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ORIGINAL RESEARCH

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# Hyperuricemia and associated factors: The case of outpatients at the Bafoussam Regional Hospital- Cameroon, an analytical cross-sectional study

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## Abstract

**Background and Aims:** Hyperuricemia constitutes a major public health issue due to its implication in many chronic diseases and metabolic syndromes. We propose to study the prevalence and associated factors of hyperuricemia to diagnose asymptomatic patients and make prognoses on the state of health of the patients.

**Methods:** An analytic cross-sectional study has been carried out at the Bafoussam Regional Hospital and the Biochemistry laboratory of the Université des Montagnes over 2 months. Sociodemographic and anthropometric characteristic was obtained; a blood sample was collected from the chosen patients and a biochemical test (uric acid, creatinine, urea, total cholesterol, high density lipoproteins cholesterol, triglyceride) was analyzed by spectrophotometric method. Statistical tests were carried out using SPSS statistical software. Logistic regression analyses identified factors associated with variables of interest. The significance was measured by a $p < 0.05$ with a confidential level of 95%.

**Results:** The patient population was made up of 100 patients. The sex ratio was 1.22 in favor of men. The prevalence of hyperuricemia in our study was 28.0% with 31.1% in women and 27.3% in men. The mean average of uric acid in the hyperuricemia population was 7.50 ± 1.24 mg/L and the normal uricemia population was 4.69 ± 1.49 mg/L ($p < 0.0001$). The mean average triglyceride in the hyperuricemia population was 143 ± 14 and 117.55 ± 55.52 mg/dL in normal uricemia with $p = 0.046$. Age range [35–45] and hypertriglyceridemia have been associated with hyperuricemia with respectively (odds ratio [OR] = 4.07, $p < 0.015$) confidence interval, CI: [0.89: 97.0]) and ([OR = 2.50, $p < 0.046$] CI: [1.01: 6.09]).

**Conclusion:** The prevalence of hyperuricemia was relatively high and has been associated with metabolic disorders in the population. It is necessary to focus on early diagnoses, treatment, and early intervention in view to prevent chronic diseases associated with hyperuricemia.

KEYWORDS
associated factors, hyperuricemia, uric acid

## 1 | INTRODUCTION

Uric acid is the end product of metabolic degradation of purine nucleotide.[1] It is in the soluble form of urate in the plasma and is excreted largely by the kidneys. Its concentration may be increased in certain situations. Hyperuricemia can therefore be defined as serum uric acid (SUA) concentrations greater than 7.0 mg/dL in men, and greater than 5.6 mg/dL in women.[2] The causes of hyperuricemia listed can be classified into two functional types: on the one hand increased production of uric acid and on the other hand the reduction of its excretion. Common causes of increased production include a diet rich in purine and increased purine metabolism. However, the causes of the decrease in its excretion include renal disorders, certain drugs, and competition for excretion between uric acid and other molecules.[3,4] Other causes include high levels of alcohol and starvation.[5] Prevalence of hyperuricemia has been reported by several studies including the study of Liu et al. in China which report a prevalence of 34.05%.[6] O et al. in Nigeria report a prevalence of 35.8% in the male population studied.[7] Kamdem et al. in Douala-Cameroon reported 31.8% hyperuricemia in their study population.[8] However, hyperuricemia remains asymptomatic in several situations. Asymptomatic hyperuricemia indicates individuals with high SUA who have not been diagnosed with gout or nephrolithiasis in the past; It is then considered a nonpathological state while its prevalence is estimated between 10% and 20% worldwide.[9] Hyperuricemia has gradually become an important worldwide issue because, in this condition, there is a high risk of crystallization of urate into monosodium urate and the crystals form usually deposits on cells, joints causing silent tissue damage and inflammations leading to gout and kidney stones if not treated.[10] It has been reported that high SUA would increase the risk of onset and progression of chronic renal failure, end-stage renal disease,[11] the occurrence of cardiovascular events, and in extreme cases death.[2,12] People with SUA elevation are found to have an increased risk of readmission for heart failure causing extended hospital stays.[5] Hyperuricemia is associated with obesity, hypertension, diabetes, dyslipidemia, metabolic syndrome, liver dysfunction, cardiovascular disease, and chronic kidney disease as reported by several authors even if the mechanisms remain to be elucidated.[13–19] Given the appearance of cardiovascular and renal comorbidities after long exposure to hyperuricemia, it is difficult to know whether hyperuricemia is a risk mark for nongouty disease or factors associated with its.[2]

Hyperuricemia constitutes a major public health issue due to its implication in many chronic diseases and metabolic syndromes. Several authors have reported his involvement in the development of several metabolic diseases as raised above.[5,7,20] In Africa in general and Cameroon in particular, patients are victims of cardiovascular and renal diseases caused by hyperuricemia due to its asymptomatic presence in some cases and the negligence of the population in other cases; thus creating silent tissue damage leading to gout and kidney stones etc and the consequence of which in extreme cases is death if adequate and timely management is not done. Given this problem, we propose to study the prevalence and associated factors of hyperuricemia in outpatients at the Bafoussam Regional Hospital (BRH) to diagnose asymptomatic patients and make prognoses on the state of health of the patients.

