Original Article

Prevalence and risk factors of prehypertensive people in the community

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Abstract

Objectives: The objectives of the present study were to determine the prevalence and risk factors of prehypertensive population in the catchment areas of Lukhoke primary care unit, Maung district, Pathumthani province.

Method: This was a cross sectional study in the participants who lived in the catchment areas of Lukhoke primary care unit (PCU) between June and November 2010. Baseline demographic data were obtained and physical examination was performed in all 469 participants, aged 35-59 years. All participants were classified into three groups according to their blood pressure using the Joint National Committee (JNC) 7 criteria; group 1: normal (BP < 120/80 mmHg), group 2: prehypertension (BP = 120-139/ 80-89 mmHg), and group 3: hypertension (BP > 140/90 mmHg). The prevalence of prehypertension was calculated and the factors correlated with increasing prevalence of prehypertension were identified using logistic regression analysis.

Results: Out of 469 participants were 196 (41.8%) men and 273 (58.2%) women with mean age 46.29 ± 7.06 years. The prevalence of prehypertension was 149/469 (31.8%). From multivariate analysis, factors which were independently associated with increasing prevalence of prehypertension included firstly, increased eating salt diet (taste); second, history of chronic diseases e.g. diabetes mellitus and high cholesterol; third, physical activity; fourth, eating high fat diet; and finally, high body mass index (BMI) ($p < 0.05$)

Conclusion: This study showed that the prevalence of prehypertension was relatively high compared with Thai population and South East Asian population. The important risk factors associated with health behaviors. The further studies should encourage the people to establish lifestyle modification among high risk population for reduction of the prevalence of hypertension.

Key words: Prevalence, Prehypertension, Risk factors

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Background

Economic growth, as well as dramatic alterations in dietary and physical activity profiles of Thais has fueled the current epidemiological transition witnessed in Thailand. Communicable diseases such as malaria and tuberculosis, which were once leading causes of morbidity, have been replaced by non-communicable diseases such as diabetes mellitus, coronary heart disease (CHD) and other vascular disorders.[1]

Hypertension is a chronic disease, as the silent killer if not completely cured and can not control blood pressure (BP) levels to the required level. It contributes to considerable morbidity including end-organs damage such as arterial and renal diseases.[2,3] The National High Blood Pressure Education Program Coordinating Committee of the Nation Heart, Lung and Blood Institute released the Seventh Report of the Joint National Committee (JNC) on prevention, detection, evaluation, and treatment of high blood pressure. According to the new report, normal BP is defined as systolic BP (SBP) less than 120 mmHg and diastolic BP (DBP) less than 80 mmHg; SBP of 120 to 139 mmHg or a DBP of 80 to 89 mmHg is defined as prehypertension. Lifestyle modifications for all patients with prehypertension and the addition of drug therapy for prehypertensive patients who have other compelling indications, including multiple diseases is recommended.[4] Clearly, these new guidelines have broadened the target population for high BP (HBP) control. However, little is known about the scope of the current high blood pressure problem.

The evidence base supporting prehypertension has been demonstrated in several studies. The JNC 7 reported the persons with prehypertension were at increased risk to develop hypertension.[4] The National Health and Nutrition Examination (NHANES) 1999-2000 estimated that 31 percent of the population were prehypertensive.[5] Greenlund and coauthors estimated that persons with prehypertension were 1.65 times more likely to have another risk factor for heart disease or stroke.[6] The NHANES in 1999-2000 found that the population of the United States at age over 18 years old had the conditions in the blood pressure criteria prehypertension (120-139/80-89 mmHg) 69.7 million people had high blood pressure stage 1 (140-159/90-99 mmHg). 25 million people had high blood pressure stage 2 (≥ 160-100 mmHg) 11 million and 105.7 million people were approximately 60% of the adult population.[7]

The condition of prehypertension refers to the level of blood pressure 120-139/80-89 mmHg. which controls blood pressure level by adjusting the behavior and does not need to reduce blood pressure drug and blood pressure monitoring.[8] The study population in the United States found that 19% got the risk of hypertension in the period of 4 years and had more risks 2 times than a group with normal blood pressure.[9] The report also found that the study was a condition by the previous hypertension were 2 sub-group is called normal (BP 120-129/80-84 mmHg) and high normal (BP 130-139/85-89 mmHg). The study population in Framingham study in 1978-1994 (4,200 male and 5,645 female) found the prevalence of high blood pressure in normal group was 17.6% and high normal group was 37.3% among the age less than 65, found in more than 4 years. In groups over 65 years found in 4 years.[10]

