Gender and Ethnic Differences in Cardiovascular Risks in Songkhla Province, Thailand: The InterASIA-South

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The subset of data on southern Thai InterAsia study conducted in 2000 was revisited in order to document gender and ethnic breakdown of prevalence of risk factors for cardiovascular diseases (CVD). Three hundred and seventy-five men and 630 women with overall mean $\pm$ SD age of 53.2 $\pm$ 11.7 years were recruited. Combined gender prevalences were: 21.1% for smoking, 15.5% for drinking, 21.8% for hypertension (systemic blood pressure $\geq$140/90 mmHg), 49.8% for impaired fasting plasma glucose (FPG 110-125 mg/dl), 9.9% for diabetes mellitus (FPG $\geq$ 126 mg/dl), 10% for body mass index $\geq$ 30 kg/m^2, 43.5% for large waist circumference (WC $\geq$90 cm in men and $\geq$ 80 in women), 62.8% for total serum cholesterol (TC), > 200 mg/dl, 38.5% for TC divided by high density lipoprotein cholesterol (HDL-C) $\geq$ 5 and 61.6% for low-density-lipoprotein cholesterol (LDL-C), $\geq$ 130 mg/dl. After using logistic regression, adjusting the effects of age and community of residence, women were less likely than men to be smokers, drinkers, or showed impaired FPG but significantly more likely to have large WC, TC $\geq$200 mg/dl and LDL-C $\geq$ 130 mg/dl. Muslims showed significantly lower risk for drinking and large WC but higher risk for low HDL-C. The differences require further research. In conclusion, gender and age have stronger association with various risk factors than ethnicity in this selected population.

Keywords: *Malay-Thai, Chinese-Thai, Lipid*

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Risks factors for cardiovascular disease (CVD) have been identified and these appeared to be similar for all populations except in its magnitude(1-3). A number of effective intervention methods had been demonstrated which included prevention of smoking, promotion of exercise and diet control(4). Application of such findings to target population in developing countries, however, has to be finely tuned to a local social setting. Studies leading to understanding of similarity and differences among different ethnic groups would be useful for planning of each locality(5-9).

Songkhla province in southern Thailand has a mixture of two main ethnic groups, namely, Thai and Chinese versus Malay extracts. The risk factors for CVD may differ because of genetic or different lifestyles. An earlier report from one of the districts in Songkhla(10) focused on this issue but the subjects were relatively young (mean ages for the 2 ethnic groups and genders ranged from 29- 34 years). In 2000, an International Collaborative Study of Cardiovascular Disease in ASIA (InterAsia) was initiated in Thailand and China(11). Songkhla, being the province of the only medical school in the southern region, was chosen as one of the five study sites in Thailand. While findings of the Thai part had been reported(12), the current article revisited the dataset from Songkhla province aiming to fill in the afore-mentioned knowledge gap. The objectives were: 1) to document the prevalence of various CVD risk factors in Songkhla province among the 2 ethnic groups, 2) to quantify the effects of ethnic difference on the levels of the CVD risk factors following adjustment for age, sex and community of residence.

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Material and Method

Overall study design and the standard operating procedures in data collection from each subject are described in a previous report[11,12]. Only the local sampling process in Songkhla province and the strategy of statistical analysis are reported here. The survey was conducted from May to October in 2000 when the total population of Songkhla province was estimated to be 1.2 million[13]. The Muslims in Songkhla are mainly of Malayu descendents and its proportion was around 20 percent. The remainder of the population is essentially Buddhist, both local, southern Thai and Chinese descendents. The information in the dataset did not allow proper classification of sub-ethnicity, therefore the main independent variable of the present study is only Muslim versus Buddhist.

