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Prevalence of Precursors of Ischemic Heart Disease in the Northeast Thailand.

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การศึกษาความชุกของปัจจัยเสี่ยงของโรคเส้นเลือดหัวใจขาดเลือดในภาคตะวันออกเฉียงเหนือของประเทศไทย

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ได้ทำการศึกษาความชุกของปัจจัยเสี่ยงของโรคเส้นเลือดหัวใจขาดเลือดในกลุ่มประชากรชายไทย อายุ 35–64 ปี ในชนบทภาคตะวันออกเฉียงเหนือของประเทศไทย โดยศึกษาในอำเภอพล จังหวัดขอนแก่น ตัวอย่างประชากรได้จากการสุ่มหมู่บ้านตามระดับการพัฒนา ข้อมูลที่เก็บคือ ข้อมูลพื้นฐาน การสูบบุหรี่ เศรษฐฐานะ ความดันโลหิต น้ำหนัก ส่วนสูงและระดับไขมันในเลือด ผลการศึกษาพบว่าประชากรชาย 209 คน จาก 8 หมู่บ้านมีอายุเฉลี่ย 47.6 ปี ประมาณสามในสี่ของประชากรมีอาชีพทำนา ความชุกของความดันโลหิตสูงชนิดซีสโตลี (>= 160 มม.ปรอท) 1.4% ชนิดไดแอสโตลี (>= 95 มม.ปรอท) 2.4% ขณะที่ความชุกของไขมันในเลือดสูง (>= 250 มก%) = 1.4% ความดันโลหิตซีสโตลี, ไดแอสโตลี และระดับไขมันในเลือดโดยเฉลี่ย (SD) 115.6 (15.3) มม.ปรอท, 75.7 (9.6) มม.ปรอท และ 147.7 (35.3) มก.% ตามลำดับ อัตราการสูบบุหรี่พบร้อยละ 75 แต่สำหรับคนที่มีน้ำหนักเกินปกติ (BMI >25 km/m^2) มีเพียงร้อยละ 17 ในการศึกษาความสัมพันธ์ของความดันโลหิตกับปัจจัยต่างๆ พบว่า ทั้งระดับไขมันในเลือดและดรรชนีมวลรวมกาย มีความสัมพันธ์เชิงบวกอย่างมีนัยสำคัญ นอกจากนี้ยังพบว่าค่าเฉลี่ยของความดันโลหิตมีแนวโน้มที่เพิ่มขึ้นตามระดับการพัฒนาด้วย

The study was conducted among northeast Thai male population aged 35-64 years in Phon district of Khon Kaen. Sampled population was selected by cluster sampling by levels of development of villages. Data collected were including, demographic data, cigarrette smoking, socioeconomic status, blood pressure, body weight, height and total serum cholesterol. There were 209 men from 8 villages with the average age of 47.6 years. About three quarters of them were farmers. The prevalence of systolic hypertension (>=160 mmHg), diastolic hypertension (>=95 mmHg) were 1.4% and 2.4% respectively. Means (SD) of systolic, diastolic blood pressures and total serum cholesterol were 115.6 (15.3) mmHg, 75.7 (9.6) mmHg and 147.7 (35.3) mg% respectively. Smoking rate was 75%, Overweight (BMI > 25 kg/m^2) was only 17% of the population. Both mean systolic and mean diastolic blood pressures had significant correlation with both total cholesterol level and body mass index, as well as the level of development of the villages.

Introduction

There is a worldwide recognition that as a country becomes more industrialized, communicable diseases become less prevalent. In addition to that, noncommunicable diseases tend to rise steadily as well as life expectancy, as a country undergoes development.

Thailand is a repidly developing country in Southeast Asia. Data from the Thailand National Statistic Department from 1969 to 1983 (1) show that, there was a decline in several major infectious diseases, as well as nutritional deficiencies. However, the incidence of heart diseases increased (fig. 1). Thus, it is timely to start collecting baseline data of cardiovascular risk factors in Thailand in order to understand the reasons for the rise of cardiovascular diseases and its associated risk factors. With this information, we can attempt to prevent the development of this epidemic in Thailand.

This study was designed to estimate the prevalence of precursors of ischemic heart disease among rural Thai adult males aged 35-64 years. This is part of the International Clincical Epidemiology Network (INCLEN) Multicenter Collaborative study on the Prevalence of the Precursors of Ischemic heart disease and Stroke.

