Rural-Urban Difference in Lipid Levels and Prevalence of Dyslipidemia: A Population-Based Study in Khon Kaen Province, Thailand

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Objectives: *To determine the lipid levels and examine the effect of an urban lifestyle on dyslipidemia, by comparing the lipid levels and the prevalence of dyslipidemia of rural vs urban dwellers in Thailand.*
Material and Method: *A cross-sectional study was conducted in both rural and urban areas of Khon Kaen province. After a 12-hour fast, blood was drawn for assessment of total cholesterol (TC), triglyceride (TG), high-density lipoprotein (HDL-C) and low-density lipoprotein (LDL-C) cholesterol. The classification of dyslipidemia was based on the NCEP ATP III guidelines.*
Results: *The authors recruited 916 subjects (595 urban; 321 rural), ranging between 20 and 88 years of age. In both the men and women, the mean TC and LDL-C were significantly higher in urban vs rural subjects (TC; 207 vs 169 for men and 204 vs 192 mg/dl for women and LDL-C; 120 vs 87 for men and 122 vs 110 mg/dl for women, $p < 0.001$). The rural women had a significantly higher mean TG (159 vs 111 mg/dl, $p < 0.001$) but lower HDL-C (51 vs 59, mg/dl, $p < 0.001$) than urban women. The TG and HDL-C between urban and rural men was not significantly different. Urban men had a significantly higher prevalence of dyslipidemia (TC $\geq$ 240 and LDL-C $\geq$160 mg/dl) than rural men (25.9 vs 3.7 per cent for TC and 16.7 vs 3.7 percent for LDL-C, $p < 0.001$) while the prevalence of hypertriglyceridemia ($\geq$ 200 mg/dl) and low HDL-C (< 40 mg/dl) was significantly higher in rural women (18.2 vs 7.9 percent for TG and 15.0 vs 3.8 per cent of HDL-C, $p < 0.001$). The results were unchanged after matching for age and sex between the urban and rural populations.*
Conclusion: *This present study demonstrated a significant difference in urban vs rural lipid levels and the prevalence of dyslipidemia. Migration to urban centers and adopting an urban lifestyle is likely related to the rising lipid level and prevalence of dyslipidemia.*

Keywords: *Rural, Urban, Prevalence, Dyslipidemia, Epidemiology, Thai*

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Coronary artery disease (CAD) is becoming more prevalent in developing countries, particularly in the urban areas. While trends indicate an improvement in the rates of CAD in many industrialized countries[1-3], in developing countries the burden is projected to rise considerably over the next decade[4].

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In Thailand, according to SEAMIC Health Statistics,[5] the death rate due to CAD has increased more than three times---*i.e.* 19.0 per 100,000 (fifth rank) in 1960 to 15.3 per 100,000 in 1970 to 31.4 per 100,000 (second rank) in 1980 to 56.0 per 100,000 in 1992 (first rank) and to 71.2 per 100,000 (first rank) in 1997. Moreover, Thantrarorongroj and Nelson reported a 6-fold increase in the CAD incidence of hospital admissions to Bangkok Adventist Hospital over three decades[6]. In Northeast Thailand, rheumatic heart disease is the main problem; however, the CAD trend is also rapidly increasing.

The prevalence of CAD risk factors has been increasing in Thailand[7]. Dyslipidemia is recognized as a major risk factor for the development and progression of CAD. It has emerged as one of the most common risk factors of CAD, and represents a significant public health problem as the proportion of elderly increases worldwide. Even though previous studies present limited information on the cardiovascular risk factors for the different Thai population groups, clinical trials clearly demonstrate the public health and economic benefits of favorable cholesterol modification[8-12]. As a result of this evidence, the National Cholesterol Education Program (NCEP) has developed guidelines for the detection, evaluation, and treatment of high blood cholesterol in adults[13].

The most recent of the NCEP recommendations, the Adult Treatment Panel III (ATP III) guidelines, released in May 2001, represent a synthesis of new data and evolved understanding, with revisions tending to reflect improved understanding of dyslipidemia and its association with CAD, improved understanding of other CAD risk factors, technical advances and advances in therapy[13].

