# Prevalence of Hyperuricaemia in King Abdulaziz University, Jeddah

BAHAA A. ABALKHAIL, Dr. PH\*. WALEED A. MILAAT Dr. PH. and
MOHAMMAD N. KORDY Dr.PH.
*Department of Community Medicine & Primary Health Care, Faculty of Medicine &
Allied Sciences, King Abdulaziz University, Jeddah, Saudi Arabia*

ABSTRACT. A study was conducted in King Abdulaziz University to assess the mean uric acid level, the prevalence of hyperuricaemia among the University staff and to investigate the related risk factors. The mean uric acid level was 5.0 mg/dl (0.30 mmol/1); men had a higher mean value than women (5.7 mg/dl, 0.34 mmol/l vs 3.6mg/dl, 0.22 mmol/l), respectively. Hyperuricaemia was found in 10.2% of the population examined, still hyperuricaemia was higher among men (13.8%) than women (2.5%). To study the related risk factors, univariate and multiple logistic regression analysis were carried out. The risk factors that were significantly associated with hyperuricaemia included sex and body overweight. Men were at 7.1 more risk to develop hyperuricaemia than women and overweight individuals were at 3.8 more risk than normal weight individuals.

Keywords: Hyperuricaemia, Uric acid, Sex, Obesity, Risk factors.

## Introduction

Plasma uric acid is the end-product of the purine metabolism; it is genetically determined and influenced by multiple factors[1]. Elevation of plasma uric acid is called hyperuricaemia and its importance lies in its relation to two diseases: gout and coronary distribution of plasma uric acid in the different ethnic groups[3,4], and to establish the association between plasma uric acid and diseases such as coronary heart diseases [5-10] and hypertension[9-12]. Also, earlier studies have shown that subjects with impaired glucose intolerance had the highest plasma uric acid levels while there was a negative association between plasma uric acid and diabetes mellitus[13-16]. Obesity was one of the

risk factors previously identified to be the most common and important predictor of plasma uric acid[4,17-19].

The aim of the present study was to assess the mean uric acid level, the prevalence of hyperuricaemia among the staff of King Abdulaziz University (KAU) and to investigate the possible related risk factors.

## Material and Methods

A multi-stage random sample of KAU teaching staff and employees was selected. A first stage stratified random sampling with three groups, proportional allocation was performed to determine the proportion of the total for each of the three groups: college, deanship and administration staff. This was followed by a second stage systematic sampling to select the required number of subjects in each group based on its size.

Data was collected using three methods: an in-person interviewing with a structured questionnaire to collect information on demography, life style, dietary habits and diseases history; direct observation for physical examination and anthropometric measures; and blood analysis using Refletron[R] Boehringer Mannheim GmbH[20] for cholesterol (mg/dl, or mmol/l) and uric acid (mg/dl, or mmol/l) taking fresh capillary blood samples. The Refletron[R] was calibrated daily and the test for uric acid measurement depends on the presence of uricase which oxidises uric acid in the presence of oxygen.

Hyperuricaemia was defined as uric acid level of >7.0mg/dl (>0.42mmol/l) for men and >6mg/dl (>0.36mmol/l) for women[13,21]. Hypercholesterolaemia was defined as cholesterol level of $\geq$240mg/dl[22-24]. The body mass index was calculated as weight in kg/ (Height in m)$^2$ and classified into normal (>27.2 for men and >26.9 for women) and overweight ($\geq$27.2 for men and $\geq$26.9 for women), respectively[25]. Hypertension was defined as any case with systolic blood pressure $\geq$140 mmHg and/or diastolic blood pressure $\geq$95 mmHg. Diabetic subjects were those who reported to have diabetes mellitus and receiving regular medical supports. High fat intake was considered according to the frequency of reported organ meat consumption.

Data analysis was carried out using SPSS/PC computer package software. The procedures for statistical analysis were as follows: 1) t-test and ANOVA to detect significant differences between means; 2) chi-square test to determine the association between each independent variable(s) and dependent variable(s) for univariate analysis; 3) multiple logistic regression analysis was done, the dependent variable was hyperuricaemia while the independent variables were age, sex, body mass index, fat intake, hypercholesterolaemia and diabetes mellitus.

