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Research Article

Serum Uric Acid Levels: From Pathophysiological to Biochemical and Pharmacological Perspectives; an Observational Research in General Population from Sindh, Pakistan

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ABSTRACT

Uric acid has been an important compound with diverse effects on body systems mainly due to the life style changes resulting into arthritis, renal stones, arthralgia and metabolic syndrome. It disturbs the biochemical and normal physiological process following disturbances in purine metabolism either increased synthesis or reduced elimination. Management is based on dietary restriction of protein diet and use of certain pharmacological agents. This observational study was conducted on general population from different areas of rural and urban Sindh on apparently healthy individuals. For study purpose 3000 volunteers were selected through consecutive sampling from both male and female sexes with age range 10 years to 60 years through informed written consent as a study requirement. Serum uric acid was measured through device method, SPSS 22nd version was used for data analysis, the male female proportion was kept equal at 1:1 with 1500(50%) male and 1500(50%) females. Population mean uric acid was 4.8mg/dl with a standard deviation of 1.1mg/dl and a range of 9.2mg/dl where 3.7mg/dl was minimum and 12.9 mg/dl as maximum, hyperuricemia (>6.8mg/dl) was found in15.73 % (472) of the population while 84.27% (2528) patients were found as normal or border line uric acid levels. Mean of uric acid was 4.7$\pm$1.2mg/dl in males and 4.2$\pm$1.4 mg/dl in females the difference was none- significant statistically (p-0.25)

Conclusion: Hyperuricemia was observed in 15.73% of individuals with non-significant difference among the two genders.

Keywords: Gout, Uric Acid, Hyperuricemia, Arthralgia.

INTRODUCTION

Uric acid is the product purine catabolism hypoxanthine gets converted into xanthine, which subsequently gets converted into uric acid by the action of enzyme, xanthine oxidase. It is a weak acid with ionization constant (pKa 5.75-10.3) so it gets ionized to form the urate crystals (99%) under physiological pH (7.40) in the extracellular Fluid. Normal Physiological and chemical processes the body produces 700mg of uric acid on daily basis out of which 30% of which 30% in excreted in feces while 70% through the kidneys unchanged, hyperuricemia (>6.8 mg/dl) occurs if the process gets disturbed [1]. The crystals of Uric acid get deposited in joint spaces (synovial fluid) which initiates the inflammation, leucocyte infiltration, leukotriene synthesis and release of other

inflammatory markers along with the enzymatic hydrolysis [2]. Hyperuricemia remains asymptomatic or it may present with certain pathologies like pain and inflammation over joints (Gouty arthritis), renal stones and metabolic syndrome or as comorbidity with hypertension, ischemic heart disease and diabetes [3,4]. According to an estimate about 8.3 million adults are affected by hyperuricemia in United States of America having a prevalence rate of 3.9% [5]. The global prevalence of hyperuricemia in adult population ranges from 10% to 40% while it is reported to be 30.1% and 31.9% for Karachi and Faisalabad Pakistan respectively. The prevalence of hyperuricemia is increased to 76.7% by the co-morbidities like in chronic renal failure patients. Male gender is affected around the age above 30 years predominantly whereas females are more affected at the postmenopausal age [6]. Mono sodium urate gets deposited into the joint spaces when the uric acid reaches above 6.8mg/dl resulting into the initiation of the pathology process [7]. Possible causes include high protein diet, certain drugs loop and thiazide diuretics, ethambutol and pyrazinamide antituberculosis drugs and the aspirin an antipyretic agent need to be evaluated while dealing a patient of hyperuricemia. The goal of treatment is to keep uric acid level below 6mg/dl as set by the European Guidelines on chronic hyperuricemia[8]. Pharmacological management ranges from colchicine for acute gout along with NSAIDS (Non-steroidal anti-inflammatory drugs), uricosuric agents, xanthine oxidase inhibitors, interleukin-1 inhibitors, pegloticase, and glucocorticoids as required from patient to patient [9]. The compliance for drugs is very poor with a compliance rate around 18% to 26% patient education is very important from preventive and therapeutic point of view [10]. This study will add to the literature available on this scientific and clinical research topic regarding the facts and figures about this part of the land.

METHODOLOGY

This observational study was conducted on general population from different areas of rural and urban Sindh on apparently healthy individuals. For study purpose 3000 volunteers were selected through consecutive sampling from both male and female sexes with the male and female proportion kept equal at 1:1. The age range of the selected volunteers was 10 years to 60 years through informed written consent as a study requirement. Willing and healthy volunteers were included while unwilling and sick individual and known cases of metabolic syndrome or hyperuricemia or patient of renal failure or patients of diuretic therapy were excluded along the children below 10 years and elderly above 60years. Serum uric acid was measured through device method, SPSS 22nd version was used for data analysis, using t-test and chi-square and frequency and percentage and mean was calculated and compared while results were prepared in the form of tables and figures.

RESULTS

There were 3000 study participants evaluated for serum uric acid levels voluntarily following consent process. The male female proportion was kept equal at 1:1 with 1500(50%) male and 1500(50%) females. Population mean uric acid was 4.8mg/dl with a standard deviation of 1.1mg/dl and a range of 9.2mg/dl where 3.7mg/dl was minimum and 12.9 mg/dl as maximum, hyperuricemia (>6.8mg/dl) was found in15.73 % (472) of the population while 84.27% (2528) patients were found as normal or border line uric acid levels. Mean of uric acid was 4.7$\pm$1.2mg/dl in males and 4.2+1.4 mg/dl [Table-1].