## 2 | MATERIALS AND METHODS

### 2.1 | Study design

We carried out an analytical cross-sectional study for 2 months from August 29 to November 1, 2022, at the BRH. The study population consisted of patients coming to the general consultation service of the regional hospital of Bafoussam. Sampling was consecutive and participants whose consent was obtained were included in the study. All patients who have for at least 8 h, and of age ranging from 25 to 45 were included. Patients presenting symptoms of hyperuricemia or any known disease in association with hyperuricemia, those under medication treatment, and pregnant women were not included. Pathologies such as cancers and others that do not affect uricemia were determined and/or identified by the interviewees, and these pathologies have been confirmed with their doctors. A questionnaire was developed to collect the sociodemographic, anthropometric (height, weight, body mass index), and bio-clinical information of participants.

### 2.2 | Biological analyzes

A volume of 3–4 mL of blood was collected in dry tubes in participants enrolled in the study. After blood collection, the samples were transported in the cooler containing ice packs directly to the Biochemistry laboratory of the Université des Montagnes accompanied by the completed technical questionnaire.

### 2.3 | Biochemical analyzes

The determination of SUA concentration was done according to the spectrophotometric method using the Beer–Lambert principle which measures the concentration of Uric acid in colored solution; it was made according to the "Human laboratory kit." The evaluation of renal function was achieved by determination of urea and determination of creatininemia by spectrophotometric method according to SGM Italia laboratory kit. The glomerular filtration flow rate was deduced from the modification of the diet in renal disease (MDRD)

equation.[21] Moreover, uremia has been determined; and lipid profile was evaluated by total cholesterol, triglyceride, high density lipoproteins (HDL) cholesterol, and low density lipoproteins (LDL) cholesterol by spectrophotometric method following the assay methods and protocol of the following manufacturers SGM Italia laboratory kit, Biolabo kit, and Inmesco laboratory kit.

## 2.4 | Data management and statistical analysis

Hyperuricemia was defined for each participant after analysis on two different blood samples, and for threshold uric acid concentrations of 3.4–7 mg/dL in men and 2.4–5.6 mg/dL in women as reported by the human laboratory kit and as highlighted in the literature. The interpretation of the uremia was made using the reference values of 10–50 mg/dL defined by the manufacturer's kit used. Creatininemia was interpreted using the following reference values: 9–13 mg/dL in men and 6–11 mg/dL in women. The glomerular filtration flow rate was deduced from the MDRD equation. Total cholesterol was interpreted from the cut-off value ≤200 mg/dL; for triglycerides 60–165 mg/dL in men and 40–140 mg/dL in women. HDL and LDL cholesterols are also interpreted according to the values defined by the manufacturer.

The data were collected and saved in an Excel 2016 spreadsheet and statistical analyses were performed using SPSS software Version 26. The variables studied were sociodemographic, clinical, and anthropometric characteristics: (height, weight, body mass index), age, sex, habits (alcohol, tobacco, protein intake), blood pressure; biological variables: uricemia, creatininemia, total cholesterol, HDL cholesterol, triglyceride, urea. Each of the biochemical parameters studied has been dichotomized and grouped into "normal, high, or low" according to the reference values and cutoff defined by the World Health Organization, the manufacturer of each reagent used, and the scientific literature. The variables were presented in frequency for qualitative and mean ± standard deviation (SD) for quantitative variables. The $\chi^2$ test and/or the Fisher exact test made it possible to compare the proportions between different groups. The comparison of the mean ± SD between the groups was made from the student test. Univariate logistic regression analyses were used to identify factors associated with metabolic complications in our study population. Significance was measured by a $p < 0.05$ and a 95% confidence level for all tests.

## 2.5 | Ethical considerations

This study has been validated and approved by the Institutional Committee of Ethics and Research of the *Université des Montagnes* (AUTHORIZATION N°. 2022/149/UdM/PR/CEAQ). The Regional Hospital of Bafoussam has issued the authorization for the collection and analysis of samples for the eligible patients of the studies

