of ≥135/85 mmHg.[6].

Socio-demographics

Demographic information collected included age (< 65and ≥ 65), gender (male and female), ethnicity (Kinh and other), education level (illiterate or elementary, junior high school, and senior high school or above), marital status (married or single/separated/divorced/widowed), and ability to pay for medication (very difficult or fairly difficult, and fairly easy or very easy).

Physical Activities

The level of physical activity was assessed using the short version of the International Physical Activity Questionnaire (IPAQ). Participants reported the time spent on four types of activities over the past seven days: sitting, walking, moderate physical activities, and vigorous physical activities. The metabolic equivalent task score in minutes per week (MET-min/wk) was calculated by multiplying the time spent on each activity by 8.0 for vigorous, 4.0 for moderate, 3.0 for walking, and 1.0 for sitting. Total scores were divided into three tertiles, corresponding to three activity groups. [7, 8]

Clinical Parameters

Clinical parameters assessed included COVID-19 infection (yes/no) and body mass index (BMI, kg/m²) categorized as BMI < 23 and BMI ≥ 23. COVID-19 infection status was determined using RT-PCR tests or nasal/throat swabs. Waist circumference was measured above the iliac crest on the midaxillary line at minimal respiration to the nearest 0.1 cm [9]. Abdominal obesity was defined as a waist circumference of ≥80 cm for females and ≥90 cm for males.[10]

Statistical analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Frequencies and percentages were calculated for categorical variables. Chi-square tests were performed to assess differences in proportions of categorical variables between two or more groups. Bivariate logistic regression was utilized to identify factors associated with hypertension. A p-value of < 0.05 was considered statistically significant.

III. Results

The characteristics of the participants are presented in Table 1. Among the 901 patients, 331 (36.7%) were male and 570 (63.3%) were female. Notably, 68.2% of the participants were aged at least 65 years. The overall prevalence of hypertension in this population was 58.9%, with higher rates observed in males (65.3%) compared to females (55.3%) . Furthermore, significant differences in the prevalence of hypertension were observed across various demographic and clinical variables, including age, gender, and body mass index (BMI) ($p < 0.05$)

Table 1. Patients' characteristics and Hypertension (N = 901).

Variables	Total n (%)	Hypertension		p
		Yes (n; %= 531; 58.9%)	No (n;%=370; 41.1)	
Age				0.001
< 65	287 (31.8)	137 (47.7)	150 (52.2)	
≥ 65	614 (68.2)	394 (64.2)	220 (35.8)	
Gender				0.003
Male	331 (36.7)	216 (65.3)	115 (34.7)	
Female	570 (63.3)	315 (55.3)	255 (44.7)	
Ethnic				0.517
Kinh	787	467 (59.3)	320 (40.7)	
Khac	114	64 (56.1)	50 (43.9)	
Education				0.373
Illiterate or elementary	326	188 (57.7)	138 (42.3)	
Junior high school	251	145 (57.8)	106 (42.2)	
Senior high school or above	324	198 (61.1)	126 (38.9)	
Married status				0.650
Single or Widowed/Divorced/Separated	172	104 (60.5)	68 (39.5)	
Married	729	427 (58.6)	302 (41.4)	
Medication payment ability				0.847
Very or fairly difficult	661	388 (58.7)	273 (41.3)	
Very or fairly easy	239	142 (59.4)	97 (40.6)	
Physical activity (MET- min/wk)				0.303
Tertile 1 (MET ≤ 3178)	300	187 (62.3)	113 (37.7)	
Tertile 2 (3178 <MET≤6252)	302	170 (56.3)	132 (43.7)	
Tertile 3 (MET> 6252)	299	174 (58.2)	125 (41.8)	
BMI				0.014
BMI < 23	499	276 (55.3)	223 (44.7)	
BMI ≥ 23	402	255 (63.4)	147 (36.6)	
WC (cm)				0.488

Non-abdominal obesity	543	315 (58.0)	228 (42.0)	
Abdominal obesity	358	216 (60.3)	142 (39.7)	
COVID infection				0.146
No	500	284 (56.8)	216 (43.2)	
Yes	401	247 (61.6)	154 (38.4)	
Drinking alcohol				
No	603	350 (58.0)	253(42.0)	
Yes	298	181 (60.7)	117 (39.3)	0.242

Abbreviations: BMI, body mass index; WC, waist circumference; MET-min/wk, metabolic equivalent task scored in minutes per week.