In addition to the conditions of high blood pressure have the opportunity to be hypertension is a group with a risk of cardiovascular disease, if there are risk factors such as obesity, diabetes and high cholesterol.[11] Epidemiological studies of a group of prehypertension related to heart disease and vascular in the years 1999-2000 found prevalence 31% and over 88% of prehypertension. There were risk factors of cardiovascular disease at least 1 factor. Consistent with studies in the U.S. population found that the risk of prehypertension was higher than those with normal blood pressure 1.65 times.[9] Risk factors for hypertension include age, sex, race-ethnicity, body mass index, family history of hypertension, education, physical activity, and diet.[12] Dietary factors include alcohol intake, sodium intake and low fat dairy foods intake.[13] The Third National Health Examination Survey, 2004, the United States is facing a serious challenge in the prevention and management of

prehypertension and hypertension. People's awareness and control of hypertension remain poor. This study highlights the seriousness of the problem and the importance of promoting lifestyle modifications.[7] Compared to previous surveys, the prevalence of hypertension and prehypertension in Thais is rising rapidly, and is spread relatively evenly across regions of Thailand.[14] Levels of awareness of hypertension were low across the country. A challenging task remains in improving screening, treatment and control of hypertension at the same time as promoting healthier lifestyle modifications.[15-17]

Therefore, it is necessary to studied the prevalence and risk factors of prehypertensived people in the community for prevention or delaying them from hypertension. The purposes of the present study were to determine the prevalence of prehypertension and to find out some important risk factors in a suspected high risk group among Watrungsit community, Pathumthani provience.

Material and Method

Study population and data collection

The present study used a cross sectional study, randomized villages in Watrungsit community. These participants were aged between 35-59 years, who lived in the catchment areas of Lukhoke primary care unit (PCU), Maung district, Pathumthani province during the period of June to November 2010. This area had prevalence ratio of hypertension higher than that of provincial level.

The authors recruited population 469 aged 35-59 out of 1,467 total population in this community, the demographics of the community, including house number, name list of people living in the houses. The protocol was revised and approved by the ethic committee of Faculty of Medicine, Thammasat University Informed consent was signed after all participants were explained about the procedure of the study. Physical examination was recorded including the weight, height and blood pressure. Blood pressure was measured by well-trained staff using standard protocol. Automatic blood pressure measurement machines (Omron IA2, Japan) were used in order to reduce operator bias. All machines were calibrated with standard sphygmomanometer before use. All subjects rested at least 5 minutes in a sitting position before measurements. Both arms were used in each subject at least twice on each arm, using the average of two consecutive lower BP values of the higher arm. Each subject completed a detailed medical questionnaire, which included items on the health data such as medical history, family history of high blood pressure, including gender, age, marital status, family characteristics, education, career, family income, religion, smoking status, alcohol consumption habits and physical activity.

Data analysis

The result of physical examination and data questionnaire were used in the analysis. Normotension was defined as SBP < 120 mmHg and DBP < 80 mmHg. Prehypertension was defined as SBP 120 to 139 mmHg and/or DBP 80 to 89 mmHg. Hypertension was defined as SBP $\geq$ 140 mmHg and/or $\geq$ DBP to 90 mmHg.[4] Body mass index (BMI) was classified into 3 categories according to Word Health Organization (WHO) criteria for Asian population. BMI between 18.5-22.9 was normal range, whereas BMI 23-24.9 and BMI more than or equal to 25 were classified as overweight (at risk) and obesity respectively.[18]

The other variables were categorized as follows: gender (male, female), age (according to decade 35-44, 45-54, and > 55 years), marital status (single, married, widowed and divorced), education (no education, primary level, second level, diploma, bachelor degree or higher), career (unemployed, agriculture, worker industry, personal business, government/public staff and others), family income (not enough, enough but no saving money and saving money), cigarette smoking (yes, no), alcohol consumption (yes, no), and eating behaviors such as salt diet, fat diet (yes, no) and physical activity (moderate level and high level). For multivariable analyses the authors collapsed the categories to represent two groups (low level and more than moderate level). The authors also assessed family history of hypertension (yes, no).

