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Demographic And Lifestyle Correlates of Serum Uric Acid Levels among Patients in Khairpur Mir's, Sindh

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Abstract

Hyperuricemia is a clinical position related to metabolic syndrome, cardiovascular and gout pathologies, mostlyprovoked by modern daily life shifts. Unlike most mammals, humans lack a functional uricase enzyme to degrade uric acid further into allantoin. This study aimed to investigate the prevalence of normal and abnormal serum uric acid levels across different age groups, genders, dietary profiles, and physical activity tiers within the population of Khairpur Mir's. A descriptive cross-sectional study was conducted involving 169 randomly selected individuals. Dietary and activity profiles were evaluated using an administered lifestyle questionnaire. Serum uric acid was determined spectrophotometrically utilizing an enzymatic uricase-based protocol at 293 nm. Data were processed using Microsoft Excel and SPSS version 24.Of the 169 subjects, 50.3% were male and 49.7% were female. Females exhibited a higher overall hyperuricemic prevalence (13.0%) compared to males (10.1%). Age-stratified breakdown showed that the highest concentration of abnormal levels occurred within the 51–70 age group, affecting 53% of females and 30% of males in that tier. While omnivorous diets correlated with high baseline patient numbers, vegetarian males surprisingly demonstrated a 50% hyperuricemia rate within their small cohort. Crucially, subjects reporting zero physical activity demonstrated significantly elevated risks of abnormal uric acid levels.Advanced age,

female gender post-menopausal status and sedentary lifestyles are strong risk factors for hyperuricemia in the target population. Public health campaigns focusing on physical mobilization and dietary regulation are essential to prevent secondary metabolic illnesses.

Introduction

Uric acid ($C_5H_4N_4O_3$, molecular mass: 168 Da) is a weak organic acid resulting from the metabolic degradation of internal or dietary purine nucleotides. In the human hepatic, muscular, intestinal, and vascular pathways, purines are broken down enzymatically via adenosine and guanine branches [1-4]. Adenosine monophosphate (AMP) transitions sequentially into adenosine, inosine, hypoxanthine, and xanthine [5-8]. Concurrently, guanine monophosphate (GMP) breaks down into guanosine and guanine, which converts directly to xanthine. The enzyme xanthine oxidase drives the final oxidation of hypoxanthine and xanthine into uric acid [9].

At a physical pH, uric acid circulates as an ionized monosodium urate (MSU) salt [10,11]. Due to mutations occurring approximately 5 to 20 million years ago during hominoid evolution, the gene encoding the urate oxidase (uricase) enzyme became permanently inactivated in humans [12,13]. Therefore humans cannot further degrade uric acid to the more soluble metabolite allantoin and therefore have baseline plasma urate concentrations approximately 10 fold higher than other non-primate mammals [14,15]. This evolutionary trait has excellent antioxidant advantages, on the order of the scavenging of singlet oxygen by ascorbic acid but with a physiological cost [16]. Super-saturation is the condition where serum concentrations are above the solubility threshold of 6.8 mg/dL in females or 7.0 mg/dL in males, leading to precipitation of MSU crystals into synovial fluid and tissues. This pathogenesis results in acute or chronic tophaceous gout, nephrolithiasis and vascular abnormalities [17-19].

Hyperuricemia is directly maintained by a complex balance between overproduction (10%) and renal underexcretion (90%) [20,21]. Hepatic purine pools are significantly accelerated by diets rich in animal protein (e.g., organ meats, red meats, and seafood), yeast formulations, and alcohol. On the other hand, a decrease in the glomerular filtration rate (GFR) or increased proximal tubular reabsorption can drastically restrict clearance [22]. In addition to diet, new epidemiological evidence has linked high serum urate directly to the epidemic of metabolic syndrome, adiposity, insulin resistance and essential hypertension worldwide [23,24]. This study is a systematic quantification of serum uric acid variations among the inhabitants of Khairpur Mir's relative to age cohorts, gender variations, nutritional habits and physical exertion parameters.

Materials and Methods

Study Area

The cross-sectional study was conducted over a period of 3 months from January to March 2019. Biological profiling and data collection was hosted across the Outpatient Department (OPD) of Civil Hospital Khairpur and clinical chemistry infrastructure of Shah Abdul Latif University, Khairpur, Sindh, Pakistan (Figure: 1).