**TABLE 1** Sociodemographic, lifestyle, and bio-clinical characteristics of the population.

| Parameters | Female *N* = 45, *n* (%) | Male *N* = 55, *n* (%) | Total *N* = 100, *n* (%) |
|---|---|---|---|
| Region | | | |
| Center | 0 (0.00) | 1 (1.89) | 1 (10.00) |
| Northwest | 4 (8.89) | 0 (0.0) | 4 (4.00) |
| West | 41 (91.11) | 54 (98.18) | 95 (95.00) |
| Family history background | | | |
| Gout | 3 (6.67) | 7 (12.73) | 10 (10) |
| Hypertension | 10 (22.22) | 18 (32.23) | 28 (28.00) |
| Kidney diseases | 2 (4.44) | 3 (5.45) | 5 (5.00) |
| Cancer | 3 (6.67) | 10 (18.18) | 13 (13) |
| None | 27 (60) | 17 (30.9) | 44 (44) |
| Body mass index | | | |
| Normal corpulence | 9 (20) | 19 (34.55) | 28 (28.00) |
| Overweight | 13 (28.89) | 17 (30.91) | 30 (30.00) |
| Obese ≥ 30 | 23 (51.11) | 19 (34.55) | 42 (42.00) |
| BP | | | |
| Normal BP | 25 (55.56) | 18 (32.73) | 43 (43) |
| Prehypertension | 15 (33.33) | 28 (50.91) | 43 (43) |
| Hypertension | 5 (11.11) | 9 (16.36) | 14 (14) |
| Eating habits | | | |
| Food rich in fat | 45 (100) | 55 (100) | 100 (100.00) |
| Food rich in glucose | 45 (100) | 55 (100) | 100 (100.00) |
| Food rich in protein | 45 (100) | 55 (100) | 100 (100.00) |
| Meat | | | |
| Meat | 44 (97.78) | 54 (98.18) | 98 (98.00) |
| 1–2 meat per week | 21 (46.67) | 19 (34.55) | 40 (40.00) |
| 2–3 meat per week | 6 (13.33) | 8 (14.55) | 14 (14.00) |
| 3–4 meat per week | 11 (24.44) | 11 (20) | 22 (22.00) |
| Everyday | 5 (11.11) | 14 (25.45) | 19 (19.00) |
| Drinks: alcohol and water | | | |
| Alcohol | 31 (68.89) | 51 (92.73) | 82 (82.00) |
| Sufficient water | 21 (46.67) | 27 (49.09) | 48 (48.00) |
| Others | | | |
| Cigarette | 4 (8.89) | 7 (12.73) | 11 (11.00) |
| Notion on uric acid | 18 (40.00) | 32 (58.18) | 50 (50.00) |
| Notion on gout | 40 (88.89) | 47 (85.45) | 87 (87.00) |

*Note*: Sufficient water (1.5–3 L daily).
Abbreviation: BP, blood pressure.

(N° 840/L/MINSANTE/SG/DRSPO/HRB/D). Each of the participants received an information leaflet providing information on the objectives, benefits, and risks related to the study. For eligible participants, one signature and consent were obtained per signature. The results obtained after the research were kept confidential.

## 3 | RESULTS

### 3.1 | Sociodemographic, lifestyle, and bioclinical characteristics of the population

Demographic data collected from $n = 100$ participants indicated that the majority 55 (55%) were male and a minority for female 45 (45%) for a sex ratio of 1.22. The mean ± SD age was 35.17 ± 6.93 with extrema of 25 and 45 years. Table 1 describes the sociodemographic, bioclinical, and lifestyle characteristics of the population.

From the table, the majority of individuals were from the western region (95%) followed by the northwest region (4%). 28% of our population had a medical family background of hypertension, and 13% for cancer. The population had a diversified diet characterized mainly by a diet rich in fat, glucose, and protein. 98% of the population regularly consumed meat, 82% alcohol, and 48% water. 42% of the total population are obese and 25% are overweight. 49.5% of our population have prehypertension over 19.72% have hypertension.

### 3.2 | Prevalence of hyperuricemia and study population by biological parameters

#### 3.2.1 | Distribution of hyperuricemia according to sex

The prevalence of hyperuricemia was 28%. Table 2 presents the distribution of hyperuricemia between different sexes.

From the table, the frequency of hyperuricemia in women is 31.1% and in men 27.3%.

#### 3.2.2 | Biological parameters in the population

In Table 3, for renal profiles, 42.86% of patients with hyperuricemia presented low clearance creatinine against 41.67% for patients with normal uricemia. For lipid check, 37.71% of patients with hyperuricemia presented hypertriglyceridemia against 13.89% for patients with normal uricemia ($p = 0.046$).

In Table 4, the mean ± SD of uric acid in the hyperuricemia population was 7.50 ± 1.24 mg/L and normal uricemia population was 4.69 ± 1.49 mg/L ($p < 0.0001$); the means ± SD of urea in the hyperuricemia population was 130.15 ± 109.50 mg/L and normal uricemia was 88.91 ± 49 mg/L ($p = 0.089$). The means ± SD of triglyceride in the hyperuricemia population was 143 ± 14 and 117.55 ± 55.52 mg/dL in normal uricemia with $p = 0.046$.

