Associated Factors of Blood Pressure Control and Complications of Hypertension in Hypertensive Rural Thai Populations of Baan Nayao, Chachoengsao Province

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Objective: *To assess associated factors of uncontrolled blood pressure and complications of hypertension in hypertensive rural Thai populations.*
Material and Method: *A cross-sectional study was conducted in hypertensive rural Thai people aged $\geq$ 35 years-old in Baan Nayao, Chachoengsao Province, Thailand. Blood pressure (BP) was measured and questionnaires were answered. After 12-hr fasting, blood samples were taken for determining plasma glucose, lipid profiles and serum creatinine. Morning urine samples were collected for microalbuminuria testing and electrocardiography (ECG) was performed to detect left ventricular hypertrophy (LVH).*
Results: *Of the 289 participants (97 males and 192 females) mean duration of hypertension was 4.29 $\pm$ 4.95 years and 61.5% did not achieve target BP control. Among participants who had ECG performed and urine sample investigation, 15.7% demonstrated LVH and 25.3% had microalbuminuria. In uncontrolled BP participants, 20% had LVH and 24.8% had microalbuminuria whereas in controlled BP participants, 7.8% had LVH and 26.1% had microalbuminuria. Uncontrolled BP was associated with males, dyslipidemia, diabetes, abdominal obesity, metabolic syndrome, always having salty food and salts added for seasoning. The independent risks of uncontrolled BP were hypertensive male (OR = 2.48, 95% CI = 1.07-5.76) and metabolic syndrome (OR = 2.59, 95% CI = 1.24-5.40). Males were also at risk for LVH (OR = 2.86, 95% CI = 1.31-6.23) and history of lipid disorders was a risk of microalbuminuria (OR = 3.13, 95% CI = 1.47-6.67).*
Conclusion: *Males and metabolic syndrome were independently associated with uncontrolled BP in hypertensive participants. Males had more risk than females to develop LVH and having history of lipid disorders lead to microalbuminuria occurrence. Thus, life style modification may prove beneficial to these rural hypertensive participants.*

Keywords: *Blood pressure control, Left ventricular hypertrophy, Microalbuminuria, Metabolic syndrome, Rural Thai population*

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Hypertension is a major problem in public health. According to the World Health Organization report in 2000, 26% of the global population had hypertension. Hypertension is one of the important cardiovascular risk factors that leads to stroke[1] and fatality. Complications of hypertension prevalently found are heart, kidney and brain damage.

It is necessary that patients with hypertension get proper treatment and blood pressure (BP) control. These will help reduce the risk of cerebrovascular disease by 25-30%, myocardial infarction by 20-25% and congestive heart failure by 50%[2]. Patients without hypertension treatment and blood pressure control will potentially have more risk of these complications. It has been found that each 20 mmHg of the systolic BP above 115 mmHg and each 10 mmHg of the diastolic BP above 75 mmHg will double the rate of cardiovascular risk[3]. The complications commonly found are left ventricular hypertrophy and microalbuminuria with rates of 33% and 6-40% respectively[4,5]. These are generally found at an early stage and will be followed by other complications. According to the US survey in 1994-2004, 35% of patients with hypertension had their blood pressure under control[6].

In Thailand, the survey of national public health in 2004[7] showed 22% of its inhabitants had prehypertension and hypertension. Also, a preliminary study on rural people in Baan Nayao community[8] revealed that 19% of them had hypertension and 26.6% had microalbuminuria. Among the hypertensive population, 30.88% had microalbuminuria that signified renal complication, possibly induced by improper BP control or other factors. Therefore, the present study has focused specifically on prevalence of uncontrolled BP and early complications such as left ventricular hypertrophy (LVH) and microalbuminuria and also to assess associated factors of uncontrolled blood pressure and complications of hypertension in hypertensive rural Thai populations of the Baan Nayao community, Chachoengsao Province.