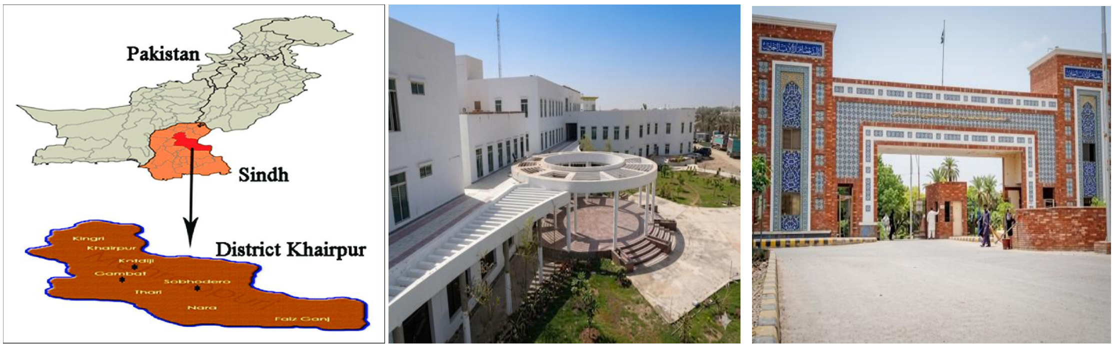

Figure: 1. (a)Khairpur Mir's map (b)Civil Hospital Khairpur (c) Shah Abdul Latif University Khairpur

Survey and Subject Allocation

We recruited a population of 169 random human subjects. A validated structured dietary questionnaire was used to collect data on lifestyle factors. The questionnaire was provided both orally and in writing to all members or participants. The most important pathway variables included baseline socioeconomic status, weekly consumption of purine-rich foods, intake of alcoholic or sugary drinks, and the number of weekly hours spent on physical activity. Subjects were divided into three age groups for a detailed comparative study.

Group 1: 20 to 35 years (n = 51)
Group 2: 36 to 50 years (n = 60)
Group 3: 51 to 70 years (n = 58)

Biochemical Assay Procedure

Aseptic venous blood samples of 2.0 mL were collected in sterile disposable syringes. For biochemical examination, these samples were immediately placed into sterile gel-clot vacuum tubes. To separate the cell fractions from the serum layer, the tubes were centrifuged for five minutes at 4000 rpm. A precise 20 µL aliquot of the separated patient serum was then combined with 1000 µL of a standard uricase reagent solution. This homogeneous assay matrix was then incubated at controlled temperatures for precisely 10 minutes to produce a visible colorless-to-pink chromogenic transition with the intensity of the pink colour change being directly proportional to the concentration of urate present. Ultimately, the experimental reagent mixture was then transferred to an automated Microlab chemistry analyser where the transmittance and the absorption spectra at 293 nm wavelength were recorded in accordance with the primary enzymatic reaction.

$$Uric\ acid + H2O + O2 \quad Uricase \quad \xrightarrow{Allantoin} + CO2 + H2O2$$

Statistical Evaluation

The raw clinical data were corrected, entered and analyzed using Microsoft Excel 2007 and SPSS (Statistical Package for the Social Sciences) Computer Software Version 24. Data were presented in descriptive statistics, percentages, frequencies and cross-tabulated matrices.

RESULTS

Sample Cohort Demographics

The empirical data shown in Table 1 were collected from 169 participants, with a very equal gender distribution of 85 males (50.3%) and 84 females (49.7%).

Table 1: Gender Distribution and Cohort Representation

Gender	Frequency	Percentage (%)	Valid Percent (%)	Cumulative Percent (%)

Male	85	50.3	50.3	50.3
Female	84	49.7	49.7	100.0
Total	169	100.0	100.0	

Table 2 shows the age distribution corresponding to the sample which was accounted for over the lifespan. The younger age group (20-35 years) consisted of 51 members (30.2%), adults of middle age (36-50 years) comprised 60 (35.5%) while mature adults (51-70 years) numbered 58 (34.3%).

