行政院國家科學委員會專題研究計畫　成果報告

老年人之高血壓、高血脂、高尿酸、高血糖和肥胖與死亡間之相關-中興新村社區老人之五年前瞻性研究

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目　錄

中文摘要

過去國外許多研究顯示成人之高血壓、高血脂、高尿酸、高血糖或肥胖與死亡有所關係，然而由於老人因生理與結構的改變，這些慢性病與死亡間的相關於老年人可能有所改變，加上大部分之老人同時伴隨著多種慢性病，任一慢性病和死亡間之相關可能會被其他伴隨之其他慢性病的存在而改變，因此老人族群中，這些慢性情況與死亡間之相關有必要再做探討。而國內更是缺乏此類之追蹤性研究。本研究目的主要探討居住於中興新村之六十五歲老人，在控制了性別、年齡、身體功能和自我評估之健康狀態後，高血壓、高血脂、高尿酸、高血糖或肥胖與五年死亡率間之相關，評估這些慢性情況解釋死亡率的相對重要性，並探討任一慢性病和死亡間之相關是否會被其他伴隨之其他慢性病的存在而改變。本研究以五年之前瞻性追蹤研究設計，被追蹤之人口為於 1998 年參與健康普查與健康檢查之 586 位六十五歲以上之老人，資料收集方式為受訓之公共衛生學生進行面訪，所收集之資料包括人口學變項、SF-36、中文版多元功能評估問卷(包含認知功能狀態、身體健康狀態、精神健康狀態、社會資源及多元功能)、中國人心理健康量、社會生活量表與人口因子等，健康檢查的項目包括體格、血壓等檢查，受測者並於斷食 12 小時後抽血作膽固醇、血糖和尿酸等血液檢查，評估是否有高血壓、高血糖、高血脂症、高尿酸等疾病。死亡狀態將由衛生署之死亡資料庫所獲得。統計分析方法為 Cox's Proportional Hazard model。經校正年齡、血糖及肌酸酐，尿酸值界於 5.3 mg/dl 到 6.0 mg/dl 之間者其死亡率明顯低於尿酸值高於 7.3 mg/dl 者。但不論男性或女性，任一項生化指標均沒有顯著與死亡有關。

關鍵詞：前瞻性追蹤研究設計；高血壓；高血脂; 高尿酸; 高血糖; 肥胖; 死亡；

Abstract

A growing body of research shows that hypertension, hypercholesterolemia, hyperuricaemia, hyperglycemia, and obesity are linked to mortality in adults. Several factors make these associations need to be addressed in the elderly population. First, due to physiologic and anatomic alterations related to aging, the strength of association of these risk factors in young or middle-aged adults might differ from that in older adults. Second, the presence of a co-morbid condition may modify the impact of an etiologic factor on the outcome. The complex interactions of co-morbid conditions need to be understood and taken into account in epidemiologic assessment of the causes of adverse health outcomes for older adults. The first objective of the present study is to examine the predictive ability and relative importance of hypertension, hypercholesterolemia, hyperuricaemia, hyperglycemia, and obesity on 5-year mortality according to gender controlling for sociodemographic factors, life style behaviors, physical illness, physical functioning, health related quality of life (HRQOL), and social support in a Chinese, community-based elderly sample. The second objective is to examine inter-dependence of these risk factors on the mortality, i.e., whether the association of any risk factor with mortality can be modified by the other four risk factors. A 5-year follow-up study design was conducted. The study cohort consisted of 586 elders resided in Chung-Shing-Shin-Tseun Community, NanTou, County in 1998. A face-to-face interview was used for data collection to collect information about sociodemographic data, health care service utilization, Chinese Health Questionnaire, etc. Blood pressure, weight, and height were obtained through physical examination. Blood samples were obtained in the morning after a 12-hour overnight fasting to get biochemical markers such as cholesterol, triglyceride, fasting glucose, and uric acid. Vital status was obtained via linkage with Death Data-set of National Health Department. The relationship between hypertension, hypercholesterolemia, hyperuricaemia, hyperglycemia, and obesity and 5-year mortality was studied using the Cox's Proportional Hazard model. After adjusting for age, fasting glucose, and creatinine, individuals in the category of uric acid greater than 5.3, but less than or equal to 6.0 had significantly decreased risk compared to those in the category of greater than 7.3. For both men and women, none of these biological marker was statistically significant at 0.05.