Material and Method

The present study protocol was approved by the Ethics Committee of the Royal Thai Army Medical Department. This cross-sectional study was conducted at Moo 15, Baan Nayao, Sanamchaiket District, Chachoengsao Province during February 2009. To select the participants, the inclusion criteria were 1) hypertensive participants aged 35 years or more 2) hypertension which was defined according to JNC7[2] guidelines and/or 3) received anti-hypertensive medication and/or 4) diagnosed with hypertension by clinician. Before measuring BP in the sitting position, participants were asked to abstain from drinking coffee and smoking for at least 30 minutes and had at least five minutes rest. Three measurements were taken at a five-minute interval and were averaged to obtain the blood pressure value used for analysis. Any participant found to have hypertension and prehypertension according to the JNC guideline was asked to answer an additional self-administered questionnaire including demographic variables, lifestyle habits, past medical history and family history of chronic diseases. The next stage included the measurement of weight, height and waist circumference. Participants with valvular heart diseases or pregnancy were excluded from the present study.

In the following days, such individuals would have additional 12 h-fasting blood tests to check-up triglyceride, cholesterol, LDL cholesterol, HDL cholesterol, glucose and creatinine. Microalbuminuria test was performed in morning urine samples using a dipstick test and ECG was performed for investigation of left ventricular hypertrophy. Participants who received medication were asked to carry medicines for checking and type of medication used. Prior to being enrolled in the present study, written informed consents were signed by participants.

In the present study, hypertensive participants whose BP level was controlled had mean BP < 140/90 mmHg. For participants with chronic kidney disease and diabetes mellitus, controlled levels of blood pressure were systolic BP < 130 mmHg and diastolic BP < 80 mmHg[2].

For diagnosis of LVH, the following criteria were used[9]: 1) Sokolow Lyon index, 2) Cornell voltage index, 3) Gubner index and 4) Romhilt-Estes scores-excessive amplitude. Individuals whose ECG results showed one or more of these criteria were defined as having LVH.

Individuals who exhibited a urine albumin-creatinine ratio of 30-300 mg/g creatinine as detected by a Clinitex microalbumin dipstick test (manufacturer' instructions) were considered as having microalbuminuria.

The present study has extensively included five co-morbidities as follows:

1) Obesity. The diagnosis criteria were based on body mass index (BMI)[10]. A person with BMI less than 18.5 kg/m^2 was considered underweight, 18.5 kg/m^2-22.9 kg/m^2 was a normal weight, 23.0 kg/m^2-24.9 kg/m^2 was overweight and 25.0 kg/m^2 or over was

considered obese.

2) Diabetes mellitus. Individuals considered as having diabetes mellitus were ones whose blood tests showed fasting plasma glucose ≥ 126 mg/dL[11] and/or ones who had a prior diagnosis of diabetes mellitus or were currently under medical treatment for diabetes mellitus.

3) Metabolic syndrome. Participants who possessed 3 of 5 of the Modified National Cholesterol Education Program of the Adult Treatment Panel III (Modified NCEP ATP III), 2005 criteria[12] were considered as having metabolic syndrome. The criteria were: 1) waist circumference of 90 cm and above for men or 80 cm and above for women; 2) triglyceride level > 150 mg/dL; 3) HDL level < 40 mg/dL for men and < 50 mg/dL for women; 4) blood pressure level 130/85 mmHg or currently on blood pressure control medication; 5) fasting plasma glucose ≥ 100 mg/dL.

4) Chronic kidney disease. Diagnosis had been made by calculation of creatinine clearance levels in a blood sample according to the Cockcroft-Gault method[13]. Persons with creatinine clearance rate of less than 60 ml/minute were determined as having chronic kidney disease.

5) Dyslipidemia. These included: 1) triglyceride level ≥ 150 mg/dL and 2) HDL level < 40 mg/dL for men and < 50 mg/dL for women[14].

