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DEMOGRAPHIC DETERMINANTS AND PREVALENCE OF ABNORMAL SERUM URIC ACID LEVELS AMONG APPARENTLY HEALTHY NIGERIAN UNIVERSITY STUDENTS

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Abstract

Serum uric acid levels are influenced by demographic factors including gender, age, and lifestyle behaviors. Abnormal levels are associated with gout, cardiovascular disease, and metabolic disorders. However, population-specific data among young Nigerian adults remains limited. This study aimed to determine the prevalence of abnormal serum uric acid levels and their association with demographic characteristics among apparently healthy Medical Laboratory Science students at the University of Jos, Nigeria. A cross-sectional study was conducted involving 100 randomly selected apparently healthy students (54 males, 46 females). Serum uric acid was analyzed using the enzymatic uricase-peroxidase method. Data were analyzed using one-way ANOVA with SPSS version 21. Statistical significance was set at $p < .05$. The overall prevalence of hyperuricaemia was 16%, with females showing significantly higher rates (26.1%) compared to males (7.4%). Hypouricaemia was observed in only 1% of participants. Mean serum uric acid levels for males and females were 5.3 ± 1.5 mg/dL and 5.0 ± 1.5 mg/dL respectively ($p > .05$). Age-specific means ranged from 4.5 ± 1.2 mg/dL (31–35 years) to 5.7 ± 1.4 mg/dL (≤20 years), with no significant differences across groups ($p = .82$). Academic level, physical exercise, alcohol consumption, and cigarette smoking did not significantly influence uric acid levels ($p > .05$ for all). While mean serum uric acid levels were within normal ranges, the 16% prevalence of asymptomatic hyperuricaemia—particularly among females—indicates a need for routine screening and early lifestyle interventions. Demographic factors did not significantly influence uric acid levels, suggesting that metabolic stability exists across subgroups.

Keywords: Hyperuricaemia; Uric acid; Demographics; Prevalence; Nigerian students; Gender differences

Introduction

Uric acid is the end product of purine metabolism in humans, derived from both endogenous synthesis and exogenous dietary sources (Martin, 2012). In most mammals, uric acid is further metabolized to allantoin by the enzyme uricase; however, humans lack this enzyme, making them susceptible to hyperuricaemia

(Rashika & Hatem, 2017). Approximately 70% of uric acid excretion occurs through the kidneys, with the remainder eliminated via the gastrointestinal tract (Veronique & Igor, 2008).

The normal reference ranges for serum uric acid are generally accepted as 3.4–7.0 mg/dL for males and 2.4–5.7 mg/dL for females (Desideri et al., 2014). Hyperuricaemia, defined as levels exceeding 7.0 mg/dL in males and 6.0 mg/dL in females (Obermayr et al., 2008), has been associated with gout, hypertension, cardiovascular disease, type 2 diabetes mellitus, and chronic kidney disease (Borghi et al., 2014; Dehghan et al., 2008). Hypouricaemia, defined as levels below 2 mg/dL, though less common, may indicate renal tubular dysfunction, xanthine oxidase deficiency, or other pathological conditions (Ogino et al., 1991).

Several demographic and lifestyle factors influence serum uric acid levels. Males typically exhibit higher levels than females due to the uricosuric effects of estrogen and differences in renal handling (Mumford et al., 2013). Age-related increases have been attributed to declining renal function (Grayson et al., 2011). Dietary factors including purine-rich foods (meat, seafood, legumes) and alcohol consumption, particularly beer, contribute to elevated uric acid (Brule et al., 1988; Yu et al., 2008). Physical exercise can transiently increase uric acid through ATP degradation during muscular exertion (Green & Fraser, 1988).

Despite the well-established associations between abnormal uric acid levels and systemic diseases, limited epidemiological data exist regarding serum uric acid distribution among young Nigerian adults, particularly university students. This knowledge gap hinders the development of population-specific reference ranges and preventive strategies.