#### 3.2.3 | Anthropometric and clinical parameters according to uricemia

Table 5 shows the distribution of anthropometric and clinical parameters according to the uricemia population; in clinical parameters, 60.71% of patients with hyperuricemia were obese over 34.72% with normal uricemia, finally, 57.27% of patients with hyperuricemia had hypertension over 42.73%.

### 3.3 | Factors associated with hyperuricemia

Table 6 shows the factors associated with hyperuricemia. Age range [35–45] and hypertriglyceridemia have been associated with hyperuricemia with, respectively ([odds ratio [OR] = 4.07, $p = 0.015$; confidence interval [CI] [0.89: 9.70]) and ([OR = 2.50, $p = 0.046$] CI: [1.01: 6.09]).

## 4 | DISCUSSION

This study aimed to determine the prevalence of hyperuricemia in outpatients at the BRH and to identify the factors associated with it because as reported by authors, it implies many chronic diseases and metabolic syndromes.

The sex ratio was 1.22 in favor of men. The explanation could be that during the period of study, more men came for a health check routine. The study population was relatively young with a mean age of 35.17 ± 6.93 years. The population had a diversified diet characterized mainly by a diet rich in fat, carbohydrate, and protein. 98% of the population regularly consumed meat, 82% alcohol, and 48% water. This diversity can be due to the mechanization of agriculture in rural areas and the increase which would be the main source of energy expenditure in rural areas.[22] Anthropometric parameter reveals that 42% of the population was obese. Among other things, adiposity is a risk factor for cardiovascular diseases, cancer, and type 2 diabetes mellitus.[17,22] The frequencies of

**TABLE 2** Distribution of hyperuricemia according to sex.

| Parameter | Female, *n* (%) | Male, *n* (%) | Total, *n* (%) | *p* Value |
|---|---|---|---|---|
| Normal uricemia | 33 (68.9) | 39 (72.7) | 72 (72.00) | 0.17 |
| Hyperuricemia | 12 (31.1) | 16 (27.3) | 28 (28.00) | |

*Note*: $\chi^2$ test.

**TABLE 3** Distribution of biological test according to normal uricemia and hyperuricemia.

| Parameters | Normal uricemia, *N* = 72 | Hyperuricemia, *N* = 28 | Total, *N* = 100 | *p* Value |
|---|---|---|---|---|
| Uric acid | | | | |
| Low | 7 (8.33) | 0 (0.00) | 6 (6.00) | <0.0001* |
| High | 0 (0.00) | 28 (100) | 28 (28.00) | |
| Normal | 65 (90.28) | 0 (0.00) | 65 (65.00) | |
| Creatinine clearance | | | | |
| Low | 30 (41.67) | 12 (42.86) | 42 (42.00) | 0.581 |
| High | 13 (18.06) | 4 (14.29) | 17 (17.00) | |
| Normal | 29 (40.28) | 12 (42.86) | 41 (41.00) | |
| Urea | | | | |
| Low | 34 (47.22) | 8 (28.57) | 58 (58.00) | 0.089 |
| High | 38 (47.22) | 20 (71.43) | 42 (42.00) | |
| Cholesterol total | | | | |
| High | 17 (23.61) | 9 (32.61) | 26 (26.00) | 0.382 |
| Low | 53 (76.39) | 19 (67.86) | 74 (74.00) | |
| Cholesterol total | | | | |
| High | 19 (26.39) | 3 (10.71) | 22 (78.00) | 0.089 |
| Low | 53 (73.61) | 25 (89.29) | 78 (78.00) | |
| Triglyceride | | | | |
| Low | 5 (6.94) | 2 (7.14) | 7 (7.00) | 0.046* |
| High | 10 (13.89) | 10 (37.71) | 20 (20.00) | |
| Normal | 57 (79.17) | 16 (57.14) | 73 (73.00) | |

*Note*: Uric acid (mg/L); creatinine clearance (mL/min); urea (mg/dL); cholesterol total (g/L); HdL cholesterol (mg/dL); triglyceride (mg/dL); $\chi^2$ test.
*Significant difference at $p < 0.05$.

**TABLE 4** mean average of biological parameters in population.

| Parameters | Normal uricemia, *N* = 72 | Hyperuricemia, *N* = 28 | Total, *N* = 100 | *p* Value |
|---|---|---|---|---|
| Uric acid | 4.69 ± 1.49 | 7.50 ± 1.24 | 5.47 ± 1.91 | <0.0001* |
| Clearance creatinine | 120.91 ± 81.88 | 147.30 ± 85.4 | 128.30 ± 119.69 | 0.581 |
| Urea | 88.91 ± 49 | 130.15 ± 109.50 | 100.46 ± 73.13 | 0.089 |
| Total cholesterol | 1.73 ± 0.35 | 1.79 ± 0.41 | 1.75 ± 0.36 | 0.382 |
| Hdl cholesterol | 49.78 ± 36.28 | 44.15 ± 23.18 | 48.21 ± 33.12 | 0.089 |
| Triglyceride | 117.55 ± 55.52 | 143 ± 14 | 124.71 ± 67.19 | 0.046* |

