# Dyslipidemia in Thai Rural Adults

Kamolthip Nillakupt, MSc*,
Oytip Nathalang, PhD**, Pasra Arnutti, MSc**,
Pote Aimpun, MD, PhD***, Ram Rangsin, MD, Dr Ph***,
Suthee Panichkul, MD, MSc***, Wiroj Areekul, MD***

** Department of Biochemistry, Phramongkutklao College of Medicine*
*** Department of Pathology, Phramongkutklao College of Medicine*
**** Department of Military and Community Medicine, Phramongkutklao College of Medicine*

*The present study aimed to determine the prevalence of dyslipidemia in adults in a rural area of Thailand. Random sampling was conducted in 443 volunteers, 187 males and 256 females, aged ≥ 35 years in Chachoengsao Province. After a 12-hour fast, the blood was drawn for the analysis of total cholesterol, triglycerides, high-density lipoprotein (HDL) and low-density lipoprotein (LDL) cholesterol. Mean serum lipids of cholesterol, LDL cholesterol, HDL cholesterol and triglycerides were 207.79 ± 46.98, 117.26 ± 36.59, 50.53 ± 2.14 and 201.21 ± 131.07 mg/dL, respectively. Nineteen percent of them had cholesterol ≥ 240 mg/dL and 10% had LDL cholesterol ≥ 160 mg/dL. Seven percent had HDL cholesterol ≤ 35 mg/dL. However, LDL/HDL cholesterol ratios > 5, were found in only 0.9%. In conclusion, the prevalence of dyslipidemia was high in rural Thai adults. Further surveillance in this population is essential in verifying the impact of dyslipidemia as a risk of cardiovascular disease in rural Thai adults.*

***Keywords:*** *Dyslipidemia, Thai adults*

***J Med Assoc Thai 2005; 88(6): 824-8***
***Full text. e-Journal:*** *http://www.medassocthai.org/journal*

Coronary heart disease (CHD) is expected to become one of the major health problems in developing countries such as Thailand, where prevalence data are scarce[1,2]. The risk factors of CHD include cigarette smoking, high blood pressure, physical inactivity, dyslipidemia and obesity. Previous studies have reported the high association between high serum cholesterol level and CHD in Caucasians and Asian populations[3-8]. In Thailand, the National Statistical Office reported that death from cardiac causes increased from 16.1/100,000 population in 1977 to 34.1/100,000 in 1982 and 546.9/100,000 in 1995[9]. Thus, identification of the prevalence of risk factors of CHD in adults and elderly populations is necessary in planning health care services. Few studies exist on the prevalence of dyslipidemia in the Thai population, especially in rural areas[10]. A previous study in an elderly Thai population, aged 60-87 years showed a high prevalence of dyslipidemia and that 34% of the hypercholesterolemia groups had LDL/HDL cholesterol ratios > 5, which indicated a high risk for CHD[11]. In contrast, the mean total cholesterol level in young adults in the Northeast of Thailand was lower compared to people in the Bangkok urban area.

Baan Na-yao, Chachoengsao Province, is a remote rural area, 200 kilometers from Bangkok. Most of its 12,000 population had migrated from rural Northeastern Thailand. Most of them are farmers who are confined to their homes and rarely travel outside their province and their dietary pattern and life style have changed little in the past 15 years. The objective of the present study was to determine the prevalence of dyslipidemia in adults who live in a remote rural area of Thailand.

## Material and Method

The subjects, aged from ≥ 35 years, were randomly recruited from Moo 15 Baan Na-yao, Chachoengsao Province, Thailand. After a 12-hour fast, 443 blood samples were drawn. The subjects were

*Correspondence to : Nillakupt K, Department of Biochemistry, Phramongkutklao College of Medicine, 315 Rajvithi Rd, Bangkok 10400, Thailand. Phone & Fax: 0-2354-7797, E-mail: address: kamolthipnk@hotmail.com*

187 males and 256 females, with ages ranging from 35 to 98 with a mean age of 51.7 years. Informed consent was obtained from all subjects. The blood samples were stored in a cool container and directly sent to the Department of Pathology, Phramongkutklao Hospital for the analysis of total cholesterol, triglycerides, high-density lipoprotein (HDL) cholesterol and low-density lipoprotein (LDL) cholesterol. Total cholesterol, triglycerides and HDL cholesterol were analyzed by the reference instrument (Roche Cobas Intrega 800, Switzerland) within 10 hours after blood collection. The LDL cholesterol was calculated using Friedwald's formula if triglyceride levels did not exceed 350 mg/dL.

