Socioeconomic Factors Influencing the Prevalence of Hypertension in the Rural Elderly Population of Thai Binh Province, Northern Vietnam

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Abstract

Introduction/ Background: Due to the aging population of Vietnam, current healthcare priorities are shifting toward the prevention of chronic diseases in the elderly.

Aims & Objectives: The purpose of this study was to identify the socioeconomic factors affecting the prevalence of hypertension in the rural elderly population.

Methods/Study design: We selected 351 individuals, aged 60–92 years, in the villages of Bach Thuan and Tan Phong, Vu Thu district, Thai Binh province, Vietnam. After excluding those with missing data, we evaluated 309 individuals (140 men and 169 women) for blood pressure, body mass index, and their responses to a social and economic questionnaire.

Results: Individuals with a high economic status had a lower prevalence of moderate or severe hypertension than those with a low economic status (OR, 0.36; 95% CI, 0.14–0.90).

Discussion/Conclusion: Our results suggest that elderly, rural men in Vietnam who are economically vulnerable are particularly at risk for developing severe hypertension.

Key words: Cross-sectional study; elderly; gender; hypertension; socioeconomic status; Vietnam

Introduction

Developing countries are now facing the double burden of infectious and chronic diseases.[1,2] In Vietnam, a developing country in Southeast Asia, heart disease and stroke currently rank among the top 10 causes of death despite the high prevalence of acquired immune deficiency syndrome.[3,4] Because of the aging population in Vietnam, chronic diseases are becoming more of an issue. According to the Global Health Observatory Data Repository, average life expectancy in Vietnam has increased from 40 years (1950–1955) to 74 years (2005–2010). This new population profile

means that public health research focused on the elderly population is necessary in Vietnam; therefore, studies aiming to identify the factors responsible for the dramatic rise in cardiovascular diseases have become a priority.

Hypertension is an important risk factor for cardiovascular disease. The number of people worldwide with uncontrolled hypertension increased from 605 million in 1980 to 978 million in 2008.[5] The World Health Organization (WHO) Non-Communicable Disease Country Profile on Vietnam documented 201,079 new diagnoses of hypertension in 2008.[4] A survey in the Mekong Delta region showed the prevalence of hypertension to be 27.3% in men and 16.2% in women aged 25–64 years.[6] Between 1980 and 2008, the mean systolic blood pressure (SBP; age-standardized estimate) reportedly increased by about 5 mmHg in both men and women.[7] Another study indicated that SBP and diastolic blood pressure (DBP) values in the adult Vietnamese population increased by 0.8 and 0.3 mmHg, respectively, in women, and 1.1 and 0.4 mmHg in men, between 2001 and 2009.[8] In yet another study, one-third of 357 adult volunteers around Ho Chi Minh City were found to have hypertension.[9] Cardiovascular disease risk factors, including hypertension, are common in Vietnamese adults, with different clustering patterns in men and women.[10] The WHO Stepwise Approach to Surveillance (STEPs) survey revealed that the association between hypertension and socioeconomic status (SES) is complex and differs between men and women in Vietnam.[11] Unfortunately, accurate population-based demographic data and knowledge of social factors is limited in Vietnam. Previous reports have described the prevalence of hypertension and the socioeconomic determinants of hypertension among the adult population in Vietnam, but the relationship between hypertension in the elderly and their gender-specific SES has not been documented.

The purpose of this study was to conduct the first survey on hypertension in Vietnam to specifically address the elderly population (>60 years of age), and to identify the demographic (age and sex) and socioeconomic (economic status, education, and occupation) factors affecting the prevalence of hypertension. The data presented herein may lead to the development of preventive programs tailored to the specific challenges faced by the elderly in this country.

Materials and Methods

Study design and sampling

In 2003, Thai Binh Medical University in Vietnam, supported by Osaka University in Japan, initiated a community-health project known as the Program for Elderly People's Health and Nutrition in the Vu Thu district, Thai Binh province. As part of this program, health examinations and interviews regarding social factors and nutrition were conducted between 2008 and 2010. The study protocol was approved by the Vietnam Ministry of Health, and all patients gave informed consent; the consent form was provided through the Vietnam National Committee on Aging.