In developing countries, as the pace of urbanization increases, the population is more dependent on diets considered unhealthy exacerbated by low physically activity. Given this background, the study of the difference in dyslipidemia prevalence between urban and rural communities needs to be undertaken to better understand the ecologic reasons underlying the present global trend. This present study was designed to determine lipid levels and to examine the effect of urbanization on dyslipidemia, by comparing the lipid levels and prevalence of dyslipidemia in a rural community vs an urban community in Thailand.

Material and Method

Setting and subjects

The present study was a cross-sectional, population-based investigation. The setting was Khon Kaen province, located 445 km northeast of Bangkok, with a population of 1.8 million and still largely agricultural.

The present study included 1,009 Thai men and women, between 20 and 88 years of age, of whom 353 were recruited from two sub-districts (Nongtoom and Koksri) representing rural areas and 656 subjects from downtown Nai-Muang sub-district (urban) in Muang (central) district of Khon Kaen province.

The rural subjects came from 14 hamlets in the two sub-districts. In each hamlet, a full list of subjects was obtained, from which 70 subjects were randomly selected by the village's administrator. The selected subjects were then sent a letter of invitation to participate in the present study. The response rate was 60.7 per cent. The urban subjects were recruited via a media campaign and the sampling technique was similar to the scheme used in rural community. All subjects were interviewed to take their medical history, and received a brief physical examination by trained study staff.

The rural subjects were farmers or worked at home while the urban subjects were office workers, factory workers, owned their own business or worked at home. Ninety-three subjects were excluded from the analysis because of their having a history of: 1) recent acute illness (*e.g.* myocardial infarction or pneumonia); 2) dyslipidemia or chronic conditions (*e.g.* cancer, chronic infection, collagen vascular disease, hepatic or renal impairment, diabetes); 3) medication affecting lipid metabolism (*e.g.* corticosteroid, statin, fibrate, cholestyramine); 4) history of migration within 5 years before study; and, 5) subjects who have worked outside their communities. The present study was conducted in accordance with the 1975 Helsinki Declaration (revised in 2000 in Edinburgh), approved by the Ethics Committee of Khon Kaen University, and with written, informed consent from all of the subjects.

Measurements

Body weight (including light indoor clothing) was measured using an electronic balance (to the nearest 0.1 kg) and standing height (without shoes) using a stadiometer (to the nearest 0.1 cm). The body mass index (BMI; weight in kg divided by height squared in m^2) was then calculated.

Specimen collections

Serum samples were collected in the morning after subjects had fasted 12 hours. Measurements included total cholesterol (TC), triglyceride (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) measured using enzymatic methods on an automatic autoanalyzer (Cobas Integra 800; Roche Diagnostics, Mannheim, Germany). The classification of dyslipidemia was based on the NCEP ATP III Guidelines[13]. The percentage of borderline high to high lipid levels will be presented.

Statistical analysis

Statistical analyses were performed using SPSS version 9.0 (SPSS, Inc, Chicago). The results were expressed as means and standard deviations (SD). Descriptive statistics were computed for each sex: the prevalence of dyslipidemia was expressed as a percentage. The age-adjusted overall prevalence for each sex was estimated using indirect standardization. The odds ratio (OR) and 95% confidence interval (95%CI) between urban and rural groups were presented. The correlation between the lipid level, age, and BMI were determined using Pearson's correlation coefficient.

Since dyslipidemia was influenced by age, in order to address the difference between lipid levels and prevalence between urban and rural subjects, a nested case-control analysis was performed, in which two sex- and age-matched individuals, one from the urban sample and the other from the rural sample, were randomly selected from the data set. In the present study, 191 (92 men and 99 women) pairs of individuals satisfied these criteria. The difference in the ratio between the groups was then tested using the paired *t*-test. Statistical significance was set at $p < 0.05$.

Results

After excluding 93 subjects, data from 916 subjects (439 men and 477 women) were analyzed. The respective mean age in men and women was 47 and 49 years. Urban subjects were significantly younger than the rural subjects in both men and women (45 vs 51 and 45 vs 56 years old in men and women, respectively; $p < 0.001$). Urban men had a significantly higher weight and BMI than rural men but comparable between urban and rural women.