***Statistical analysis***

Statistical analysis was performed by Statistical Package for Social Science (SPSS) for Windows release 7.5.1 (Social Science Data Service, University of California, Davis). Means and standard deviations of various numerical parameters were calculated. Un-paired Student's t-test was used to compare the mean serum lipid levels among groups. Scatter diagram, linear regression and correlation between age, gender and serum lipids were applied. P-value < 0.05 was considered to be statistically significant.

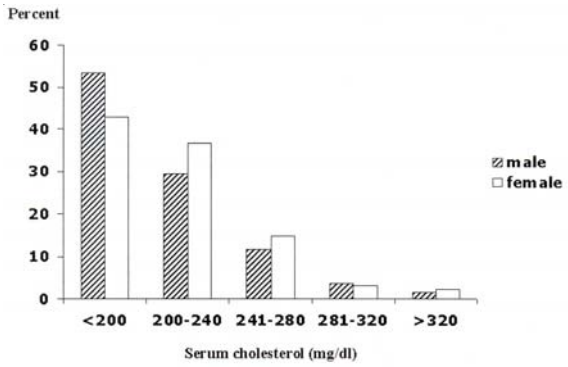


**Fig. 1** Percentage distribution of serum cholesterol

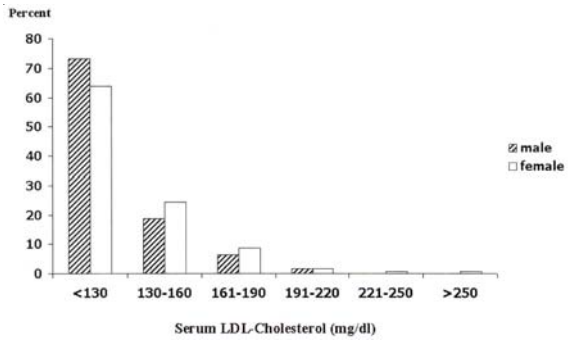


**Fig. 2** Percentage distribution of LDL cholesterol

**Results**

There were 443 subjects recruited in the present study. Fifty-eight percent of them were farmers, while 11% were employees, 10% merchants, 8% housekeepers, 4% officers and others, 9%. The body mass index (BMI) of the women and men was 24.71 ± 3.96 and 23.14 ± 3.34 kg/m$^2$, respectively.

The means and standard deviations of serum total cholesterol, LDL cholesterol, HDL cholesterol and triglycerides were 207.79 ± 46.98, 117.26 ± 36.59, 50.53 ± 2.14 and 201.21 ± 131.07 mg/dL, respectively. The means and standard deviations of serum lipid levels of the subjects in each gender are shown in Table 1. The women had significantly higher LDL cholesterol and HDL cholesterol levels than the men. The distribution of serum total cholesterol, LDL cholesterol and triglycerides in each gender are shown in Fig. 1, 2 and 3, respectively.

It was found that 57.03% of the women and 46.51% of the men had a total cholesterol level greater than 200 mg/dL, while 20.31% of the women and 17.1% of the men had a total cholesterol level greater than 240 mg/dL. On the other hand, 33.2% of the women and 43.32% of the men had serum triglyceride levels greater than 200 mg/dL. For LDL cholesterol, 63.75% of the women and 73.3% of the men had the desirable level lower than 130 mg/dL. Furthermore, 11.95% of the women and 7.95% of the men had a LDL choles-

**Table 1.** Serum lipid levels of women and men (mean ± SD mg/dL)

| Serum lipids (mg/dL) | Women (n = 256) | Men (n = 187) | Total (n = 443) |
|---|---|---|---|
| Total cholesterol | 211.51±49.17 | 202.69±43.41 | 207.79±46.98 |
| LDL cholesterol | 121.11±37.79 | 111.42±34.79* | 117.26±36.59 |
| HDL cholesterol | 51.92±12.01 | 49.18±14.32* | 50.53±2.14 |
| Triglycerides | 193.10±134.15 | 212.32±126.24 | 201.21±131.07 |