The study location is in Thai Binh province. Thai Binh province is located in northern Vietnam, about 100 km southeast of the capital, Hanoi. The province has a population of approximately 1,865,400 and covers 1546.6 km^2, including 1 city and 7 districts.[12] Each district has a "Thi tran" (town under district) and a "Xa" (village). The Vu Thu district in Thai Binh province has 40 villages, including the research area. Bach Than and Tan Phong, where health examinations were conducted in 2008, are villages in Vu Thu district. Bach Thuan houses 8,155 people and contains 6

communities; the over-60 population in Bach Thuan is 1,230, and 144 individuals (11.7%) were selected for this research project. Tan Phong houses 8,870 people and contains 7 communities; the over-60 population in Tan Phong is 1,145, and 172 individuals (15.1%) were selected for this research project. The living location of 35 people could not be determined. The sample size required for a good representation of the population in each village was determined according to statistical guidelines published by the WHO.[13]

In 2008, a total of 351 individuals aged 60 years and over from Bach Thuan and Tan Phong, 154 men and 197 women, answered our survey. All patients underwent a health examination wherein blood pressure measurements and body mass index (BMI), which was calculated using weight and height measurements, were recorded. Information about age, sex, geographic area, preference for alcohol consumption, preference for salty-food, and SES was obtained from a 7-page questionnaire, created at the Thai Binh Medical University.

Social risk factors: Classification and assessment

We used a questionnaire to investigate the impact of SES on the prevalence of hypertension. The most widely used SES parameters in social epidemiology are education, occupational status, and income.[14,15] Educational history was assessed by the following 6 choices in the questionnaire: (1) less than 4 years of education; (2) graduated from elementary school; (3) graduated from junior high school; (4) graduated from high school; (5) graduated from vocational school; (6) graduated from university or graduate school. Respondents' education level was then separated into 4 categories: subjects with less than secondary school education, subjects with secondary-school education, subjects with high school education or more, and subjects who did not answer this question.

Occupational status was identified by asking about the respondents' occupation before the age of 60 years. The 4 choices were the only types of employment available during the subjects' lifespan: farmer, central government employee or army employee, local government employee, and merchant. Occupational status was separated into 5 groups: the 4 categories listed, and subjects who did not answer this question.

The questionnaire asked about respondents' income over the prior month. Only 101 of 351 people (28.7%) answered this question, but other questions were designed to assess economic conditions. Questions from the Life Standard Measurement Study conducted by the World Bank regarding housing conditions and toilet conditions were adapted for our questionnaire. The condition of the subject's house was assessed by the following 4 choices: (1) excellent, a tile or concrete roof, over 2 floors, and concrete walls; (2) good, a tin or fiber cement roof and a high-quality wood fence; (3) fine, a thatch-grass roof and a wooden fence; and (4) inferior, a temporary dwelling and a bamboo or thatch-grass fence. The condition of the subject's toilet access was assessed by the following 6 choices: (1) hole dug in the yard; (2) toilet where there are 2 separate rooms; (3) toilet with a water pond; (4) toilet in 1 room; (5) flush toilet; and (6) no toilet. To simplify the assessment of economic conditions, 3 groups were established: (1) a high economic level was assigned if the subject's house was made of concrete and they had a flush toilet; (2) a moderate economic level was assigned if the subject's roof was made of concrete or if they had a flush toilet; and (3) a low economic level was assigned if the subject's house was not concrete or if they did not have a flush toilet.

Identification of hypertension

Doctors and nurses from Thai Binh Medical University and staff from the local medical station measured blood pressure in each subject. Blood pressure was measured in a resting, sitting position using either a mercury sphygmomanometer (Kawamoto) or an electronic tonometer (OMRON) with cuffs of appropriate size, following the standardized protocol defined for this program. Blood pressure was measured at least once for each subject. If the blood pressure was more than 140/90 mmHg, it was measured again.

Hypertensive subjects were defined as those with SBP values equal to or greater than 140 mmHg or DBP values equal to or greater than 90 mmHg, using guidelines determined by WHO and the International Society of Hypertension. These guidelines were also used to define moderately or severely hypertensive subjects as those with SBP equal to or greater than 160 mmHg or DBP values equal to or greater than 100 mmHg.[16]

Statistical analysis

Both descriptive and analytical statistics were carried out using Statistical Analysis System (SAS) software, version 9.2. A multivariate logistic regression model was performed to examine the association between social determinants and hypertension. A *P*-value of <0.05 was used to indicate statistical significance.