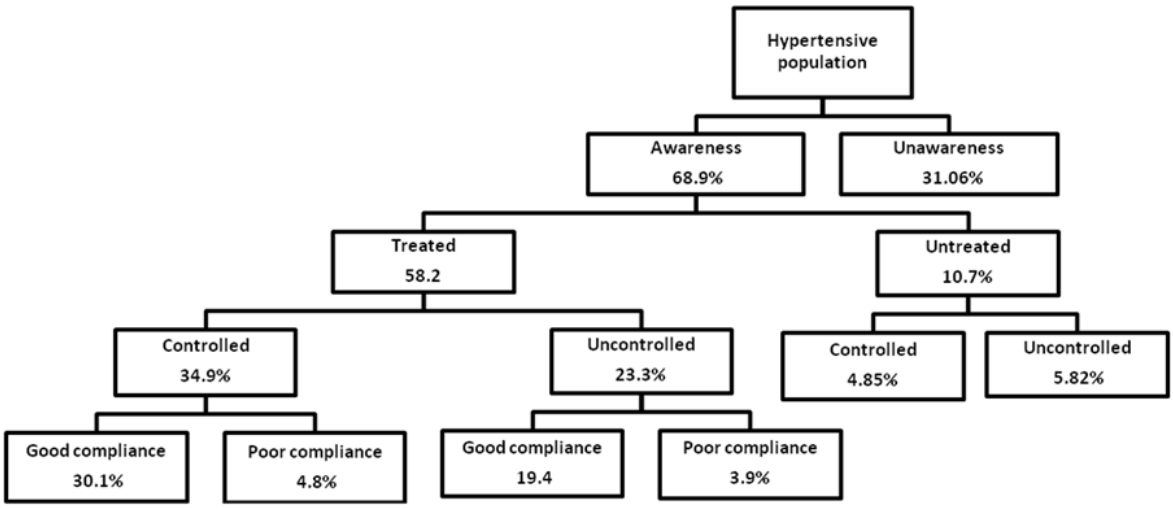
Data obtained from questionnaires and co-morbidities will be analyzed to determine factors that affect blood pressure control or lead to the development of complications in hypertensive patients.

Statistical analysis

Statistical analysis was performed with STATA version 12. Qualitative variables are presented with frequency and percentage. Quantitative variables are expressed as the mean and standard deviation (SD). A binary logistic regression model was built to explain the independent association of uncontrolled BP, LVH and microalbuminuria at the significance level of $p < 0.05$. Variables were introduced to the model using the backward condition method.

Results

Two hundred and eighty nine hypertensive participants (97 males and 192 females) with a mean aged of 56.94 ± 12.2 participated in the present study and their characteristic data are shown in Table 1. In addition, mean duration of hypertension was 4.29 ± 4.95 years. The antihypertensive medicines used as confirmed by physicians were as follows: diuretics (61%), ACEI (60.5%), beta-blockers (17.3%), calcium channel blockers (CCB) (2.5%) and alpha-blockers (1.2%). Overall, 61.5% of participants could not control their blood pressure. As shown in Table 2, males, dyslipidemia, diabetes, abdominal obesity, having metabolic syndrome, salty food intake and salts added for seasoning were found to be associated with uncontrolled BP. However, after adjusting for the rest of remaining variables by multivariate analysis, males and having metabolic syndrome were confirmed to be the independent risk factors of uncontrolled BP [OR 2.48 (95%CI 1.07-5.76) and OR 2.59 (95%CI 1.24-5.40),



(Good compliance = the participants follow up their blood pressure recently within six months)

Fig. 1 Awareness and compliance of hypertensive populations

respectively]. In the present study, only 217 hypertensive participants had ECG investigation and of these, 15.7% developed LVH. As shown in Table 3, uncontrolled BP participants developed LVH (20%) more than the controlled BP group (7.8%). When participants were classified as normotension, prehypertension and hypertension, LVH was detected the most in the hypertension group (19.7%). In addition, LVH was found more frequently in male hypertensive participants (25.7%) than in female (10.9%) and also in participants who smoked rather than nonsmokers. These variables were found to be associated with LVH, nevertheless, by multivariate analysis; independent risk factor for the development of LVH was only being male [OR 2.86 (95% CI 1.31-6.23)]. As shown in Table 4, among 182 hypertensive participants having urine examination, the overall prevalence of microalbuminuria was 25.27%. There were 24.8% and 26.1% of uncontrolled BP and controlled BP participants, respectively, whose microalbuminuria was found to be positive. Higher percentages of microalbuminuria were found in hypertensive participants with a history of lipid disorders (46.51%) and in diabetic hypertensive participants (37.5%). In the multivariate analysis, hypertensive participants with history of lipid disorders were approximately three times more likely to develop microalbuminuria (95%CI 1.47-6.67) and no clear evidence was found for the association between microalbuminuria and uncontrolled BP or diabetes. When considering albuminuria as a main outcome, it was found that diabetic hypertensive participants had a 2.64-folds increased risk of albuminuria [95%CI (1.20-5.85), p 0.016] compared to non-diabetic hypertensive participants (data not shown). Additional analysis of questionnaires as summarized in Fig. 1 shows that among hypertensive participants, 68.9% had awareness of hypertension. Of this group, 58.2% received anti-hypertensive drugs; however, 23.3% could not control their blood pressure. For the untreated group, almost 6% were defined as having uncontrolled BP. Moreover, when categorizing the data by level of BP control, hypertension awareness was found to be 68.6% and 92.6% among uncontrolled BP and controlled BP participants, respectively (data not shown). A total of 58.3% of hypertensive participants believed that hypertension could be completely cured and there was no need to neither see doctors nor continue taking hypertensive medicines.