* $p < 0.05$

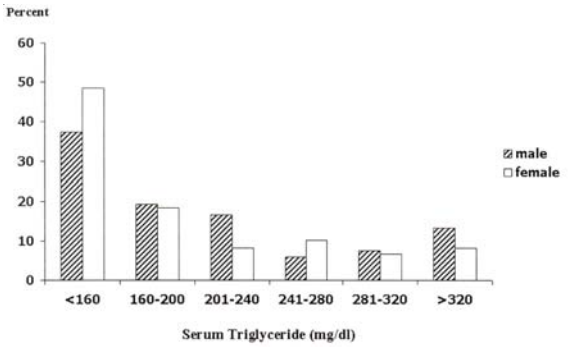


**Fig. 3** Percentage distribution of serum triglycerides

terol level greater than 160 mg/dL. However, a HDL cholesterol level lower than 35 mg/dL was found in only 2.34% of the women and 9.1% of the men. Thus, only 0.9% of them had LDL/HDL cholesterol ratios > 5, which indicated a high risk for coronary heart disease.

The cholesterol level increased with age in both genders and this trend was demonstrated clearly in the women as shown in Fig. 4. In addition, the LDL cholesterol level increased significantly with age in both genders (Fig. 5). On the other hand, the HDL cholesterol level increased with age in the women but gradually decreased in the men (Fig. 6). Regarding triglycerides, the level increased with age in both genders but the trend was demonstrated clearly in the women as shown in Fig. 7.

## Discussion

Few studies exist on dyslipidemia in adults who live in rural areas of Thailand and most of the data in the past few decades reflect malnutrition as a