## Results

A total of 863 participants with known blood uric acid level were included in the study. There were 586 (67.9%) men and 277 (32.1%) women. Table 1 shows the distribution of the mean uric acid and prevalence of hyperuricemia by age and sex. The mean uric acid was 5.0 mg/dl, (0.30 mmol/l) (95% CI=4.9-5.1) and the prevalence of

hyperuricaemia was found to be 10.3%. Men had a significantly (P<0.001) higher mean uric acid of 5.7 mg/dl, (0.34 mmol/l) (95% CI=5.6-5.8) than women who showed a mean value of 3.6 mg/dl, (0.22 mmol/l) (95% CI=3.4-3.7), respectively.

TABLE 1. Distribution of the mean uric acid and prevalence of hyperuricemia by age and sex.

| Men | | | | | |
|---|---|---|---|---|---|
| Age | Examined no. | Mean | 95% CI* | Prevalence of hyperuricemia no. | (%) |
| 20-29 years | 61 | 5.5 | 5.2-5.8 | 5 | 8.2 |
| 30-39 years | 192 | 5.7 | 5.5-5.9 | 30. | 15.6 |
| 40-49 years | 195 | 5.7 | 5.5-5.9 | 30 | 15.4 |
| 50 + years | 138 | 5.7 | 5.5-5.9 | 16 | 11.6 |
| Total | 586 | 5.7 | 5.6-5.8 | 81 | 13.8 |
| Women | | | | | |
| 20-29 years | 49 | 3.1 | 2.8-3.3 | 0 | 0.0 |
| 30-39 years | 112 | 3.4 | 3.2-3.6 | 1 | 0.9 |
| 40-49 years | 90 | 4.0 | 3.6-4.3** | 4 | 4.4 |
| 50 + years | 26 | 3.9 | 3.4-4.5 | 2 | 7.7 |
| Total | 277 | 3.6 | 3.4-3.7 | 7 | 2.5 |
| Total | | | | | |
| 20-29 years | 110 | 4.4 | 4.1-4.7 | 5 | 4.5 |
| 30-39 years | 304 | 4.8 | 4.7-5.0 | 31 | 10.2 |
| 40-49 years | 285 | 5.2 | 5.0-5.3 | 34 | 11.9 |
| 50 + years | 164 | 5.4 | 5.2-5.6 | 18 | 11.0 |
| Total | 863 | 5.0 | 4.9-5.1 | 88 | 10.2 |

\* 95%CI = 95% confidence interval
\*\*Significant change according to the 95% confidence interval

There was no relation detected between the mean uric acid and age in men. However, the mean uric acid in women was found to increase significantly with age and women of 40 years and over showed a significantly higher mean uric acid level than the younger groups (Figure 1). Despite this increase in mean uric acid with age, the mean values in women were less than that in men and this was seen for all age groups.

The significant correlates of hyperuricaemia in the univariate analysis (Table 2) were sex and body mass index. Men were 6.2 times more at risk of hyperuricaemia than women. Overweight subjects had 3.6 times higher rate than normal individuals. The association of age, fat intake, cholesterol and diabetes mellitus to hyperuricaemia did not reach statistical significance. Although hypertensives were at 1.5 more risk of hyperuricaemia than the normotensives, the results did not reach statistical significance.

The logistic regression model for hyperuricaemia is shown in Table 3. Seven independent variables were analyzed, the significantly related factors to hyperuricaemia were still sex (OR = 7.1, 95% CI = 3.0-16.8) and body mass index (OR = 3.8, 95% CI = 2.2-6.4), respectively.
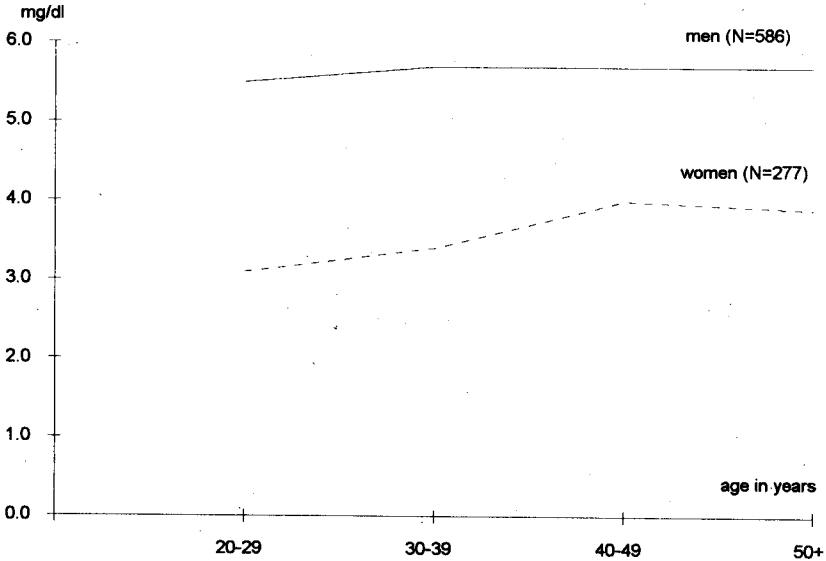
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FIG. 1. Distribution of the mean uric acid by age and sex.