Discussion

This investigation on rural Thai hypertensive population was a cross-sectional study; therefore, results were interpreted within the limitations. It was found that as high as 61.5% of hypertensive participants did not achieve the target of blood pressure control. Factors found to affect BP control were being male, having diabetes, dyslipidemia, abdominal obesity, high triglyceride level, metabolic syndrome, always having salty food and adding salt for seasoning. Among these variables, abdominal obesity, one component of metabolic syndrome, affected BP control the most. This might be a clue that abdominal obesity may be a predictor of uncontrolled BP. However, independent risks of uncontrolled hypertension were found to be being male and with accompanying metabolic syndrome. The result suggested that although each component of metabolic syndrome had influence on BP control, metabolic syndrome components were not the independent risk of uncontrolled BP on their own. People with uncontrolled hypertension had a potential to develop complications of cardiovascular diseases and LVH has been shown to be an independent risk factor for such diseases in a hypertensive population. In the present study, 15.7% of hypertensive population had signs of electrocardiographic LVH and this figure was in keeping with the retrospective study of hypertensive Thai population using secondary data from a community hospital[15]. To my knowledge this was the first report on LVH prevalence conducted in a rural hypertensive Thai population. A study in the general Thai population reported LVH prevalence was 13%[16]. Another study demonstrated a prevalence of 28-62% in Thai elderly as detected by echocardiography[17]. LVH was higher in uncontrolled BP than the controlled BP participants and in males more than females. These results were similar to the cross sectional study in Spanish hypertensive population aged more than 55 with LVH diagnosed according to Cornell criteria[18]. Salaco et al reported a higher LVH prevalence in hypertensive participants on treatment both in uncontrolled (ranging from 20.8%-24.5%) and controlled groups (ranging from 24.1%-27.6%)[19]. Prevalence discrepancy may be due to methods of evaluation and type of study-base. Consistent with other studies, males were associated with LVH[15,16,18] and for independent risk factor of LVH[16,18,20]. Poor BP control was not found to be an independent risk of LVH in the present study. The possibility might be that the studied population had short duration of hypertension, thus, physiological adaptive LVH may not yet have developed.

Microalbuminuria prevalence in a hyper-

Table 1. Characteristics of the hypertensive participants

Characteristics	Results
Demographic (n = 289)	
Age (year)	56.94 ± 12.20
Income (baht/year)	48,101 ± 66,832
Sex	
Male	97 (33.56%)
Female	192 (66.44%)
Occupation	
Agriculture	153 (59.30%)
Employee	32 (12.40%)
Unemployed	58 (22.48%)
Others	46 (17.82%)
Education	
At least elementary education	226 (78.20%)
No education	29 (10.03%)
Others	34 (11.77%)
CV diseases in family (n = 204)	23 (11.3%)
Hypertension in family (n = 199)	47 (23.6%)
Diabetes in family (n = 203)	43 (21.%)
Family history of lipid disorders (n = 170)	43 (11.3%)
Participant history of hypertension (n = 264)	207 (78.4%)
Participant history of diabetes (n = 262)	50 (19.1%)
Participant history of lipid disorders (n = 194)	51 (26.3%)
Participant history of kidney disease (n = 178)	5 (2.8%)
Clinical	
Body mass index (kg/m^2)	24.97 ± 3.95
Waist circumference (cm)	78.45 ± 21.66
Systolic BP (mmHg)	133.41 ± 16.83 (min 80-max 190)
Diastolic BP (mmHg)	83.76 ± 11.12 (min 48-max 130)
FPG (mg/dL)	98.39 ± 28.39 (min 65.3-max 256.0)
Total cholesterol (mg/dL)	201.46 ± 41.85 (min 97.0-max 447.6)
Triglyceride (mg/dL)	208.70 ± 124.66 (min 25.0-max 865.0)
HDL-c (mg/dL)	46.07 ± 11.82 (min 25.0-max107.0)
LDL-c (mg/dL)	117.09 ± 34.97 (min 15.0-max 237.7)

