



## PREVALENCE OF HYPERURICEMIA IN PORT HARCOURT LOCAL GOVERNMENT AREA, RIVERS STATE, NIGERIA

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### ABSTRACT

In a population based cross-sectional study, a total of 100 apparently healthy subjects (58 males 42 females) randomly selected from Port Harcourt, Rivers State, Nigeria, were investigated for serum uric acid level (SUA). SUA was estimated by Uricase method using a clinical chemistry analyzer (Map-Lab plus)®. Of the 100 subjects investigated, prevalence of hyperuricemia ( $>416\mu\text{mol/L}$  for males and menopausal women, and  $>339\mu\text{mol/L}$  for pre-menopausal women) was observed to be 56% of which males and females had % prevalence of 32% and 24% females respectively. The prevalence rate of hyperuricemia in females was high in the age intervals 61-70 (7%) and 51-60 (5%) years respectively. The lowest prevalence rate of 2% was observed in females in the age intervals 21-30 years. In males, the highest prevalence rates of 12% was observed at age intervals 61-70%, followed by 8% in age intervals 21-30 years, and the lowest prevalence of 3% in age intervals 41-50 years. Uric acid level increased significantly with age in post-menopausal women, probably due to diminished estrogen secretion. The overall high prevalence rate of 56% may be a reflection of high seafood and alcohol consumption in Rivers State.

**KEYWORDS:** Prevalence, Hyperuricaemia, Port Harcourt, Nigeria.

### INTRODUCTION

Hyperuricaemia is a condition that occurs when serum uric acid (SUA) levels are  $\geq 420\mu\text{mol/L}$  in men and  $\geq 360\mu\text{mol/L}$  in women. A metabolic disorder that accompanies excess serum uric acid level is known as Gouty Arthritis, in which excess uric acid is deposited in the joints, causing painful swelling, especially in the toes and feet.<sup>[1,2]</sup> Ultimately this may lead to persistent attacks, chronic pain, and in some patients, joint damage.<sup>[1,2]</sup> Hyperuricaemia has also been associated with increased morbidity in patients with hypertension, cardiovascular disease, dyslipidemia, osteoarthritis, and decline in renal function in women and the elderly.<sup>[1,2,3,4]</sup> In developing countries, dyslipidaemia and hypertension are strongly associated with coronary heart disease, myocardial infarction, and peripheral vascular disease, and has been reported to be the main cause of death in developing countries.<sup>[5,6]</sup>

Prevalence of asymptomatic hyperuricaemia in general has been put at 2-13% worldwide.<sup>[7]</sup> A progressive increase in hyperuricaemia and cardiovascular risks observed worldwide has been linked to rising prevalence of overweight and obesity as well as increase in consumption of sugar sweetened beverages.<sup>[7,8,9]</sup>

Hyperuricaemia and particularly gouty arthritis are far more common in men than women.<sup>[10]</sup> Only 5% of patients with gout are women, but uric acid levels increase in women after menopause. Pre-menopausal women are less likely to develop hyperuricaemia because estrogen causes increased urate clearance.<sup>[10]</sup>

Racial differences in the prevalence of hyperuricaemia have been highlighted by several studies<sup>[11]</sup>. A high prevalence of hyperuricaemia exists in indigenous races of the pacific such as Filipinos, Samoans and Maori probably because of the combination of a high seafood diet and poorly defined genetic differences in the excretion of uric acid.<sup>[12,13]</sup> A high prevalence of hyperuricaemia also exists in Africans.<sup>[10,14]</sup> In their studies have also linked the high prevalence values in Africa to consumption of seafood and excessive alcohol intake in Riverine communities. In a rural population in the Niger Delta area of Nigeria a prevalence of 17.2% has been reported.<sup>[15]</sup> and 35.8% in the urban city of Abakiliki Nigeria.<sup>[16]</sup> The aim of this study was therefore to determine the prevalence of hyperuricaemia in Port Harcourt located in the Niger Delta area of Rivers State.

## MATERIALS AND METHODS

### 2.1 Materials

Materials used in this study include Semi-automated clinical chemistry analyser (Map-Lab plus)®, Centrifuge, automatic pipette and serum specimens from the subjects that participated in the study. A commercially prepared uric acid reagent purchased from Randox Laboratories, United Kingdom was used.

### 2.2 Study Location

This study was conducted in Port Harcourt, in Portharcourt local government area of Rivers State. Port Harcourt is the state capital and commercial centre of Rivers state as well as the third largest commercial centre in Nigeria after Lagos and Abuja but ranks first in oil and gas trade. It is located in the South-South geographical region of Nigeria, bounded on the South by the Atlantic Ocean.

### 2.3 Subjects

A total of 100 apparently healthy subjects (58 males and 42 females) between the ages of 18 – 65 years were randomly selected from Port Harcourt, Rivers State, Nigeria, were investigated for serum uric acid level (SUA). The inclusion and exclusion criteria were based on the information obtained during interview and filled questionnaire.