Both urban men and women had significantly higher TC and LDL-C levels than the rural subjects and the difference was more pronounced in men. Rural women had significantly higher TG and lower HDL-C than urban women while there was no significant difference in TG and HDL-C between urban and rural men (Table 1).

The authors classified the lipid abnormalities (TC, TG and LDL-C) as borderline high and high according to NCEP ATP III criteria[13]. In men, the prevalence of borderline high/high TC and LDL-C were significantly higher in urban men than rural men, while the prevalence of hypertriglyceridemia and low HDL-C were not different between urban and rural areas. In women, the prevalence of borderline high/high TG and low HDL-C were significantly higher among the rural subjects than their urban counterparts, while the prevalence of high TC and LDL-C levels were equivalent between urban and rural women. However, if using borderline high for TC and LDL-C, the prevalence of dyslipidemia in urban women was significantly higher than among rural women (Table 2).

The prevalence of dyslipidemia increased with advancing age, however for TC and LDL-C, the prevalence of borderline high/high TC and LDL-C were observed in the younger age group in both urban and rural subjects, but it was more pronounced among urban subjects while the prevalence of borderline high/high TG was observed in only rural subjects. For the entire population, the age-adjusted prevalence of high TC ($\geq$ 240 mg/dl), TG ($\geq$ 200 mg/dl), LDL-C ($\geq$ 160 mg/dl) and low HDL-C (<40 mg/dl) in urban vs rural subjects was 16.2 vs 6.4, 13.9 vs 15.3, 13.7 vs 5.9 and 6.4 vs 9.9 per cent, respectively.

The associations between age and lipid levels were presented in Fig. 1. The TC, LDL-C and TG levels increased with advancing age while HDL-C decreased with age. The urban subjects tended to have higher TC, LDL-C and HDL-C levels than rural subjects when comparing by the same age groups while the TG levels between the two communities were equivalent, except between 20-29 years of age.

In the present study, the TC, TG and LDL-C levels increased with increasing BMI ($r = 0.21$, 0.25 and 0.17, respectively, $p < 0.001$); while the HDL-C level decreased with increasing BMI ($r = -0.16$, $p < 0.001$), the association was more pronounced in men, although modest.

After matching for sex and age, 92 and 99 pairs of men and women, respectively, were analyzed. Urban men were significantly heavier than rural men while there was no significant difference between urban and rural women (Table 3). Both urban men and women had significantly higher TC and LDL-C levels than rural subjects but had similar TG levels. Urban subjects tended to have higher HDL-C level than rural subjects but a significant difference was observed only in women.

Discussion

Dyslipidemia is sometimes considered a "consequence" of modernization, because the prevalence of dyslipidemia in developed countries is often higher than in developing countries[1,8]. Furthermore, within both developed and developing countries, the prevalence of dyslipidemia is higher in urban vs rural regions[14].

The prevalence of dyslipidemia in Thailand varies among studies as the differences depend on the criteria for diagnosis. Previous studies reported that the prevalence of dyslipidemia was high in urban

Table 1. Characteristics of study subjects

	Urban	Rural	Mean difference (95%CI)
Men	n = 305	n = 134	
Age (yr)	45.2 ± 9.9	51.1 ± 18.2	-5.9 (-8.5 to -3.2)*
Body weight (kg)	66.0 ± 10.6	58.4 ± 9.0	7.6 (5.5 to 9.6)*
Height (cm)	166.0 ± 5.5	161.1 ± 5.8	4.9 (3.7 to 6.0)*
Body mass index (kg/m2)	23.9 ± 3.6	22.5 ± 3.1	1.4 (0.8 to 2.1)*
Total cholesterol (mg/dl)	206.7 ± 42.5	169.4 ± 41.9	37.3 (28.7 to 45.9)*
Triglyceride (mg/dl)	171.7 ± 109.7	158.8 ± 85.0	12.9 (-8.0 to 33.8)
HDL-cholesterol (mg/dl)	52.6 ± 11.1	51.0 ± 11.7	1.5 (-0.8 to 3.8)
LDL-cholesterol (mg/dl)	120.0 ± 38.6	86.6 ± 34.9	33.4 (25.8 to 41.1)*
Women	n = 290	n = 187	
Age (yr)	45.2 ± 9.9	55.7 ± 17.1	-10.5 (-12.9 to -8.1)*
Body weight (kg)	56.2 ± 10.2	54.6 ± 10.5	1.6 (-0.2 to 3.6)
Height (cm)	154.8 ± 6.5	150.6 ± 5.5	4.2 (3.1 to 5.4)*
Body mass index (kg/m2)	23.4 ± 4.6	24.0 ± 4.1	-0.6 (-1.4 to 0.2)
Total cholesterol (mg/dl)	204.2 ± 40.2	192.6 ± 53.0	11.6 (3.2 to 19.9)*
Triglyceride (mg/dl)	111.4 ± 78.1	159.0 ± 106.6	-47.5 (-64.2 to -30.9)*
HDL-cholesterol (mg/dl)	59.0 ± 13.1	50.8 ± 11.4	8.2 (5.9 to 10.5)*
LDL-cholesterol (mg/dl)	122.2 ± 36.5	110.1 ± 44.6	12.1 (4.8 to 19.5)*