Data are expressed as mean ± SD and n (%), CV = cardiovascular

tensive population in the present study was 25.3%. This prevalence rate was lower than previous reports in a hypertensive Thai population where microalbuminuria was detected using Micral test strip[8,21,22]. A hypertensive person with a history of dyslipidemia was 3.13 times more likely to have microalbuminuria than those without. A previous study reported that reduction of hypertriglyceridemia was associated with the slow progression of nephropathy in diabetes patients[23] and this may also apply to hypertensive patients. Surprisingly, no difference was found in the prevalence of microalbuminuria between controlled and uncontrolled BP group which differed from studies which suggesting that microalbuminuria was associated with the early detection of renal damage from hypertension[24]. The result in the present study was in keeping with the study of Gojaseni et al[20] demonstrating that less effective BP control was not the risk factor of elevated urinary albumin excretion. As is already known, microalbuminuria appears to be associated with the severity and duration of hypertension and short hypertensive duration in the studied population may explain our result. From the present study, however, co-morbidity diseases in hypertensive population should be controlled in order to reduce the chance for the development microalbuminuria and whether microalbuminuria can predict subsequently kidney complication in hypertensive

Table 2. Risk factors of uncontrolled blood pressure in hypertensive participants (n = 289)

TYPE	Uncontrolled BP	Controlled BP (95% CI)	Unadjusted OR (95% CI)	Adjusted OR	p-value
Age	57.32 ± 11.37	56.32 ± 13.48	1.01 (0.99-1.03)		
Sex					
Male	70 (72.2)	27 (27.8)	2.02 (1.19-3.42)	2.48 (1.07-5.76)	0.034
Female	108 (56.3)	84 (43.7)	1		
Metabolic syndrome					
Yes	90 (77.6)	26 (22.4)	2.08 (1.09-3.97)	2.59 (1.24-5.40)	0.012
No	45 (62.5)	27 (37.5)	1		
Waist circumference					
Abdominal obesity	96 (67.1)	47 (32.9)	2.64 (1.11-6.29)		
Normal	65 (54.2)	55 (45.8)	1		
Triglyceride level					
High	119 (70.4)	50 (29.6)	2.33 (1.40-3.89)		
Normal	51 (50.5)	50 (49.5)	1		
Dyslipidemia					
Yes	76 (71.7)	30 (28.3)	1.89 (1.12-3.19)		
No	94 (57.3)	70 (40.7)	1		
Diabetes					
Yes	28 (80.0)	7 (20.0)	1.73 (1.05-2.85)		
No	141 (60.3)	93 (39.7)	1		
Salty food					
Always	97 (67.8)	46 (32.2)	1.69 (1.05-2.73)		
Not always	81 (55.5)	65 (44.5)	1		
Adding salt for seasoning					
Always	81 (70.4)	34 (29.6)	1.89 (1.15-3.12)		
Not always	97 (55.7)	77 (44.3)	1		
Smoking					
Always	29 (69.0)	13 (31.0)	1.58 (0.78-3.2)		
Not always	126 (58.6)	89 (41.4)	1		
Drinking					
Always	23 (63.9)	13 (36.1)	1.16 (0.55-2.45)		
For party time	35 (60.3)	23 (39.7)	0.99 (0.54-1.84)		
Exercise					
No	99 (59.6)	67 (40.4)	1.05 (0.61-1.79)		
Yes	48 (58.5)	34 (41.5)	1		
CV diseases in family					
Yes	17 (73.9)	6 (26.1)	1.44 (0.54-3.84)		
No	120 (63.3)	61 (37.7)	1		
Hypertension in family					
Yes	31 (66.0)	16 (34.0)	0.98 (0.49-1.95)		
No	101 (66.4)	51 (33.6)	1		
DM in family					
Yes	31 (72.1)	12 (27.9)	1.39 (0.66-2.92)		
No	104 (65.0)	56 (35.0)	1		

Data are expressed as mean ± SD and n (%), CV = Cardiovascular, DM = Diabetes mellitus and always means regularly performed

population remains to be further studied.