This study aimed at determine the mean serum uric acid levels and their distribution across demographic subgroups, evaluate the prevalence of hyperuricaemia and hypouricaemia. and assess the association between demographic factors (gender, age, academic level) and serum uric acid levels.

Materials and methods

Study Design and Population

A cross-sectional study was conducted among 100 apparently healthy Medical Laboratory Science students of the University of Jos, Nigeria. Participants were randomly selected following informed consent.

Inclusion and Exclusion Criteria

Inclusion: Apparently healthy Medical Laboratory Science students who provided written informed consent.

Exclusion: Students with gouty arthritis, diagnosed metabolic disorders, or non-MLS students.

Sample Collection and Laboratory Analysis

Venous blood samples (5 mL) were collected into plain tubes, centrifuged at 3000 rpm for 5 minutes, and serum separated. Uric acid estimation was performed using the enzymatic uricase-peroxidase method as described by Fossati et al. (1980).

Statistical Analysis

Data were analyzed using SPSS version 21. One-way ANOVA was employed for group comparisons. Statistical significance was set at $p < .05$.

Results

Table 1: Demographic Characteristics of Study Participants

Characteristics	**Number**	**Percentage (%)**
Gender		
Male	54	54.0
Female	46	46.0
Total	100	100
Age group (years)		
≤20	5	5.0
21–25	55	55.0
26–30	24	24.0
31–35	9	9.0
36–40	4	4.0
≥41	3	3.0
Total	100	100
Level		
200	39	39.0
300	23	23.0
400	23	23.0
500	15	15.0
Total	100	100

Physical exercise		
Yes	75	75.0
No	25	25.0
Total	100	100
Alcohol intake		
Yes	21	21.0
No	79	79.0
Total	100	100
Cigarette smoking		
Yes	3	3.0
No	97	97.0

A total of 100 students participated (54 males, 46 females). Age distribution showed that 55% were aged 21–25 years, 24% were 26–30 years, and the remaining distributed across other age groups. Academic level distribution was: 200 level (39%), 300 level (23%), 400 level (23%), and 500 level (15%). Regarding lifestyle factors, 75% engaged in regular physical exercise, 21% consumed alcohol, and only 3% smoked cigarettes.

Table 2: Mean Serum Uric Acid Levels by Demographic Characteristics

Characteristics	**Frequency**	**Mean Uric Acid (mg/dL)**	**SD**	***p*-value**	***F*-value**
Gender					
Male	54	5.3	1.5	.5886	0.5329
Female	46	5.0	1.5		
Total	100				
Age group					
≤20	5	5.7	1.4	.8214	0.4804
21–25	55	5.1	1.4		

26–30	24	5.2	1.6		
31–35	9	4.5	1.2		
36–40	4	5.1	1.1		
≥41	3	4.9	2.0		
Total	100				

Mean serum uric acid levels showed no statistically significant differences across gender, age groups, academic levels, or lifestyle categories ($p > .05$ for all comparisons).

Table 3: Prevalence of Hyperuricaemia and Hypouricaemia

Characteristics	**Number**	**Low (%)**	**Normal (%)**	**High (%)**
Gender				
Male	54	0 (0.0)	50 (92.6)	4 (7.4)
Female	46	1 (2.2)	33 (71.7)	12 (26.1)
Total	100	1	83	16
Age group				
≤20	5	0 (0.0)	4 (80.0)	1 (20.0)
21–25	55	1 (1.8)	44 (80.0)	10 (18.2)
26–30	24	0 (0.0)	22 (91.7)	2 (8.3)
31–35	9	0 (0.0)	8 (88.9)	1 (11.1)
36–40	4	0 (0.0)	3 (75.0)	1 (25.0)
≥41	3	0 (0.0)	2 (66.7)	1 (33.3)
Total	100	1	83	16

Note. Normal range of uric acid: Men 3.4–7.0 mg/dL; Women 2.4–5.7 mg/dL.