Keywords. Cohort study; hypertension; hypercholesterolemia; hyperuricaemia; hyperglycemia; obesity; mortality

SPECIFIC OBJECTIVE

The first objective of the present study is to examine the predictive ability and relative importance of hypertension, hypercholesterolemia, hyperuricaemia, hyperglycemia, and obesity on 5-year mortality according to gender controlling for age in a Chinese, community-based elderly sample. The second objective is to examine inter-dependence of these risk factors on the mortality, i.e., whether the association of any risk factor with mortality can be modified by the other four risk factors.

BACKGROUND AND SIGNIFICANCE

Why Health Issues of Elders Is Important in Taiwan

Several significant phenomena of aging population such as prolonged life expectancy and increasing proportion of the very old have been emerged in the past decade. The average life expectancy is 78 years for women and 72 years for men in Taiwan. There were more than 1.6 million individuals aged 65 and over who represent 8.44% of the total population (Department of Health, 2000).

Along with the aging population, the mortality and morbidity patterns change. Most of the 10 leading causes of death in people 65 years and older are now related to chronic diseases. Cerebrovascular disease is the second leading cause of death; cardiovascular disease is the third; and hypertension is ninth. In addition to this marked change in the cause of death, the causes of morbidity have shifted to chronic disable conditions such as hypertension, cerebrovascular disease, diabetes and heart disease. For example, 33.2 percent in elderly men living in the community and 40.9 percent in women report hypertension (Liau, 1998). As the population ages, the burden of the population becomes heavier (the absolute numbers of chronic disease increase). In addition, the clinical consequences of chronic disease are usually long term. Thus these chronic diseases adversely affect the health individually or of Taiwan population as a whole.

The Importance of Hypertension, Hypercholesterolemia, Hyperuricaemia, Hyperglycemia, and Obesity in Disease Prevention

Chronic disease is a major issue to be addressed in improving the health status of older adults. For many chronic diseases such as cardiovascular disease, cerebrovascular disease, elevated blood pressure, total cholesterol, serum uric acid, blood sugar, and anthropometric index have been identified as modifiable risk factors. For example, reduced serum total cholesterol levels by 1 percent had been associated with 2 percent reduction in risk for the cardiovascular disease (Lipids Research Clinics Programs, 1984). Patients treated with antihypertensive drugs could have a 38 percent decrease in cardiovascular mortality (Amery, 1985). Thus, early intervention of these modifiable risk factors is the key point to the reduction of morbidity and mortality of several chronic diseases.

The Importance of the Current Study

Although the associations of these risk factors with chronic diseases or mortality have been well studied in adult population, several factors make these associations need to be addressed in the elderly population. First, due to physiologic and

anatomic alterations related to aging, illness presentation changes as age increases (Wallace, 1992). Under these alterations, these risk factors might make the older adult more vulnerable and put them at increase risk of death, i.e., the strength of association of these risk factors in young or middle-aged adults might differ from that in older adults.

Second, the complexity of chronic disease in older adults increases because the concurrent presence of more than one chronic condition or co-morbidity is prevalent. Co-morbid conditions must be considered in interpreting causal models or associations. The presence of a co-morbid condition may modify the impact of an etiologic factor on the outcome. For example, assessing the role of hypertension as a cause of cardiovascular death requires knowledge of concurrent hypercholesterolemia, hyperuricaemia, hyperglycemia, or obesity, which may also cause cardiovascular death. Conversely, it may be also important to ask, from the point of view of prevention, whether the adverse impact of hypertension on death is important only in the presence of hypercholesterolemia, hyperuricaemia, hyperglycemia, or obesity.

Co-morbidity is thus an important dimension of health status in older adults, and it is therefore important to hypothesize and test for the role of co-morbidity in outcome of interest. The complex interactions of co-morbid conditions need to be understood and taken into account in epidemiologic assessment of the causes of adverse health outcomes for older adults. Co-morbid illness may modify the primary factor of interest, and co-morbidity itself may also independently be a risk factor for adverse outcomes. Better understanding of the roles of co-morbidity in the health status of older adults could lead to unique approaches to prevention in this age group.