Despite high percentages in hypertensive awareness and regular follow-ups, a high prevalence of uncontrolled BP was found among a rural hypertensive Thai population which was in accordance with the health survey of this population in 2008 carried

Table 3. Selected risk factors of left ventricular hypertrophy in hypertensive participants

TYPE	LVH	Non-LVH (95% CI)	Unadjusted OR (95% CI)	Adjusted OR	p-value
Age	60.71 ± 11.96	56.60 ± 12.01	1.03 (1.00-1.06)		
Sex					
Male	18 (25.7)	52 (74.3)	2.83 (1.34-5.98)	2.86 (1.31-6.23)	0.008
Female	16 (10.9)	131 (89.1)	1		
Smoke					
Always	8 (25.8)	23 (74.2)	2.82 (1.09-7.30)		
Ex-smoker	6 (27.3)	16 (72.7)	3.04 (1.05-8.83)		
Sometimes	1 (33.3)	2 (66.7)	4.06 (0.35-7.16)		
No smoke	17 (11.0)	138 (89.0)	1		
BP control					
Uncontrolled	28 (20.0)	112 (80.0)	2.96 (1.17-7.50)		
Controlled	6 (7.8)	71 (92.2)	1		
Level of BP (mmHg)					
Hypertension (>140/90)	24 (19.7)	98 (80.3)	4.53 (1.02-20.13)		
Prehypertension (120/80-139/89) mmHg	7 (13.7)	44 (86.3)	2.94 (0.58-15.04)		
Normal (<120/80)	2 (5.1)	37 (94.9)	1		

Data are expressed as mean ± SD and n (%), LVH = left ventricular hypertrophy

Table 4. Selected risk factors of microalbuminuria in hypertensive participants

TYPE	MAU	Normal (95%CI)	Unadjusted OR OR (95%CI)	Adjusted	p-value
History of lipid disorder					
Yes	20 (46.5)	23 (53.5)	3.55 (1.69-7.45)	3.13 (1.47-6.67)	0.003
No	25 (19.7)	102 (80.3)	1	1	
Diabetes mellitus					
Yes	9 (37.5)	15 (62.5)	2.04 (0.82-5.06)		
No	35 (22.7)	119 (77.3)	1		
BP control					
Uncontrolled	29 (24.8)	88 (75.2)	0.93 (0.46-1.86)		
Controlled	17 (26.1)	48 (73.9)	1		

Data are expressed as mean ± SD and n (%), MAU = microalbuminuria

out by the Department of Military and Community Medicine, Phramongkutklao College of Medicine. Consistent with previous report[7], it was noted that among the awareness group, only 34.9% had desirable BP level. The present study has shown the association of metabolic syndrome with uncontrolled BP and hence modifiable factors such as health behaviors and dietary patterns seemed to be involved. Nevertheless, further study should be carried out to identify the real causes of uncontrolled BP whether the lifestyles will remain unchanged, including inadequate health service and knowledge provided at the primary care level or even physician inertia so as to provide better care and proper management.

Misunderstanding remained about hypertension in this community. Most people believed if blood pressure once was controlled, hypertension would have been completely cured and there was no need to neither see doctors nor continue taking antihypertensive drugs. This data gave a strong suggestion that primary health care team was very important not only for follow-up but also provided

knowledge and accurate information to this population.

Conclusion

The present study revealed a high prevalence of uncontrolled BP and its independent associated factors (*i.e.*, male and metabolic syndrome) in a rural Thai hypertensive population. LVH and micro-albuminuria were found in both controlled and uncontrolled hypertension. Males had greater risk than females to develop left ventricular hypertrophy and hypertensive participants with lipid disorders history had greater risk for microalbuminuria.

Limitations of the study

Several points were noted in this cross-sectional study. First, all information was collected at the time during the period of study; second, information from the questionnaires was based on self-reports. Third, this research was limited to only the hypertensive population, resulting in a limited number of participants. In addition, missing data occurred from the refusal of some participants to have their blood tested or urine examined. These may affect statistical analysis of data. Fourth, the microalbuminuria detection employed the antibody-based dipstick, and the possibility of false positive/negative may have occurred. Despite these study limitations, valid information could be drawn from the present study. In addition, the present study demonstrated simple screening procedures with acceptable costs such as ECG and microalbuminuria tests for early risk assessment in rural hypertensive people. Using these screening tests at the primary care level or in the prospective cohort studies may help in better hypertension control and prevent cardiovascular events in rural hypertensive Thai populations.