Statistical analysis

The characteristics between normotension and prehypertension were presented as percentage for categorical variables and mean ± standard deviation (SD) for continuous variables. Comparisons between characteristics in each BP group were carried out using One-Way Analysis of Variance (ANOVA) for continuous variables and Chi-square tests for categorical variables. Logistic regression analyses were used to test significant determinants of prehypertension and normotension status, with prehypertension and normotension serving as the dichotomous outcome variable. Gender, age, BMI, marital status, family characteristics, education, career, family income, religion, smoking status, alcohol consumption habits, eating behaviors and physical activity were the independent predictor variables. Stepwise backward selection was used as the method for variable selection, and variables with $p > 0.05$ were eliminated from the model.

Results

A total of 469 participants comprised of 196 (41.8%) men and 273 (58.2%) women with mean age 46.29 ± 7.06 years ranging from 35 to 59 years were included in the present study. The prevalence of prehypertension was 149/469 (31.8%). Normal blood pressure and hypertension were observed in 258/469 (55%) and 62/469 (13.2%). Among 62 participants who had hypertension, 43 participants (69.23%) were previously diagnosed as having hypertension, while the other 19 participants (30.77%) were newly detected (Table 1).

Table 1 Prevalence of prehypertension normal blood pressure and hypertension (HT) in 469 participants

Characteristics	Total N = 469	Normotension N = 258	Prehypertension N = 149	Hypertension N = 62
Gender				
Male	196 (41.8)	109 (42.2)	61 (40.9)	26 (41.9)
Female	273 (58.2)	149 (57.8)	88 (59.1)	36 (58.1)
Known HT	-	-	-	43 (69.23)
Not knowing HT	-	-	-	19 (30.77)

Table 2 showed the baseline demographic information of total participants (469 participants). In this study majority (61.4%) of the participants were married. Half had finished primary school and were workers in the industry. More than half had enough income but no saving.

Table 2 Baseline demographic information of total participants (469 participants)

Characteristics	Total N = 469	Normotension N = 258	Prehypertension N = 149	Hypertension N = 62
Age (yrs)	46.29 ± 7.06	46.28 ± 7.18	46.31 ± 6.8	46.35 ± 6.4
Marital status				
Single	60 (12)	31 (12)	25 (16.8)	4 (16.8)
Married	307 (61.4)	173 (67.1)	91 (61.1)	43 (61.1)
Widowed	84 (16.8)	48 (18.6)	30 (20.1)	6 (20.1)
Divorced	18 (9.8)	6 (2.3)	3 (2)	9 (2)
Education				
No education	10 (2.6)	5 (1.9)	3 (2)	2 (3.2)
Primary school	103 (22.2)	36 (14.2)	42 (28.2)	25 (40)
Secondary school	242 (50.8)	147 (55.8)	67 (45)	28 (44.8)
Diploma	91 (19.6)	58 (23.4)	29 (19.5)	4 (6.4)
Bachelor degree or higher	23 (4.8)	12 (4.7)	8 (5.4)	3 (5.6)
Career				
Unemployed	22 (4.7)	12 (4.7)	5 (3.3)	2 (3.2)
Agriculture	71 (15)	20 (7.8)	28 (17.8)	13 (20.8)
Worker in the industry	232 (49.4)	69 (41.8)	41 (26.5)	30 (48)
Personal business	58 (12)	93 (36.1)	46 (33)	8 (12.8)
Government/public staff	61 (13.1)	32 (12.4)	20 (13.4)	4 (6.4)
Others	25 (5.8)	11 (4.3)	9 (6)	5 (8.8)
Family income				
Not enough	125 (23.8)	62 (24)	38 (25.4)	25 (40.2)
Enough but no saving money	245 (53.1)	147 (57)	69 (46.2)	29 (46.4)
Saving money	102 (23.1)	49 (19)	42 (28.4)	8 (13.4)