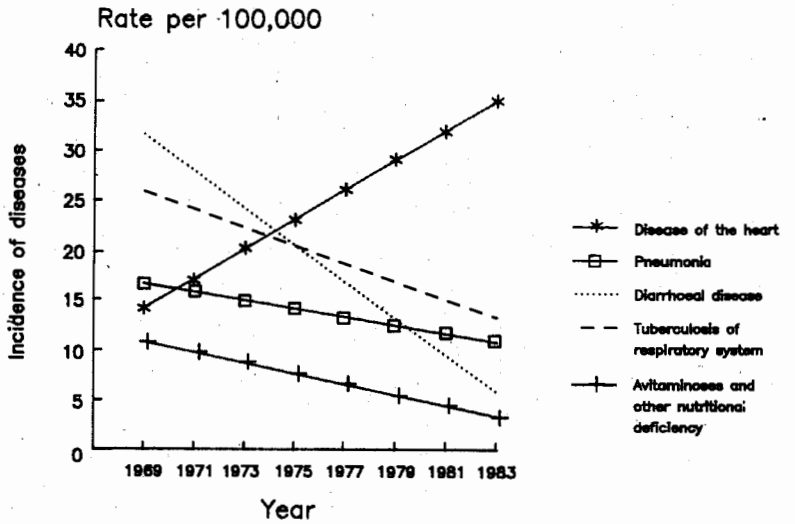

Figure 1 Trends of the disease incidence in Thailand.
(from : National Health Statistics department ministry of Public Health Thailand)

Materials and Methods

Population selection

This study was carried out in Khon Kaen province in northeast Thailand. Phon district was selected for study because it is geographically similar to most of the northeast districts.

From 11 subdistricts of Phon district, 3 subdistricts were randomly selected. (fig.2) Within these 3 subdistricts, villages were classified into three types, advanced, moderately and poorly developed, according to the village classification of the Department of Community Development.

Villages are classified according to 5 indices. These indices are basic structure of the village, productivity, health status, availability of water resources and finally educational status of villages.

Within these 3 classes of villages, 2 villages were randomly selected from each class. Another village was also randomly selected from the urbanized villages around the municipal area of the province. In order to compensate for drop-out of subjects, one additional moderately developed village was selected, to make up at least 200 subjects as required by the INCLEN Multicenters Collaborative study.

For each village, a household list was used for systematic selection of the subjects. From every other household a male aged 35-64 years was selected. Two hundred eighty-three subjects from 8 villages were included in the study. Totally, the numbers of responders were 209. The response rate was 74%

Outcome variables

The variables to be measured (Table 1) were age, cigarette smoking status and number of cigarettes smoked per day.

Blood pressure was measured twice. The first measurement was taken after 10 minutes of sitting, and the second one was taken 10 minutes later. Observers were trained and tested for comparability using the movies of BP measurement of the School of London. Ordinary mercury sphygmomanometers were used. Blood pressures were recorded to the nearest 2 mmHg and diastolic phase 5 was used. Mean of two measurements was reported.

Figure 2. Method of selection of the study population

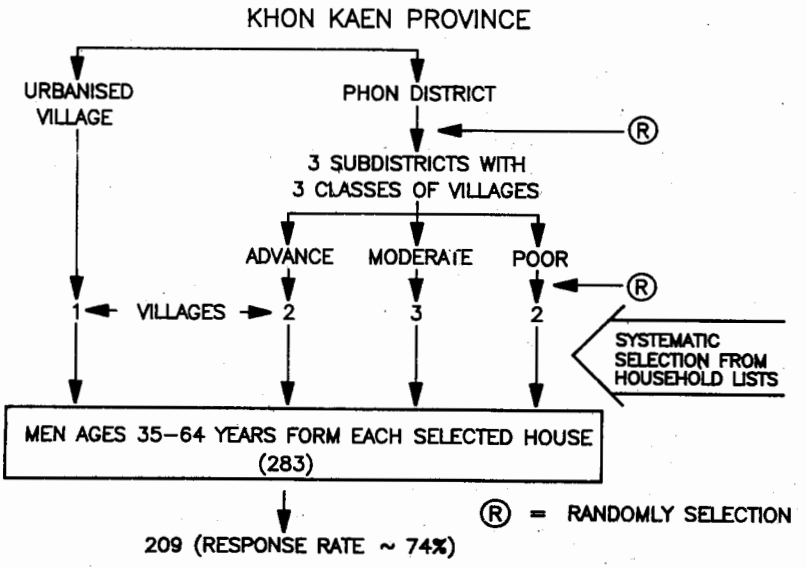

Table 1. Measured outcome variables

- AGE
- CIGARETTE SMOKING
- BLOOD PRESSURE
- BLOOD CHOLESTEROL
- SOCIOECONOMIC STATUS
- BODY MASS INDEX

Venous blood was drawn for cholesterol measurement after the subject had been sitting for 10 minutes.

