

**PREVALENCE OF HYPERURICEMIA IN PATIENTS RECEIVED AT THE
LABORATORY OF THE NATIONAL REFERENCE UNIVERSITY HOSPITAL CENTER**

Nadjioroum Ngam-Asra¹, Brahim Boy Otchom*², Nguinambaye Mberdoum Memti³, Mbaïoumanssem Djerané Elie¹, Abdelsalam Tidjani¹ and Guelmbaye Ndoutamia Anaclet⁴

¹University of N'Djamena, Faculty of Human Health Sciences.

²Toumaï University, Department of Biomedical and Pharmaceutical Sciences.

³University of N'Djamena, Faculty of Exact and Applied Sciences.

⁴Food Quality Control Center (CECOQDA).

***Corresponding Author: Brahim Boy Otchom**

Toumaï University, Department of Biomedical and Pharmaceutical Sciences.

Article Received on 20/07/2020

Article Revised on 10/08/2020

Article Accepted on 30/08/2020

ABSTRACT

Hyperuricemia is a precipitating factor for gout and kidney disease as well as a significant risk factor for metabolic syndrome and cardiovascular disease. The main causes of increased uricemia are either lower excretion, higher synthesis, or both. The objective of the study is the determination of hyperuricemia in order to improve management of patients received at the National Reference Hospital-University Center (CHU-RN) of N'Djamena in Chad. **Material and Methods:** this was a prospective, descriptive and analytical study involving 450 patients of both sexes aged 20 to 65 years, received at the laboratory of the CHU-RN for a biochemical assessment in November 2018 to November 2019. **Results:** The hospital prevalence of hyperuricemia was 35.55%. Men were more represented with 58%. The 20-29 years age group (44%) and normally overweight subjects (51%) were the most represented. Among the 160-hyperuricemia subjects, 10% had gout, 17.5% had arterial hypertension, 16.5% renal failure and 56% asymptomatic. Mean uric acid levels were significantly elevated ($p < 0.05$) in overweight subjects ($426.45 \pm 189.51 \mu\text{mol} / \text{l}$) in the age group of 46-65 years ($431.32 \pm 165.43 \mu\text{mol} / \text{l}$) and subjects with renal failure ($659.57 \pm 217.39 \mu\text{mol} / \text{l}$). Carrier levels of uric acid, triglycerides, total cholesterol and LDL cholesterol increased with age with the exception of HDL cholesterol. Investigation of the independent relationship between uricemia and lipid profile showed a strong correlation between uricemia and triglycerides, total cholesterol, HDL cholesterol and LDL cholesterol at significance level $P < 0.01$. The study on the relationship between uricemia and hyperuricemia-related diseases showed that there is also a correlation between uricemia and arterial hypertension (hypertension), gout and renal failure at the level of significance. $P < 0.01$. **Conclusion:** The hospital prevalence of hyperuricemia was 35.55%. This is why it is important to undertake a study to assess hyperuricemia in the Chadian population.

KEYWORDS: hyperuricemia, Prevalence, lipid balance, CHU-RN.

INTRODUCTION

Hyperuricemia is a common biochemical abnormality, resulting from excessive urate production and / or decreased renal excretion of uric acid, which is based on the limit of solubility of urate in body fluids with a urate concentration greater than $416 \mu\text{mol/l}$ (or 70 mg/l). When the level of uric acid in the blood is increased, there is a high risk of having a gout attack.^[1] Uric acid (UA) is a waste in the final stage of protein degradation and, more specifically, of the chemical family of purines. These purines (or purine bases) are a group of nitrogenous substances involved in the formation of nucleic acids (DNA or RNA). Although UA therefore has vasoconstrictive, pro-inflammatory, pro-oxidative and