The current epidemiologic study of elderly population will provide the information of incidence of death and their etiology, importing in a way that clinical study cannot. Etiologic factors identified in the study will guide clinicians to choose effective interventions to improve the health status of older adults. Relative importance of etiologic factors will facilitate health administrators and policy makers to determine the priority of health programs and allocation of health resources.

Methods

Study Design

A 5-year prospective follow-up study will be conducted. In 1998, a Health Survey and medical examination were administered to 586 residents aged over 65 years old of Chung-Shing-Shin-Tseun Community, NanTou County of Taiwan. These 586 elders were linked with Death Dataset of National Health Department (1998-2002).

Study Population and Study Sample

The target population for the Health Survey was residents aged over 65 years old of Chung-Shing-Shin-Tseun Community, NanTou County of Taiwan in May 1998. The sampling frame of this study used the set of all family records from the Bureau of Households. According to this sampling frame, there were a total of 1,774 elderly residents in this area during the time of study. Among these elders, 651 elders did not participate our study because they were not contacted (n=514) or refused to participate (n=137). The reasons for not be contacted were moving out (n=251), death (n=24), mistake of the sampling frame (n=11), hospitalization (n=16), and not at

home during 3 visits made by interviewers (n=212). The proportion of non-contact is 16.83%. After excluding those who were not contacted from the population, the overall response rate was 89.13%. Among these elders who were enrolled in the Health Survey, only 586 elders completed the medical examination with blood samples being drawn. The current study was based on these elders who completed both Health Survey and medical examination.

Data Collection for Baseline Health Survey

We used a face-to-face interview for data collection. At the beginning of the study, a trained interviewer visited the study subjects at their homes to collect information about sociodemographic data and information about perceived health. Three attempts were made to contact selected study subjects in a week. If the last attempt failed to contact a subject, this subject would be given up.

Measurement

Dependent Variable : Vital Status Ascertainment

Vital status will be obtained via linkage with Death Dataset of National Health Department (1998-2002). The precise date of death along with date of study entry was used to calculate the event time. Those whose status was not confirmed or who did not die were defined as censored.

Independent Variables

Hypertension

Blood pressure was measured by a mercury sphygmomanometer in the sitting position. Subjects were considered to have high blood pressure if the average of three readings exceeded 140 mmHg Systolically and/or 90 mmHg diastolically (Subcommittee of WHO/ISH Mild Hypertension Liaison Committee, 1993).

Biochemical Markers & Clinical Cutpoints for Defining Abnormality

Blood was drawn with minimal trauma from an antecubital vein in the morning after a 12-hour overnight fasting and was sent for analysis within four hours of blood collection. Biochemical markers such as cholesterol, triglyceride, fasting glucose, creatinine, and uric acid were analyzed by a biochemical autoanalyzer (Chem 1^{+}, Technicon, USA) at the Department of Clinical Laboratory of Chung-Shing Hospital. The clinical cutpoints for defining abnormality were given below:

Hypercholesterolemia: total cholesterol ≥ 200 mg/dl (National Cholesterol Education Program, 1993).

Hypertriglyceridemia: triglyceride ≥200 mg/dl (National Cholesterol Education Program, 1993).

Hyperuricemia: serum uric acid ≥7.0mg/dl in men and ≥6.5 mg/dl in women (Saggiani, 1996).

Hyperglycemia: fasting glucose ≥110 mg/dl (The expert committee on the diagnosis and classification of diabetes mellitus, 1997).

Anthropometric Index & Obesity

Weight and height were measured during physical check-up. Body mass index (BMI) was derived from the formula of weight (kg) ÷ $(\text{height})^2$ (m^2). BMI≥24 was defined as overweight; BMI≥30 was defined as overweight.

Sociodemographic Factors

Age, gender, income, marital status, ethnicity, employment status, and education were collected in the questionnaire.