TABLE 2. Correlates of hyperuricemia in univariate analysis.

| Correlates | Categories | Hyperuricemia | | Odds ratio | 95%CI* for |
|---|---|---|---|---|---|
| | | Yes | No | OR | OR |
| Age | | | | | |
| | 20-29 years | 5 | 105 | 1.0 | – |
| | 30-39 years | 31 | 273 | 2.4 | 0.9-7.2 |
| | 40-49 years | 34 | 251 | 2.8 | 1.0-8.5 |
| | 50 + years | 18 | 146 | 2.6 | 0.9-8.3 |
| Sex** | | | | | |
| | women | 7 | 270 | 1.0 | – |
| | men | 81 | 505 | 6.2 | 2.7-14.8 |
| Body mass index** | | | | | |
| | normal | 21 | 410 | 1.0 | – |
| | overweight | 65 | 357 | 3.6 | 2.1-6.1 |
| Fats | | | | | |
| | normal | 29 | 273 | 1.0 | – |
| | high intake | 59 | 502 | 1.1 | 0.7-1.8 |
| Blood pressure | | | | | |
| | < 140/95mmHg | 63 | 612 | 1.0 | – |
| | ≥ 140/95mmHg | 25 | 160 | 1.5 | 0.9-2.6 |
| Cholesterol | | | | | |
| | < 240mg/dl | 83 | 691 | 1.0 | – |
| | ≥ 240mg/dl | 5 | 74 | 0.6 | 0.2-1.5 |
| Diabetes mellitus | | | | | |
| | normal | 82 | 707 | 1.0 | – |
| | diabetic | 6 | 68 | 0.8 | 0.3-1.9 |

* 95%CI = 95% confidence interval
**$P < 0.001$

TABLE 3. Logistic regression analysis of hyperuricemia.

| Risk factors | Categories | Odds ratio | 95%CI* | P |
|---|---|---|---|---|
| Age | | | | 0.9226 |
| | < 40 years | 1.0 | | |
| | 40 + years | 1.1 | 0.6-1.7 | |
| Sex | | | | 0.0000 |
| | women | 1.0 | | |
| | men | 7.1 | 3.0-16.8 | |
| Body mass index | | | | 0.0000 |
| | normal | 1.0 | | |
| | overweight | 3.8 | 2.2-6.4 | |
| High fats in diet | | | | 0.7913 |
| | no | 1.0 | | |
| | yes | 0.9 | 0.6-1.6 | |
| Blood pressure | | | | 0.7842 |
| | < 140/95mmHg | 1.0 | | |
| | ≥ 140/95mmHg | 1.1 | 0.6-1.8 | |
| Cholesterol | | | | 0.3711 |
| | < 240 mg/dl | 1.0 | | |
| | 240 + mg/dl | 0.6 | 0.2-1.7 | |
| Diabetes mellitus | | | | 0.2544 |
| | normal | 1.0 | | |
| | diabetic | 0.6 | 0.2-1.5 | |

*95%CI=95% confidence interval

## Discussion

In the previous studies[26-28] in Saudi Arabia, the mean uric acid level ranged between 4.3 to 5.8 mg/dl for men and from 3.4 to 4.8 mg/dl for women. Our results were nearly similar to such studies, as the mean uric acid measured was 5.7 mg/dl, (0.34 mmol/l) (range: 5.6-5.8 mg/dl) for men; 3.6 mg/dl, (0.22 mmol/l) (range: 3.4-3.7 mg/dl) for women and the total mean uric acid was 5.0 mg/dl (range: 4.9-5.1 mg/dl). The mean uric acid level was significantly higher in men than women which confirms the results of previous study on Saudi population[27].

