

Hypertriglyceridemia and the Related Factors in Middle-aged Adults in Taiwan

Cheng-Chieh Lin, Tsai-Chung Li², Shih-Wei Lai, Kim-Choy Ng¹,
Kuo-Che Wang, Chiu-Shong Liu

Department of Community Medicine, and ¹Department of Emergency, China Medical College Hospital;

²Institute of Chinese Medicine, China Medical College, Taichung, Taiwan, R.O.C.

Background. Our purpose was to evaluate the relationship between hypertriglyceridemia and the related factors in middle-aged adults.

Methods. We used data collected from the Provincial Government in Chung-Hsing Village in Taiwan during May 1998. All officers included in the study were between 40 and 64 years old. Totally, 709 volunteers underwent blood tests. To study the significant correlates of hypertriglyceridemia, the *t*-test, chi-squared analysis, and multivariate logistic regression were used.

Results. Our results showed that the participants included 40% men and 60% women. The mean age was 50.5 ± 6.8 years. The mean triglyceride values were 1.74 ± 1.17 mmol/L in the men and 1.43 ± 0.85 mmol/L in the women, respectively ($p < 0.001$). The proportions of hypertriglyceridemia were 20.1% in the men and 12.7% in the women ($p < 0.01$). After controlling the other covariates, the multivariate logistic regression analysis showed that the significant related factors of hypertriglyceridemia were abnormal glutamic pyruvic transaminase, hypercholesterolemia, hyperglycemia, and hyperuricemia.

Conclusions. Hypertriglyceridemia is more common in middle-aged men than in middle-aged women. It is recommended that serum triglyceride levels should be tested if high serum glutamic pyruvic transaminase value, hypercholesterolemia, hyperglycemia, or hyperuricemia is found in middle-aged adults. (Mid Taiwan J Med 2001;6:1-6)

Key words

hypertriglyceridemia, middle-aged adults

INTRODUCTION

Hypertriglyceridemia has been identified as one of the risk factors for the cardiovascular disease that can be modified [1,2]. The combination of high serum triglyceride, small low-density lipoprotein particles, and a reduction in high-density lipoprotein cholesterol levels has been identified as an atherogenic lipoprotein phenotype, or lipid

triad [3]. In a report by Fu et al, the increase of serum triglycerides was the major characteristic of middle-aged male with hyperlipidemia [4]. Because of the rapid and marked change in life styles and dietary habits, chronic diseases have become major public health problems. In Taiwan, the cardiovascular disease is the third leading cause of death after neoplasm and the cerebrovascular disease [5]. In a study by Chou et al, the mean triglyceride values were 1.92 ± 1.32 mmol/L in men and 1.76 ± 1.28 mmol/L in women. The prevalence of hypertriglyceridemia (≥ 2.26 mmol/L) was 26.7% in the men and 23.8% in

Received : August 3, 2000. Revised : September 13, 2000.
Accepted : December 4, 2000.

Address reprint requests to : Shih-Wei Lai, Department of Community Medicine, China Medical College Hospital, No 2, Yuh-Der Road, Taichung 404, Taiwan, R.O.C.

Table 1. The prevalences of hypertriglyceridemia in middle-aged adults with different characteristics

Variable	Total number	No. (%) of cases with hypertriglyceridemia	<i>p</i> value
Gender			0.011
Men	284	57 (20.1)	
Women	425	54 (12.7)	
Age			0.023
< 50 (years)	348	43 (12.4)	
≥ 50 (years)	361	68 (18.8)	
Obesity (BMI ≥ 28 kg/m ²)			0.001
No	639	90 (14.1)	
Yes	68	21 (30.9)	
Systolic pressure ≥ 140 (mm Hg)			0.002
No	594	82 (13.8)	
Yes	113	29 (25.7)	
Diastolic pressure ≥ 90 (mm Hg)			0.005
No	573	79 (13.8)	
Yes	133	32 (24.1)	
GPT > 30 U/L			0.001
No	270	23 (8.52)	
Yes	439	88 (20.1)	
Total cholesterol ≥ 5.18 (mmol/L)			0.001
No	505	58 (11.5)	
Yes	204	53 (26.0)	
Fasting glucose ≥ 6.05 (mmol/L)			0.001
No	666	92 (13.8)	
Yes	42	18 (42.9)	
Uric acid (men ≥ 416.5, women ≥ 386.8 μmol/L)			0.001
No	434	46 (10.6)	
Yes	274	65 (23.7)	

BMI = body mass index; GPT = glutamic pyruvic transaminase.

the women [6]. Until now, few researchers have assessed the prevalence of hypertriglyceridemia and the related factors in middle-aged Taiwanese adults. As a result, recommendations for the promotion of healthy life styles and disease prevention in middle-aged adults remain uncertain. Thus, it is time to pay attention to the health of middle-aged adults in Taiwan.