antiangiogenic properties that may promote the development of kidney failure, UA is known to be an antioxidant. It would react with superoxide anion and peroxynitrite and thus help maintain the high level of extracellular superoxide dismutase by preventing its oxidative degradation.^[2] Under specific conditions of severe oxidative stress, an increase in uric acid could therefore have certain antioxidant and beneficial effects in the short term. Prolonged hyperuricemia would be deleterious.^[3] The number of patients with hyperuricemia disorders has been increasing in recent years. Studies carried out on the prevalence of hyperuricemia have shown a determining role of the latter: either by the increase in life expectancy and the variations in life

which seeks to approximate that of the Western one leading to complications in particular gout and uric lithiasis, the worsening of the clinical picture, in patients with co-morbidities such as diabetes, kidney failure, high blood pressure (hypertension), cardiovascular disease and many other conditions.^[4,5]

Our study aims to contribute improving the management of hyperuricemia in subjects received at the CHU-RN of N'Djamena in Chad.

MATERIAL AND METHODS

This was a prospective, descriptive and analytical study on patients of both sexes. Uric Acid, HDL Cholesterol, LDL Cholesterol, Total Cholesterol, Triglycerides and Creatinine tests were conducted using the Pentra C400

Biochemical Machine. Word and SPSS software (version 22) were used for data writing and analysis. For the comparison of the different means, we used the student's test at the significance level $P < 0.05$.

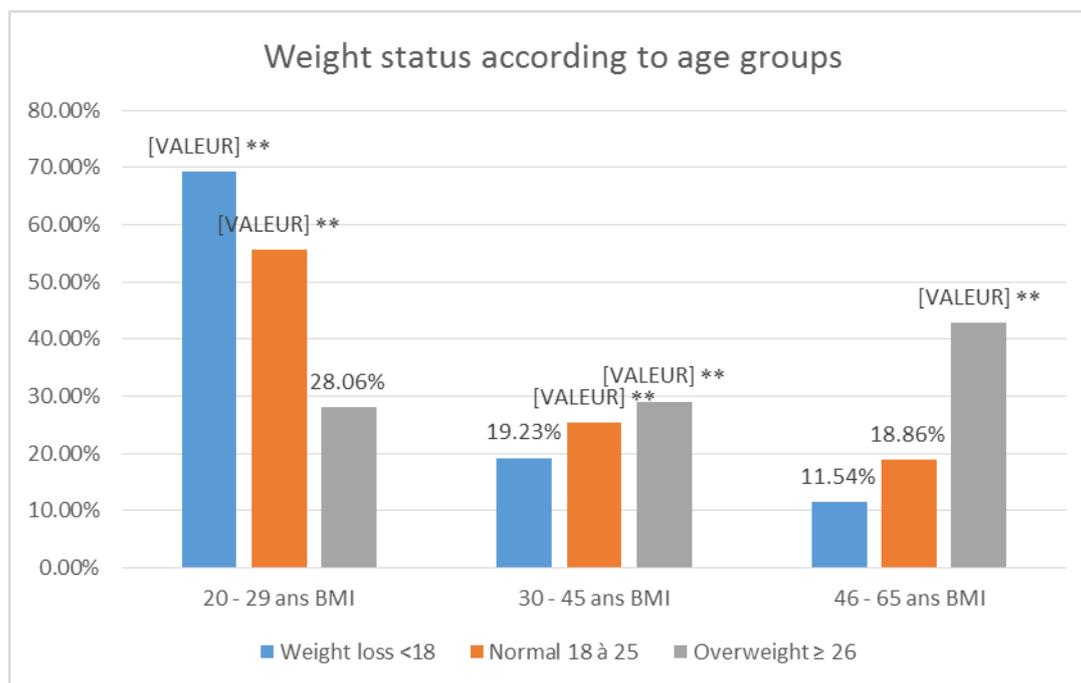
RESULTS

Sociodemographic characteristics of patients

On 450 patients, we had 263 men (58%) and 187 women (42%) with a sex ratio of 1.4 in favor of men. The average age was 35.81 years, with the extremes of 20 and 65 years. The average age of the male was 35.33 years, the female was 36.48 years. The 20-29 age group was the most represented, followed by 45-65, then 30-45, with 44%, 29% and 27% respectively. Subjects with normal BMI represented 51%, followed by overweight subjects 43% and 6% underweight.