*Note*: Mean ± standard deviation; uric acid (mg/L); creatinine clearance (mL/min); urea (mg/dL); cholesterol total (g/L); HDL cholesterol (mg/dL); triglyceride (mg/dL); student test.
*Significant difference at $p < 0.05$.

overweight and obesity reported in this study are also higher than those of Adebayo et al.[23] reported in the adult Nigerian rural population (20.9% and 8.4%, respectively) and those reported recently in the Ethiopian study (19.9% and 8.6%, respectively).[24] However, the prevalence of overweight and obesity in our study is lower than those reported in previous studies of urban adult populations in Cameroon and South Africa.[25,26] In addition, 30% of the population was underweight; this could be due to an increase in food expenditure and the social value of being overweight, which is perceived by "popular imagery" as a sign of well-being; not to mention the traditional energy found in the West, region of Cameroon as indicated above.[22]

**TABLE 5** Distribution of anthropometric and clinical parameters according to uricemia in the population.

| Parameters | Normal uricemia, *N* = 72, *n* (%) | Hyperuricemia, *N* = 28, *n* (%) | Total, *N* = 100, *n* (%) | *p* Value |
|---|---|---|---|---|
| BMI | | | | |
| Normal corpulence | 22 (30.56) | 6 (30.56) | 28 (28.0) | 0.760 |
| Underweight | 25 (34.72) | 5 (17.86) | 30 (25.0) | 0.982 |
| Obesity | 25 (34.72) | 17 (60.71) | 42 (42.0) | 0.055 |
| BP | | | | |
| Normal BP | 30 (27.75) | 19 (22.15) | 49 (49.5) | 0.697 |
| Prehypertension | 8 (20.58) | 21 (79.42) | 39 (30.58) | 0.059 |
| Hypertension | 3 (42.73) | 8 (57.27) | 11 (19.72) | 0.956 |

*Note*: Normal BP (<120/85 mmHg); prehypertension (*N* ≥ 120/85 mmHg); hypertension (≥140/85 mmHg); normal corpulence (≥18.5, <25); underweight (≥25, <30); obesity (≥30); $\chi^2$ test.

Abbreviations: BMI, body mass index; BP, blood pressure.

**TABLE 6** Factors associated with hyperuricemia.

| Parameters | Hyperuricemia | | OR (CI 95%) | *p* Value |
|---|---|---|---|---|
| | Yes, *n* = 28 (%) | No, *n* = 72 (%) | | |
| Age (35–45) | 9 (31.03) | 12 (16.9) | 4.07 (0.89; 9.7) | 0.015* |
| Hypertension | 8 (57.27) | 3 (42.73) | 1.81 (0.1; 5.41) | 0.288 |
| Alcohol | 24 (85.71) | 58 (80.56) | 5.01 (23; 10.40) | 0.305 |
| Meat | 13 (46.43) | 63 (87.5) | 9.48 (0.9; 10.0) | 0.982 |
| 0.5 L water | 6 (21.43) | 30 (46.67) | 1.03 (0.5; 4.80) | 0.982 |
| Obesity | 17 (60.71) | 25 (34.72) | 2.49 (0.84; 7.44) | 0.101 |
| Hypertriglyceridemia | 10 (37.71) | 10 (13.89) | 2.50 (1.01; 6.09) | 0.046* |

*Note*: Univariate analysis.

Abbreviations: CI, confidence interval; OR, odds ratio.

*Significant difference at $p < 0.05$.

The determination of uricemia was done by colorimetric measure with a spectrophotometer. At the end of this, the prevalence of hyperuricemia was 28%. This reflects the high frequency of hyperuricemia in the Cameroonian population in general and the West, in particular, came in routine consultation and lack of any treatment. This high prevalence would reflect hypermetabolism or a renal excretion deficit; this can be explained by the fact that this study population was cosmopolitan and had a diversified diet rich in purine and lipids obtained from the questionnaire or maybe because a patient coming to the hospital may have an unknown metabolic disorder or pathologies that could increase their SUAs count.[27] As described in the literature, the causes of hyperuricemia include a large intake of purine through diet and increased purine metabolism.[3,4] Studies have estimated the prevalence of hyperuricemia obtained by Liu et al. in China (34.05%),[6] Suraamornkul et al. in the Bangkok population (24.4%),[28] O et al. (35.8%),[7] Kamdem et al. in Douala-Cameroon (31.8%).[8] These reported prevalences are close to ours with some differences. These differences could be explained by the diversity and differences that may exist between the different study populations.