Table 2: Age Cohort Frequencies

Age Group (Years)	**Frequency**	**Percent (%)**	**Valid Percent (%)**	**Cumulative Percent (%)**
20–35	51	30.2	30.2	30.2
36–50	60	35.5	35.5	65.7
51–70	58	34.3	34.3	100.0
Total	169	100.0	100.0	

Gender and Age Dynamics on Hyperuricemia

Statistically better mean absolute peak serum values were seen in the male group (max = 8.8 mg/dL), but population-wide anomalies varied toward females. Pathological levels were found in 13.0% of women and 10.1% of men (Table 3).

Table 3: Gender-Stratified Pathological UratePrevalences

Clinical Status / Gender Category	**Population Percentage (%)**	**Cumulative Percentage (%)**
Normal Male	40.2%	40.2%
Abnormal/Hyperuricemic Male	10.1%	50.3%
Normal Female	36.7%	87.0%
Abnormal/Hyperuricemic Female	13.0%	100.0%
Total	100.0%	

Cross tabulated by age, neither younger male or female subjects (20-35 years) had abnormally high uric acid levels (0%). However, hyperuricemic manifestations were rapidly increased in older cohorts. Within the 51–70 age group, an alarming 53% of females (n = 15) and 30% of males (n = 9) had clinically abnormal values (Table 4).

Table 4: Age-Bracketed Hyperuricemic Manifestation

Age Bracket	**Total Male**	**Abnormal Male**	**Abnormal Male %**	**Total Female**	**Abnormal Female**	**Abnormal Female %**	**Combined Total**
20–35	25	0	0%	26	0	0%	51
36–50	30	8	26%	30	7	23%	60
51–70	30	9	30%	28	15	53%	58
Total	85	17	20%	84	22	26%	169

Influence of Diet and Physical Activity

The overwhelming most of the total dataset set (n = 148) was made up of omnivorous diets. In this traditional group, an abnormally elevated uric acid level was seen in 25.3% females and 15.5% males. Interestingly, the abnormality rate was 50.0% in the small vegetarian sub-cohort (n = 21) in males, whereas dietary vegetarian females were lower at 15.3% (Table 5).

Table 5: Dietary Profile Cross-Tabulation

Dietary Habit	Normal Male	Abnormal Male	Male Abnormal %	Normal Female	Abnormal Female	Female Abnormal %	Total
Omnivore	65	12	15.5%	53	18	25.3%	148
Vegetarian	4	4	50.0%	11	2	15.3%	21
Total	69	16	18.8%	64	20	23.8%	169

The physical mobilization data revealed that inactive states directly exacerbated hyperuricemia. At zero hour of physical activity the hyperuricemic rate in elderly group (51-70 years) was 60% in males and 66.6% in females. In contrast, those who exercised 4 to 6 hours per week were consistently determined to be below standard clinical thresholds for nearly all age groups (Table 6).

Table 6: Interactive Impact of Physical Exertion across Age Classes

Age Class & Weekly Activity Tier	Normal Male	Abnormal Male	Male Abnormal %	Normal Female	Abnormal Female	Female Abnormal %
Age 20–35						
* 2–3 Hours	5	0	0%	7	0	0%
* 4–6 Hours	21	0	0%	18	0	0%
Age 36–50						
* 2–3 Hours	3	6	66.66%	9	6	40.0%
* 4–6 Hours	19	2	9.5%	15	0	0%
Age 51–70						
* 0 Hours	4	6	60.0%	4	8	66.6%
* 2–3 Hours	12	1	7.6%	8	5	38.4%
* 4–6 Hours	6	1	16.6%	3	0	0%