Serum cholesterol was measured by using Boehringer Mannheim diagnostic Reflotron machine, a rapid dry chemistry method, which gives results with good precision (6, 7)

Socioeconomic status and body mass index were also measured.

Statistical Analysis

Mean and standard deviation were used for continuous variables while proportion was used for discrete data. Correlation and multiple regression analysis were used to find the associations among variables.

Results

Two hundreds and nine subjects were in the study with a mean age of 47.8 years and an average of 5 years. of education. Only 4% of them had tertiary education. About 72 percent of them were rice farmers. Although the national mean annual income is about 26,000 baht (3), more than 60 percent of the study population earned an income of less than 20,000 baht/year.

Fourteen percent of them had blood pressure measured last year and more than half never have blood pressure checked before. Two percent of the subjects were currently on antihypertensive treatment. Three quarters were current smokers with the mean number of cigarette smoked per day of 10.7.

The mean systolic and diastolic blood pressures (SD) were 115.6 (15.3) and 75.7 (9.6) mmHg respectively. The mean serum total cholesterol (SD) was 147.7 mg% (35.3) or 3.8 mmol/litre (0.9), and the mean body mass index (SD) was 21.9 (3.2) kilogram per square meter. (Table 2)

The prevalence of hypercholesterolemia was 1.4% when using the cut off point at equal or more than 250 mg%.

The prevalence of systolic hypertension was 1.4% while the diastolic hypertension was 2.4%. The prevalence of smokers was 75.1% and only 17.0% of the study subjects were overweight (BMI $>$ 25 km/m^2). (Table 3)

There was statistically significant positive correlations between body mass index and total serum cholesterol ($r = 0.34$, $P < 0.01$). Both body mass index and total serum cholesterol had significant positive correlations with both systolic ($r = 0.38$ and 0.21 respectively) and diaslotic ($r = 0.38$ and 0.25 respectively) blood

TABLE 2. STUDY RESULTS

NUMBER	209	
MEAN AGE IN YEARS (SD)	47.8	(8.6)
MEAN IN YEAR EDUCATION (SD)	5	(2)
TERTIARY EDUCATION (%)	4	
RICE FARMER (%)	71.8	
INCOME < 19,999 B/YR (%)	64	
BLOOD PRESSURE MEASURED (%)		
IN LAST YEAR	14	
NEVER	63	
CURRENT TREATMENT FOR HYPERTENSION	2	
CURRENT SMOKERS (%)	75	
MEAN NUMBER OF CIGARETTE/DAY	10.7	
SYSTOLIC BP (mmHg)	115.6	(15.3)
DIASTOLIC BP (mmHg)	75.7	(9.6)
TOTAL CHOLESTEROL (mg%)	147.7	(35.3)
(MMOL/L)	3.8	(0.9)
BODY MASS INDEX, (KG/M^2)	21.9	(3.2)

Table 3. Prevalence rates

- HYPERCHOLESTEROLEMIA (> = 250 MG%) = 1.4 %
- SYSTOLIC HYPERTENSION (> = 160 MMHG) = 1.4 %
- DIASTOLIC HYPERTENSION (> = 95 MMHG) = 2.4 %
- CIGARETTE SMOKERS = 75 %
- BODY MASS INDEX (> 25 Kg/m^2) = 17 %

perssure. ($P < 0.01$). Age had no relation with all four factors.

By applying multiple regression analysis to examine the inter-relationships between these factors, only total serum cholesterol had a significant positive relationship with body mass index. ($r = 0.35$, $P > 0.0001$)

When we examined the relationship between village development versus age, weight, height, body mass index, total serum cholesterol, blood pressure and prevalence of smoking, only systolic and diastolic blood pressures showed statistically significant differences among different classes of development (Table 4) the mean systolic

Table 4. The relationship between the level of development of the villages and the mean blood pressures.