The InterAsia study originally aimed to evaluate differences among the rural versus urban and the well versus less-developed[12]. The lists of all communities were obtained from the development office of the provincial community. While one well-developed and one less-developed area were aimed to be randomly chosen from both rural and urban communities, none of the available rural communities was less-developed. Finally, seven communities were chosen, five in rural, one developed urban community in Hat Yai city and the other less-developed in Songkhla city. In each selected community, the list of the household and the residents was obtained from the local health centre. This was used as the sampling frame for the study subjects. All residents who were 35 years old or over, willing to sign the consent form that had passed the institutional ethics committee, and could arrive at the data collection centre, temporarily set up for the study, were invited.

The aim for the overall sample size was 1,000 subjects with uniform age and sex distribution. Despite knowing that the prevalence of various risk factors can vary, such sample size would have an approximate precision (within 95% confidence limit) of 3.1% if the the prevalence is 50%, which should be acceptable. On the other hand, the prevalence of risk factors among each ethnic group was unknown but this sample size would also allow detection of significant difference between the prevalence of 30% in one group and 20% in the other. In order to have the prevalence of hypertension and DM comparable with the Thai InterAsia study, age- and sex-standardized prevalence were also computed based on distributions of these two demographic variables in the Thai-InterAsia dataset[12].

The blood pressure (BP) was measured by mercury sphygmomanometer and the average of the second and the third readings was used. Hypertension (HT) was defined as systolic $\geq$ 140 mmHg or diastolic $\geq$ of 90 mmHg. Body mass index (BMI, in kg/m^2) was calculated from body weight in kilograms divided by the square of the height in meters. The BMI risks, in kg/m^2, were partitioned into 25-29.9 (overweight) and 30 or above (obese). Abdominal obesity was defined by waist circumference (WC, in cm) of $\geq$ 90 for men and $\geq$ 80 for women and waist-hip ratio (WHR) of $\geq$ 0.90 for men and $\geq$ 0.85 for women. Level of fasting plasma glucose (FPG, in mg/dl) was separated into impaired fasting glucose (IFG) (FPG of 110-125) and diabetes mellitus (DM) (FPG $\geq$ 126). Total cholesterol level (TC, in mg/dl) had two cut off values, $\geq$ 200 and $\geq$ 240. Elevated triglyceride (TG, mg/dl) was set at $\geq$ 150. One Buddhist man had a TG of 1873 mg/dl, this was excluded from calculations for TG, LDL-C and non-HDL cholesterol but included in the binary outcome analysis. Risk values for high density lipoprotein-cholesterol (HDL-C, mg/dl) were set at $\leq$ 35 for men and $\leq$ 40 for women. High TC/HDL-C ratio was set at $\geq$ 5. Low density lipoprotein cholesterol (LDL-C) was calculated as TC minus TG/5 minus HDL-C using the Friedewald's transformation and only where TG $\leq$ 400 mg/dl (21 subjects had fasting TG > 400 mg/dl). The cut off value for high LDL-C was $\leq$ 130 mg/ dl. Non-HDL-cholesterol (non HDL-TC, in mg/dl) was calculated from TC minus HDL-C among those with TG $\leq$ 400 mg /dl. No further partition was used for this value.

Data analysis

To compare risk factors across subgroups, Tables are displayed with break down by gender and ethnicity. Variables with continuous outcome were expressed as means and standard deviations. Variables with binary outcome were expressed as prevalence and 95% confidence interval. The latter included smoking, alcoholic intake, HT, DM, high BMI, abdominal obesity and hyperlipidemia. Finally, to test the independent effects of ethnicity, age, gender and community, logistic regression was used to compute adjusted odds ratio and 95% confidence intervals. Since being rural/urban and developed/less-developed were attributes of each community, they were not in the regression model. Other risk factors such as alcohol, diet and exercise were not included as they were beyond the current objectives. Significant difference was set at $p < 0.05$.