Four study models were created: model 1 represented the crude data; model 2 was adjusted for age, sex, and geographic area; model 3 was adjusted for BMI, preference for alcohol consumption, and preference for salty-food preference, physical or lifestyle factors that could have a connection to hypertension; model 4 was adjusted for other social factors such as education level, occupation level, and economic level. Both model 2 and model 3 were adjusted for confounding factors and model 4 was analyzed for mediating factors. The SAS 9.2 multilevel mixed-effect linear regression model was used. To highlight the difference between women and men, the same models were analyzed by gender groups.

Results

Subject characteristics

The sociodemographic characteristics of the study patients are listed in Table 1. We excluded 42 of the 351 total respondents (14 men and 28 women) from analysis because of missing data on age and blood pressure, and missing answers on social factors in the questionnaire. Thus, a total of 309 individuals, 140 (45.3%) men and 169 (54.7%) women, were included in the final analysis. The average age in women was 71.5 ± 6.9 years, and in men was 71.4 ± 6.9 years; there was no significant difference in age or in subjects' geographic distribution (Table 1).

Women had lower education levels than men. More than 43% of women did not complete secondary school, compared with 17% of men. Furthermore, men were 3 times more likely to finish high school than women. Accordingly, most women were limited to farming occupations whereas men

had some variety to their occupations. Both men and women had similar economic statuses, because most women were married and financially dependent on their husbands. Collectively, these data suggest that men are likely to better understand hypertension and its interventions than women.

Table 2 shows the physical and lifestyle characteristics of the study subjects, including biological factors and self-reported behavioral factors. The distribution of SBP values was significantly different between women and men. SBP in men (mean, 133.7 mmHg; 95% CI, 129.6–137.9 mmHg) was higher than that seen in women (mean, 127.6 mmHg; 95% CI, 123.8–131.35 mmHg), and twice as many men exhibited a SBP value above 180 mmHg and a DBP value higher than 100 mmHg (Table 2). Despite their higher education level, elderly men were more likely to develop hypertension than elderly women. Being overweight did not appear to be a risk factor in these communities. Men were taller and proportionally heavier than women; the mean BMI in men and women was 19.3 ± 2.8 and 19.6 ± 3.3, respectively. There was a dramatic difference between men and women in their eating habits with respect to salty foods, with men having a higher preference for salty food. These data suggest that diet or eating habits may contribute to the higher incidence of hypertension seen in elderly men.

Socioeconomic Status (SES)

The impact of social status on the risk of developing hypertension was determined by multivariate logistic regression for all subjects, and for each gender separately. Four models were considered in this analysis, as described in the Methods section. Tables 3 and 5 show that there was no significant difference in the incidence of moderate or severe hypertension between the models in the overall study population and in the subset of female participants. Likewise, there was no statistically significant difference in the association of educational level or occupational status with the prevalence of moderate or severe hypertension, either in the overall study population or in either gender-specific group (Tables 3, 4, 5). However, Table 4 shows that individuals with high economic status were less likely to have moderate or severe hypertension than those with low economic status (OR, 0.37; 95% CI, 0.15–0.94) (Table 3), and the trend in men was stronger than in the overall study population (OR, 0.17; 95% CI, 0.04–0.83) (Table 4). Overall, this analysis suggests that an individual's economic status prevails over their educational level to prevent hypertension, likely through health behaviors.

Discussion

The growing incidence of cardiovascular disease in Vietnam is, in part, due to the aging population as most adults now live long enough to develop chronic diseases. While epidemiology studies have identified hypertension as a major risk factor for cardiovascular disease in Vietnam,[6,8,9,11,17] none of these studies address the particular situation of the elderly in rural areas in North Vietnam. The present study tested the influence of demographic, clinical, and socioeconomic factors on the incidence of hypertension in elderly villagers, who will soon represent a majority of the Vietnamese population.