Clinical and biochemical parameters of uricemia were evaluated in population, blood pressure, lipid profile, and renal function. This evaluation permitted to identifier that, 42.86% of patients with hyperuricemia presented low clearance creatinine against 41.67% for patients with normal uricemia, and 71.43% of patients with hyperuricemia presented high serum urea against 47.22% for patients with normal uricemia ($p = 0.089$), this result demonstrates that renal dysfunction can lead to accumulation of uric acid.[29,30] Indeed, hyperuricemia is common in patients with chronic renal failure. Serum UA level could therefore be considered as a marker of kidney disease whose increase is mainly observed due to its altered excretion. These observations were also described by Kaze et al. who report hyperuricemia as a predictor of renal disease ([3.12 (1.58–6.16), $p = 0.002$]).[31]

After evaluation of the lipid profile, it appears that dyslipidemia was present in the population with hyperuricemia. Indeed, 32.61% of patients with hyperuricemia presented total hypercholesterolemia against 23.61% for patients with normal uricemia, 37.71% of patients with hyperuricemia presented hypertriglyceridemia against 13.89% for patients with normal uricemia ($p = 0.046$), 84.29% of patients with hyperuricemia presented low HDL cholesterol against 73.61% for patients with normal uricemia. Indeed, several authors report a significant association between hyperuricemia and lipid profile. They suggest that hyperuricemia may promote metabolic alterations, resulting in postprandial increases in triglyceride levels, a buildup of triglycerides in the liver tissue, as well as disturbances in the insulin response in the liver, adipose tissue, and muscular. This justifies the association between asymptomatic hyperuricemia and lipid profile indicators found in our study. They also suggest that hyperuricemia results in disruptions of lipid homeostasis; in this case, uric acid levels can be used as a biomarker for predicting the future incidence of dyslipidemia in a healthy person.[9]

Regarding clinical parameters, 60.71% of patients with hyperuricemia were obese over 34.72% with normal uricemia, finally, 79.42% of patients with hyperuricemia had prehypertension over 20.58% ($p = 0.059$). Authors have also reported an association of hyperuricemia with arterial hypertension; In particular, they report the role of hyperuricemia in the pathogenesis of hypertension. This is notably the case of Yu et al. in China who reported 67.6% of hypertensive in its patient population with hyperuricemia.[32] SUA has been reported to be correlated with an increased risk of hypertension, diabetes, kidney failure, obesity, and metabolic syndrome. The potential mechanisms include nitric oxide inhibition, vascular smooth muscle cell proliferation, activation of the angiotensin-renin system, endothelial cell dysfunction, inflammation, and induction of oxidative stress.[10,27,29,32]

The secondary aim of this study was to identify factors associated with hyperuricemia in this population. Results for associated factors show a significant association between Uric acid and age ranging from 35 to 45 ([OR = 4.07, $p = 0.015$] CI: [0.89: 9.70]), from our result, we may say that as age increases uric acid levels also increased; As reported by previous studies, the age was confirmed as an independent risk factor for hyperuricemia[12]; also reported by Haque et al.[33] This can be explained by an increase in cells and nutrition metabolism.[4] The increase in SUA levels with age may be the result of normal purine metabolism, but a reduction in the excretion of its byproduct; kidney function therefore deteriorates with age.[27] Our finding is in agreement with some studies showing age as a risk factor for high blood uric acid levels.[12,34] Hypertriglyceridemia was also positively and significantly associated with hyperuricemia in the study ([OR = 2.50, $p = 0.046$] CI: [1.01: 6.09]). Indeed, as described, the increase in free fatty acids (obesity) results from the increase in triglycerides resulting in the production of adenosine triphosphate which leads to an increase in uric acid, being the end product of metabolism.[27] This result is consistent with the results of Liu et al. in Guangdong province of China.[6] Alcohol ([OR = 5,01, $p < 0.304$] CI: [0.23: 19.41]) was also associated with hyperuricemia, this can be explained by the fact that beer is highly rich in purines especially guanosine which favors uric acid production. It has been reported that alcohol is the most important cause of hyperuricemia.[35] This observation was also reported by O et al. in Abakaliki in Nigeria.[7] Finally, hypertension ([OR = 1.87, $p < 0.288$] [0.34: 37.55]) was positively associated with hyperuricemia. This observation was also reported by O et al. in Abakaliki Nigeria, and Liu et al. in Guangdong province of China.[6]

## 5 | CONCLUSION

At the end of our study, the prevalence of hyperuricemia was relatively high (28%) between outpatients at the regional hospital of Bafoussam. Hyperuricemia has been associated with metabolic disorders in the population. Age range [35–45] and hypertriglyceridemia have been associated with hyperuricemia with respectively ([OR = 4.07, $p < 0.015$] CI: [0.89: 97.0]) and ([OR = 2.50, $p < 0.046$] CI: [1.01: 6.09]). It is necessary to focus on early diagnoses, treatment, and early intervention in view to prevent chronic diseases associated with hyperuricemia.