Results

The number of subjects residing in rural and urban areas were similar (504 vs 501, the data of one subject were lost). Although the selection criteria

Table 1. Selected characteristics of the study subjects among the two ethnic groups

	Buddhist	Muslim	Total
N	680	325	1005
Men (%)	255 (37.5)	120 (36.9)	375 (37.3)
Age, years (mean $\pm$ SD)	53.4 $\pm$ 11.8	52.5 $\pm$ 11.6	53.2 $\pm$ 11.7
% Married/cohabitant	78.1	79.1	78.4
% Rural*	42.1	67.1	50.1
% No education*	14.4	30.8	19.7
% Not employed*	27.1	18.8	24.4
Yearly family income*	60 (36-100)	43 (30-72)	50 (36-96)

* Statistically significant difference
Yearly income x1,000 B (median and IQR)

included age over 35 years, 12 subjects were younger. They were, however, included in the analysis as the minimum age was 33.4 years. Table 1 shows the distribution of age, marital status and gender by ethnic groups. The Buddhists were less likely to reside in a rural community, had a higher level of formal education, lower proportion of being employed but with a higher yearly family income. Table 2 shows the distribution of the various parameters broken down by gender and ethnicity. Women tended to have higher BMI, TC, LDL-C and non-HDL-TC. Muslims tended to have lower HDL-C and subsequently higher TC/HDL-C ratio.

Table 3 shows the prevalence of various risk factors for the whole study sample and breakdown by gender and ethnicity. A quarter had never had their blood pressure measured. Hypertension was around 20% in all groups. Over two-thirds of the subjects found to be hypertensive at the survey were not aware of this problem (data not shown). With regard to risk behaviors, half of the men smoked compared to around 4% among the women. Forty-six per cent of the Buddhist men drank at least on 12 different days in the past year in contrast to 12.5% of Muslim men. Indices of obesity (i.e. BMI, WC, WHR) were higher in the women, and Muslim women appeared to have higher prevalence of BMI of $\geq$ 30 kg/m^2 and high WHR when compared to Buddhist women. Muslim men showed less abdominal obesity. DM appeared equally distributed at about 10%, but higher prevalence of IFG was found among the men. Hyperlipidemia was common across all groups. Around 63 percent of the subjects showed TC above 200 mg/dl, similar to the distribution of high LDL-C; and the percentage was still as high as 29 percent when the cut point was raised to 240 mg/dl. Twenty two percent of the group had level of HDL-C below the chosen range; this was more marked in Muslims of both genders and reflected by the higher ratio of TC/HDL-C. Women showed a higher prevalence of low HDL-C despite having a higher average HDL-C.

Table 4 shows the results of the logistic regression which tested the independent effects of gender, age (using < 45 years as reference) and ethnicity on the various risk factors. Women had higher proportion of obesity and lipid risks. Older age was associated with less smoking, and drinking, higher frequency of HT, DM, high WHR, TC $\geq$ 240, TG $\geq$ 150 and high TC/HDL-C although risk from HDL-C did not appear to be affected by age. The two ethnic groups had similar risks except Muslims showed less proportion of abdominal obesity, but more with low HDL-C.

Discussion

Apart from the descriptive statistics of various risk factors in the southern region, which is one of the objectives of the report, the existing data also showed that gender and age have stronger association with various risk factors than ethnicity. The striking ethnic difference was that Muslims were associated with lower HDL-C but also with lower risk of abdominal obesity.

The prevalence and gender differential of smoking prevalence in the present study is lower than the report from other parts of the nation of 25%(12), which in itself was relatively low compared with many other Asian countries(14). However, the difference may be confounded by age and sex distribution. Within the study area, smoking prevalence was not much influenced by ethnicity.

Similar to smoking, alcohol is often referred to as being related to “masculinity”(15). In this study area, ethnicity (especially the part related to religion), plays a very important role in regulation of drinking. The difference was as much as five fold.