The blood pressure values obtained in this study suggest that elderly Vietnamese men and women are equally susceptible to developing hypertension. Based on SBP values, the prevalence

of hypertension was 38.6% and 30.9% in men and women, respectively. Lower values were obtained using DBP as the diagnostic criterion: 22.9% and 19.5%, respectively (Table 2). These data are consistent with an earlier study, conducted in 25- to 64-year-old residents of the Mekong Delta region, which showed a hypertension prevalence of 27.3% in men and 16.2% in women.[4] Taken together, these data suggest that the prevalence of hypertension in Vietnam is not affected by age. However, an age-stratified study in 25- to 80-year-old subjects from the city of Hanoi and the Thai Binh lowland area reported a gradual increase in hypertension prevalence with age, from 12.4% to 66.2% in men, and from 4.4% to 63% in women.[6] Another study in 25- to 64-year-old subjects from the Bavi district in North Vietnam showed a higher prevalence of hypertension in the 55- to 64-year age group than in the 25- to 34-year age group.[2] One possible explanation for these differing results may be derived from the geographic differences between the studies. While we focused on 2 villages, Bach Than and Tan Phong in Thai Binh province, Vietnam, previous studies recruited subjects from the Mekong Delta region,[4] the city of Hanoi, the Can Tho,[6] and the Bavi district.[2]

Socioeconomic determinants of hypertension are complex and vary by sex, likely due to health behaviors. The WHO STEPs survey, conducted in a rural Vietnamese community, showed that men with a lower educational and occupational status, but a higher economic status, are more likely to be hypertensive than men in other categories.[11] In contrast, women with a lower occupational and economic status are more likely to be hypertensive than their higher-status counterparts.[11] Another report from the WHO STEPs survey showed that smoking is a major risk factor for hypertension. Smoking is the main form of tobacco use in Bavi, and is very common among men; about 63% of men report that they currently smoke, and 58% report doing so daily, while the prevalence of smoking among women is only 0.6%.[18] Along with the reported association between smoking and hypertension in Vietnamese men,[19] the prevalence of alcohol consumption is much higher in men than in women, reflecting the Vietnamese culture.[6] In our survey, the difference in the prevalence of alcohol consumption between men and women was not statistically significant. The prevalence of alcohol consumption is a more appropriate risk factor compared to alcohol preference. We observed that men were more likely to be fond of salty foods. Vietnamese National Institution of Nutrition states that the intake of "Gia vị nước chấm" (salt, or a food source made from fermented salted fish) is 25.71 g/day in men and 25.26 g/day in women.[20] Collectively, men have more behavioral risk factors than women.

Economic status is also related to the prevalence of hypertension via health behaviors such as smoking, alcohol consumption, and food choices. People in the lowest income groups are significantly more likely to be current smokers.[21] Gender disparity remains, as a high household economic status seems to benefit men more than women with respect to mortality from non-communicable disease,[22] yet elderly men in our study still had more severe hypertensive disease than women. Early intervention, especially in men regardless of their economic status, is necessary to prevent the observed health inequity related to hypertension.

This study had some limitations. As it was a cross-sectional study, the results cannot be considered to prove cause and effect. Moreover, the patient population was small compared with previous surveys. A total of 1996 subjects responded to the WHO STEPs survey, carried out in the Bavi district,[10,11] whereas the present study had only 309 subjects. Another disadvantage was the lack of some important information related to hypertension, such as smoking status and the use of antihypertensive medications.

Conclusion

According to findings in this study, elderly men are at considerably higher risk of developing severe hypertension than elderly women, despite their higher educational and economic status. The present study suggests that elderly men should be particularly targeted for hypertension and cardiovascular disease preventive programs in the rural areas of Vietnam. The major risk factors for hypertension in this elderly population appear to be related to eating habits, particularly salty food intake and health-related behavior such as alcohol intake. These data may lead to the design of educational documents customized for the rural elderly population of Vietnam. The complex interaction between socioeconomic status and gender differences in health behavior in this study highlighted the importance of gender specific approaches in prevention of chronic diseases.