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Potential conflicts of interest

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ปัจจัยที่มีผลต่อการควบคุมความดันโลหิตสูงและภาวะแทรกซ้อนของความดันโลหิตสูงในประชากรไทย บ้านนายาว จังหวัดฉะเชิงเทรา ที่มีภาวะความดันโลหิตสูง

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วัตถุประสงค์: *เพื่อศึกษาปัจจัยที่เกี่ยวข้องกับการควบคุมความดันโลหิตและภาวะแทรกซ้อนของโรคความดันโลหิตสูงในประชากรชนบทไทยที่มีความดันโลหิตสูง*

วัสดุและวิธีการ: *เป็นการศึกษาแบบ cross-sectional study โดยเก็บข้อมูลประชากรชนบทไทย ในบ้านนายาว จ. ฉะเชิงเทรา ประเทศไทย อายุตั้งแต่ 35 ปี ที่มีภาวะความดันโลหิตสูง โดยทำการวัดความดันโลหิต เก็บข้อมูลแบบสอบถาม และเจาะเลือดภายหลังอดอาหาร 12 ชั่วโมง เพื่อตรวจวัดระดับน้ำตาล ไขมันชนิดต่างๆ และระดับครีเอตินีน เก็บตัวอย่างปัสสาวะในตอนเช้าเพื่อประเมินภาวะไมโครอัลบูมิน และตรวจคลื่นไฟฟ้าหัวใจเพื่อประเมินภาวะหัวใจห้องล่างซ้ายโต*

ผลการศึกษา: *จากผู้เข้าร่วมการวิจัยจำนวนทั้งสิ้น 289 คน (เพศชาย 97 คน และเพศหญิง 192 คน) มีระยะเวลาเฉลี่ยในการเป็นโรคความดันโลหิตสูง 4.29 $\pm$ 4.95 ปี ร้อยละ 61.5 ไม่สามารถควบคุมความดันโลหิตได้ ในผู้ที่ได้รับการตรวจคลื่นไฟฟ้าหัวใจพบภาวะหัวใจห้องล่างซ้ายโตร้อยละ 15.7 และผู้ที่ได้รับการตรวจปัสสาวะพบภาวะไมโครอัลบูมินในปัสสาวะ ร้อยละ 25.3 ในกลุ่มที่ไม่สามารถควบคุมความดันโลหิตได้พบภาวะหัวใจห้องล่างซ้ายโตร้อยละ 20 และภาวะไมโครอัลบูมินในปัสสาวะ ร้อยละ 24.8 ในขณะที่กลุ่มที่ควบคุมความดันโลหิตได้พบร้อยละ 7.8 และ 26.1 ตามลำดับ ปัจจัยที่เกี่ยวข้องกับการไม่สามารถควบคุมความดันโลหิต ได้แก่ เพศชาย ไขมันในเลือดสูง เบาหวาน อ้วน ภาวะอ้วนลงพุง รับประทานอาหารรสเค็ม โดยเพศชาย มีความเสี่ยงต่อการไม่สามารถควบคุมความดันโลหิต 2.48 เท่า และภาวะอ้วนลงพุงมีความเสี่ยง 2.59 เท่า นอกจากนี้เพศชายจะมีโอกาสเสี่ยงต่อภาวะหัวใจห้องล่างซ้ายโตมากกว่าเพศหญิง 2.86 เท่า และผู้ที่มีประวัติ เป็นไขมันในเลือดผิดปกติมีความเสี่ยงต่อการเกิดภาวะไมโครอัลบูมินในปัสสาวะ 3.13 เท่า*

สรุป: *เพศชายและภาวะอ้วนลงพุงเป็นปัจจัยเสี่ยงต่อการไม่สามารถควบคุมความดันโลหิตในผู้ที่มีความดันโลหิตสูง เพศชายมีความเสี่ยงต่อภาวะหัวใจห้องล่างซ้ายโตมากกว่าเพศหญิง และภาวะไมโครอัลบูบินในปัสสาวะมีความสัมพันธ์กับการมีประวัติไขมันในเลือดผิดปกติ ดังนั้นการปรับเปลี่ยนพฤติกรรม จะมีส่วนช่วยในการควบคุมความดันโลหิตเพื่อลดอัตราการเกิดโรคแทรกซ้อนจากความดันโลหิตสูงในประชากรกลุ่มนี้ได้*