Table I: Weight status by sex.

	Weight loss BMI<18		Normal BMI= 18-25		Overweight BMI≥26		Total N
	N	%	N	%	N	%	
Sex							
Male	16	6.1	142	54	105	39.9	263
Female	10	5.3	86	46	91	48.7	187
Total	26	5.8	228	50.6	196	43.6	450



** Statically significant age group, i.e. $P < 0.01$

Figure 1: Weight status according to age groups.

Prevalence of hyperuricemia

During our study, we counted 450 patients, 160 of whom were hyperuricemia, i.e. a prevalence of 35.55%. Among these hyperuricemia patients in our study, 10% had gout, 17.5% had arterial hypertension, 16.25% renal failure and 56.5% asymptomatic.

Table II: Hyperuricemia patients by sex.

Variables	N	%	N'	%	P
Sex					
Male	263	58.4	91	34.6	P>0.05
Female	187	41.6	69	36.9	
Total	450	100	160	35.55	

N = Number of patients, N' = Number of hyperuricemia patients, % = percentage.

Table III: Hyperuricemia patients by age.

Age range	N	%	N'	%
Year				
20 – 29	200	44.4	11	5.5
30 – 45	120	26.7	54	45
46 – 65	130	28.9	95	73*
Total	450	100	160	35.55

N = Number of patients, N' = Number of hyperuricemia patients, % = percentage.

* Statically significant value i.e. P <0.05

Table IV: Biological parameters according to BMI.

	Weight loss BMI<18	Normal BMI = 18-25	Overweight BMI≥26
Parameters			
UA (μmol/l)	349.45 ±5.8	310.58±121.96	426.45±189.51**
TG (g/l)	1.2 ±4.53	0.73±0.35	1.17±0.46**
Chol. Total (g/l)	2.15 ±1.36	1.82±0.45	2.20±0.41*
C-HDL (g/l)	0.9 ±3.40	0.74±0.31	0.64±0.25
C-LDL (g/l)	1.01 ±6.79	0.93±0.33	1.34±0.31**

* Statically significant value i.e. P <0.05

** Statically significant value i.e. P <0.01

UA = uric acid, TG = triglyceridemia, Chol. T. = total cholesterolemia

HDL-C = HDL cholesterolemia, LDL-C = LDL cholesterolemia

Table V: Biological parameters according to age.

	20-29 years N = 200	30-45 years N = 120	46-65 years N = 130
Parameters			
UA (μmol/l)	276.59 ± 108.23	380.83 ±148.22	431.32 ± 165.43*
TG (g/l)	0.78 ± 0.27	0.95 ± 0.45	1.08 ± 0.54
Chol. Total (g/l)	1.85 ± 0.45	2.06 ± 0.44	2.12 ± 0.41*
C-HDL (g/l)	0.78 ± 0.30	0.68 ± 0.27	0.63 ± 0.22
C-LDL (g/l)	0.91 ± 0.22	1.19 ± 0.38	1.27 ± 0.37*

* Statically significant value i.e. P <0.05

Table VI: Biological parameters depending on the disease.

Parameters	Hyperuricemia			Asymptomatic
	HTA N=28	Gout N= 16	Renal failure N= 26	Asymptomatic N= 90
UA ($\mu\text{mol/l}$)	586.18 \pm 158.65*	589.40 \pm 128.37*	659.57 \pm 217.39*	517.29 \pm 50.78
TG (g/l)	1.40 \pm 0.57	1.23 \pm 0.56	1.22 \pm 0.52	1.30 \pm 0.54
Chol. Total (g/l)	2.36 \pm 0.22	2.29 \pm 0.17	2.32 \pm 0.30	2.32 \pm 0.29
C-HDL (g/l)	0.51 \pm 0.10	0.50 \pm 0.11	0.55 \pm 0.13	0.53 \pm 0.11
C-LDL (g/l)	1.57 \pm 0.14	1.54 \pm 0.14	1.52 \pm 0.25	1.52 \pm 0.23

* Statically significant value i.e. $P < 0.05$

Insuff. Renal = renal failure; Asymp. = Asymptomatic

Table VII: Correlation between uricemia and lipid balance.