In our recent survey of middle-aged adults in Chung-Hsing Village in Taiwan, we evaluated the prevalence of hypertriglyceridemia and the related factors.

MATERIALS AND METHODS

In May 1998, a cross-sectional study was conducted in Chung-Hsing Village in Taiwan. All of the officers working at the Provincial Government who were between 40 and 64 years old were chosen for this study. A total of 709 volunteers visited Chung-Hsing Hospital and underwent blood tests.

Blood pressure was measured using a mercury sphygmomanometer while the subjects were in the sitting position. Weight and height were measured. Blood samples were obtained in the morning after the subjects had fasted for 12 hours overnight. A number of bio-chemical markers, such as glutamic pyruvic transaminase (GPT), total cholesterol, triglyceride, fasting glucose, and uric acid were analyzed using a biochemical autoanalyser (Chem1⁺, Technicon, USA) at the Department of Clinical Laboratory of Chung-Hsing Hospital within 4 hours of collection. Body mass index (BMI) was measured as follows: weight (kg) ÷ height (m)². BMI ≥ 28 was defined as obese, 25 ≤ BMI < 28 was overweight, 20 ≤ BMI < 25 was normal and BMI < 20 was underweight [7]. High serum GPT values were defined as GPT > 30 U/L [8]. Hypercholesterolemia was defined as total cholesterol ≥ 5.18 mmol/L and hyper-

Table 2. Results of multivariate logistic regression for hypertriglyceridemia in adults

Variable	EP (SE)	OR	95% CI
Intercept	-2.85 (0.50)		
Gender (men as reference)			
Women	-0.25 (0.24)	0.78	0.49–1.25
Age (< 50 years as reference)			
≥ 50	0.23 (0.23)	1.26	0.80–1.97
BMI (kg/m ² , non-obese as reference)			
Obesity	0.62 (0.32)	1.86	0.99–3.45
Systolic pressure (< 140 mmHg as reference)			
≥ 140	0.16 (0.35)	1.17	0.59–2.32
Diastolic pressure (< 90 mmHg as reference)			
≥ 90	0.27 (0.33)	1.31	0.69–2.49
GPT (≤ 30 U/L as reference)			
> 30	0.67 (0.27)	1.95	1.15–3.31*
Total cholesterol (< 5.18 mmol/L as reference)			
≥ 5.18	0.85 (0.23)	2.35	1.50–3.68 [†]
Fasting glucose (< 6.05 mmol/L as reference)			
≥ 6.05	1.32 (0.37)	3.74	1.83–7.67 [†]
Uric acid (men < 416.5, women < 386.8 μmol/L as reference)			
≥ 416.5 (women ≥ 386.8)	0.78 (0.24)	2.18	1.35–3.49 [†]

* $p < 0.05$, [†] $p < 0.01$, [‡] $p < 0.001$. EP = estimated parameter; SE = standard error; OR = odds ratio; CI = confidence intervals; BMI = body mass index; GPT = glutamic pyruvic transaminase.

triglyceridemia was defined as triglyceride ≥ 2.26 mmol/L [9]. Hyperglycemia was defined as fasting glucose ≥ 6.05 mmol/L [10]. Subjects were considered to have high blood pressure if the average of three readings exceeded 140 mmHg systolically and/or 90 mmHg diastolically [11]. Hyperuricemia was defined as serum uric acid ≥ 416.5 μmol/L in the men and ≥ 386.8 μmol/L in the women [12].

The statistical analyses were performed by the aid of a SAS package (Version 6.12, SAS Institute Inc., Cary, North Carolina). The methods of statistical analysis in this study were *t*-test, chi-squared analysis, and multivariate logistic regression. A *p* value less than 0.05 was considered statistically significant.

RESULTS

Our study sample included 40% men and 60% women from total 709 subjects. The mean age was 50.5 ± 6.8 years. The mean triglyceride values were 1.74 ± 1.17 mmol/L in the men and 1.43 ± 0.85 mmol/L in the women, respectively ($p < 0.001$). The proportions of hypertriglyceridemia were 20.1% in the men and 12.7% in the women ($p < 0.01$).

The results of the chi-squared analysis for hypertriglyceridemia among the related factors are shown in Table 1. The significant correlates of those with hypertriglyceridemia were male gender, age older than 50 years, obesity, high systolic pressure, high diastolic pressure, high serum GPT value, hypercholesterolemia, hyperglycemia, and hyperuricemia.