#### 2.3.1 Inclusion criteria

Participants used in the study were those that consented, not obese, non-alcoholics or long history of alcohol intake, apparently healthy without any history of arthritis, gout, chronic disease or ailment and are also not on any form of drugs prior to or during the study

#### 2.3.2 Exclusion criteria

Subjects excluded from the study were those that did not give their consent, obese, alcoholics or with long history of alcohol intake, with history of chronic disease or ailment and are also on any form of drugs prior to or during the study.

### 2.4 Sample Collection

A total of One Hundred (100) serum samples were collected for this study at various locations in Port Harcourt and its environs. Whole blood specimen were collected into plain bottle and allowed to stand for 30 minutes for clot to occur. After the formation of blood clot, the specimens were retracted using applicator stick and centrifuge at 4000rpm for 5 minutes. Serum specimens were collected as supernatant and were transferred into another well labeled plain bottle for the analysis of calcium. Serum uric acid levels were determined using the uricase enzymatic method and procedure followed was as instructed by the manufacturer of the uric acid kit.

## RESULT

The results obtained from this study as indicated in Table 3.1 shows that 32 males and 24 females were hyperuricaemic from the whole group were hyperuricaemic representing 32.0% and 24.0% prevalence in male and female subjects respectively which collectively summed to 56 hyperuricaemia cases, representing 56% prevalence of hyperuricaemia in our study. The average age of the hyperuricaemic females and males were  $46.01 \pm 11.98$  and  $48.47 \pm 15.59$  with uric acid levels of  $503.75 \pm 79.89$  and  $544.97 \pm 111.64$  respectively.

Of the 100 subjects, 26 males and 18 females had normal serum uric acid which also represents 26% and 18% prevalence of normal uric acid levels making normo-uricaemic prevalence of 44%. The average age of normo-uricaemic males and females were  $43.08 \pm 13.27$  and  $40.19 \pm 14.93$  with uric acid levels of  $337.81 \pm 57.16$  and  $262.38 \pm 64.0$  respectively.

Furthermore, when different age intervals were considered (table 3.3) in both hyperuricaemic males and females, age intervals of 61 -70 had 12%; 21 – 30 had 8% while the least prevalent level was observed in within the age intervals of 41 – 50 years with a prevalence of 3%. Age interval 31- 40 and 51- 60 had 5% and 4% respectively. From the results obtained, it was observed that the highest occurrence of hyperuricaemic was in 61 – 70 years, followed by 21 -30years while the least was seen 41-50 years. When the age intervals of hyper-uricaemic females were considered, 61 -70 had 7%, 31 - 40 had 6% while the least % prevalence was seen in 21-30 years with a value of 2%. Age interval of 41 -50 and 51 -60 had prevalence of 4% and 5% respectively. The result obtained also indicates that the highest % prevalence was observed at the age interval of 61 – 70 years followed by the age interval of 31 – 40 years. Age intervals of 21 – 30 in the hyper-uricaemic females had the least %prevalence of 2 with serum uric acid level of  $472.0 \mu\text{mol}$ . Generally, it was observed in this study that men had higher level of hyperuricaemia compared to female subjects (table 3.1). The results obtained also indicated even at different age intervals; men had higher level of hyperuricaemia compared to females especially within the age intervals of 61 – 70 years.

Table 3.3 shows the summary of the %prevalence of hyperuricaemia in males and females with values of 32.0% and 24.0% respectively. The overall % prevalence of hyperuricaemia was observed to be 56.0% in the population study. In addition, the % prevalence of normo-uricaemic males and females were observed to be 24 and 18 respectively with a total of 44% prevalence.

**Table 3.1: Uric acid levels and % prevalence among males and females with hyperuricaemia and normo-uricaemia.**

Subjects	N	Age (years)	Uric Acid ( $\mu\text{mol}$ )	% Prevalence
Female				
Hyperuricaemia	24	46.01 $\pm$ 11.98	503.75 $\pm$ 79.89	24
Normal	18	40.19 $\pm$ 14.93	262.38 $\pm$ 64.0	18
Males				
Hyperuricaemia	32	48.47 $\pm$ 15.59	544.97 $\pm$ 111.64	32
Normal	26	43.08 $\pm$ 13.27	337.81 $\pm$ 57.16	26

Key: N = Number of Subjects, Uric acid level was expressed as Mean $\pm$ SD, where SD= Standard Deviation

**Table 3.2: Mean uric acid values and % prevalence of hyperuricemia at different age intervals.**

Age intervals of hyper-uricaemic Subjects	N	Mean Uric acid ( $\mu\text{mol}$ )	% Prevalence
Males			
21 -30	8	499.88	8
31 -40	5	585.80	5
41 -50	3	443.33	3
51 -60	4	516.25	4
61 -70	12	535.58	12
Females			
21 -30	2	472.0	2
31 -40	6	529.83	6
41 -50	4	483.0	4
51 -60	5	500.80	5
61 -70	7	531.0	7

Key: N = Number of subjects

**Table 3.3: Summary of % Prevalence of Hyperuricaemia and normo-uricaemia in males and females in the study population.**

Sex	No of subjects		% Prevalence of Hyper-uricaemia
	Hyperuricaemia	Normo-uricaemia	
Males	32	26	32
Females	24	18	24
Sub-totalTotal	56	44	56
Grand total = 100	56	44	

## DISCUSSION

From the results obtained from this study, it was observed that males and females had a % prevalence of hyper-uricaemia of 32% and 24% respectively, summing up to 56% in the study population. The prevalence rate in our finding is higher than the reports of [15]. In their study, they reported a prevalence rate of 17.2% in rural communities in the Niger Delta region of Nigeria with a total of 500 participants within the age range of 15 - 95 years. Our finding agrees with the findings of [16]. In their study, healthy male adults in Abakaliki, a riverine metropolis like Port Harcourt was recruited. They reported a prevalence rate similar to that obtained in our study.