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Table 1: Sociodemographic characteristics

	Male		Female		P Value
	n	(%)	n	(%)	
Age (years)					
60-64	27	(19.3)	33	(19.5)	
65-69	29	(20.7)	28	(16.6)	
70-74	35	(25.0)	52	(30.8)	
75-79	30	(21.4)	33	(19.5)	p>0.91
80-85	16	(11.4)	16	(9.5)	
85-89	2	(1.4)	6	(3.6)	
90-	1	(0.7)	1	(0.6)	
Area					
Bach Thuan	47	(33.6)	78	(46.2)	
Tan Phong	81	(57.9)	70	(41.4)	p>0.29
No answer	12	(8.6)	21	(12.4)	
Education level					
Less than secondary school	24	(17.1)	74	(43.8)	
Secondary school	26	(18.6)	30	(17.8)	p<0.01**
High school or more	14	(10.0)	5	(3.0)	
No answer	76	(54.3)	60	(35.5)	
Occupation (before 60 years old)					
Farmer	82	(58.6)	146	(86.4)	
Central government employee or army	46	(32.9)	12	(7.1)	
Local government employee	10	(7.1)	5	(3.0)	p>0.66
Merchant	1	(0.7)	5	(3.0)	
No answer	1	(0.7)	1	(0.6)	
Economic level					
Poor	30	(21.4)	39	(23.1)	
Middle	56	(40.0)	65	(38.5)	p>0.84
Fair	54	(38.6)	65	(38.5)	

Table 2: Physical and lifestyle characteristics

	Male		Female		P value
	n	(%)	n	(%)	
Systolic blood pressure					
<140mmHg	86	(61.4)	117	(69.2)	p>0.11
140-159mmHg	27	(19.3)	28	(16.6)	
160-179mmHg	16	(11.4)	18	(10.7)	
180+mmHg	11	(7.9)	6	(3.6)	
Diastolic blood pressure					
<90mmHg	108	(77.1)	136	(80.5)	p>0.93
90-99mmHg	18	(12.9)	26	(15.4)	
100-109mmHg	11	(7.9)	7	(4.1)	
110+mmHg	3	(2.1)	0	(0.0)	
Weight					
<40kg	19	(13.6)	75	(44.4)	p<0.01**
40-49kg	72	(51.4)	64	(37.9)	
50+kg	49	(35.0)	30	(17.8)	
Hight					
<145cm	7	(5.0)	60	(35.5)	p<0.01**
145-154cm	35	(25.0)	96	(56.8)	
155+cm	98	(70.0)	13	(7.7)	
Body mass index					
<18.0kg/m2	45	(32.1)	58	(34.3)	p>0.49
18.0-19.9kg/m2	39	(27.9)	39	(23.1)	
20.0-24.9kg/m2	52	(37.1)	61	(36.1)	
25.0-29.9kg/m2	4	(2.9)	10	(5.9)	
30.0+kg/m2	0	(0.0)	1	(0.6)	
Preference of Alcohol					
Love	48	(34.3)	47	(27.8)	p>0.65
Like	77	(55.0)	98	(58.0)	
Don't like	13	(9.3)	20	(11.8)	
No answer	2	(1.4)	4	(2.4)	
Preference of salty food					
Love	22	(15.7)	2	(1.2)	p>0.51
Like	51	(36.4)	9	(5.3)	
Don't like	61	(43.6)	150	(88.8)	
No answer	6	(4.3)	8	(4.7)	

Table 3: Social factors associated with the prevalence of moderate to severe hypertension

	No at risk	No of hypertension	Odds ratio (95% confidence interval)			
			Model 1	Model 2	Model 3	Model 4
Gender						
Male	140	27	1.44(0.79-2.64)	1.24(0.66-2.32)	1.88(0.91-3.86)	1.96(0.87-4.45)
Female	169	24	1.0	1.0	1.0	1.0
Education level						
Less than secondary school	98	11	1.0	1.0	1.0	1.0
Secondary school	56	5	0.78(0.26-2.36)	1.20(0.36-4.06)	1.37(0.39-4.79)	1.21(0.33-4.48)
High school or more	19	3	1.48(0.37-5.92)	2.25(0.48-10.54)	2.28(0.44-11.92)	2.64(0.39-17.83)
No answer	136	32	**2.43(1.16-5.11)***	1.43(0.52-3.89)	1.47(0.53-4.10)	1.31(0.46-3.68)
Occupation (before 60 years old)						
Farmer	228	42	1.0	1.0	1.0	1.0
Central government employee or army	58	9	0.74(0.33-1.68)	1.06(0.41-2.73)	0.86(0.31-2.39)	0.83(0.26-2.65)
Local government employee	15	0	-	-	-	-
Merchant	6	0	-	-	-	-
No answer	2	0	-	-	-	-
Economic level						
Poor	69	18	1.0	1.0	1.0	1.0
Middle	121	21	0.60(0.29-1.22)	0.69(0.33-1.45)	0.80(0.36-1.74)	0.74(0.34-1.65)
Fair	119	12	**0.32(0.14-0.71)***	0.44(0.19-1.01)	**0.40(0.17-0.96)***	**0.36(0.14-0.90)***

Model 1: Crude odds ratio and 95% confidence intervals.