Table 3 The relationship between normotensive and prehypertensive groups

Characteristics	Total N = 407	Normotensive N = 258	Prehypertensive N = 149	p-value
Age (yrs)				
35-45	186 (45.7)	118 (46.2)	68 (45)	0.089
More than 46	221 (54)	140 (53.8)	81 (55)	
Weight (kg)	62.78 ± 10.62	63.21 ± 10.88	62.03 ± 10.14	0.279
Height (cm)	161.35 ± 6.74	161.63 ± 6.72	160.86 ± 6.77	0.265
BMI (kg/m^2)	24.01 ± 3.65	24.18 ± 3.8	23.93 ± 3.34	0.510
BMI (kg/m^2)				0.022
Normal	161 (39.6)	99 (38.4)	62 (4.6)	
Overweight	106 (26)	71 (27.5)	35 (23.5)	
Obesity	140 (34.4)	88 (34.1)	52 (34.9)	
Eating high fat diet				0.001
Yes	245 (60.2)	140 (54.3)	105 (70.5)	
No	162 (39.8)	118 (45.7)	44 (29.5)	
Eating salt diet (taste)				0.020
Yes	235 (57.7)	150 (58.1)	85 (57.1)	
No	172 (42.3)	108 (41.9)	64 (43)	
Physical activity				0.000
High level	245 (60.2)	135 (52.3)	110 (73.8)	
Moderate level	162 (39.8)	123 (47.7)	39 (26.2)	
Characteristics of work				0.058
High intensity	172 (42.3)	108 (41.9)	64 (43)	
Moderate intensity	235 (57.7)	150 (58.1)	85 (57.1)	
History of chronic disease				0.000
Yes	122 (33.4)	54 (23.4)	68 (50.7)	
No	243 (66.6)	177 (76.6)	66 (49.3)	
Family history of hypertension				0.156
Yes	96 (23.6)	55 (21.3)	41 (27.5)	
No	311 (76.4)	2.3 (78.7)	108 (72.5)	
Cigarette smoking				0.280
Yes	84 (20.6)	49 (19)	35 (23.5)	
No	323 (79.4)	150 (81)	114 (76.5)	
Alcohol consumption				0.008
Yes	86 (20.6)	44 (17.1)	42 (28.2)	
No	321 (78.9)	219 (82.9)	107 (71.8)	

*$p < 0.05$

Table 3 showed the baseline physical examination and health behavior of the participants (407 participants), as well as the relationship between normotensive and prehypertensive groups, the mean weight and height in the study population were 62.78 ± 10.62 kg and 161.35 ± 6.74 cm. The mean BMI was 24.01 ± 3.65 kg/m^2. Using modified criteria for diagnosis of overweight and obesity mentioned above, most participants had BMI within the normal range (39.6%) but 26% and 34.4% were classified as overweight (BMI 23.5-24.9) and obese (BMI > 25), respectively. There were significant differences between normotension and prehypertension in eating salt food, eating fat food, physical activity, history of chronic disease and alcohol consumption.

From multivariate analysis, factors which were independently associated with increased prevalence of prehypertension included firstly, increasing eating salt diet (taste); second, history of chronic disease; third, low physical activity; fourth, eating high fat diet; and finally, high BMI ($p < 0.05$) (Table 4).

Table 4 Multivariate logistic analysis between normotensive and prehypertensive participants

Variables	OR	95%CI		p-value
		Lower	Upper	
BMI (kg/m^2)				
Normal	1.000			
Overweight	1.711	1.009	2.902	0.046
History of chronic disease				
No	1.000			
Yes	4.524	2.594	7.890	0.000
Alcohol consumption				
No	1.000			
Yes	1.615	0.850	3.071	0.144
Eating high fat diet				
No	1.000			
Yes	1.968	1.155	3.354	0.010
Eating salt diet (taste)				
No	1.000			
Yes	7.122	3.951	12.838	0.000
Physical activity				
High level	1.000			
Moderate level	2.570	1.656	3.988	0.000

*$p < 0.05$

Discussion

The purpose of the present study was to determine the prevalence of prehypertension and to find out some important risk factors in a suspected high risk group among Watrungsit community, Pathumthani province.

Population of the study was the data of prehypertension in Thai community. The authors found high prevalence (31.8%) of prehypertension in the study population. This study supported previous studies, the prevalence from the Third National Health Examination Survey (NHES III) in Thailand in 2004, which had of prehypertension of 36.7%, and much more than the prevalence from the InterASIA study in Thailand in the year 2000, which showed a 21% overall prevalence of prehypertension.[15] The prevalence of prehypertension in males from other previous studies varied from 36% in Taiwan to as high as 51.2% in Loaning province in China.[16] Although there are diversities in the study population among those studies, making comparison between studies are very difficult. The present study revealed equal or higher prevalence of prehypertension in the population studies despite more favorable risk factors compared to other studies from Thailand.[17]

Multivariate analysis revealed higher eating salt diet (taste), history of chronic disease, physical activity, eating high fat diet and high BMI were independently associated with increased prevalence of prehypertension. The relationship between these factors and prehypertension justifies further large scale studies to confirm the present findings and also to find the possible mechanism to explain such relationship. Of special interest is high salt diet which has been found in many previous studies to be associated with hypertension.[18] Recent studies showed that high salt diet increased risk of blood pressure progression and risk of developing hypertension.[19-21]

Conclusion

The 7th JNC report introduced this new term in order to emphasize on its importance and to raise the public attention and awareness of this entity. This study showed that the prevalence of prehypertension was relatively high compared with Asian countries. The important risk factors are associated with health behaviors, so delaying the progression of the disease using an intervention is necessary. Further studies should be encouraged to establish lifestyle modification in high risk group.