Our results compared with other studies[29] show no significant influence of age on the mean uric acid level in men. However, the mean uric acid level in women was found to increase significantly with age. In the present study, women of 20-39 years showed nearly unchanged mean uric acid values. Then, the mean uric acid level showed an increase for older women. Despite this rise, which appears to be correlated with age of menopause, suggesting a possible hormonal control; values in women did not reach those in men of comparable age.

The strongest factors related to hyperuricaemia in the univariate analysis and the multiple logistic regression model were sex and body mass index. The multiple logistic re-

gression analysis has shown that men were at 7.1 times more at risk to develop hyper-uricaemia that women which confirms previous published findings[3,29-30].

Overweight was previously published[4, 30] to be associated with hypertension and hyperuricaemia. The results support this finding as overweight individuals were at 3.8 more risk to develop hyperuricaemia than normal weight individuals.

Several studies revealed the association of hypertension and hyperuricaemia[11, 31, 32]. In the present study this relation did not reach statistical significance. The correlation of hypertension to hyperuricaemia may be related to a renal disease[33] which was not reported by the participants of the present study.

In previous studies[4, 33] the association between hypercholesterolaemia and hyper-uricaemia was not proved and our findings support such observation. Also our results did not show the association of hyperuricaemia to high fat consumption which was detected in previously published studies[30].

Some studies revealed a negative association between diabetes mellitus and hyper-uricaemia[13,16]; this relation was seen in our results but did not reach statistical significance.

Nevertheless, the present study has revealed that hyperuricaemia is strongly associated with sex and overweight and probably with hypertension. The results of this epidemiological study have raised the possibility that non-pharmacological primary prevention strategies may be feasible. For example, men with a history of hypertension and weight gain in adulthood are at the highest risk for developing hyperuricaemia. These men should be counselled to lose weight, have their hypertension controlled and advised to increase their physical activities.

## Acknowledgement

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# مدى انتشار ارتفاع نسبة حمض اليوريك في الدم بجامعة الملك عبد العزيز – جـدة

**بهاء أبا الخيل ، وليد ملعاط ، و محمد كردي**

*قسم طب المجتمع ، كلية الطب والعلوم الطبية ، جامعة الملك عبد العزيز*
*جـــــدة – المملكة العربية السعودية*

**المستخلص .** الهدف من هذه الدراسة هو معرفة مستوى حامض اليوريك بالدم ومدى انتشار ارتفاع نسبته بالدم والعوامل المصاحبة له بين العاملين بجامعة الملك عبد العزيز بجدة . ولقد تم القيام بمسح حقلي بأخذ عينة عشوائية على عدة مراحل من ثلاث مجاميع من العاملين بالجامعة متمثلة في عمادات ، كليات وإدارات خلال فترة عام ١٩٩٦م . وتم جمع البيانات بثلاث طرق وهي : مقابلة شخصية وقياسات أنثربومترية وقياسات في الدم (الكوليسترول وحامض اليوريك) ، ولدراسة العوامل المصاحبة لارتفاع نسبة حامض اليوريك بالدم جرى استخدام التحليل المنفرد والمشترك للعوامل إحصائيًا . ولقد وجد أن مستوى متوسط حامض اليوريك بالدم هو ٥ مجم/ دل (٣,٠ م م/ل) والرجال لهم أعلى نسبة متوسط مقارنة مع الأناث (٧,٥ مجم/ دل (٣٤,٠ م م/ل) مقابل ٦,٣ مجم/ دل (٢٢,٠ م م/ل)) . ارتفاع نسبة حامض اليوريك بالدم مثَّل ١٠,٢٪ من العينة وأيضًا كان ارتفاع نسبة حامض اليوريك بالدم أكثر في الرجال من الإناث ١٣,٨٪ من عينة الرجال مقابل ٢,٥٪ من عينة الإناث . وأهم النتائج التي وجدت عند دراسة العوامل المصاحبة لارتفاع نسبة حامض اليوريك بالدم هي العلاقة بينه وبين الجنس والوزن حيث أن الرجال كانوا ١,٧ مرة أكثر عرضة لحدوث ارتفاع في نسبة حامض اليوريك بالدم مقارنة بالإناث ، والبدناء ٣,٨ مرة أكثر عرضة لارتفاع نسبة حامض اليوريك بالدم مقارنة بغير البدناء ، وعلى هذا الأساس يمكن عمل استراتيجيات على مستوى الوقاية الأولية لارتفاع نسبة حامض اليوريك بالدم بواسطة طرق غير دوائية .