* Statistical significance at p < 0.001

Table 2. Prevalence of dyslipidemia using NCEP ATP III in urban and rural subjects

	Urban	Rural	Odds ratio (95%CI)	p-value
Borderline high and High				
Men	n = 305	n = 134		
Total cholesterol ≥ 200 mg/dl	167 (54.8)	27 (20.1)	2.7 (1.9 to 3.9)	<0.001
Triglyceride ≥ 150 mg/dl	138 (45.2)	55 (41.0)	1.1 (0.9 to 1.4)	0.465
LDL-cholesterol ≥ 130 mg/dl	126 (41.3)	12 (9.0)	4.6 (2.6 to 8.1)	<0.001
Women	n = 290	n = 187		
Total cholesterol ≥ 200 mg/dl	152 (52.4)	76 (40.6)	1.3 (1.0 to 1.6)	0.015
Triglyceride ≥ 150 mg/dl	53 (18.3)	74 (39.6)	0.5 (0.3 to 0.6)	<0.001
LDL-cholesterol ≥ 130 mg/dl	112 (38.6)	54 (28.9)	1.3 (1.0 to 1.7)	0.031
High				
Men				
Total cholesterol ≥ 240 mg/dl	72 (25.9)	5 (3.7)	9.0 (3.6 to 22.8)	<0.001
Triglyceride ≥ 200 mg/dl	88 (28.9)	32 (23.9)	1.3 (0.8 to 2.1)	0.298
LDL-cholesterol ≥ 160 mg/dl	51 (16.7)	5 (3.7)	5.2 (2.0 to 13.3)	<0.001
Women				
Total cholesterol ≥ 240 mg/dl	50 (17.2)	32 (17.1)	1.0 (0.6 to 1.6)	0.53
Triglyceride ≥ 200 mg/dl	23 (7.9)	34 (18.2)	0.4 (0.2 to 0.7)	0.001
LDL-cholesterol ≥ 160 mg/dl	43 (14.8)	27 (14.4)	1.0 (0.6 to 1.7)	0.990
Low HDL-cholesterol (< 40 mg/dl)				
Men	25 (8.2)	15 (11.2)	0.7 (0.4 to 1.3)	0.368
Women	11 (3.8)	28 (15.0)	0.3 (0.1 to 0.5)	<0.001

Table 3. Characteristics of urban and rural subjects after matching for sex and age

