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# 中臺灣地區高尿酸血症個體之代謝症候群盛行率

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## 摘　要

藉由代謝症候群的篩選及早期治療，可減少心血管疾病的發生。然而，在高尿酸血症的個體中，不同程度的尿酸值是否會影響代謝症候群之盛行率，臺灣本土的資料很少見，且血清尿酸值在這方面的潛在可利用性也很少被研究。爲了了解尿酸值與代謝症候群盛行率的相關性，我們蒐集了自西元2004年一月至十二月間，3065位某醫學中心的員工體檢資料加以分析，年齡從18至81歲(635位男性，2430位女性)。研究顯示，代謝症候群的盛行率，隨尿酸值的增加而呈現顯著的增加，相對危險比值(Odds ratio)亦有相同的結果，而尿酸值大於或等於9 mg/dL這組其代謝症候群出現的相對危險比值，在男女生組別分別是尿酸值小於5 mg/dL組的5.64及7.62倍。尿酸值越高的，具有多個代謝症候群組成因子的百分比亦隨著增加。各組再依年齡四分位數分析，代謝症候群的盛行率隨年齡增加而增加。本研究給我們『愈高的尿酸值，代謝症候群的危險性或盛行率增加』之訊息，甚至尿酸值處於正常範圍內而其年紀較大者，亦值得我們小心代謝症候群的存在。因爲高尿酸血症常常伴隨有較高的代謝症候群盛行率，臨床上，應視高尿酸血症爲心血管疾病的一個重要的潛在標誌。

關鍵詞：高尿酸血症(Hyperuricemia)
代謝症候群(Metabolic syndrome)
美國國家膽固醇教育計畫成人治療準則第三次報告(NCEP/ATP III)

## 引言

高尿酸血症在臨床上並不少見，根據文獻上報告，西方國家之盛行率約爲8.7-35.1%[1]，而在臺灣的統計調查則爲17.3-25.8%[2-3]。許多研究顯示高尿酸值爲代謝症候群(metabolic syndrome)構成要素之一[4-5]，且與肥胖[5]，葡萄糖不耐症[6]，高血脂症[7]，高血壓[8]有著顯著的相關聯。2001年美國發表"國家膽固醇教育計畫"(NCEP)之成人治療準則第三次報告(Adult Treatment Panel III report, ATP III)，確認代謝症候群爲心血管疾病之多重複雜危險因子，強調應受更多臨床醫師的注意[9]。研究顯示藉由代謝症候群的篩選及早期治療，可減少心血管疾病的發生[10]。但是，在高尿酸血症的個體中，不同程度的尿酸值是否會影響代謝症候群之盛行率，至目前爲止，尚無此類之本土性

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報告。因此，我們嘗試評估不同等級尿酸值之個體，其代謝症候群的盛行率，並探討不同的性別年齡在這些組別中，對於代謝症候群之影響。

## 材料及方法

本研究對象取自西元2004年一月至十二月間，中部某醫學中心的員工生日體檢資料共3065位（635位男性，2430位女性）。各種血液的生化指標及所有身體檢查之變數幾乎皆於同一時間完成。血壓的量測是在抽血前，採坐姿並使用自動化的血壓計測量。身體質量指數以體重(kg)除以身高平方($m^2$)計算。腰圍測量以皮尺繞過腰部，調整高度使能通過左右兩側腸骨上緣至肋骨下緣之中間點，維持正常呼吸，於吐氣結束時，量取腰圍。

生化檢測以空腹至少八小時後，早上抽血檢測。代謝症候群的定義是參照亞洲標準，修改自西元2001年NCEP/ATP III的定義，滿足下列條件(含)三項以上者：男性腰圍大於90公分、女性大於80公分，三酸甘油脂大於150 mg/dL，男性高密度脂蛋白膽固醇低於40 mg/dL、女性低於50 mg/dL，血壓大於等於130/85 mmHg，空腹血糖大於等於100 mg/dL。