Table 1: study results for various parameters

Parameters	Analysis
Male	1500(50%)
Female	1500(50%)
Mean Serun Uric Acid mg/dl	4.8$\pm$1.1
Mean Serun Uric Acid mg/dl in Males	4.7$\pm$1.2
Mean Serun Uric Acid mg/dl in Females	4.2$\pm$1.4
Minimum level found mg/dl	3.7
Maximum level found mg/dl	12.9
Range of uric acid in study population mg/dl	9.2
Normal levels in study population mg/dl	2528(84.27%)
Hyperuricemia in study population mg/dl	472(15.73%)

Table 2: Gender based comparison of serum uric acid levels

Parameter	Normal	Hyperuricemia	Total
Male (1500)	1262(42.07%)	238(7.93%)	1500(50%)
Female (1500)	1266(42.20%)	234(7.80%)	1500(50%)
Total	2528(84.27%)	472(15.73%)	3000(100%)

There was non-significant difference between the two genders (p-0.25)

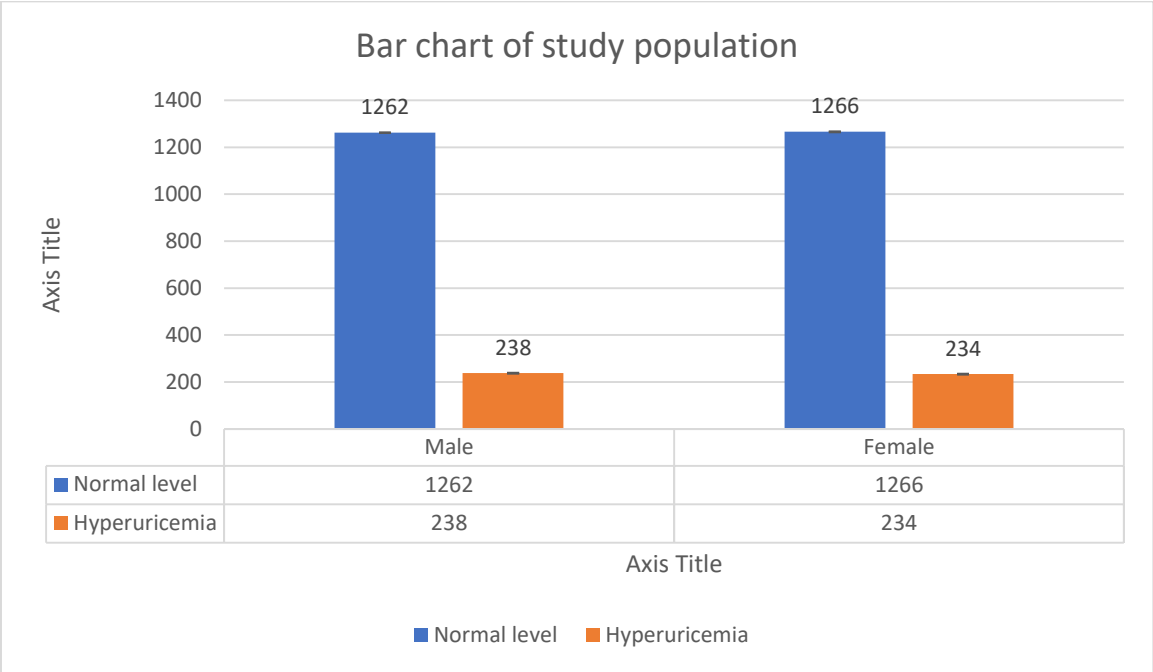

Figure 1: Bar Chart Representation of Comparison B/W Males and Females

DISCUSSION

Our current research findings fall inconsistent with the study results of the Yanyan Zhu et al (2011), reporting the mean of uric acid level as 6.14 mg/dl for the females while the male as 4.87 mg/dl [5]. Current results also slightly differ from our previous study, Ashique Ali Arain et al (2017) may be due to the sample size and population selected [11]. Jamshed et al. (2016) study reslts also falls inconsistent with our study results as their research was on coronary artery disease patients, the mean uric acid reported by them in males was 7.2mg/dl while in females it was 5.9mg/dl, this difference may be attributed to the difference in study population [12].Dasti MA et al. (2015) reported 13.74mg/dl as population mean, while 11.74mg/dl for males whereas 14.43mg/dl for females however their study population was the hypertensive patients [13]. Choi HY et al (2017) found the mean uric acid in males as 5.93mg/dl whereas 4.37 mg/dl in females with a significant difference between the two genders which is inconsistent with our findings [14].

Colchicine was used as an acute management in our society of physicians followed by the Allopurinol an inhibitor of the key enzyme 'xanthine oxidase' responsible for the synthesis of uric acid, having an active metabolite, an extra advantage whereas NSAIDs and steroids remain the add on drugs from patient to patient.

Study Limitations

This work has a lot of limitations with a mare observation while true comparisons gone missing, where renal function test could have been conducted and incorporated, blood pressure, sugar levels and body mass index could have been very handy went missing. A comparison between adults and children would have had another interesting impact on the research. We couldn't cover that much broader topic due to our own limitation but hope is alive to conduct such a broader and real impactful project with the inclusion certain new parameters.

Recommendations

An impactful real scientific research study as proposed above in our limitations is recommended. It is further recommended that

public awareness educational programs about the non-pharmacological management and about the compliance of medicine should be arranged at community levels.

CONCLUSION

Hyperuricemia was observed in 15.73% of individuals with non-significant difference among the two genders

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