Correlation		A.U.	TG	Chol. T.	C-HDL	C-LDL
Tau-B by Kendal	Correlation Coefficient	1.000	0.493**	0.581**	0.132**	0.628**
	Sig. (bilateral)	-	$P < 0.01$	$P < 0.01$	$P < 0.01$	$P < 0.01$
	n	450	450	450	450	450

** Statically significant value i.e. $P < 0.01$

UA = uric acid; TG = triglyceridemia; Chol. T. = total cholesterolemia

HDL-C = HDL cholesterolemia; LDL-C = LDL cholesterolemia

DISCUSSION

Sociodemographic characteristics of patients

We recorded 263 men and 187 women during our study. The sex ratio was 1.4 in favor of men. The mean uric acid level obtained was $363.77 \pm 108.23 \mu\text{mol/l}$ in men against $362.63 \pm 153.46 \mu\text{mol/l}$ in women. The difference was not significant. Contrary to our study, certain authors have obtained the male predominance of uricemia compared to women, notably Lutonadio in 2003 in Kinshasa, Chéickna in 2010 in Mali.^[6,7] Women's estrogen has a urate depressant effect.^[8]

A progressive and significant increase ($P < 0.01$) in the uric acid level was observed as a function of age: from $276.59 \pm 108.23 \mu\text{mol/l}$ in the age group of 20-29 years to $480.49 \pm 165.43 \mu\text{mol/l}$ (46-65). In the literature, the uricemia rate increases sharply with age in individuals of both sexes after geriatric age.^[9,10]

Based on BMI, we observed a uric acid carrier rate of $349.45 \pm 5.80 \mu\text{mol/l}$ in lean subjects; from $310.58 \pm 121.98 \mu\text{mol/l}$ in normal-weight subjects and $426.45 \pm 189.51 \mu\text{mol/l}$ in overweight subjects. The difference was significant ($P < 0.01$). Zeghar and al. in Algeria in 2017 obtained a significantly elevated mean uricemia in overweight people.^[10]

Hyperuricemia

During our study, we identified 160 cases of hyperuricemia out of a sample of 450, or 35.55%. Lutonadio in Kinshasa in DRC in 2003 reported a hospital prevalence of 53%.^[6] The hospital prevalence of hyperuricemia in our study greatly exceeds that observed in Western populations (5% -18% in men and 2.5% -

3.5% in women), in the Indian population of the Amazon region of Brazil (5.6%), in healthy Spanish males (5.1%), in Russian and hypertensive patients (31%).^[11,12,13,14] On the other hand, in Thai patients, young Caucasians from Norway and coronary Bulgarians the prevalence of hyperuricemia is high respectively by 49.6%; 51%; 51.5%.^[15,16] Hyperuricemia depends on several factors including study subjects, history of diabetes, history of high blood pressure, geographic space. This high uricemia trend in our study could be explained by the fact that the study takes place in a hospital setting and the subjects could have several conditions that would be the cause of the hyperuricemia. The staple food is a lot of meat in Chad.

Hyperuricemia was much more prevalent in men (56.87%) than in women (43.13%). The difference was not statically significant. Among the 160 hyperuricemia subjects in our study, 10% had gout, 17.5% had high blood pressure, 16.25% developed renal failure, and 56.5% were asymptomatic.