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บทคัดย่อ

ความชุกและปัจจัยเสี่ยงของภาวะความดันโลหิตสูงระยะเริ่มต้นในชุมชน

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วัตถุประสงค์: เพื่อหาความชุกและปัจจัยเสี่ยงที่มีความสัมพันธ์กับภาวะความดันโลหิตสูงระยะเริ่มต้น ของประชากรในศูนย์บริการสาธารณสุขชุมชนหลักหก อำเภอเมือง จังหวัดปทุมธานี

วิธีการศึกษา: เป็นการศึกษาแบบภาคตัดขวาง ศึกษาประชากรที่อาศัยอยู่ในศูนย์สุขภาพชุมชนหลักหก อำเภอเมือง จังหวัดปทุมธานี ระหว่างเดือนมิถุนายน ถึงเดือนพฤศจิกายน พ.ศ. ๒๕๕๓ ที่มีอายุระหว่าง ๓๕-๕๙ ปี จำนวน ๔๖๙ คน ทำการเก็บข้อมูลพื้นฐาน และตรวจร่างกาย แบ่งกลุ่มประชากร เป็น ๓ กลุ่มตามระดับของช่วงความดันโลหิตของ the Joint National Committee (JNC) ๗ กลุ่ม ๑: ความดันโลหิตปรกติ (BP < ๑๒๐/๘๐ มิลลิเมตรปรอท), กลุ่ม ๒ : ความดันโลหิตสูงระยะเริ่มต้น (BP = ๑๒๐-๑๓๙/ ๘๐-๘๙ มิลลิเมตรปรอท) และกลุ่ม ๓: ความดันโลหิตสูง (BP > ๑๔๐/๙๐ มิลลิเมตรปรอท) นำผลที่ได้มาคำนวณหาค่าความชุกของภาวะความดันโลหิตสูงระยะเริ่มต้น และหาปัจจัยเสี่ยงที่มีความสัมพันธ์กับโรคความดันโลหิตสูงระยะเริ่มต้นโดยใช้ logistic regression analysis

ผลการศึกษา: กลุ่มตัวอย่างทั้งหมดจำนวน ๔๖๙ คน ประกอบด้วยเพศชาย ๑๙๖ คน (ร้อยละ ๔๑.๘) และเพศหญิง ๒๗๓ คน (ร้อยละ ๕๘.๒) อายุเฉลี่ย ๔๖.๒๙ ± ๗.๐๖ ปี พบความชุกของความดันโลหิตสูงระยะเริ่มต้นเท่ากับร้อยละ ๓๑.๘ จาก multivariate analysis พบปัจจัยที่มีความสัมพันธ์กับความชุกของความดันโลหิตสูงระยะเริ่มต้นอย่างมีนัยสำคัญทางสถิติ ได้แก่ การรับประทานอาหารที่มีรสเค็ม มีประวัติเป็นโรคเรื้อรัง ได้แก่ เบาหวาน และไขมันในเลือดสูง มีกิจกรรมทางกายน้อย การรับประทานอาหารที่มีไขมันมาก และดัชนีมวลกายมีค่าสูงตามลำดับ (ค่าพี < ๐.๐๕)

สรุป: จากการศึกษาครั้งนี้พบว่า ความชุกของความดันโลหิตสูงระยะเริ่มต้นของคนในชุมชนสูงใกล้เคียงกับความชุกของความดันโลหิตสูงระยะเริ่มต้นของประชากรไทยและประชากรในกลุ่มประเทศเอเชียตะวันออกเฉียงใต้ และปัจจัยเสี่ยงที่สำคัญเป็นพฤติกรรมสุขภาพที่เกี่ยวข้องกับการพฤติกรรมการบริโภคและกิจกรรมทางกาย ดังนั้น จึงควรให้ความสำคัญกับการส่งเสริมสุขภาพโดยการปรับเปลี่ยนพฤติกรรมของประชากรกลุ่มนี้เพื่อเป็นการป้องกันการเกิดโรคความดันโลหิตสูงต่อไป

คำสำคัญ: ความชุก, ภาวะความดันโลหิตสูงระยะเริ่มต้น, ปัจจัยเสี่ยง