Statistical Analysis

First, mortality rates for each quartile of baseline blood pressure, biological markers and BMI will be calculated. The model-building procedure will adopt the method described by Hosmer et al. (1989). To examine the independent effect and relative importance of the five risk factors, Cox's proportional hazards models will be then used to estimate the relative risk of death during the follow-up period for abnormal elders versus normal elders. These variables will be examined separately by sex and adjusted only for age. Subsequently, these variables will be examined simultaneously, adjusting for age. The estimated coefficients of the final multivariate model will provide the independent effect of these risk factors while the standardized coefficients allow us to compare the relative importance of these risk factors. To examine the inter-dependence of these risk factors, all possible interaction terms of these risk factors will be added one by one into the final main-effect multivariate model in order to identify the significant interaction terms. At last, all significant interaction terms will be added to the final multivariate model.

Results

Table 1 shows the crude and age-adjusted relative risks (RRs) of mortality for BMI, SBP, DBP, fasting glucose, cholesterol, triglyceride, creatinine, and uric acid for men. Among the elderly men, BMI, fasting glucose, cholesterol, and creatinine exhibited significant associations with all-cause mortality. These associations were independent of age. Individuals in the category of BMI less than 18.5 had significantly increased risk compared to those in the BMI category of greater than or equal to 18.5, but less than 24 (crude RR=2.98, 95% CI: 1.40-6.34; age adjusted RR=2.49, 1.17-5.32). Elders in the category of fasting glucose less than or equal to 85 had significantly increased risk compared to those in the category of 85-92 (crude RR=2.18, 95% CI: 1.07-4.46; age-adjusted RR=2.32, 95% CI: 1.14-4.75). Elders in the category of cholesterol less than or equal to 166 had significantly increased risk compared to those in the category of greater than 220 (crude RR=2.79, 95% CI: 1.30-5.97; age-adjusted RR=2.45, 95% CI: 1.14-5.27). Elders in the category of creatinine less than or equal to 1.2 had significantly decreased risk compared to those in the category of greater than 1.6 (crude RR=0.47, 95% CI: 0.23-0.97; age-adjusted RR=0.43, 95% CI: 0.21-0.89).

By examining the interaction terms of the significant main effects, only the interaction of creatinine and fasting glucose is statistically significant. The RRs and 95% CI of all variables in the final model are presented in Table 2. For variables without significant interaction, as age increased by one year, the mortality increased by 10% (RR=1.10, 95% CI: 1.05-1.15); individuals in the category of BMI less than 18.5 had significantly increased risk compared to those in the BMI category of greater than or equal to 27 (RR=3.68, 95% CI: 1.46-9.26); individuals in the category of cholesterol less than or equal to 166 had significantly increased risk compared to those in the category of greater than 220 (RR=4.82, 95% CI: 1.93-12.05); individuals in the category of cholesterol 166-220 had significantly increased risk compared to those in the category of greater than 220 (RR=2.68, 95% CI: 1.14-6.31); individuals in the category of triglyceride less than or equal to 93 had significantly decreased risk

compared to those in the category of greater than 174 (RR=0.37, 95% CI: 0.17-0.81). For variables with significant interaction, creatinine is only significant when fasting glucose is greater than 85, but greater than or equal to 104. Individuals in the category of creatinine less than or equal to 1.2 had significantly decreased risk compared to those in the category of greater than 1.6 (RR=0.22, 95% CI: 0.06-0.79). However, fasting glucose isn't statistically significant at all levels of creatinine.

Table 3 shows the crude and age-adjusted RRs of mortality for BMI, SBP, DBP, fasting glucose, cholesterol, triglyceride, creatinine, and uric acid for women. The crude RR is statistically significant only for uric acid. After adjusting for age, its effect doesn't remain significant. Thus we didn't fit the final multivariate model for female. No significant interaction term was detected. The significant variables were age and uric acid. After adjusting for fasting glucose, creatinine and uric acid, as age increased by one year, the mortality increased by 16% (RR=1.16, 95% CI: 1.07-1.26). After adjusting for age, fasting glucose, and creatinine, individuals in the category of uric acid greater than 5.3, but less than or equal to 6.0 had significantly decreased risk compared to those in the category of greater than 7.3 (RR=0.20, 95% CI: 0.04-0.99, p for trend=0.37).