Depending on age, we observed a statically significant ($p < 0.05$) gradual increase in the rate of uricemia from 276.59 ± 108.23 in subjects aged 20-29 years to 431.32 ± 165.43 in subjects aged 46-65 years. Zeghar and al. in Algeria in 2017^[10] showed that the age group most affected by hyperuricemia is the elderly persons. This increase in uricemia with age could be explained by the fact that kidney function with aging slows down and causes high urinary acidity that can cause urinary stones that can be the cause of hyperuricemia.

One of the important indicators strongly correlated with hyperuricemia is the body mass index (BMI). The more

overweight the subject, the higher the prevalence of hyperuricemia. The result of our study showed a marked increase in uricemia in overweight subjects compared to normal and thin. Zeghar and al. in Algeria made the same observation in the study in 2017.^[10] Epidemiological studies have suggested that a high BMI triggers risk factors for lifestyle diseases such as type 2 diabetes, cardiovascular disease and hyperuricemia.^[6,10]

During the study, we observed clinical signs suggestive of gout. These are joint pain quantified at 8.13%; arthritis is observed at 1.25% and tophus at 0.63% in hyperuricemia patients. The main risk factor for gout is hyperuricemia. The uricemia level in these gout patients was in the range of $589.40 \pm 128.37 \mu\text{mol/l}$. The proportion of gout patients is often estimated at 10 to 15%, which shows that the finding of hyperuricemia has very low specificity for the diagnosis of gout.

According to the glomerular filtration rate (GFR), we divided the patients into 6 stages of renal failure: stage 1, stage 2, stage 3A, stage 3B, stage 4 and stage 5. We observed an established renal insufficiency. In 10% of stage 3B patients, 4.37% stage 4 and 1.88% stage 5 out of 160 hyperuricemia patients.

We also investigated the independent relationship between uricemia and lipid profile. The results showed a strong correlation between uricemia and triglycerides, total cholesterol, HDL cholesterol and LDL cholesterol with a significance level of $p < 0.01$. Zeghar and al. in Algeria in 2017^[10] observed a correlation between uricemia and triglyceride levels, and total cholesterol with a significance level of $p < 0.01$. Tao-Chun Peng and al. in 2014^[17] in the study on the relationship between hyperuricemia and lipid profiles in American adults, showed that LDL cholesterolemia, total cholesterolemia, and triglyceridemia, are significantly associated with hyperuricemia levels, while that HDL cholesterol has been inversely associated.

We focused our study on the relationship between uricemia and diseases related to hyperuricemia. The results of our work have shown that there is a correlation between uricemia and arterial hypertension (hypertension), gout and renal failure at the significance level $p < 0.01$. Other authors have obtained this trend of significant correlation between uricemia and hyperuricemia-related diseases: Nguedia and Coll. in 2014 in the South-West region of Cameroon^[18], Masanari and Coll. in 2016 in Japan^[19], Lutonadio in 2003 in Kinshasa^[6] and Soraya and Coll. in 2009 in Switzerland.^[20]

CONCLUSION

The prevalence of hyperuricemia in our study was 35.55%. The male was more exposed than the female. The prevalence of hyperuricemia gradually increased with age. Overweight and hypertension are the risk factors. The presence of metabolic syndrome is a risk

factor for diseases such as uric nephropathy, gout, high blood pressure and cardiovascular disease.

A significant correlation is observed between uric uricemia and lipid profile, as well as between uricemia and hyperuricemia-related diseases.

It makes sense to help reduce hyperuricemia by expanding the study to the entire Chadian population.