	Urban	Rural	Mean difference (95%CI)	p-value
Men	n = 92	n = 92		
Body weight (kg)	63.8 $\pm$ 8.8	58.7 $\pm$ 9.6	5.1 (2.6 to 7.8)	<0.001
Height (cm)	162.6 $\pm$ 5.6	161.1 $\pm$ 5.7	1.5 (-0.4 to 3.3)	0.113
Body mass index (kg/m^2)	24.2 $\pm$ 3.2	22.6 $\pm$ 3.2	1.6 (0.7 to 2.5)	0.001
Total cholesterol (mg/dl)	209.5 $\pm$ 44.2	168.1 $\pm$ 43.8	41.4 (29.1 to 53.5)	<0.001
Triglyceride (mg/dl)	161.4 $\pm$ 114.8	157.3 $\pm$ 85.9	4.1 (-25.5 to 33.6)	0.785
HDL-cholesterol (mg/dl)	52.9 $\pm$ 10.	51.6 $\pm$ 11.3	1.3 (-1.6 to 4.1)	0.402
LDL-cholesterol (mg/dl)	125.4 $\pm$ 39.1	85.0 $\pm$ 36.7	40.4 (28.9 to 51.7)	<0.001
Women	n = 99	n = 99		
Body weight (kg)	55.5 $\pm$ 10.1	57.4 $\pm$ 10.2	-1.9 (-4.8 to 0.9)	0.191
Height (cm)	151.2 $\pm$ 7.4	153.0 $\pm$ 4.92	-1.8 (-3.6 to -0.1)	0.041
Body mass index (kg/m^2)	24.4 $\pm$ 5.2	4.4 $\pm$ 3.6	-0.1 (-1.3 to 1.2)	0.957
Total cholesterol (mg/dl)	210.2 $\pm$ 41.6	188.4 $\pm$ 56.2	21.8 (8.1 to 35.4)	0.002
Triglyceride (mg/dl)	127.5 $\pm$ 87.9	149.1 $\pm$ 105.3	-21.6 (-50.2 to 7.0)	0.137
HDL-cholesterol (mg/dl)	57.0 $\pm$ 12.6	50.3 $\pm$ 11.4	6.7 (3.3 to 10.1)	<0.001
LDL-cholesterol (mg/dl)	127.2 $\pm$ 38.3	108.3 $\pm$ 46.6	18.9 (6.4 to 31.3)	0.003

Table 4. Mean serum total cholesterol of population in Thailand

Year	Population	n	Age (yrs)	Mean TC (mg/dl)
1978	Healthy rural subjects (Chaiya, Ang Thong)[44]	49	24-56	190
1987	Heathy Research Workers (Bangkok)[45]	49	24-56	190
1993	Healthy rural subjects (Phon, Khon Kaen)[41]	923	30-65	163 (M:158, F:166)
1996	Healthy urban subjects (EGAT, Bangkok)[18]	4,014	35-54	217
1998	Healthy rural subjects (Nampong, Khon Kaen)[40]	355	30-65	M:186, F:195
1998	Healthy urban and rural subjects[12]	8,789	$\geq$30	M:187, F:198
1999	Postmenopausal urban women (Bangkok)[15]	80	44-60	259
2000	Elderly rural subjects (Samut Songkhram and Ratchaburi)[19]	203	$\geq$60	262
2005	Healthy rural subjects (Chachoengsao)[46]	443	$\geq$35	208
2005	Healthy rural subjects (Khon Kaen)[47]	325	20-88	183 (M:169, F:192)
2005	Healthy urban subjects (Bangkok) [43]	5,305*	$\geq$35	M:214, F:221
2005	Healthy rural subjects (North, Northeast and South) [43]	5,305*	$\geq$35	M:186, F:200

TC; total cholesterol, M; Male, F; Female
* Included urban and rural subjects in the same study

areas[15-18] and among the rural elderly[19], but these studies lacked data to compare the lipid levels and prevalence of dyslipidemia within the same province.

Khon Kaen is the one province in Northeast Thailand in which urbanization is proceeding rapidly, particularly in the central district where the capital city is located. In contrast, people in the rural areas of the province continue to follow a traditional lifestyle. Therefore, Khon Kaen province constitutes an ideal setting for studying the urban vs rural differences.

Indeed, the present study demonstrated that the TC and LDL-C levels in urban men and women were significantly higher than the rural population, whereas rural women had significantly higher TG levels and lower HDL-C levels than urban women. Using the NCEP ATP III criteria, urban men had a sig-