Table 2. Mean values of characteristics of the study subjects

	All subjects		All subjects				All subjects				Men				Women			
			Men		Women		Buddhist		Muslim		Buddhist		Muslim		Buddhist		Muslim	
	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD	mean	SD
Age	53.2	11.7	55.7	12.3	51.7	11.1	53.4	11.8	52.5	11.6	55.8	12.1	55.4	12.7	52.1	11.4	50.8	10.6
Systolic BP, mmHg	123.4	20.6	125.5	19.6	122.1	21.1	123.6	20.7	122.9	20.4	125.4	19.5	125.7	20.0	122.6	21.4	121.3	20.5
Diastolic BP, mmHg	77.4	12.4	78.7	12.8	76.7	12.1	77.9	12.5	76.4	12.2	79.3	13.0	77.5	12.3	77.1	12.1	75.8	12.2
BMI, kg/m ^{2}	24.4	4.3	22.9	3.6	25.2	4.5	24.4	4.1	24.3	4.7	23.2	3.5	22.4	3.7	25.1	4.3	25.4	4.8
WC, cm	82.2	11.9	81.6	11.2	82.5	12.3	82.5	11.4	81.4	12.8	83.1	10.8	78.5	11.4	82.2	11.8	83.2	13.3
WHR	0.86	0.08	0.88	0.07	0.85	0.08	0.86	0.08	0.86	0.08	0.89	0.07	0.87	0.08	0.84	0.08	0.86	0.09
FPG, mg/dl	108.8	31.1	108.2	24.4	109.1	34.5	108.4	29.8	109.7	33.8	107.7	22.5	109.3	28.0	108.7	33.4	110.0	36.8
TC, mg/dl	218.5	48.4	210.1	45.3	223.5	49.6	220.5	50.4	214.3	43.8	210.3	45.1	209.9	45.8	226.6	52.4	216.9	42.6
TG, mg/dl	133.7	81.2	144.0	92.1	127.5	73.4	134.9	82.2	131.2	79.1	146.6	99.2	138.7	75.5	128.0	69.5	126.7	81.0
HDL-C, mg/dl	48.0	12.8	46.1	11.8	49.1	13.2	49.5	12.9	45.0	12.0	47.6	12.0	43.1	10.7	50.6	13.3	46.1	12.5
TC/HDL ratio	4.8	1.5	4.8	1.3	4.8	1.7	4.7	1.3	5.1	1.8	4.6	1.3	5.1	1.4	4.7	1.4	5.1	2.1
LDL-C, mg /dl	144.9	43.9	136.6	41.5	149.8	44.5	145.6	45.3	143.4	40.8	135.1	40.7	139.7	43.2	151.7	46.7	145.6	39.3
Non-HDL-C, mg/dl	170.3	45.3	163.3	41.6	174.4	46.8	171.0	46.9	168.7	41.6	161.5	40.8	166.9	43.1	176.6	49.4	169.8	40.8

BP = blood pressure, BMI = body mass index, WC = waist circumference, WHR = waist hip ratio, FPG = fasting plasma glucose, TC = total cholesterol, HDL-C = high density lipoprotein, TG = triglyceride, For LDL-C = low density lipoprotein cholesterol and nonHDL-C, the TG has to be ≤ 400 mg/dl