Model 2: Further adjusted for demographic factors (age and area).

Model 3: Further adjusted for physical and lifestyle factors (body mass index and preference for alcohol and salty food).

Model 4: Further adjusted for other social factors (education level, or occupation, and economic level).

*:$p<0.05$

Table 4: Social factors associated with the prevalence of moderate to severe hypertension in men

	No at risk	No of hypertension	Odds ratio (95% confidence interval)			
			Model 1	Model 2	Model 3	Model 4
Education level						
Less than secondary school	24	2	1.0	1.0	1.0	1.0
Secondary school	26	3	1.43(0.22-9.42)	1.76(0.23-13.59)	1.66(0.20-13.48)	1.65(0.17-15.86)
High school or more	14	3	3.00(0.44-20.66)	3.12(0.36-27.17)	2.72(0.28-26.01)	3.50(0.30-40.83)
No answer	76	19	3.67(0.79-17.06)	4.03(0.57-28.55)	5.50(0.77 39.16)	3.97(0.46-34.53)
Occupation (before 60 years old)						
Farmer	82	18	1.0	1.0	1.0	1.0
Central government employee or army	46	9	0.77(0.31-1.94)	1.15(0.41-3.24)	0.95(0.30-3.01)	0.87(0.23-3.37)
Local government employee	10	0	-	-	-	-
Merchant	1	0	-	-	-	-
No answer	1	0	-	-	-	-
Economic level						
Poor	30	10	1.0	1.0	1.0	1.0
Middle	56	11	0.49(0.18-1.34)	0.54(0.19-1.51)	0.53(0.17-1.65)	0.57(0.17-1.86)
Fair	54	6	**0.25(0.08-0.78)***	0.30(0.09-1.01)	**0.17(0.04-0.65)***	**0.18(0.04-0.83)***

Model 1: Crude odds ratio and 95% confidence intervals.
Model 2: Further adjusted for demographic factors (age and area).
Model 3: Further adjusted for physical and lifestyle factors (body mass index and preference for alcohol and salty food).
Model 4: Further adjusted for other social factors (education level, occupation, and economic level).
*: $p<0.05$

Table 5: Social factors associated with the prevalence of moderate to severe hypertension in women

	No at risk	No of hypertension	Odds ratio (95% confidence interval)			
			Model 1	Model 2	Model 3	Model 4
Education level						
Less than secondary school	74	9	1.0	1.0	1.0	1.0
Secondary school	30	2	0.516(0.11-2.54)	0.98(0.17-5.53)	0.68(0.13-3.69)	1.10(0.17-6.96)
High school or more	5	0	-	-	-	-
No answer	60	13	2.00(0.79-5.06)	0.75(0.21-2.66)	0.69(0.19-2.49)	0.65(0.17-2.53)
Occupation (before 60 years old)						
Farmer	146	24	1.0	1.0	1.0	1.0
Central government employee or army	11	0	-	-	-	-
Local government employee	5	0	-	-	-	-
Merchant	5	0	-	-	-	-
No answer	2	0	-	-	-	-
Economic level						
Poor	39	8	1.0	1.0	1.0	1.0
Middle	65	10	0.71(0.25-1.97)	0.86(0.29-2.54)	0.79(0.26-2.37)	0.81(0.26-2.56)
Fair	65	6	0.39(0.13-1.24)	0.58(0.17-1.92)	0.51(0.15-1.71)	0.45(0.13-1.63)

Model 1: Crude odds ratio and 95% confidence intervals.
Model 2: Further adjusted for demographic factors (age and area).
Model 3: Further adjusted for physical and lifestyle factors (body mass index and preference for alcohol and salty food).
Model 4: Further adjusted for other social factors (education level, occupation, and economic level).
*: $p<0.05$