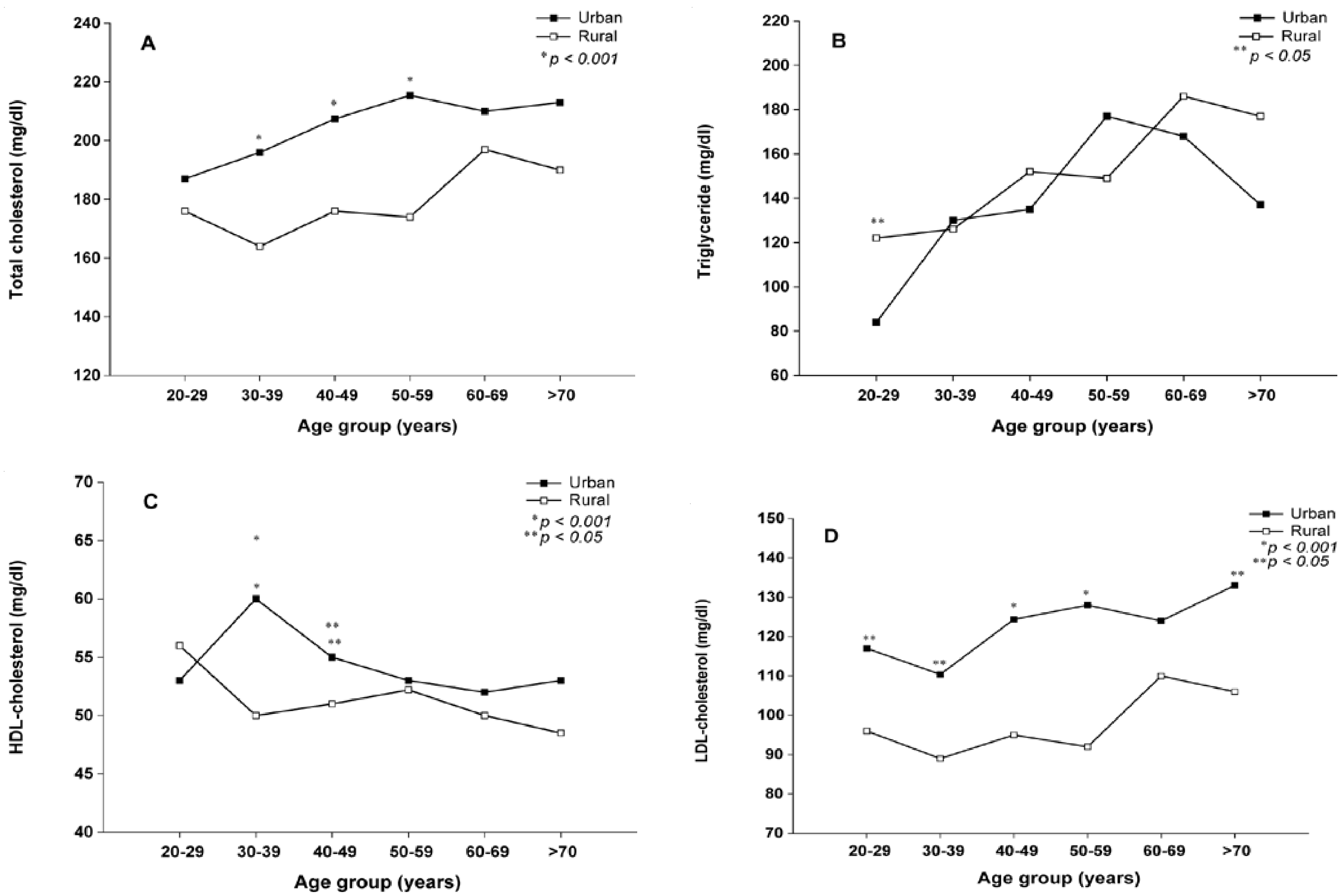

Fig. 1 Compare total cholesterol (A), triglyceride (B), HDL-cholesterol (C) and LDL-cholesterol levels between urban and rural subjects by age group

nificantly higher prevalence of borderline high TC and LDL-C than rural men (OR 2.7, 95%CI: 1.9-3.9 for TC and OR 4.6, 95%CI 2.6-8.1 for LDL-C) and the difference of prevalence was more pronounced when using a higher cut-off level to classify dyslipidemia (OR 9.0, 95%CI: 3.6-22.8 for TC and OR 5.2, 95%CI 2.0-13.3 for LDL-C). However, the difference in prevalence in dyslipidemia between urban and rural women was observed when using borderline high TC and LDL-C cut-offs (OR 1.3, 95%CI: 1.0-1.6 for TC and OR 1.3, 95%CI 1.0-1.7 for LDL-C) but not for high TC and LDL-C cut-offs.