Table 3. Prevalence of risk factors among the study subjects

	All						All				Men				Women			
	All		Men		Women		Buddhists		Muslims		Buddhists		Muslims		Buddhists		Muslims	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
HT	21.8	19.3-24.5	24.3	20.0-28.9	20.3	17.2-23.7	22.9	19.8-26.3	19.4	15.2-24.1	25.5	20.3-31.3	21.7	14.7-30.1	21.4	17.6-25.6	18.0	13.0-24.0
Smoking	21.1	18.6-23.8	49.1	43.9-54.3	4.4	3.0-6.4	20.3	17.3-23.5	22.8	18.3-27.7	46.3	40.0-52.6	55.0	45.7-64.1	4.7	2.9-7.2	3.9	1.7-7.5
Alcohol	15.5	13.3-17.9	35.2	30.4-40.3	3.8	2.5-5.6	20.4	17.5-23.7	5.2	3.1-8.2	45.9	39.6-52.2	12.5	7.2-19.8	5.2	3.3-7.7	1.0	0.1-3.5
BMI ≥ 30 kg/m^2	10.0	8.2-12.0	2.4	1.1-4.5	14.4	11.8-17.4	8.5	6.5-10.9	12.9	9.5-17.1	2.0	0.6-4.5	3.3	0.9-8.3	12.5	9.5-16.0	18.5	13.5-24.5
Abdominal obesity	43.5	40.4-46.6	22.9	18.8-27.5	55.7	51.7-59.6	44.7	40.9-48.5	40.9	35.5-46.5	27.5	22.1-33.4	13.3	7.8-20.7	55.1	50.2-59.9	57.1	50.0-64.0
Excess WHR	43.5	40.4-46.6	39.7	34.7-44.9	45.7	41.8-49.7	42.6	38.9-46.5	45.2	39.7-50.8	43.1	37.0-49.5	32.5	24.2-41.7	42.4	37.6-47.2	52.7	45.6-59.7
DM	9.9	8.1-11.9	9.1	6.4-12.4	10.3	8.1-13.0	9.6	7.5-12.0	10.5	7.4-14.3	9.0	5.8-13.2	9.2	4.7-15.8	9.9	7.2-13.1	11.2	7.2-16.4
IFG	49.8	46.6-52.9	55.5	50.3-60.6	46.3	42.4-50.3	49.7	45.9-53.5	49.8	44.3-55.4	55.7	49.4-61.9	55.0	45.7-64.1	46.1	41.3-51.0	46.8	39.8-53.9
TC (>200 mg/dl)	62.8	59.7-65.8	57.1	51.9-62.1	66.2	62.3-69.9	63.8	60.1-67.4	60.6	55.1-66.0	56.5	50.1-62.6	58.3	49.0-67.3	68.2	63.6-72.6	62.0	54.9-68.6
TC (≥240 mg/dl)	28.6	25.8-31.5	23.2	19.0-27.8	31.7	28.1-35.5	31.0	27.6-34.7	23.4	18.9-28.4	23.1	18.1-28.8	23.3	16.1-31.9	35.8	31.2-40.5	23.4	17.8-29.8
High TG	30.0	27.2-33.0	33.6	28.8-38.6	27.9	24.5-31.6	31.0	27.6-34.7	28.0	23.2-33.2	35.7	29.8-41.9	29.2	21.2-38.2	28.2	24.0-32.8	27.3	21.3-34.0
Low HDL-C.	22.4	19.8-25.1	16.0	12.4-20.1	26.2	22.8-29.8	17.4	14.6-20.4	32.9	27.8-38.3	11.4	7.7-15.9	25.8	18.3-34.6	20.9	17.2-25.1	37.1	30.4-44.1
High TC/HDL-C	38.5	35.5-41.6	38.1	33.2-43.3	38.7	34.9-42.7	35.3	31.7-39.0	45.2	39.7-50.8	33.3	27.6-39.5	48.3	39.1-57.6	36.5	31.9-41.2	43.4	36.5-50.5
High LDL-C	61.6	58.5-64.6	56.3	51.1-61.4	64.8	60.9-68.5	61.3	57.5-65.0	62.2	56.6-67.4	54.5	48.2-60.7	60.0	50.7-68.8	65.4	60.7-69.9	63.4	56.4-70.0

Smoking = currently smoking. Alcohol implied > 12 drinks in past 12 months
The other risks were defined in the methods

Table 4. Odds ratios (95%CI) showing the effects of gender, age and ethnicity on various independent variables in the first column+