REFERENCES

1. Chapman PT, Yarwood H, Harrison AA, Stocker CJ, Jamar F, Gundel RH. Endothelial activation in monosodium urate monohydrate crystal induced inflammation: in vivo and in vitro studies on the roles of tumor necrosis factor alpha and interleukin-1. *Arthritis Rheum*, 1997; 40: 955-965.
2. Milliquin M. La goutte : principale manifestation. *Concours médical*, 2004; 126: 1589-1592P.
3. Wikipédia, goutte (maladie) Site : « <http://fr.wikipedia.org/wiki/goutte>. [Internet], [visité 06 juin 2019].
4. Borel J.P. Mécanismes moléculaires et chimiques à l'origine des maladies, Prion-Roche. *Biochimie pour le clinicien*. Paris: 2009.
5. Ngongoto Prosper. Prise en charge de l'hyperuricémie et ses complications. Thèse de doctorat en médecine. Complexe Hospitalo-Universitaire le Bon Samaritain, N'Djamena, Tchad, 2019.
6. Lutonadio JD. Hyperuricémie, groupe sanguin B et autres facteurs de risque cardiovasculaire à Kinshasa. Thèse de doctorat en médecine, Université Simon Kimbangu RDC, 2003. 41p.
7. Chéickna Sylla. L'approche steps Wise de la goutte dans le service de rhumatologie au CHU du point « G » à Bamako, [Thèse : Med], Mali, 2010.
8. Richette P, Bardin T. *Epidémiologie de la goutte*. La lettre du rhumatologue, 2012, N°384.
9. Mikuls TR, Farrar JT, Bilker WB, Fernandes S, Schumacher Jr. HR, Saag KG. Gout epidemiology: results from the UK. *General Practice Research Database*, 1990-1999. *Ann Rheum Dis*, 2005; 64: 267-72.
10. Zeghar Meriem, Zebiri Islam. Physiopathologie de l'acide urique : Etude biochimique auprès des adultes de la commune d'El-Khroub, Mémoire de Master. Université des Frères Mentouri Constantine, Algérie, 2017: 83p.
11. Bardin T. *Epidémiologie de la goutte*. *Rev Rhum*, 2006; 74: 147-149.
12. Avares EF, Vieira-filho JP, Andriolo A, Gimeno SG, Franco LJ. Metabolic and cardiovascular risk patterns of an India tribe living in the amazon Region of Brazil. *Hum. Biol.*, 2003: 31-46.
13. Corella D, Silla J, Ordovas JM, Sabatera A, Ruiz de la Fuente, Portoleso, Ganzalez JL. Association of blood Uric Acid with other cardiovascular risk factors in the male working population in Valencia. *Rev. Clin. Esp.*, 1999: 806-812.

14. Donskov AS, Balkarov IM, Gulob GV, Anikina SA, Saltykova NG, Levchok SM, Gravrilova ES. Clinical implication of the body mass and waist/thigh indices in hypertensive patients: correlations with blood Uric acid levels. *Klin. Med (Mosk)*, 2002: 31-34.
15. Rattarasarn C, Leelawattara R, Soonthernpun S, Setasuban W, Thamprasita, Lima et al. Regional abdominal fat distribution in learn and obese thial type II diabetic women, relationships with insulin sensitivity and cardiovascular risk factors. *Metabolism*, 2003: 1444-1447.
16. Clausen JO, Borsch-Johnson K, Ibsen H, Pedersen O. Analysis of the relationship between fasting serum Uric acid and the insulin index in a population-based sample of 380 young healthy Caucasians. *Endocrinol*, 1998: 63-69.
17. Tao-Chun Peng, Chung-Ching Wang, Tung-Wei Kao, James Yi-Hsin Chan, YaHui Yang, Yaw-Wen Chang, and Wei-Liang Chen. Relationship between Hyperuricemia and Lipid Profiles in US Adults, 2014.
18. Nguedia Assob JC, Ngowe MN, Nsagha DS, Njunda AL, Waidim Y, et Coll : the relationship between Uric Acid and Hypertension in adults in Fako Division, SW Region Cameroon. *J Nuttn Food*, 2014: 85p.
19. Masanari Kuwabara. Hyperuricemia, Cardiovascular Disease, and Hypertension, 2016.
20. Soraya H. Hyperuricémie dans l'hypertension artérielle et l'insuffisance rénale : facteur causal ou épiphénomène. *Revue Médicale Suisse*. 2009, 154-155p.