母群體的各項基本資料以平均值 ± 標準差描述。代謝症候群的盛行率，依研究對象的尿酸值高低分成(1)小於5 mg/dL (2) 5-6.9 mg/dL (3) 7-8.9 mg/dL (4)大於或等於9 mg/dL等4組計算。以邏輯迴歸分析評估，各組相對於尿酸值小於5 mg/dL這組之相對危險比值(Odds Ratio, OR)及校正年齡、性別後的相對危險比值，及校正年齡、性別、肌酸肝值、體重及白血球細胞計數後的相對危險比值。此外，我們也計算不同的代謝症候群組成因子數量在不同尿酸值組別裡的百分比，及不同等級的年齡、性別在各尿酸值組別的代謝症候群盛行率。

## 結果

本研究平均年齡爲32.9歲，20.7%爲男性，平均身體質量指數 22.5 $kg/m^2$，平均尿酸值 5.37 ± 1.45 mg/dL (表一)。結果顯示代謝症候群的盛行率，隨尿酸值的增加而呈現顯著性的增加。在女生族群中，尿酸值大於5 mg/dL的各組與尿酸值小於5 mg/dL這組的代謝症候群相對危險比值依序分別爲3.36，14.57及36.15 ($P < 0.001$)，此關係在校正多項變數(包括年齡、體重，肌酸肝值及白血球計數)後仍有相同的結果(表二之一)

表一：Demographic data of the study population (n = 3065)

| | Mean ± SD | Range |
|---|---|---|
| Gender (Male) | 20.7% | |
| Age (year-old) | 32.9 ± 8.9 | 18 - 81 |
| BW (kg) | 58.94 ± 11.96 | 32.4 - 142.1 |
| BMI ($kg/m^2$) | 22.451 ± 3.678 | 14.10 - 45.36 |
| WC (cm) | 76.1 ± 10.0 | 54 - 128 |
| SBP (mm-Hg) | 115.7 ± 14.5 | 73 - 197 |
| DBP (mm-Hg) | 79.1 ± 10.3 | 40 - 131 |
| FPG (mg/dL) | 89.6 ± 13.5 | 61 - 325 |
| HDL-C (mg/dL) | 62.2 ± 14.3 | 28 - 118 |
| Triglyceride (mg/dL) | 86.4 ± 64.3 | 21 - 1176 |
| LDL-C (mg/dL) | 108.3 ± 29.7 | 26 - 260 |
| WBC No. (/μL) | 6048.8 ± 1594.4 | 2400 - 18600 |
| Creatinine (mg/dL) | 0.85 ± 0.17 | 0.5 - 2.0 |
| Uric acid (mg/dL) | 5.37 ± 1.45 | 1.3 - 13.1 |

表二之一：Prevalence of the Metabolic Syndrome in Women According to Serum Uric Acid Levels

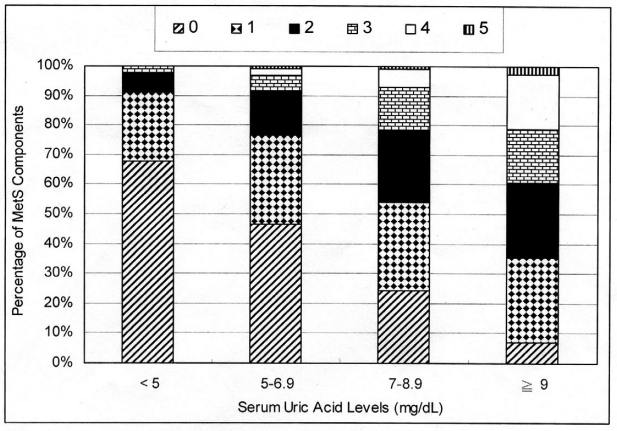
| | Uric Acid Levels (mg/dL) | | | |
|---|---|---|---|---|
| N = 2430 | < 5 (n = 1330) | 5 - 6.9 (n = 981) | 7 - 8.9 (n = 112) | ≧ 9 (n = 7) |
| Prevalence, % (95% CI) | 2.0 (1.2 - 2.8) | 6.5 (5.0 - 8.0) | 23.2 (15.4 - 31.0) | 42.9 (6.2 - 79.6) |
| Unadjusted OR (95% CI) | 1.0 | 3.36 (2.13-5.32) § | 14.57 (8.15-26.05) § | 36.15 (7.71-169.42) § |
| Age-adjusted OR (95% CI) | 1.0 | 3.13 (1.97-4.96) § | 12.06 (6.65-21.87) § | 36.59 (7.69-174.07) § |
| Mutivariate OR* (95% CI) | 1.0 | 1.78 (1.07-2.96) § | 4.54 (2.29-9.00) § | 7.62 (1.06-55.07) § |

