

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/l); 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

Correspondence & reprint requests to: Dr. Bahaa A. Abalkhail, P.O. Box 6615, Jeddah 21452, Saudi Arabia.
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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 ≥ 240 mg/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 (≥ 27.2 for men and ≥ 26.9 for women), respectively^[25]. Hypertension was defined as any case with systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 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.

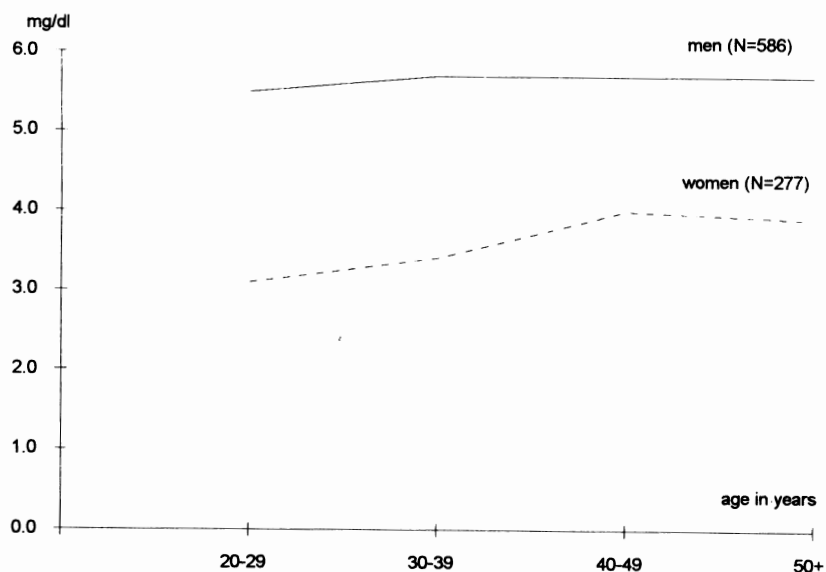


FIG. 1. Distribution of the mean uric acid by age and sex.

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	< 40 years	1.0		0.9226
	40 + years	1.1	0.6-1.7	
Sex	women	1.0		0.0000
	men	7.1	3.0-16.8	
Body mass index	normal	1.0		0.0000
	overweight	3.8	2.2-6.4	
High fats in diet	no	1.0		0.7913
	yes	0.9	0.6-1.6	
Blood pressure	< 140/95mmHg	1.0		0.7842
	≥ 140/95mmHg	1.1	0.6-1.8	
Cholesterol	< 240 mg/dl	1.0		0.3711
	240 + mg/dl	0.6	0.2-1.7	
Diabetes mellitus	normal	1.0		0.2544
	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 hyperuricaemia than 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 hyperuricaemia 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 hyperuricaemia^[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.

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References

- [1] **Tietz WW.** *Fundamentals of Clinical Chemistry*. Philadelphia, London: WB Saunders Co., 1982.
- [2] **Roubenoff R.** Gout and hyperuricemia. *Rheum Dis Clin N. Am* 1990; **16**: 539-550.
- [3] **Hall AP, Barry PE, Dawber TR.** Epidemiology of gout and hyperuricemia: a long term population study. *Am J Med* 1967; **42**: 27-37.
- [4] **Yano K, Rhoads GG, Kgan A.** Epidemiology of serum uric acid among 8,000 Japanese American men in Hawaii. *J Chronic Dis* 1977; **30**: 171-184.
- [5] **Hall AP.** Correlation among hyperuricemia, hypercholesterolemia, coronary disease and hypertension. *Arthritis Rheum* 1965; **8**: 846-852.
- [6] **Welborn TA, Cumpston GN, Cullen KJ.** The prevalence of coronary heart disease and associated factors in an Australian rural community. *Am J Epidemiol* 1969; **89**: 521-536.
- [7] **Klein R, Klein BE, Cornioni JC.** Serum uric acid: its relationship to coronary heart disease, in Evans County, Georgia. *Arch Intern Med* 1973; **132**: 401-410.