The higher prevalence rate of hyper-uricaemia observed in our study in the urban city of Port Harcourt compared to the rural population could be as a result of higher consumption of high calorie foods and sugar sweetened beverages amongst cities dwellers compared to rural

dwellers. It was also observed that the issues of day-to-day stress in cities to meet up responsibilities are higher in the cities compared to the rural areas. The differences in the stress level could also account for higher prevalence of hyperuricaemia in the cities as a result of increased cell degradation or breakdown in cause some metabolic activities to sustain energy requirement of the body. These findings are also in line with the reports of [7,17,18]. Our study also observed that the prevalence of hyperuricaemia is higher in males than in females. This finding concurs with the research of [6,15,15] reported % prevalence of 25 and 13.7 for male and female subjects respectively while [6] reported % occurrence of 69.4 and 30.6 in a single-centre survey among patients with coronary artery disease. Similar report was given by [19]. It was stated that 35.2% of men had hyperuricaemia in a study carried out in Seychelles.

The differences observed in males and females could be as result of increased muscular mass activities in males

compared to females, due to increased testosterone activity in males that stimulates increased muscular mass. This report agrees with the finding of.<sup>[20]</sup> Also, the increase consumption of alcohol especially among males in the Niger Delta region of Rivers state could have contributed to higher prevalence in men. In addition, the decrease observed in females could also be as a result of hormonal activities of estrogen and other sex hormones such as progesterone which have been associated with the reduction of uric acid in the plasma. This finding is also in line with finding of<sup>[19,21,22,23,24]</sup> Though the mechanism of action is not clear, it has been reported that estrogen has been implicated in enhance urinary excretion uric acid and reduced muscular mass in females compared to males. This was further demonstrated when injection of estrogen in males reduces the uric acid levels while menopausal women with reduced estrogen levels had higher uric acid levels compared to pre-menopausal women.<sup>[23,25]</sup>

When age intervals were considered, it was observed that in females, the prevalence of hyperuricaemia was high in the age intervals of 61-70 and 51-60 years, with a % prevalence of 7% and 5% respectively. This result is in agreement with the findings of<sup>[19]</sup> These prevalence rates are all higher than the prevalence rate of 2-13% of asymptomatic hyperuricaemia in the general population worldwide. These high prevalence rates seen in this study could be as result of the location of these populations near the Atlantic (sea) with easy access to seafood rich in purines which are oxidized to uric acid.

However, the discrepancy in hyperuricaemic levels seen in the age intervals of 61 -70 and 51 -60 years compared to age intervals of 21 -30, 31 – 40 as well as 41 -50 might be due to the presence of higher concentration of reproductive hormones in the different age intervals. Due to reduced estrogen and progesterone levels in the age intervals of 61 -70 and 51 -60 (menopausal women), uric acid tends to increase in the serum compared to the age intervals within premenopausal years. This finding also agrees with the statements of<sup>[10,23,24,25]</sup> that the high prevalence rate of uric acid observed in post menopausal women is consistent with their post-menopausal status resulting in diminished estrogen secretion. The lowest prevalence rate of 2% observed in the age intervals of 21-30 years could be because the ovaries are actively secreting estrogen believed to reduce the serum uric acid level in the body.

In males, when age intervals were considered, the highest prevalence rate of 12% was observed at age group of 61-70 years, with mean Serum uric acid value of 535.58 $\mu$ mol/l. This is followed by the prevalence rate of 8% in age groups 21-30 years with mean Serum uric acid value of 499.88 $\mu$ mol/l. Our result agrees with the findings of<sup>[26]</sup> which reported increase in serum uric acid value with age. The increase seen in age interval of 21 - 30 years compared to 31 – 40 as well as 41 – 50, could be as a result of increased muscular activities involved in

that age interval. The prevalence rate of hyperuricaemia at different age intervals in males and females shows that age appears to be an important risk factor in increasing serum uric acid. Hyperuricaemia has been known to pose risks in the development of coronary artery disease.<sup>[6]</sup>

## CONCLUSION

Results obtained from this study, indicate that the % prevalence of hyper-uricaemia in Port Harcourt is high and was shown to be higher in men compared to women. Therefore, it is advised that habits such as smoking, alcohol consumption, regular consumption high calorie food and purine-rich diets should be checked in order to reduce the risks and sudden occurrence of coronary heart disease.

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