OR = odds ratio; CI = confidence interval
*Adjust for age, creatinine level, body weight and white cell count
§ $p < 0.05$

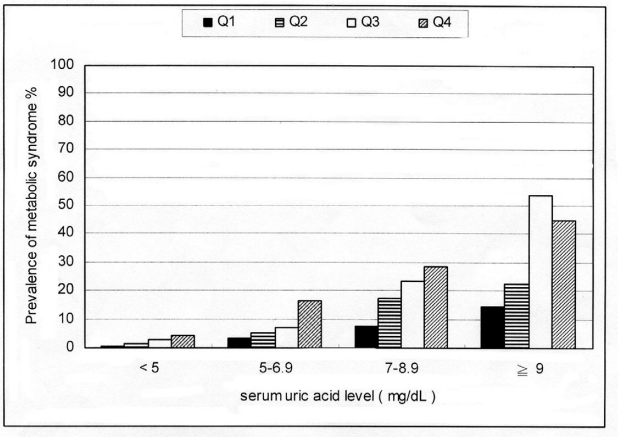
表二之二： Prevalence of the Metabolic Syndrome in Men According to Serum Uric Acid Levels

| | Uric Acid Levels (mg/dL) | | | |
|---|---|---|---|---|
| N = 635 | < 5 ( n = 29 ) | 5 - 6.9 ( n = 303 ) | 7 - 8.9 ( n = 239 ) | ≧ 9 ( n = 64 ) |
| Prevalence, % (95% CI) | 6.9 ( 0 - 16.1 ) | 13.9 ( 10 - 17.8 ) | 20.9 ( 15.7 - 26.1 ) | 39.1 ( 27.1 - 51.1 ) |
| Unadjusted OR (95% CI) | 1.0 | 2.17 (0.50-9.47) | 3.57 (0.82-15.52) | 8.65 (1.89-39.62) § |
| Age-adjusted OR (95% CI) | 1.0 | 2.15 (0.49-9.50) | 4.08 (0.93-17.99) | 10.65 (2.28-49.70) § |
| Mutivariate OR* (95% CI) | 1.0 | 2.59 (0.51-13.13) | 3.24 (0.65-16.27) | 5.64 (1.05-130.26) § |

OR = odds ratio; CI = confidence interval
*Adjust for age, creatinine level, body weight and white cell count
§ $p < 0.05$




圖一： Percentage of metabolic syndrome components at variable serum uric acid levels MetS = Metabolic syndrome.




圖二： Prevalence of metabolic syndrome according to serum uric acid levels stratified by age group. Age was divided by quartile, with ascending order from Q1 to Q4 (The range of age in Q1 ≦ 26, Q2: 27 - 30, Q3: 31 - 37, Q4 ≧ 38 ). Trend of p value in each group by uric acid level are < 0.05 (except the group with uric acid level < 5 mg/dL).