Table 7 shows the crude and age-adjusted RRs of mortality for BMI, SBP, DBP, fasting glucose, cholesterol, triglyceride, creatinine, and uric acid categorized according clinical criteria stratified by man and woman. For man, obesity, hypertension and hypercholesterolemia reach significance level of 0.25 while for woman, hypertension, abnormal creatinine and hyperuricemia reach significance level of 0.25. In order to better control for the confounding effect, these variables with age were entered simultaneously into the final multivariate model (table 8). For both men and women, none of these biological marker was statistically significant at 0.05.

Table 1. Crude and age-adjusted relative risks of mortality for BMI, SBP, DBP, fasting glucose, cholesterol, triglyceride, creatinine, and uric acid categorized by quartiles for man.

Variables	Man		
	No.	Crude RR (95%CI)	Age-adjusted RR (95%CI)
Body Mass Index (>21.5287 & ≤23.9390 as reference)	379		
≤21.5287		1.51 (0.78-2.93)	1.31 (0.67-2.56)
23.9390< Body Mass Index ≤26.5625		0.79 (0.37-1.69)	0.77 (0.36-1.64)
26.5625< Body Mass Index		1.00(0.49-2.04)	0.90 (0.44-1.85)
Body Mass Index (>18.5 & ≤24 as reference)	379		
≤18.5		2.98 (1.40-6.34)	2.49 (1.17-5.32)
24< Body Mass Index ≤27		0.77 (0.41-1.45)	0.77 (0.41-1.45)
27< Body Mass Index		1.03 (0.52-2.04)	0.97 (0.49-1.93)
SBP (>142 as reference)	384		
≤118		0.93 (0.49-1.79)	0.91 (0.47-1.75)
118<SBP≤129		0.96 (0.49-1.86)	1.08 (0.56-2.10)
129<SBP≤142		0.76 (0.38-1.53)	0.74 (0.37-1.49)
DBP (>87 as reference)	384		
≤70.5		1.52 (0.82-2.81)	1.19 (0.64-2.23)
70.5<DBP≤79		0.70 (0.34-1.44)	0.67 (0.32-1.37)
79<DBP≤87		0.68 (0.32-1.42)	0.64 (0.30-1.33)
Fasting Glucose (>85 & ≤92 as reference)	387		
≤85		2.18 (1.07-4.46)	2.32 (1.14-4.75)
92< Fasting Glucose ≤104		1.51 (0.70-3.25)	1.50 (0.70-3.24)
104< Fasting Glucose		1.64 (0.77-3.49)	1.60 (0.75-3.41)
Cholesterol (>220 as reference)	387		
≤166		2.79 (1.30-5.97)	2.45 (1.14-5.27)
166< Cholesterol ≤194		1.80 (0.80-4.07)	1.36 (0.59-3.11)
194< Cholesterol ≤220		2.08 (0.94-4.63)	1.87 (0.84-4.17)
Triglyceride (>174 as reference)	386		
≤93		0.62 (0.32-1.22)	0.53 (0.27-1.05)
93< Triglyceride ≤123		0.77 (0.41-1.46)	0.69 (0.37-1.32)
123< Triglyceride ≤174		0.73 (0.38-1.41)	0.67 (0.35-1.28)
Creatinine (>1.6 as reference)	386		
≤1.2		0.47 (0.23-0.97)	0.43 (0.21-0.89)
1.2< Creatinine ≤1.4		0.71 (0.38-1.30)	0.70 (0.38-1.28)
1.4< Creatinine ≤1.6		0.46 (0.22-0.97)	0.45 (0.21-0.94)
Uric Acid (>8.4 as reference)	386		
≤6.2		0.99 (0.52-1.88)	0.84 (0.44-1.61)
6.2< Uric Acid ≤7.35		1.01 (0.51-2.00)	0.93 (0.47-1.84)
7.35< Uric Acid ≤8.4		0.78 (0.39-1.56)	0.80 (0.40-1.60)

SBP：systolic blood pressure, DBP：diastolic blood pressure

Table 2 Multivariate relative risks of mortality for BMI, fasting glucose, cholesterol, triglyceride, and creatinine, categorized by quartiles for man.