Table 2 shows the results of the bivariate logistic regression models. In the model, patients aged 65 years or older were more likely to have hypertension compared to patients younger than 65 years (OR = 1.961; 95% CI: 1.476, 2.606; p = 0.001). Similarly, patients with a BMI of 23 or higher were more likely to have hypertension compared to those with a BMI less than 23 (OR = 1.402; 95% CI: 1.071, 1.834; p = 0.014). Female patients had a lower risk of hypertension compared to male patients (OR = 0.658; 95% CI: 0.497, 0.870; p = 0.003).

Table 2. Associated factors of Hypertension via bivariate logistic regression analysis.

Variables	**Hypertension**	
	OR (95% CI)	**p**
Age		
< 65		
≥ 65	1.961 (1.476, 2.606)	0.001
Gender		
Male		
Female	0.658 (0.497, 0.870)	0.003
Ethnic		
Kinh		
Khac	0.877 (0.590, 1.304)	0.517
Education		
Illiterate or elementary		
Junior high school		
Senior high school or above	1.074(0.918, 1.255)	0.373
Married status		
Single or Widowed/Divorced/Separated		
Married	0.924(0.658, 1.298)	0.650
Medication payment ability		
Very or fairly difficult		
Very or fairly easy	1.030 (0.762, 1.392)	0.847
Physical activity (MET- min/wk)		
Tertile 1 (MET ≤ 3178)		
Tertile 2 (3178 <MET≤6252)		
Tertile 3 (MET> 6252)	0.918(0.780, 1.080)	0.303
BMI		
BMI < 23		
BMI ≥ 23	1.402(1.071, 1.834)	0.014
WC (cm)		
Non-abdominal obesity		
Abdominal obesity	1.101 (0.839, 1.445)	0.488
COVID infection history		
No		
Yes	1.220 (0.933, 1.595)	0.146
Drinking alcohol		
No		
Yes	0.894 (0.674, 1.187)	0.439

Abbreviations: BMI, body mass index; WC, waist circumference; MET-min/wk, metabolic equivalent task scored in minutes per week.

Table 3 presents the results of the bivariate logistic regression models with gender stratification. Among male participants, both age and BMI were significantly associated with hypertension. Additionally, patients with abdominal obesity, as indicated by waist circumference, had a higher likelihood of hypertension compared to participants without abdominal obesity (OR = 2.882; 95% CI: 1.235, 6.727; p = 0.014). In female participants, only age was significantly associated with hypertension.

Table 3. Associated factors of Hypertension via bivariate logistic regression analysis with Gender Stratification

Variables	Hypertension			
	Male		Female	
	OR (95% CI)	p	OR (95% CI)	p
Age				
< 65				
≥ 65	2.005 (1.228, 3.272)	0.005	1.894 (1.333, 2.692)	0.001
Ethnic				
Kinh				
Khac	0.884 (0.455, 1.718)	0.716	0.865 (0.526, 1.423)	0.568
Education				
Illiterate or elementary				
Junior high school				
Senior high school or above	1.311(0.992, 1.732)	0.057	0.948 (0.783, 1.1470	0.581
Married status				
Single or Widowed/Divorced/Separated				
Married	1.271(0.504, 3.204)	0.611	0.746 (0.511, 1.088)	0.128
Medication payment ability				
Very or fairly difficult				
Very or fairly easy	0.970 (0.575, 1.636)	0.910	1.083 (0.748, 1.5680	0.673
Physical activity (MET- min/wk)				
Tertile 1 (MET ≤ 3178)				
Tertile 2 (3178 <MET≤6252)				
Tertile 3 (MET> 6252)	0.865(0.653, 1.146)	0.312	0.951 (0.777,1.163)	0.625
BMI				
BMI < 23				
BMI ≥ 23	2.065(1.303, 3.271)	0.002	1.061 (0.757,1.487)	0.731
WC (cm)				
Non-abdominal obesity				
Abdominal obesity	2.882 (1.235, 6.727)	0.014	1.216 (0.872, 1.696)	0.248
COVID infection history				
No				
Yes	1.114 (0.708, 1.751)	0.641	1.382 (0.987,1.937)	0.060
Drinking alcohol				
No				
Yes	1.122 (0.696, 1.810)	0.636	1.209 (0.757,1.9332)	0.427