Furthermore, in the present study, rural women had a significantly higher prevalence of hypertriglyceridemia and low HDL-C than urban women whereas these findings were not observed in men. After statistical analysis, the authors demonstrated that the patterns of lipid levels were unchanged after matching for sex and age between urban and rural subjects compared with the entire population analysis, except for TG level that showed no significant difference between urban and rural women. These findings were consistent with previous studies in Tunisian, Rajasthan (India), Costa Rican, Mexican, and Polish populations and in Papua New Guinea[20-26] but were not consistent with some other studies[27-29].

With growing urbanization and industrialization in Asia, there is a concomitant rise in the level of serum TC and with it a rise in CHD. Rising lipid levels in Asia are related to age, race, sex, economic development, urbanization, per capita food intake (mainly fat), and increase of non-lipid risk factors such as diabetes. Increasing wealth of a nation and resultant urbanization are very important tools to decrease poverty, improve the quality of life, and expand longevity, but they are also associated with rising TC level and subsequently increasing CHD incidence[14]. In all the Asian countries, serum TC levels were also higher in the urban compared with the rural population.

In Singapore, the only Asian country which is 100 per cent urbanized (since 1980), showed a rise of serum TC similar to that seen in the US and UK from the 1950s to the 1980s followed thereafter by a decline[14]. This is reflected in the trend (rise followed by a decline) of CHD morbidity and mortality as well. In spite of a declining trend in serum TC level, CHD morbidity and mortality are still high in Singapore, comparable to Western countries[30-32].

The rest of the Asian countries show a different pattern from Singapore. In general, there is still a rising trend in serum TC level and in CAD mortality in most Asian countries[14]. Japan is considered an exception in having a decreasing CAD mortality in spite of an increasing trend in serum TC[5,33-36], perhaps attributable to better control of other CAD risk factors such as hypertension and smoking[33,34].

As urbanization progresses in Thailand, the nation has become less active, and is consuming more saturated fat and less fiber[37-40], the latter being traditional symbols of affluence, particularly in urban areas[39]. The finding from the present study showed that the pattern of lipid abnormalities and prevalence of dyslipidemia were different between urban and rural communities. This difference could be partially explained by the different diet. Urban subjects might consume unhealthy food containing more saturated fat and protein, a high calorie diet, while rural subjects eat the traditional high carbohydrate (*i.e.* glutinous rice), low protein and fat diet [18,40-42]. From the results of the present study, region-specific approaches to reduce the cardiovascular risk and subsequent treatment protocols are essential to obtain maximum benefit.

The literature indicated that TC levels in healthy Thai subjects range from 163 mg/dl in the rural population[41] to 221 mg/dl in the urban population[43]. Among the rural population, the TC levels depended on the age group and settings of studies[12,19,40,41,43,44,46,47]; however, the rural subjects, who lived in the central urban region, tended to have a higher level of TC than the northeast region of Thailand (Table 4).

The present findings must be interpreted within the context of a number of potential strengths and weaknesses. The data were obtained from a large and well defined rural vs urban area, which allowed the rural and urban difference to be reliably delineated. The present study subjects were Thai, among whom cultural backgrounds and environmental living conditions are different from other populations. Thus, care should be taken when extrapolating these results to other populations. Moreover, the measurement error of lipid levels could result in misclassification of dyslipidemia. Such limitations are common in this type of study.

In conclusion, the present study demonstrated the urban-rural difference in lipid levels and prevalence of dyslipidemia. The effect of urbanization may be related to a rising lipid level and prevalence of dyslipidemia. Measures and screening should be implemented to encourage a healthy diet and lifestyle in order to reverse the rising lipid problem and prevent CAD in the Thai population.