DISCUSSION

The analytical results have shown that serum uric acid profiles are significantly different by age, gender, dietary structures and active physiological energy expenditure. The tendency of urate to increase with age is very consistent with systemic renal maturation and decay models. The fractional urate excretion rate is higher in infants and children because of unique tubular variations, as described in historical pediatric data. But as the renal tubules reach complete structural maturity and slowly age, the clearance velocities drop, resulting in an overall increase in the baseline blood concentrations in later life. The endocrine alterations directly account for the significant rise in percentages of female hyperuricemia in the elderly group (51-70 years) up to 53%. Estrogen is a strong uricosuric and thus, in younger women, promotes the urinary excretion of uric acid. However, this hormonal protection is lost in post-menopausal life stages, leading to a decrease in the proximate tubular clearance and a rapid increase in female serum urate parameters. The high hyperuricemic percentage (50%) of vegetarian males demands careful metabolic consideration. To avoid consuming rich animal organs like liver, kidneys, and red meat, traditional purine limitations are required. However, purine-rich foods like legumes, lentils, chickpeas, and green vegetables like spinach are a major component of many local vegetarian substitutes. Urate levels may suddenly rise as a result of these plant purines and high carbohydrate levels that boost insulin-mediated reabsorption in the kidneys. Furthermore, current research suggests that exercise is crucial for controlling urate equilibrium. Severe and excessive hyperuricemia was found in inactive people. Sedentary lifestyles reduce overall glomerular filtration rate (GFR) capacity, slow down metabolic processes, increase fat around the organs, and decrease insulin sensitivity. Contrary to the points of systemic saturation, frequent exercise guarantees improved blood circulation and efficient kidney function.

CONCLUSION

This study demonstrates that serum uric acid levels in the Khairpur region are influenced by age, gender, diet, and lifestyle choices. Although elderly ladies are the primary population at risk for hyperuricemia, males have the greatest amounts. These health hazards are increased by sedentary lifestyles. Public health initiatives should encourage balanced lifestyles in order to address these problems and prevent associated metabolic disorders including gouty arthritis and cardiac difficulties. Physicians should recommend regular exercise regimens, limit consumption of legumes and high-purine animal products, make sure patients are properly hydrated, and keep a careful eye on their weight.

Author Contribution

Ms. Maria NajamMemon and *Dr. Sehrish Memon* conceptualized, collected samples, designed experiments, *Dr. Abdul RaheemShar, Ms. Farzana Mangrio* and *Mr. Nisar Ahmed Veesar* prepared the draft of the article. *Dr. Ali Ibrahim Shar, Mr. Sohail Raza Jogi* and *Mr. Muhammad AzeemKeerio* interpreted the data. All authors read, revised, and approved the final version of the manuscript.

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Conflict of Interest

The authors declare no conflict of interest

REFERENCES

Sun, L., Zhang, M., Zhao, J., Chen, W. and Wang, G., 2025. The human gut microbiota and uric acid metabolism: genes, metabolites, and diet. *Critical Reviews in Food Science and Nutrition*, *65*(31), pp.7612-7632.

Ji, J., An, Z.Y., Khan, A., Peng, L., Kulshreshtha, S., Salama, E.S., Yun, H., Liu, P., Jin, W.L. and Li, X., hyperuricemia by degrading purine nucleosides and improving gut microbiota metabolism.

Cicero, A.F., Fogacci, F., Di Micoli, V., Angeloni, C., Giovannini, M. and Borghi, C., 2023. Purine metabolism dysfunctions: experimental methods of detection and diagnostic potential. *International journal of molecular sciences*, *24*(8), p.7027.

Alqarni, A., 2023. *Constitutive release of purines in control of vascular contractility* (Doctoral dissertation, University of Nottingham (United Kingdom)).

Mitra, M., Mitra, S. and Nandi, D.K., 2024. Human Physiology and Metabolism: An Overview. *Body Recomposition*, pp.43-58.

Grove, A., 2025. The delicate balance of bacterial purine homeostasis. *Discover Bacteria*, *2*(1), p.14.

Morningstar, J., Lee, J., Mahon, S., Brenner, M. and Nath, A.K., 2024. Mass spectrometric analysis of purine intermediary metabolism indicates cyanide induces purine catabolism in rabbits. *Metabolites*, *14*(5), p.279.