Using sex-specific reference ranges (males: 3.4–7.0 mg/dL; females: 2.4–5.7 mg/dL), the overall prevalence of hyperuricaemia was 16%, while 83% had normal levels and 1% had hypouricaemia. Females demonstrated a substantially higher prevalence of elevated uric acid (26.1%) compared to males (7.4%).

Discussion

This study provides novel data on serum uric acid levels and the prevalence of abnormal values among apparently healthy Nigerian university students. The overall prevalence of hyperuricaemia (16%) is comparable to rates reported in other populations (Song et al., 2018) but concerning given the young age and asymptomatic presentation of participants.

The most striking finding was the marked gender disparity in hyperuricaemia prevalence: 26.1% of females had elevated uric acid compared to only 7.4% of males. This contrasts with established literature reporting higher uric acid levels in males (Bolarin & Bolarin, 2005; Martin, 2012). This apparent paradox may be explained by several factors. First, females have a lower normal reference range (2.4–5.7 mg/dL versus 3.4–7.0 mg/dL for males), meaning that a given absolute value is more likely to be classified as elevated in females. Second, the premenopausal status of most female participants may influence hormonal fluctuations affecting uric acid excretion (Mumford et al., 2013). Third, dietary habits—particularly increased consumption of purine-rich foods among female students—may contribute to this pattern, though this was not specifically assessed in the present study.

The absence of significant gender differences in mean uric acid levels (5.3 mg/dL for males versus 5.0 mg/dL for females) further supports the importance of using sex-specific cut-offs rather than a single universal threshold. This finding has implications for clinical practice, emphasizing the need for laboratory reference ranges to be stratified by sex and, where possible, by age and population.

Age-related analyses revealed no significant differences across groups, although the 21–25 years age group had the largest number of participants with elevated levels (18.2%). The lack of statistical significance may reflect the relatively narrow age range of the study population, with 84% of participants aged ≤30 years. The small sample sizes in older age groups (≥31 years, n = 16) limited statistical power to detect age-related trends.

The lack of association between lifestyle factors (physical exercise, alcohol consumption, cigarette smoking) and uric acid levels warrants careful interpretation. The 21% prevalence of alcohol consumption is lower than in many university populations, and the very low smoking prevalence (3%) limited the ability to detect effects. Additionally, blood samples were not collected immediately after exercise, which may explain the absence of the transient exercise-induced elevation reported by Green and Fraser (1988).

The variation across academic levels, though not statistically significant, showed highest mean levels among 300-level students (5.5 mg/dL). While speculative, this may reflect transitional changes associated with mid-undergraduate years, including academic stress and dietary changes. Longitudinal studies following students across their academic careers would better characterize these patterns.

Clinical and Public Health Implications

The 16% prevalence of asymptomatic hyperuricaemia among young adults has several implications:

1. Early Identification: Routine uric acid screening during university health check-ups could identify at-risk individuals before complications develop.

2. Lifestyle Interventions: Modifiable risk factors including dietary modification (reduced purine intake, increased hydration) and weight management should be emphasized (Richette & Bardin, 2010).

3. Sex-Specific Reference Ranges: Laboratories should implement sex-specific normal ranges to avoid misclassification and ensure appropriate clinical decision-making.

4. Long-Term Cardiovascular Risk: Given the association between hyperuricaemia and cardiovascular disease (Borghi et al., 2014), early detection provides an opportunity for primary prevention.

Conclusion

Serum uric acid levels among apparently healthy Medical Laboratory Science students at the University of Jos were generally within normal physiological ranges. However, the 16% prevalence of asymptomatic hyperuricaemia—particularly among females (26.1%)—highlights the need for routine screening and early lifestyle interventions. Demographic factors including gender, age, academic level, physical exercise, alcohol consumption, and smoking did not significantly influence uric acid levels. The findings support the use of sex-specific reference ranges in clinical practice and underscore the importance of population-specific epidemiological data for public health planning.

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Conflict of Interest

The authors declare no conflicts of interest.

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