The results of multivariate logistic regression for hypertriglyceridemia are shown in Table 2. After controlling the other covariates, the significant correlates of hypertriglyceridemia were high serum GPT value (Odds ratio [OR] = 1.95, 95% Confidence intervals [CI] = 1.15–3.31), hypercholesterolemia (OR = 2.35, 95% CI = 1.50–3.68), hyperglycemia (OR = 3.74, 95% CI = 1.83–7.67), and hyperuricemia (OR = 2.18, 95% CI = 1.35–3.49). No significant associations were found between hypertriglyceridemia and gender, age, obesity, or hypertension.

DISCUSSION

GPT catalyzes the transfer of the amino group of alanine to glutaric acid, forming glutamic acid and pyruvic acid [13]. Elevated serum GPT usually indicates liver damage [13].

In our report, hypertriglyceridemia was significantly associated with high serum GPT values. Because hypertriglyceridemia always results in fatty changes in the liver, the fat accumulation in the cytoplasm of hepatocytes causes a leakage of cytoplasmic GPT into the blood [8]. Therefore, increased serum GPT activities might be detected if hypertriglyceridemia were present.

In a report by Miccoli et al, the combination of high serum triglyceride levels, small low density lipoprotein particles, and a reduction in high density lipoprotein cholesterol levels were commonly associated with peripheral resistance to the action of insulin, hyperinsulinism, central and visceral obesity, hypertension, hyperuricemia, hypercoagulability [3]. The clustering of these disorders was called metabolic syndrome. In our study, hypertriglyceridemia was significantly associated with hypercholesterolemia and hyperglycemia. In previous studies, hyperlipidemia was often associated with obesity, glucose intolerance/diabetes mellitus, and essential hypertension [12,14-16]. In our study, hypertriglyceridemia was also significantly associated with hyperuricemia, which was similar to a report by Saggiani et al [12]. The above findings further demonstrated that there were significant associations between hypertriglyceridemia and hypercholesterolemia, and hyperglycemia, and hyperuricemia. Thus, clustering of metabolic disorders within the same individual is the rule [12,14-16]. However, no significant associations were found between hypertriglyceridemia and gender, age, obesity, or hypertension in our study. This may be due to environmental and racial differences, but the real needs further investigation.

In conclusion, hypertriglyceridemia is more common in middle-aged men than in middle-aged women. Hypertriglyceridemia was significantly associated with high serum GPT value, hypercholesterolemia, hyperglycemia, and hyperuricemia in middle-aged adults. It is recommended that serum triglyceride values should be tested if high

serum GPT value, hypercholesterolemia, hyperglycemia, or hyperuricemia are observed in middle-aged adults.

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以中興新村為例：中年人高三酸甘油脂血症與其相關因子之研究

林正介 李采娟² 賴世偉 黃金財¹ 王國哲 劉秋松

中國醫藥學院附設醫院 社區醫學部 急診部¹ 中國醫藥學院 中醫研究所²

背景 爲了瞭解中年人高三酸甘油脂血症的分佈情形與其相關因子。

方法 於1998年5月以中興新村省政府員工40歲至64歲之中年人爲樣本，共有709位自願者完成抽血檢查，本次研究即以這709人爲基礎。統計方法採用 t 檢定，卡方檢定與多變項羅吉斯迴歸分析。

結果 其中男性佔40.0%，女性佔60.0%，平均年齡爲 50.5 ± 6.8 歲。男性三酸甘油脂的平均值爲 1.74 ± 1.17 mmol/L，女性三酸甘油脂的平均值爲 1.43 ± 0.85 mmol/L ($p < 0.001$)。男性高三酸甘油脂血症的盛行率爲20.1%，女性高三酸甘油脂血症的盛行率爲12.7% ($p < 0.01$)。在控制其他變項之後，以多變項羅吉斯迴歸分析來看，高三酸甘油脂血症的相關因子爲高GPT值 (glutamic pyruvic transaminase)、高膽固醇血症、高血糖症與高尿酸血症。

結論 男性中年人高三酸甘油脂血症比女性中年人常見。當中年人有高GPT值、高膽固醇血症、高血糖症或高尿酸血症時，應同時檢驗血中三酸甘油脂。(中台灣醫誌 2001;6:1-6)

關鍵詞

高三酸甘油脂血症，中年人

聯絡作者：賴世偉

地址：404台中市北區育德路2號

中國醫藥學院附設醫院 社區醫學部

收文日期：8/3/2000

修改日期：9/13/2000

接受日期：12/4/2000