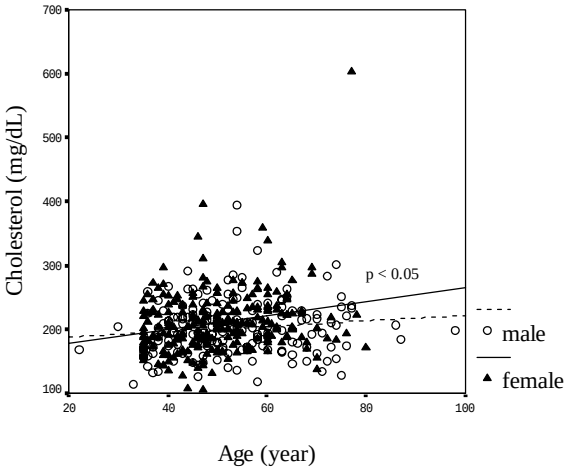


**Fig. 4** Scatter plot of cholesterol, age and gender

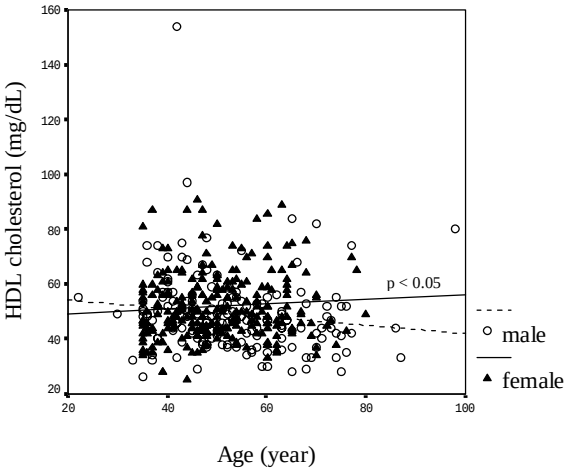


**Fig. 6** Scatter plot of HDL cholesterol, age and gender

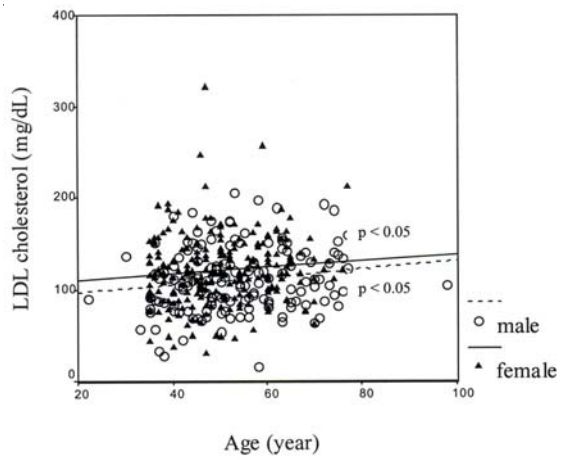


**Fig. 5** Scatter plot of LDL cholesterol, age and gender

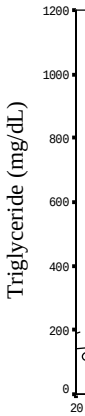


**Fig. 7** Scatter plot of triglyceride, age and gender

major problem[10,11]. A previous study in the Northeastern part of Thailand showed that the mean cholesterol and LDL cholesterol levels were very low compared to Bangkok and other affluent urban areas, which were due to low fat intake[10]. Presently, the dietary pattern and lifestyle of Thai people have changed. Thus, high dietary fat intake influences the high serum lipid levels[12,13].

Regarding the data of the National Health Survey in the Thai population, the prevalence of hypercholesterolemia increased with age from below 10% in young adults, to about 25% in the elderly[14]. In the present study, the cholesterol levels and prevalence of dyslipidemia were slightly higher than those in the report on young adults in Singapore and other countries in Southeast Asia, which have a similar change in life-style from the past decades[15]. Recent data suggested that elevated serum total cholesterol is a risk factor for death from CHD and the apparent adverse effects associated with low cholesterol levels are secondary to co-morbidity and fragility[16,17]. Additionally, a low HDL cholesterol level is a more specific and powerful predictor of risk for coronary death than total cholesterol[18]. However, age, sex, cigarette smoking, high blood pressure and depression are also risk factors for CHD[3-8]. The present results showed the high prevalence of dyslipidemia in the present study group, especially in the women. In addition, the serum cholesterol level increased by age in both genders as a clear trend[12].

This finding is alarming and it is recommended that more attention should be paid to adults in the rural areas of this country. Even though the benefit of treatment of individuals with hypercholesterolemia for primary coronary prevention is controversial, health education and campaigns to lower fat and cholesterol intake in this population are essential. Furthermore, long-term follow-up is necessary to verify the impact of high cholesterol levels in this group.

**Acknowledgements**

The authors wish to thank the Phramongkutklao Hospital Foundation and laboratory testing assistance from the staff of the Department of Pathology, Phramongkutklao Hospital, which was greatly appreciated.

**References**

1. Vital Statistics. Department of Statistics, Ministry of Public Health, 1968.
2. Vital Statistics. Department of Statistics, Ministry of Public Health, 1970.
3. Hoffmeister H, Mensink GB, Stolzenberg H, Hoeltz J, Kreuter H, Laaser U, et al. Reduction of coronary heart disease risk factors in German cardiovascular prevention study. Prev Med 1996; 25: 135-45.
4. Twisk JW, Kemper HC, van Mechelen W, Post GB. Which lifestyle parameters discriminate high- from low-risk participants for coronary heart disease risk factors. Longitudinal analysis covering adolescence and young adulthood. J Cardiovasc Risk 1997; 4: 393-400.
5. Hughes K, Yeo PP, Lun KC, Thai AC, Sothy SP, Wang KW, et al. Cardiovascular diseases in Chinese, Malays, and Indians in Singapore. II. Differences in risk factor levels. J Epidemiol Community Health 1990; 44: 29-35.
6. Tatsanavivat P, Klungboonkrong V, Chirawatkul A, Bhuripanyo K, Manmontri A, Chitanondh H, et al. Prevalence of Coronary heart disease and major cardiovascular risk factors in Thailand. Int J Epidemiol 1998; 27: 405-9.
7. Bauman A, Owen N. Habitual physical activity and cardiovascular risk factors. Med J Aust 1991; 154: 22-8.
8. InterASIA Collaborative Group. Cardiovascular risk factor levels in urban and rural Thailand-The international collaborative study of cardiovascular disease in Asia (InterASIA). Eur J Cardiovasc Prev Rehabil 2003; 10: 249-57.
9. National Statistic Office, Office of the Prime Minister. Statistical yearbook Thailand. No.44. 1997, Bangkok: Text and Journal Publication, 1997; 38: 78.
10. Bhuripanyo K, Tasanavivat P, Matrakool B, Muktabhant B, Bhuripanyo P, Harnthaveesompol S. A prevalence survey of lipids abnormalities of rural area in Amphoe Phon, Khon Kaen. J Med Assoc Thai 1993; 76: 101-8.
11. Yamwong P, Assantachai P, Amornrat A. Prevalence of dyslipidemia in the elderly in rural areas of Thailand. Southeast Asian J Trop Med Public Health 2000; 31: 158-62.
12. Tanphaichitr V, Pakpeankitvatana R, Leelahagul P, Achariyanont P, Viruenchavee N. Dyslipidemia in urban Thais. Biomed Environ Sci 1996; 9: 199-203.
13. Ahmed SM, Clasen ME, Donnelly JE. Management of dyslipidemia in adults. Am Fam Physician 1998; 57: 2192-204.
14. Chuprapawan C. The Health System Research Institute. Report for the First National Health Survey in Thai population 1991-1992. Bangkok: Desire, 1996: 105-7 (in Thai).
15. Teo WS, Ng AS, Chee TS, Chua TS, Yan P. Lipid screening in a volunteer population in Singapore. Ann Acad Singapore 1992; 21: 5-9.
16. Corti MC, Guralnik JM, Salive ME, Harris T, Ferrucci L, Glynn RJ, et al. Clarifying the direct relation between total cholesterol levels and death from coronary heart diseases in older persons. Ann Intern Med 1997; 126: 753-60.