	Women vs. Men	@age 45-54.9	@age 55-64.9	@age 65+	Muslim vs. Buddhist
Never TC	1.3 (0.9-2.1)	0.5 (0.3-0.9)[a]	0.5 (0.3-0.96)[a]	0.6 (0.3-1.2)	1.4 (0.7-3.1)
Never BP	0.5 (0.4-0.7)[c]	1.0 (0.7-1.5)	0.8 (0.5-1.2)	0.9 (0.6-1.4)	1.1 (0.7-1.6)
HT	0.9 (0.7-1.3)	2.4 (1.4-4.1)[c]	4.9 (3.0-8.2)[c]	4.5 (2.7-7.7)[c]	0.7 (0.5-1.2)
Current smoking	0.04 (0.02-0.06)[c]	0.5 (0.3-0.8)[b]	0.6 (0.3-0.9)[a]	0.4 (0.2-0.7)[b]	1.0 (0.6-1.6)
Alcohol	0.05 (0.03-0.09)[c]	0.8 (0.5-1.4)	0.4 (0.2-0.7)[b]	0.4 (0.2-0.8)[b]	0.2 (0.1-0.4)[c]
BMI (obese)	7.7 (3.5-17.0)[c]	1.1 (0.6-1.8)	0.7 (0.4-1.3)	0.7 (0.4-1.4)	1.2 (0.7-2.2)
Abdominal obesity	4.3 (3.2-5.9)[c]	2.1 (1.5-3.1)[c]	1.6 (1.1-2.3)[a]	1.3 (0.8-2.0)	0.7 (0.4-1.0)[a]
Excess WHR	1.4 (1.0-1.8)	2.6 (1.8-3.7)[c]	3.3 (2.3-4.9)[c]	3.5 (2.3-5.3)[c]	0.8 (0.6-1.2)
DM	1.1 (0.7-1.8)	1.8 (0.9-3.3)	2.3 (1.2-4.3)[a]	2.3 (1.2-4.5)[a]	1.3 (0.7-2.3)
IFG	0.6 (0.5-0.8)[b]	1.4 (1.0-1.9)	1.2 (0.8-1.7)	1.1 (0.7-1.6)	1.1 (0.7-1.5)
TC ($\geq$ 200 mg/dl)	1.6 (1.2-2.1)[b]	1.6 (1.1-2.2)[a]	1.5 (1.0-2.2)[a]	1.6 (1.0-2.4)[a]	1.2 (0.8-1.7)
TC ($\geq$ 240 mg/dl)	1.7 (1.2-2.3)[b]	2.4 (1.6-3.6)[a]	2.6 (1.7-3.9)[c]	2.4 (1.5-3.8)[c]	0.9 (0.6-1.4)
Low HDL-C	2.3 (1.6-3.2)[c]	1.2 (0.8-1.8)	1.3 (0.8-2.0)	1.5 (0.9-2.6)	1.9 (1.2-3.0)[b]
High TG	0.8 (0.6 – 1.0)	1.9 (1.3-2.7)[b]	1.5 (1.0-2.2)	1.3 (0.9-2.0)	1.1 (0.7-1.7)
High TC/HDL-C	1.1 (0.8-1.4)	1.5 (1.1-2.1)[a]	2.2 (1.5-3.1)[c]	1.6 (1.0-2.3)[a]	1.2 (0.9-1.8)
High LDL-C	1.5 (1.1-2.0)[b]	1.3 (0.9-1.8)	1.9 (1.3-2.7)[b]	1.2 (0.8-1.8)	1.1 (0.7-1.6)

[a] $p < 0.05$, [b] $p < 0.01$, [c] $p < 0.001$, @ vs. age < 45 years do these need to be super script?

The higher prevalence of low HDL-C among the Muslim was also seen in an earlier report among the younger ages from Southern Thailand(10). In the 1992 National Health Survey in Singapore(5). Malays in Singapore, showed a lower average HDL-C than the local Chinese. Long-term cardiovascular effect of these differences in HDL-C among the 2 ethnic groups is not known. Reports from Singapore can be looked at in terms of ischemic heart disease and of acute MI. Lee et al(16), on nearly 25,000 person-years of follow-up, reported that Indians have the highest incidence of coronary heart disease (10.6 per 1,000 subject years), and next the Malays and then the Chinese. Adjusted hazard ratio by Heng et al(17) showed that Malays have a similar incidence of coronary heart disease to the Chinese. On the other hand, Mak et al(7) followed acute myocardial infarction among the ethnic groups and showed that Malays have the highest 28 days and 1 year mortalities. These are cross-sectional and hence, as yet, do not answer the final effect of low HDL-C on CVD in these ethnic groups living within a similar geographical environment. There was another Thai group(17), whose population showed very high prevalence of low HDL-C (70%) in both men and women, but these were associated with low TC as well.There are no data on vascular events.