一尿酸值大於5 mg/dL的三組，其相對危險比值各爲小於5 mg/dL這組的1.78 、4.54及7.62倍。但在男生族群中，只有尿酸值大於或等於9 mg/dL的這組，其代謝症候群相對危險比值爲尿酸值小於5 mg/dL這組的5.64倍且具統計意義(表二之二)。代謝症候群組成因子的數量，在尿酸值小於5 mg/dL這組，至多出現4個因子，但有3或4個因子的比率並不高，各爲0.2% 及1.9% ；出現3 、4 、5個因子的百分比，隨著尿酸值的增加而增加，沒有任何代謝症候群組成因子的百分比，則隨著尿酸值的上升而減少 ( 圖一 )。各組別依不同性別分析可發現，不論男女生，當尿酸值愈高時，代謝症候群盛行率就越愈高，但同組別的男女，其盛行率則沒有差別。各組別依母群體的年齡作四分位數分組，並校正性別、體重，肌酸肝值及白血球計數等因素後，發現除了尿酸值小於5 mg/dL的這組外，代謝症候群的盛行率皆隨年齡增加而增加 ( 圖二 )。

## 討論

本研究評估尿酸值高低與代謝症候群的相關性，發現尿酸值愈高的組別，代謝症候群的盛行率愈高，即使把影響尿酸值高低的多項因素列入考慮並加以校正後，仍然有同樣的趨勢。此類結果在某些文獻也發現，代謝症候群的盛行率與血清尿酸值呈正相關性[11]。血清尿酸值升高也常見於高三酸甘油酯[12-14]、高血壓[15]及高血糖[12,16]的個體，而這些因子正是代謝症候群的組成要素。血中過高的胰島素會增加腎小管對於鈉離子的再吸收，進而阻礙腎臟排出尿酸的能力[17]，造成血清尿酸值的上升，所以當血清中胰島素值越高時，尿酸值就可能越高。由於代謝症候群也是一種高

胰島素血症的狀態[18]，同時伴隨有高尿酸血症的情況就不足爲奇了。尿酸值過高可能導致血管內皮細胞的功能受損[19]，間接造成高血壓的發生。另外，尿酸值過高的個體也常合併有高三酸甘油酯血症，雖然原因仍然不明確，但可發現血清三酸甘油酯的濃度與尿酸值的高低呈現正相關性[12-14]。綜上所述，高尿酸血症常常伴隨著代謝症候群的各個組成因子，所以當尿酸值越高時，代謝症候群的盛行率是可能增加的。

代謝症候群代表內臟型肥胖、高血壓、血脂異常及胰島素阻抗導致的葡萄糖不耐症的群組，它是發展成動脈粥樣硬化、冠狀動脈心臟病及腦梗塞的共同病理機轉[8,20-22]。本研究發現，儘管尿酸值處於正常範圍內，代謝症候群的盛行率或組成因子的數量，仍是隨尿酸值升高而增加。此種代謝症候群組成因子出現的比率，隨尿酸值上升而有顯著性的增加的研究也曾有報導[23-24]，但在東方人的文獻報告則不多見。儘管一些研究顯示，高尿酸血症和心血管疾病的關係，在校正其它危險因子後並不足以讓尿酸構成心血管疾病的獨立危險因子[25-27]，Framingham研究也告訴我們尿酸值並非冠狀動脈心臟病的獨立相關危險因子[26]，但Tae等人發現，高尿酸值與高血壓，胰島素阻抗有獨立相關，甚至尿酸值仍處於正常範圍時，也可觀察到代謝症候群的各項因子隨尿酸值升高而增加[28]。Barbara等人發現，隨著代謝症候群組成份因子出現比率的增加，5年後心血管疾病及糖尿病的發生機會將隨之增加[20]。根據本研究，尿酸值大於或等於9 mg/dL這組在男女不同的族群裏，出現代謝症候群的相對危險比值各爲小於5 mg/dL那組的5.64及7.62倍，意味著高尿酸值的出現，尤其是尿酸值異常高時，併存代謝症候群的機會隨之大增，擁有組成因子的數量也提高。由此推論，高尿酸血症的個案其將來之心血管疾病及糖尿病的發生機會將高於一般正常人。因此，臨床醫師對於具有異常尿酸值的個案應提高警覺，必須發掘是否有代謝症候群各項因子的存在，並且及早積極介入預防及治療。