### AUTHOR CONTRIBUTIONS

**Romaric De Manfouo Tuono**: Conceptualization; investigation; methodology; supervision; validation; writing—review and editing. **Aude Bernie Famessi Samou**: Methodology; writing—original draft. **Marius Tchoumke Mbiandjeu**: Writing—original draft; writing—review and editing. **Pascal Blaise A Koul Well A Well**: Writing—review and editing. **Pascal Dieudonne Djamen Chuisseu**: Methodology; supervision; writing—review and editing.

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### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

### DATA AVAILABILITY STATEMENT

The data used to support the findings of this study are available from the corresponding author upon request. The authors confirm that the data supporting the findings of this study are available within the article [and/or] its supplementary materials.

### TRANSPARENCY STATEMENT

The lead author Romaric De Manfouo Tuono affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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## REFERENCES


1. Koto R, Nakajima A, Horiuchi H, Yamanaka H. Serum uric acid control for prevention of gout flare in patients with asymptomatic hyperuricemia: a retrospective cohort study of health insurance claims and medical check-up data in Japan. *Ann Rheum Dis*. 2021;80(11):1483-1490.
2. Si K, Wei C, Xu L, et al. Hyperuricemia and the risk of heart failure: pathophysiology and therapeutic implications. *Front Endocrinol (Lausanne)*. 2021;12:770815.
3. Wei X, Fu B, Chen X, et al. U-shaped association between serum uric acid and short-term mortality in patients with infective endocarditis. *Front Endocrinol (Lausanne)*. 2021;12:750818.
4. Magalhães ELGDe, Juvanhol LL, Danielle CG, et al. Uric acid: a new marker for metabolic syndrome? results of a population-based study with adults. *Nutr Metab Cardiovasc Dis*. 2021;31(7):2077-2080. doi:10.1016/j.numecd.2021.03.012
5. Gao H, Wang H, Shan G, et al. Prevalence of dyslipidemia and associated risk factors among adult residents of Shenmu City, China. *PLoS One*. 2021;16:e0250573.
6. Liu W, Liu W, Wang S, et al. Prevalence and risk factors associated with hyperuricemia in the pearl river delta, Guangdong Province, China. *Risk Manag Healthc Policy*. 2021;14:655.
7. Ewenighi Chinwe O, Uchechukwu D, Uchechukwu E, et al. Prevalence of hyperuricemia and its risk factors in healthy male adults from Abakaliki metropolis, Nigeria. *J Mol Pathophysiol*. 2015;4(3):94-98.
8. Kamdem F, Doualla M, Lekpa FK, et al. Prevalence and factors associated with hyperuricemia in newly diagnosed and untreated hypertensives in a sub-Saharan. *Arch Cardiovasc Dis*. 2016;109(10):527-532. doi:10.1016/j.acvd.2016.02.009
9. Al Shanableh Y, Hussein YY, Saidwali AH, et al. Prevalence of asymptomatic hyperuricemia and its association with pre-diabetes, dyslipidemia, and subclinical inflammation markers among young healthy adults in Qatar. *BMC Endocr Disord*. 2022;22:21.
10. Kimura Y, Tsukui D, Kono H. Uric acid in inflammation and the pathogenesis of atherosclerosis. *Int J Mol Sci*. 2021;22(22):12394.
11. Tada K, Maeda T, Takahashi K, et al. Association between serum uric acid and new onset and progression of chronic kidney disease in a Japanese general population: Iki epidemiological study of atherosclerosis and chronic kidney disease. *Clin Exp Nephrol*. 2021;25:751-759. doi:10.1007/s10157-021-02042-7
12. Zhang Y, Nie FQ, Huang XB, et al. High prevalence and low awareness of hyperuricemia in hypertensive patients among adults aged 50–79 years in Southwest. *BMC Cardiovasc Disord*. 2022;22:2. doi:10.1186/s12872-021-02427-2
13. Ali N, Perveen R, Rahman S, et al. Prevalence of hyperuricemia and the relationship between serum uric acid and obesity: a study on Bangladeshi adults. *PLoS One*. 2018;13:e0206850.
14. Singh SK, Singh R, Singh SK, Iquebal MA, Jaiswal S, Singh A. Prevalence of hyperuricemia and the relationship between serum uric acid and hypertension in new onset diabetic patients: a cross-sectional Indian study. *Diabetes Metab Syndr Obes*. 2022;15:1809-1817.
15. Molla NH, Kathak RR, Sumon AH, Barman Z. Assessment of the relationship between serum uric acid levels and liver enzymes activity in Bangladeshi adults. *Sci Rep*. 2021;11(1):20114. doi:10.1038/s41598-021-99623-z