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ความแตกต่างของระดับไขมันในเลือดและความชุกของภาวะไขมันในเลือดผิดปกติระหว่างประชากรที่อาศัยอยู่ในเขตชนบทกับเขตเมือง จังหวัดขอนแก่น

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วัตถุประสงค์: *เพื่อศึกษาและเปรียบเทียบระดับของไขมันในเลือดและความชุกภาวะไขมันในเลือดผิดปกติระหว่างผู้ที่อาศัยอยู่ในเมืองกับชนบทของประเทศไทย*

วัสดุและวิธีการ: *เป็นการศึกษาแบบตัดขวางในเขตเมืองและชนบท จังหวัดขอนแก่น ภายหลังการอดอาหารเป็นเวลา 12 ชั่วโมง ได้ทำการเจาะเลือดเพื่อวัดระดับคอเลสเตอรอล ไตรกลีเซอไรด์ เอชดีแอลและแอลดีแอลคอเลสเตอรอล โดยใช้เกณฑ์การวินิจฉัยตาม NCEP ATP III*

ผลการศึกษา: *มีผู้เข้าร่วมศึกษาทั้งสิ้น 916 ราย (595 และ 321 รายจากในเมืองและชนบท) อายุระหว่าง 20-88 ปี พบว่าค่าเฉลี่ยของระดับคอเลสเตอรอลและแอลดีแอลคอเลสเตอรอลในผู้ที่อาศัยอยู่ในเมืองมีระดับสูงกว่าผู้ที่อาศัยอยู่ในเขตชนบททั้งเพศชายและหญิงอย่างมีนัยสำคัญทางสถิติ โดยเพศชายระดับคอเลสเตอรอลเท่ากับ 207 และ 169 มก./ดล. เพศหญิงมีระดับเท่ากับ 204 และ 192 มก./ดล. ในผู้ที่อาศัยอยู่ในเมืองและชนบทตามลำดับ สำหรับแอลดีแอลคอเลสเตอรอล เพศชายมีระดับเท่ากับ 120 และ 87 มก./ดล. ในผู้ที่อาศัยอยู่ในเมืองและชนบทตามลำดับ และเพศหญิงมีระดับเท่ากับ 122 และ 110 มก./ดล. ในผู้ที่อาศัยอยู่ในเมืองและชนบทตามลำดับ เพศหญิงที่อาศัยอยู่ในเขตชนบทมีระดับไตรกลีเซอไรด์สูงกว่า (159 และ111 มก./ดล.) และมีระดับเอชดีแอลคอเลสเตอรอลต่ำกว่าผู้ที่อาศัยอยู่ในเมือง (51 และ 59 มก./ดล.) ในขณะที่ไม่พบความแตกต่างของระดับไตรกลีเซอไรด์และเอชดีแอลคอเลสเตอรอลระหว่างเพศชายที่อาศัยอยู่ในเมืองและชนบท การศึกษานี้พบว่าผู้ชายที่อาศัยอยู่ในเมืองมีความชุกของคอเลสเตอรอล ≥ 240 มก./ดล. คิดเป็นร้อยละ 25.9 เทียบกับ 3.7 ในผู้ที่อาศัยในชนบทและแอลดีแอลคอเลสเตอรอล ≥ 160 มก./ดล. คิดเป็นร้อยละ 16.7 เทียบกับ 3.7 ในผู้ที่อาศัยในชนบท พบความชุกของภาวะไตรกลีเซอไรด์สูง (≥ 200 มก./ดล.) และเอชดีแอลคอเลสเตอรอลต่ำ (< 40 มก./ดล.) มากกว่าในผู้หญิงที่อาศัยในชนบท โดยพบร้อยละ 18.2 เทียบกับ 7.9 สำหรับภาวะไตรกลีเซอไรด์สูง และร้อยละ 15.0 เทียบกับ 3.8 สำหรับเอชดีแอลคอเลสเตอรอล และเมื่อทำการวิเคราะห์โดยควบคุมอายุและเพศระหว่างสองกลุ่มพบว่าไม่มีความแตกต่างกัน*

สรุป: *การศึกษานี้ได้นำเสนอความแตกต่างของระดับไขมันในเลือดและความชุกของภาวะไขมันในเลือดผิดปกติระหว่างผู้ที่อาศัยอยู่ในชนบทกับในเมือง พบว่าผู้ที่อาศัยอยู่ในที่มีความเจริญมากอาจส่งผลให้มีระดับไขมันในเลือดสูงขึ้นและทำให้ความชุกของภาวะไขมันในเลือดผิดปกติเพิ่มขึ้น*