	ADVANCE (N=78)	MODERATE (N=84)	POOR (N=47)	P
SYSTOLIC BP $\bar{X}$ (SD)	121.2 (16.6)	111.2 (13.1)	114.2 (14.2)	0.0002
DIASTOLIC BP $\bar{X}$ (SD)	79.4 (9.8)	73.7 (8.5)	73.1 (9.6)	0.0001

and mean diastolic blood pressures were higher in the advanced villages than the moderately and poorly developed villages (P = 0.0002 and 0.0001 respectively). Thus, the more developed a village was the higher the mean blood pressure of the inhabitants.

Discussion

To compare the results of this study with the previous studies done in Thailand. Particularly one which was done in 1977 by Pongpaew P and colleague (4) to collect baseline data for the lipid pattern in Thai population, both urban and rural areas. Most of the rural subjects were farmers aged 18-17 years old, they were unselected and apparently healthy , the mean serum cholesterol of the population was 184.8 (± 35.6) mg% which was about 25% higher than the present study.

Another study done in 1985 by Sakornpant P. and colleague (5) in central part of Thailand, about 60 kilometers from Bangkok, the population sample were cluster sampling, 30-59 years of age, the prevalence of systolic, diastolic blood pressures and hypercholesterolemia were higher than the present study, they were 3%, 6% and 6.2% respectively. The mean serum cholesterol was 186.8 mg% which was also about 25% higher than this study. Percents of smokers is higher in the present study compared to the second study, 76 percents and 61 percents respectively. The explainations for the discrepancies between the results of the previous studies and the present study are mainly 2 points. Firstly the differences of population characteristics, and recruitment of subjects into the study. The first study might be subjected to a selection bias because it was self-selected population. The second study was done in the central area and very close to the capital of Thailand where the subjects as a whole would have been different in life styles and socioeconomic status from the subjects from the rural northeart Thailand. Secondly the cholesterol measurement methods and technology were different.

Also from this study the positive relationships between body mass index and cholesterol level is confirmed.

Another interesting finding is the positive relationship between the level of development of the villages and blood pressure, suggesting that there is an elevation of mean blood pressure of both systolic and diastolic with increasing village developement. This result lends support to the hypothesis that the more developed a community is, the higher the blood pressures will be.

Because the mean cholesterol level was strikingly lower in this study than the previous studies, in order to evaluate the negative bias of the Reflotron cholesterol results, 175 serum samples of 209 samples were re-analysed by Bochringer-Mannheim kits using the Hitachi 704 automatic system (intraassay coefficient of variation were lower than 1% while interassay coefficient of variation were $< 2.5\%$). The correlation of the cholesterol results derived from Reflotron and Hitachi 704 machines was 0.669, while the mean serum cholesterol derived from the latter machine was 161.1 mg% which was 9% higher than that measured by Reflotron dry chemistry method used in this study. However regarding the Hitachi 704 cholesterol results, the prevalence of hypercholesterolemia ($>$ 250 mg%) has not changed from 1.4%.

conclusion

Among rural Thai males 35-64 years of age there are low prevalence of hypercholesterolemia and hypertension. Smoking however, was highly prevalent in the study population. The multiple stepwise regression shows strong association between cholesterol and body mass index. Finally, the study also suggests an association between the level of villages development and blood pressures, both systolic and diastolic blood pressure.

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References

1. National Health Statistic department. Thai population health status. Proceeding of the first national public health assembly of Thailand. Bangkok Ministry of Public Health. 12-15 September 1988; PAGE 9.
2. Research and Evaluation Division. Assessment of levels of village development 1987, Khon Kaen province. Department of Community Development, Ministry of Interior. 1987.
3. Mevongukose S. Siam Almanac. Bangkok Siambun Co.Ltd. 2531-2532.
4. Pongpaew P, Saovakontha S, Schelp FP, et al. Serum lipid pattern in upban and rural Thai population. J. Nutr. Sci. Vitaminol. 1987; 24: 289-296.
5. Sakornpant P, Panyaprateep B. Prevalence of hypertension and related risk factors. Thai Heart journal 1988; 1: 46.
6. Sridama V, Harnasasvas S, Leumphol M, et al. Measurement of lipid levels by using rapid dry chemistry method. Inter Med 1989; 91-95.
7. Burke II JJ, Fischer PM. A clinician's guide to the office measurement of cholesterol. JAMA 1988; 259:3444-48.