Variable	RR (95% CI)
Age (years)[a]	1.10 (1.05-1.15)
Body Mass Index (>27 as reference) [a]	
Body Mass Index ≤18.5	3.68 (1.46-9.26)
18.5< Body Mass Index ≤27	1.11 (0.58-2.13)
Cholesterol (>220 as reference) [a]	
Cholesterol ≤166	4.82 (1.93-12.05)
166< Cholesterol ≤220	2.68 (1.14-6.31)
Triglyceride (>174 as reference) [a]	
Triglyceride ≤93	0.37 (0.17-0.81)
93< Triglyceride ≤174	0.59 (0.32-1.07)
When Fasting Glucose ≤85 [b]	
Creatinine (>1.6 as reference)	
Creatinine ≤1.2	0.81 (0.21-3.08)
1.2< Creatinine ≤1.6	0.38 (0.12-1.27)
When 85< Fasting Glucose ≤104 [b]	
Creatinine (>1.6 as reference)	
Creatinine ≤1.2	0.22 (0.06-0.79)
1.2< Creatinine ≤1.6	0.42 (0.17-1.05)
When Fasting Glucose >104 [b]	
Creatinine (>1.6 as reference)	
Creatinine ≤1.2	1.31 (0.11-15.46)
1.2< Creatinine ≤1.6	3.59 (0.42-30.46)
When Creatinine ≤1.2 [c]	
Fasting Glucose (>104 as reference)	
Fasting Glucose ≤85	3.48 (0.63-19.21)
85< Fasting Glucose ≤104	0.83 (0.14-4.89)
When 1.2< Creatinine ≤1.6 [c]	
Fasting Glucose (>104 as reference)	
Fasting Glucose ≤85	0.57 (0.24-1.36)
85< Fasting Glucose ≤104	0.54 (0.24-1.21)
When Creatinine >1.6 [c]	
Fasting Glucose (>104 as reference)	
Fasting Glucose ≤85	8.97 (0.98-82.02)
85< Fasting Glucose ≤104	4.24 (0.51-35.27)

[a] RR was estimated from the final model for man:
H(t)=h0*exp(?+0.09age+1.30bmi1+0.10bmi2+1.96fg1+1.53fg2+1.57chol1+0.99chol2-0.99trig1-0.53trig2+0.40creat1+1.23creat2-0.85fg1*creat1-2.49*fg1*creat2-1.68fg2*creat1-2.04fg2*creat2; bmi1: ≤18.5, bmi2:18.5-27, fg1: ≤85, fg2:85-104, chol1: ≤166, chol2: 166-220, trig1: ≤93, trig2: 93-174, creat1: ≤1.2, creat2: 1.2-1.6.

[b] RR was estimated from model with age, cholesterol, creatinine and triglyceride for man, stratified by fasting glucose status.

[c] RR was estimated from model with age, cholesterol, fasting glucose and triglyceride for man, stratified by creatinine status.

Table 3 Crude and age-adjusted relative risks of mortality for BMI, SBP, DBP, fasting glucose, cholesterol, triglyceride, creatinine, and uric acid categorized by quartiles for woman.