依性別分組計算，代謝症候群的盛行率，不論性別皆隨尿酸值的增加而顯著性增加，而在同等級的尿酸值組別中，男女性的盛行率相當。女性賀爾蒙會讓腎小管對於尿酸的再吸收減少，影響尿酸值的高低[29-30]；相反的，男性賀爾蒙的濃度則與尿酸值的高低有正相關性[31]。所以在同樣的生理條件下，男性的尿酸值應該大於女性。由此推論，在同等級的尿酸值分組下，代謝症候群各組成因子在女性出現的比率可能會大於男性，也就是說，代謝症候群的盛行率女性應該多於男性[11,32]。但本研究的樣本，在同一尿酸值的組別裡，男性的體重大於女性，導致代謝症候群的比率上升，故校正體重的因素後，男女性的盛行率沒有差異。年齡是決定代謝症候群的一個因素之一，年紀越大，其盛行率也越高[33-34]。本研究依年齡分組計算分析後，除了尿酸值小於5 mg/dL這組外，代謝症候群的盛行率隨年齡之增加而增加，其可能原因爲：尿酸值小於5 mg/dL這組的代謝症候群盛行率較低(2.1%)，造成再依年齡分組時，各分組個案數太少而沒有統計學上的意義。

本研究的所有資料來自醫院員工生日體檢資料，對於個人的生活型態、過去病史及是否服用藥物等因素，並沒有加以評估，故其結果可能有所誤差。其次，樣本皆來自中部某一醫學中心，可能存在取樣上的偏差，是否能應用於全臺灣族群可能需再進一步評估。另外，本研究爲一橫段式的研究，只是觀察到尿酸值高低與代謝症候群的盛行率有其相關性，無法知道其因果關係，是否尿酸值增加會直接造成代謝症候群的出現增加是無法推論的。

## 結論

本研究爲探討尿酸值高低與代謝症候群的關係：尿酸值越高，合併有代謝症候群的機會隨之大增，其各組成因子出現的比率也越高，即使尿酸值處於正常範圍內也有相同的現象。在同一尿酸值等級下，年紀較大時也可觀察到代謝症候群的可能性升高。此結果提醒臨床醫師，高度注意尿酸值其背後可能的意義，及早積極介入預防及治療心血管疾病的發生。至於要完全了解尿酸值高低與代謝症候群危險性的因果關係，需再進一步作前瞻性的研究分析。

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# Prevalence of the Metabolic Syndrome in Individuals with Hyperuricemia in Central Taiwan

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The occurrence of cardiovascular disease can be reduced by the screening and early treatment of metabolic syndrome. However, little information existed about whether different graded levels of uric acid in individuals with hyperuricemia will affect the prevalence of metabolic syndrome in Taiwan. The potential application of hyperuricemia was also studied little. To investigate the association between different uric acid levels and prevalence of metabolic syndrome, a total of 3065 subjects of all hospital staff, aged 18 to 81 years (635 males, 2430 females), who received health examination from Jan. 2004 to Dec. 2004 were enrolled in our study. The study showed that the prevalence of metabolic syndrome increased significantly across successive grade of serum uric acid concentrations, also the odds ratio (ORs) for the association between increasing levels of serum uric acid and the metabolic syndrome. Those who had serum uric acid concentrations ≧ 9 mg/dL had a 5.18-fold increased in risk of metabolic syndrome, as compaired with those with concentrations < 5 mg/dL. Percentage of the more metabolic syndrome components increased as the serum uric acid concentrations increased. The prevalence of metabolic syndrome in each subgroup of the same uric acid level persisted in increasing across successive quartiles of age. This study indicate that high serum uric acid confers increased risk or prevalence of metabolic syndrome even for those whose uric acid levels are in the normal range but with higher age. In clinical practice, since high serum uric acid is associated with higher prevalence of metabolic syndrome, we must think hyperuricemia as an important potential marker for cardiovascular disease. ( J Intern Med Taiwan 2008; 19: 325-330 )