Chu, W.Y., Allegaert, K., Dorlo, T.P., Huitema, A.D. and ALBINO Study Group, 2022.Semi-mechanistic modeling of hypoxanthine, xanthine, and uric acid metabolism in asphyxiated neonates. *Clinical Pharmacokinetics*, *61*(11), p.1545.
Mudgal, R. and Singh, S., 2024. Xanthine oxidoreductase in the pathogenesis of endothelial dysfunction: an update. *Current Hypertension Reviews*, *20*(1), pp.10-22.
Yang, Q., Xu, Y., Zhang, J., Xiao, N., Lu, H., Chen, B., Yang, B., Xie, Z. and Li, Z., 2026. From soluble uric acid to sodium urate crystal: immune metabolic inflammation driven by uric acid morphological transformation and mechanism-oriented therapy. *Frontiers in Immunology*, *17*, p.1794782.
Rodríguez-Iturbe, B., Johnson, R.J. and Sánchez-Lozada, L.G., 2023.Relationship between hyperuricemia, HSP70 and NLRP3 inflammasome in arterial hypertension. *Archivos de cardiología de México*, *93*(4), pp.458-463.
Ungur, D., 2025. *Increasing the therapeutic potential of febuxostat by developing new formulations with improved solubility and bioavailability* (Doctoral dissertation, Université Côte d'Azur; UniversitateaBabeș-Bolyai (Cluj-Napoca, Roumanie; 1945-....)).
Roman, Y.M., 2023. The role of uric acid in human health: insights from the uricase gene. *Journal of personalized medicine*, *13*(9), p.1409.
Zinellu, A. and Mangoni, A.A., 2023. A systematic review and meta-analysis of the association between uric acid and allantoin and rheumatoid arthritis. *Antioxidants*, *12*(8), p.1569.
Yiyou, L., Congcong, Z., Guilin, R., Jiannan, Q., Yilong, F., Fucai, L., Qingsheng, L., Zhiling, Y., Lin, C. and Xiaobing, D., 2025.Alisol B ameliorated metabolic dysfunction-associated steatotic liver disease via regulating purine metabolism and restoring the gut microbiota disorders. *Phytomedicine*, *145*, p.156992.
Costantini, D., 2024. *The role of organismal oxidative stress in the ecology and life-history evolution of animals*.Springer.
Olukiran, O.S., Akomolafe, R.O., Alabi, Q.K. and Ogundipe, D.J., 2024. Sex-related changes in renal function markers, electrolytes and hematological indices of rats of different age groups in relation to protein excretion. *Comparative Clinical Pathology*, *33*(1), pp.55-67.
Gitimu, R., 2023. *Reference Ranges for Triage Room, Biochemical, Hematological and Tumour Marker Parameters for Taita-Taveta County, Kenya* (Doctoral dissertation, Kenyatta University).
Kuwabara, M., Hisatome, I., Ae, R., Kosami, K., Aoki, Y., Andres-Hernando, A., Kanbay, M. and Lanaspa, M.A., 2025.Hyperuricemia, A new cardiovascular risk. *Nutrition, Metabolism and Cardiovascular Diseases*, *35*(3), p.103796.
Du, L., Zong, Y., Li, H., Wang, Q., Xie, L., Yang, B., Pang, Y., Zhang, C., Zhong, Z. and Gao, J., 2024. Hyperuricemia and its related diseases: mechanisms and advances in therapy. *Signal Transduction and Targeted Therapy*, *9*(1), p.212.
Jaco, J., Banda, K., Varki, A. and Gagneux, P., 2026. Red Meat in Human Evolution, Health, and Disease: From A Blessing to A Curse?. *The Quarterly Review of Biology*, *101*(2), pp.85-146.
Ying, X., Li, X., Deng, S., Zhang, B., Xiao, G., Xu, Y., Brennan, C., Benjakul, S. and Ma, L., 2025. How lipids, as important endogenous nutrient components, affect the quality of aquatic products: An overview of lipid peroxidation and the interaction with proteins. *Comprehensive Reviews in Food Science and Food Safety*, *24*(1), p.e70096.
Thompson, L.E. and Joy, M.S., 2022. Endogenous markers of kidney function and renal drug clearance processes of filtration, secretion, and reabsorption. *Current opinion in toxicology*, *31*, p.100344.

Khan, S., Kingston, J. and Moinuddin, Z., 2024. Renal physiology: blood flow, glomerular filtration, and plasma clearance. *Anaesthesia& Intensive Care Medicine*, *25*(5), pp.344-347.