Variables	Woman		
	No.	Crude RR (95% CI)	Age adjusted RR (95% CI)
Body Mass Index (>21.4289 & ≤24.0070 as reference)	192		
≤21.4289		1.52 (0.43-5.37)	1.25 (0.35-4.45)
24.0070< Body Mass Index ≤26.3722		0.75 (0.17-3.35)	0.80 (0.18-3.61)
26.3722< Body Mass Index		0.74 (0.17-3.31)	0.74 (0.17-3.32)
Body Mass Index (>18.5 & ≤24 as reference)	192		
≤18.5		1.38(0.29-6.48)	1.28 (0.27-6.04)
24< Body Mass Index ≤27		0.52 (0.14-1.95)	0.57 (0.15-2.18)
27< Body Mass Index		0.80 (0.21-3.00)	0.93 (0.24-3.50)
SBP (>152 as reference)	194		
≤116		1.16 (0.31-4.31)	1.47 (0.39-5.50)
116<SBP≤132.5		1.15 (0.31-4.29)	1.09 (0.29-4.08)
132.5<SBP≤152		0.89 (0.22-3.55)	1.06 (0.26-4.27)
DBP (>89 as reference)	194		
≤70		0.67 (0.18-2.49)	0.64 (0.17-2.40)
70<DBP≤81		1.19 (0.36-3.89)	1.53 (0.46-5.17)
81<DBP≤89		0.54 (0.13-2.24)	0.62 (0.15-2.63)
Fasting Glucose (>85 & ≤94 as reference)	198		
≤85		0.81 (0.27-2.42)	0.57 (0.19-1.71)
94< Fasting Glucose ≤106		0.39 (0.10-1.53)	0.38 (0.10-1.45)
106< Fasting Glucose		0.45 (0.12-1.73)	0.46 (0.12-1.77)
Cholesterol (>239 as reference)	198		
≤182		1.16 (0.31-4.31)	0.70 (0.18-2.69)
182< Cholesterol ≤211		0.68 (0.15-3.05)	0.47 (0.10-2.11)
211< Cholesterol ≤239		1.64 (0.48-5.59)	1.47 (0.43-5.04)
Triglyceride (>206 as reference)	196		
≤105.5		1.96 (0.59-6.49)	1.24 (0.36-4.26)
105.5< Triglyceride ≤149		1.18 (0.32-4.41)	1.44 (0.38-5.40)
149< Triglyceride ≤206		0.47 (0.09-2.55)	0.57 (0.10-3.13)
Creatinine (>1.2 as reference)	195		
≤1.0		0.79 (0.27-2.34)	0.90 (0.30-2.67)
1.0< Creatinine ≤1.1		0.35 (0.07-1.71)	0.45 (0.09-2.28)
1.1< Creatinine ≤1.2		0.80 (0.23-2.83)	1.05 (0.29-3.77)
Uric Acid (>7.3 as reference)	197		
≤5.3		0.62 (0.22-1.79)	0.56 (0.20-1.64)
5.3< Uric Acid ≤6.0		0.19 (0.04-0.91)	0.23 (0.05-1.07)
6.0< Uric Acid ≤7.3		0.31 (0.08-1.17)	0.31 (0.08-1.16)

SBP：systolic blood pressure, DBP：diastolic blood pressure

Table 4. Crude and age-adjusted relative risks of mortality for BMI, SBP, DBP, fasting glucose, cholesterol, triglyceride, creatinine, and uric acid categorized by clinical criteria, stratified by gender.

Variables	Man			Woman		
	No.	Crude RR (95% CI)	Age adjusted RR (95% CI)	No.	Crude RR (95% CI)	Age adjusted RR (95% CI)
Obesity	379			191		
yes (body mass index ≥24)		0.73 (0.44-1.19)	0.72 (0.44-1.19)		0.59 (0.22-1.63)	0.68 (0.24-1.89)
Fat	379			191		
yes (body mass index ≥30)		0.56 (0.14-2.29)	0.59 (0.14-2.40)		1.26 (0.17-9.53)	2.34 (0.29-18.73)
Hypertension	384			193		
yes (SBP ≥140 mmHg or DBP ≥90 mmHg)		1.27 (0.78-2.05)	1.34 (0.82-2.17)		0.61 (0.23-1.63)	0.56 (0.21-1.50)
Hyperglycemia	387			197		
yes (fasting glucose ≥110 mg/dl)		0.93 (0.51-1.70)	0.90 (0.49-1.65)		0.72 (0.21-2.47)	0.81 (0.23-2.79)
Hypercholesterolemia	387			197		
yes (cholesterol ≥200 mg/dl)		0.56 (0.33-0.94)	0.66 (0.39-1.17)		1.18 (0.46-2.99)	1.58 (0.61-4.05)
Hypertriglyceridemia	386			195		
yes (triglyceride ≥200 mg/dl)		1.15 (0.64-2.08)	1.33 (0.73-2.40)		0.96 (0.35-2.66)	1.03 (0.37-2.88)
Abnormal Creatinine	386			194		
yes (creatinine ≥1.5 mg/dl)		1.12 (0.69-1.80)	1.14 (0.71-1.85)		2.57 (0.85-7.73)	1.97 (0.65-5.99)
Hyperuricemia	386			196		
yes (uric acid ≥7 mg/dl in men, uric acid ≥6.5 mg/dl in women)		0.78 (0.49-1.26)	0.89 (0.55-1.44)		1.76 (0.72-4.34)	1.68 (0.68-4.15)

SBP：systolic blood pressure, DBP：diastolic blood pressure

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