17. Sritara P, Cheepudomwit S, Chapman N, Woodward M, Kositchaiwat C, Tunlayadechanont S, et al. Twelve-year changes in vascular risk factors and their associations with mortality in a cohort of 3499 Thais: the Electricity Generating Authority of Thailand study. Int J Epidemiol 2003; 32: 461-8.
18. Corti MC, Guralnik JM, Salive ME, Harris T, Field TS, Wallace RB, et al. HDL cholesterol predicts coronary heart disease mortality in older adults. JAMA 1995; 274: 539-44.

## *การศึกษาภาวะ dyslipidemia ในคนไทยที่อยู่ในชนบท*

***กมลทิพย์ นิลคุปต์, อ้อยทิพย์ ณ ถลาง, ภัสรา อาณัติ, พจน์ เอมพันธุ์, ราม รังสินธุ์, สุธี พานิชกุล, วิโรจน์ อารียกุล***

*การวิจัยนี้มีวัตถุประสงค์เพื่อหาความชุกของภาวะ dyslipidemia ในประชากรที่อาศัยในพื้นที่ห่างไกลความเจริญของประเทศไทย การศึกษาทำโดยการสุ่มตัวอย่างตามความสมัครใจจากชาวบ้านที่มีอายุ ≥ 35 ปี ในชุมชนที่อาศัยในจังหวัดฉะเชิงเทรา จากนั้นทำการเจาะเลือดหลังจากมีการอดอาหารเป็นเวลา 12 ชั่วโมง เพื่อนำมาวิเคราะห์หาปริมาณ Total cholesterol, triglyceride, high-density lipoprotein (HDL) cholesterol และ low-density lipoprotein (LDL) cholesterol ในซีรัม พบว่าค่าเฉลี่ยของระดับ total cholesterol, LDL cholesterol, HDL cholesterol และ triglyceride มีค่าเป็น 207.79 ± 46.98, 117.26 ± 36.59, 50.53 ± 2.14 และ 201.21 ± 131.07 mg/dL ตามลำดับ นอกจากนี้ยังพบว่า 19% ของตัวอย่างที่วิเคราะห์มี cholesterol ≥ 240 mg/dL และ 10% มี LDL cholesterol ≥ 160 mg/dL และ 7% ของประชากรมี HDL cholesterol ≤ 35 mg/dL อย่างไรก็ตาม พบว่าอัตราส่วนระหว่าง LDL cholesterol และ HDL cholesterol > 5 ซึ่งเป็นค่าที่บ่งชี้ถึงอัตราเสี่ยงในการเกิดโรคหลอดเลือดหัวใจ มีอยู่เพียง 0.9% โดยสรุป พบว่ามีความชุกของภาวะ dyslipidemia สูงในประชากรไทยที่อาศัยในพื้นที่ห่างไกลความเจริญ อย่างไรก็ตาม ควรมีการศึกษาเพิ่มเติมในประชากรกลุ่มนี้เพื่อให้แน่ใจว่าภาวะ dyslipidemia มีผลต่อความเสี่ยงในการเกิดโรคหลอดเลือดหัวใจผิดปกติ*