Abbreviations: BMI, body mass index; WC, waist circumference; MET-min/wk, metabolic equivalent task scored in minutes per week.

IV. Discussion

This study highlights the significant prevalence of hypertension among community-dwelling elderly individuals in Thai Nguyen City, Vietnam, with a notable 58.9% of participants affected. The findings underscore the urgent need for targeted interventions tailored to this demographic, especially considering the aging population and the burden of hypertension on healthcare systems.

Age emerged as a critical determinant of hypertension, with individuals aged 65 and older showing a significantly higher risk. This aligns with existing literature that associates vascular changes and increased rigidity of blood vessels with aging, which contributes to elevated blood pressure levels [11]. The strong association between increased BMI and hypertension further emphasizes the importance of addressing obesity as a modifiable risk factor, particularly abdominal obesity, which showed a significant correlation with hypertension in male participants [12].

Obesity, especially abdominal obesity, contributes to the development of hypertension through several physiological mechanisms. Increased adipose tissue can lead to heightened levels of inflammation and insulin resistance, both of which are linked to elevated blood pressure. Moreover, visceral fat, which accumulates around the abdomen, is particularly detrimental, as it can disrupt normal metabolic processes and promote the release of hormones that constrict blood vessels, ultimately raising blood pressure levels [13].

Additionally, the gender-specific differences observed in this study warrant further investigation. While abdominal obesity was significantly associated with hypertension in male participants, this raises important questions about the underlying factors influencing this relationship in women. Abdominal obesity is generally more prevalent in men, and this type of fat-known as visceral fat-is particularly detrimental as it can disrupt metabolic processes and heighten the risk of hypertension. Men typically have higher levels of testosterone, which can affect fat distribution and contribute to the accumulation of visceral fat. This fat is closely linked to various health issues, including hypertension, due to its role in promoting inflammation and insulin resistance[14].

Gender differences in hypertension prevalence were evident. While male participants exhibited a higher risk of hypertension, female participants demonstrated a lower risk, consistent with other studies that

report gender-based physiological and lifestyle variations influencing blood pressure [15, 16] . However, the protective effect observed in females may diminish post-menopause due to hormonal changes. Estrogen is believed to have a beneficial impact on vascular health, contributing to the maintenance of lower blood pressure levels before menopause[17]. These findings underscore the need for gender-specific health strategies to effectively address these differences.

The study's methodology ensured a comprehensive representation of both urban and rural areas, offering insights into the geographic variability of hypertension risk factors. This is crucial for designing effective public health interventions that are sensitive to local contexts.

Despite these valuable insights, the study has limitations. The cross-sectional design limits causal inferences, and the reliance on self-reported data may introduce bias. Future research should consider longitudinal studies to better understand the causal pathways of hypertension and incorporate more diverse populations to enhance generalizability.

Overall, this research enhances our understanding of the dynamics of hypertension in elderly populations, reinforcing the need for targeted prevention and management strategies that address age, body mass index ,and waist circumference, along with gender differences. Public health policies should prioritize awareness campaigns, routine screenings, and lifestyle modification programs to mitigate the impact of hypertension among the elderly.

V. Conclusion

This study underscores the urgent need for targeted interventions to address the high prevalence of hypertension among community-dwelling elderly individuals in Thai Nguyen City, Vietnam. Associated factors such as age, body mass index, and waist circumference highlight the necessity for tailored health strategies. Public health policies must prioritize awareness campaigns and lifestyle modification programs to effectively mitigate the impact of hypertension on this vulnerable population.

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