- [8] **Medalie JH, Kahn HA, Neufeld HN.** Five year myocardial infarction incidence II. Association of single variables to age and birthplace. *J Chronic Dis* 1973; **26**: 329-349.
- [9] **Hagerup LM.** Coronary heart disease risk factors in men and women: from the population study in Glostrup, Denmark. *Acta Med Scand* 1973; **557**: 52-55.
- [10] **Myers AR, Epstein FH, Dodge HJ.** The relationship of serum uric acid to risk factors in coronary heart disease. *Am. J Med* 1968; **45**: 520-528.
- [11] **Breckenridge A.** Hypertension and hyperuricemia. *Lancet* 1966; **1**: 15-18.
- [12] **Stamler J, Berkson DM, Dyer AL.** Relationship of multiple variables to blood pressure: findings from four Chicago epidemiologic studies. in: **Paul O**, ed. *Epidemiology and control of hypertension*. New York: Stratton Intercontinental Medical book Corporation, 1975; 307-352.
- [13] **Tuomilehto J, Zimmet P, Wolf E.** Plasma uric acid level and its association with diabetes mellitus and some biologic parameters in a biracial population in Fiji. *Am J Epidemiol* 1988; **108**: 321-336.
- [14] **Herman JB, Medalie JH, Goldour U.** Diabetes, prediabetes and uricaemia. *Diabetologia* 1976; **12**: 47-52.
- [15] **Herman JB, Goldour U.** Uric acid and diabetes: observations in population study. *Lancet* 1982; **2**: 240-243.
- [16] **Mikkelsen WM.** The possible association of hyperuricemia and/or gout with diabetes mellitus. *Rheum* 1965; **8**: 853- 859.
- [17] **Jackson L, Taylor R, Faaiuso S.** Hyperuricaemia and gout in Western Samoans. *J Chronic Dis* 1981; **34**: 65-75.
- [18] **Goldbourt U, Medalie JH, Herman JB.** Serum uric acid: correlation with biochemical, anthropometric, clinical and behavioral parameters in 10,000 Israeli men. *J Chronic Dis* 1980; **33**: 435-443.
- [19] **Chang NC:** Rheumatic diseases in China. *J Rheumatol* 1983; **10**: 41-45.
- [20] **Merdes H, Rittersdorf W, Werner W.** *Clin Chem* 1985; **31**: 921-923.
- [21] **Prior IAM, Rose BS, Harvey HPB.** Hyperuricemia, gout and diabetic abnormality in Polynesian people. *Lancet* 1966; **1**: 333-338.
- [22] **National Cholesterol Education Program Expert.** Panel on detection, evaluation and treatment of high blood cholesterol in adults. *Arch Intern Med* 1988; **148**: 36-69.
- [23] **Burke GL, Sprafka JM, Folson AR.** Trends in serum cholesterol levels from 1980-1987. The Minnesota Heart Survey. *N. Engl J Med* 1991; **314**: 941-946.
- [24] **Kannel WB, Castell WP, Gordon T.** Serum cholesterol, lipoproteins and risk of coronary heart diseases. *Ann Intern Med* 1971; **74**: 1-12.
- [25] **The Metropolitan 1983 Data** (Van Itallie 1985; NIH 1985).
- [26] **Khoja SM, Saleem AM, Taha AM and Hakim NA.** Plasma lipid levels of a selected Saudi Arabia Population in the Western Region. *Saudi Med J* 1993; **14**: 315-321.
- [27] **El-Hazmi MAF, Warsy AS.** Plasma uric acid in Saudi Arabs. *Saudi Med J* 1995; **16**: 488-492.
- [28] **Bacchus R, Kilshaw BH, Madkour M, Al-Bassam S, Al-Farhan B.** Preliminary studies on a reference range for Saudi Arabian males serum uric acid. *Saudi Med J* 1980; **1**: 160-164.
- [29] **Mikkelsen WM, Dodge HJ, Valkenburg H.** The distribution of serum uric values in a population unselected as to gout or hyperuricemia: Tecumseh, Michigan, 1959-1960. *Am J Med* 1965; **39**: 243-251.
- [30] **Chou P, Soong LN, Lin HI.** Community-based epidemiological study on hyperuricemia in Pu-Li, Taiwan. *Jformos Med Assoc* 1993; **92**: 597-602.
- [31] **Cannon PJ, Stason WB, DEmartini FE.** Hypertension in primary and renal hypertension. *New Engl J Med* 1966; **175**: 457.
- [32] **Garrick R, Bauer GE, Ewan CE.** Serum uric acid in normal and hypertensive Australian subjects: from a continuing epidemiological survey on hypertension commenced in 1955. *NZ Med J* 1972; **2**: 351.
- [33] **Kelly WN, Fox IH.** Gout and related disorders of purine metabolism. In: *Textbook of Rheumatology*, 2nd ed. Philadelphia: WB Saunders, 1985; 1359-1398.

مدى انتشار ارتفاع نسبة حمض اليوريك في الدم بجامعة الملك عبد العزيز - جدة

بهاء أبا الخيل ، وليد ملعاط ، و محمد كردي

قسم طب المجتمع ، كلية الطب والعلوم الطبية ، جامعة الملك عبد العزيز
جدة - 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 حقلّي بأخذ عينة عشوائية على عدة مراحل من ثلاث مجاميع من العاملين بالجامعة متمثلة في عمادات ، كليات وإدارات خلال فترة عام ١٩٩٦ م . وتم جمع البيانات بثلاث طرق وهي : مقابلة شخصية وقياسات أنثروبومترية وقياسات في الدم (الكوليسترول وحامض اليوريك) ، ولدراسة العوامل المصاحبة لارتفاع نسبة حامض اليوريك بالدم جرى استخدام التحليل المنفرد والمشارك للعوامل إحصائياً . ولقد وجد أن مستوى متوسط حامض اليوريك بالدم هو ٥ مجم/ دل (٣ , ٠ م /م ل) والرجال لهم أعلى نسبة متوسط مقارنة مع الإناث (٧ , ٥ مجم/ دل (٤ , ٣٠ م /م ل) مقابل ٦ , ٣ مجم/ دل (٢٢ , ٠ م /م ل) . ارتفاع نسبة حامض اليوريك بالدم مثل ٢ , ١٠٪ من العينة وأيضاً كان ارتفاع نسبة حامض اليوريك بالدم أكثر في الرجال من الإناث ٨ , ١٣٪ من عينة الرجال مقابل ٥ , ٢٪ 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 ٧ , ١ مرة أكثر عرضة لحدوث ارتفاع في نسبة حامض اليوريك بالدم مقارنة بالإناث ، والبدناء ٨ , ٣ 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 .