Conclusion

The prevalence of CVD risk factors in Songkhla province in 2000 showed minimal ethnic differences but the variations due to sex and age are striking. Long-term follow-up is required to appreciate the effect of these differences.

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ความแตกต่างด้านความเสี่ยงต่อโรคหลอดเลือดและหัวใจระหว่างเพศและระหว่างชาติพันธุ์ในจังหวัดสงขลา - ข้อมูลจากการศึกษา InterASIA-South

วีระศักดิ์ จงสู่วิวัฒน์วงศ์, ธาดา ยิบอินซอย, นวลตา อาภาคัพภะกุล

คณะผู้นิพนธ์ได้วิเคราะห์ข้อมูลจากการศึกษา InterAsia ในปี พ.ศ. 2543 เฉพาะส่วนของภาคใต้เพื่อจำแนกความแตกต่างของความเสี่ยงต่อโรคหลอดเลือด และหัวใจระหว่างเพศและระหว่างชาติพันธุ์ มีชาย 375 คน หญิง 630 คน อายุเฉลี่ย 53.2 ปี ค่าเบี่ยงเบนมาตรฐาน 11.7 ปี พบว่าความชุกของปัจจัยเสี่ยงต่าง ๆ ของกลุ่มตัวอย่างเป็นดังนี้ สูบบุหรี่ร้อยละ 21.1, ดื่มสุราร้อยละ 15.5, ความดันโลหิตสูง (เกิน 140/90 มม.ปรอท) ร้อยละ 21.8, ระดับกลูโคสในพลาสมาเริ่มผิดปรกติ (110-125 มก./ดล.) ร้อยละ 49.8, เบาหวาน (ระดับกลูโคสในพลาสมาตั้งแต่ 126 มก./ดล. ขึ้นไป) ร้อยละ 9.9, ดัชนีมวลกายเกิน 30 กก./ม^2. ร้อยละ 10, ลงพุง (เส้นรอบเอว 90 ซม. ขึ้นไปในชาย และ 80 ซม. ขึ้นไปในหญิง) ร้อยละ 43.5, ระดับซีรัมคอเลสเตอรอลทั้งหมดเกิน 200 มก./ดล. ร้อยละ 62.8, ระดับซีรัมคอเลสเตอรอลทั้งหมดเกิน 5 เท่าของคอเลสเตอรอลที่อยู่ในไขมันความหนาแน่นสูง (HDL-Cholesterol) ร้อยละ 38.5, ระดับคอเลสตอรอลที่อยู่ในไขมันความหนาแน่นต่ำเกิน 130 มก./ดล. ร้อยละ 61.1 การวิเคราะห์ด้วยสมการถดถอยลอจิสติกเพื่อปรับอิทธิพลของหมู่บ้านและอายุ พบว่าหญิงสูบบุหรี่ ดื่มสุราและมีระดับกลูโคสในเลือดผิดปกติน้อยกว่าชายแต่ลงพุงและมีระดับคอเลสเตอรอลทั้งหมด และคอเลสเตอรอลที่อยู่ในไขมันความหนาแน่นต่ำ (LDL-Cholesterol) มากกว่าชาย, ชาวมุสลิมดื่มสุราและลงพุงน้อยกว่าชาวพุทธแต่มีความชุกของภาวะระดับคอเลสเตอรอล ที่อยู่ในไขมันความหนาแน่นต่ำมากกว่าชาวพุทธ ควรศึกษาหารายละเอียดเพิ่มเติมของความแตกต่างนี้ โดยสรุป เพศและอายุมีความสัมพันธ์กับปัจจัยเสี่ยงต่าง ๆ มากกว่าชาติพันธุ์ในประชากรที่ศึกษามานี้