16. Ali N, Miah R, Hasan M, et al. Association between serum uric acid and metabolic syndrome: a cross-sectional study in Bangladeshi adults. *Sci Rep*. 2020;10:7841. doi:10.1038/s41598-020-64884-7
17. Ali N, Rahman S, Islam S, et al. The relationship between serum uric acid and lipid profile in Bangladeshi adults. *BMC Cardiovasc Disord*. 2019;19:42.
18. Singh SK, Singh R, Singh SK, Iquebal MA, Jaiswal S, Rai PK. Prevalence of obesity in newly onset diabetes mellitus and its relationship with uric acid: an Indian cross-sectional study. *Int J Gen Med*. 2023;16:1217-1226.
19. Singh SK, Singh R, Singh SK, Iquebal MA, Jaiswal S, Rai PK. Uric acid and diabetes mellitus: an update. *Postgrad Med J*. 2023;99:1220-1225. doi:10.1093/postmj/qgad081
20. Ajlouni K, Al Hourani HM, Al-Raoush RB, Khader YS, Ajlouni K. Prevalence of hyperuricemia and associated factors among type 2 diabetic patients in Jordan. *Int J Gen Med*. 2022;15:6611-6619.
21. Nakhjavan-shahraki B, Yousefifard M, Ataei N, et al. Accuracy of cystatin C in prediction of acute kidney injury in children; serum or urine levels: which one works better? A systematic review and meta-analysis. *BMC Nephrol*. 2017;18:120.
22. Simo LP, Agbor VN, Temgoua FZ, et al. Prevalence and factors associated with overweight and obesity in selected health areas in a rural health district in Cameroon: a cross-sectional analysis. *BMC Public Health*. 2021;21:475.
23. Adebayo RA, Balogun MO, Adedoyin RA, et al. Prevalence and pattern of overweight and obesity in three rural communities in southwest Nigeria. *Diabetes Metab Syndr Obes*. 2014;153-158. doi:10.2147/DMSO.S55221
24. Dagne S, Gelaw YA, Abebe Z, Wassie MM. Factors associated with overweight and obesity among adults in northeast Ethiopia: a cross-sectional study. *Diabetes Metab Syndr Obes*. 2019;12:391-399.
25. Pasquet P, Temgoua LS, Melaman-sego F, Froment A, Rikong-Adié H. Prevalence of overweight and obesity for urban adults in Cameroon. *Ann Hum Biol*. 2003;30:551-562.
26. Kamadjeu RM, Edwards R, Atanga JS, Kiawi EC, Unwin N, Mbanya J. Anthropometry measures and prevalence of obesity in the urban adult population of Cameroon: an update from the Cameroon Burden of Diabetes Baseline Survey. *BMC Public Health*. 2006;6:228.
27. Maiuolo J, Oppedisano F, Gratteri S, Muscoli C, Mollace V. Regulation of uric acid metabolism and excretion. *Int J Cardiol*. 2016;213:8-14. doi:10.1016/j.ijcard.2015.08.109
28. Uaratanawong S, Suraamornkul S, Angkeaw S, Uaratanawong R. Prevalence of hyperuricemia in Bangkok population. *Clin Rheumatol*. 2011;30(7):887-893.
29. Skoczyńska M, Chowaniec M, Szymczak A, Langner-hetmańczuk A, Maciążek-chyra B, Wiland P. Pathophysiology of hyperuricemia and its clinical significance—a narrative review. *Reumatologia*. 2020;58:312-323.
30. Hu Y, Chan Z, Li C, et al. Higher serum uric acid levels are associated with an increased risk of vision-threatening diabetic retinopathy in type 2 diabetes patients. *Invest Ophthalmol Vis Sci*. 2021;62(4):23.
31. Kaze FF, Meto DT, Halle M-P, Ngogang J, Kengne A-P. Prevalence and determinants of chronic kidney disease in urban adults' populations of northern Cameroon: a cross-sectional study. *BMC Nephrol*. 2019;16:117.
32. Yu C, Ren X, Pan L, et al. Association between serum uric acid and hypertension in Han and Yugur of Gansu Province: The China National Health Survey. *Kidney Blood Press Res*. 2021;46(6):723-733.
33. Haque T, Rahman S, Islam S, Molla NH, Ali N. Assessment of the relationship between serum uric acid and glucose levels in healthy, prediabetic, and diabetic individuals. *Diabetol Metab Syndr*. 2019;11:49. doi:10.1186/s13098-019-0446-6

34. Zhang L, Yang L, Wang C, et al. Individual and combined association analysis of famine exposure and serum uric acid with hypertension in the mid-aged and older adult: a population-based cross-sectional study. *BMC Cardiovasc Disord*. 2021;21:420. doi:10.1186/s12872-021-02230-z
35. Kawamoto R, Kikuchi A, Akase T, Ninomiya D, Tokumoto Y, Kumagi T. Alcohol consumption and serum uric acid are synergistically associated with renal dysfunction among community-dwelling persons. *J Clin Lab Anal*. 2021;35(6):e23812.

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