INTERNATIONAL JOURNAL OF PHARMACY AND ANALYTICAL RESEARCH

ISSN:2320-2831

IJPAR |Vol.6 | Issue 3 | July - Sep -2017
Journal Home page: www.ijpar.com

Research article *Open Access*

A study to evaluate the correlation between serum uric acid and triglyceride level and its association with body mass index in type 2 diabetic patients

Mathew George[1], Lincy Joseph[2], Rani Manju[3], Bincy Joseph*

[1]*Department of Pharmacology, Pushpagiri College of Pharmacy, Thiruvalla-689107, Kerala, India*
[2]*Department of Pharmaceutical Chemistry, Pushpagiri College of Pharmacy, Thiruvalla-689107,Kerala, India.*
[3]*Department of Pharmacy Practice, Pushpagiri College of Pharmacy, Thiruvalla-689107, Kerala, India*

***Corresponding Author: Bincy Joseph**
Email: bincypathil@gmail.com

ABSTRACT

Uric acid is a novel risk factor for diabetes. Diabetes mellitus is a chronic metabolic disorder and a major public health problem around the world. Hyperurecemia is commonly associated with traditional risk factors like hyperglycemia, dyslipidemia and central obesity. Patients with type2 diabetes, increased level of uric acid may be an early sign of diabetic kidney disease.

As there are only few studies conducted regarding the correlation between serum uric acid and triglyceride level and its association with body mass index in type2 diabetes patients, the present study is undertaken Among the 80 diabetic enrolled patients the study showed that, as the p-value <0.01 , there exist a correlation between hyperurecemia and hypertriglyceridemia which is a prominent factor for development of cardiovascular and renal complications.

These association had a close link with their BMI. That is, as the BMI increases the chance for development of hyperurecemia and hypertriglyceridemia is very high in overweight, class 1,2,3 obese patients .The study also give an evidence for hypourecemic effect of metformin and other hypoglycemic medications.

Thus the study can be concluded that by stating that a restriction over BMI, uric acid and triglyceride level may reduce the percentage for the development of diabetic complications

Keywords: Serum uric acid, Triglycerides, Type2diabetes, BMI

INTRODUCTION

Diabetes mellitus (DM) is a group of metabolic disorder in which there are high blood sugar levels over a prolonged period of time. It is a group of disorders characterized by chronic hyperglycemia associated with disturbance of carbohydrate, fat and protein metabolism due absolute or relative deficiency of insulin secretion or its action. The prevalence of T2DM is a chronic metabolic disease that is a major public health problem around the world. With rapid economic growth, increases in life expectancy and changes in lifestyle, the incidence of diabetes mellitus has increased. Obesity and weight gain are the recognized causes of T2DM [1].

Uric acid (UA) is the end product of human purine metabolism. Hyperuricemia is a condition in which the subject has increased serum uric acid levels. Studies have noted that an elevated level of uric acid predicts the development of diabetes, obesity, hypertension and the metabolic syndrome. People who had higher uric acid levels are more likely to get type 2 diabetes. The diabetic patients with increased serum uric acid level appear to be at increased risk of developing diabetic complication. Hyperurecemia is an independent risk factor for kidney dysfunction in diabetic patients. Hyperurecemia is probably associated with glucose intolerance due to various mechanisms, however most important is association between insulin an renal resistance to absorption of urate [8].

Metabolic syndrome (MS) is considered a collection of cardiovascular risk factors that generally includes central obesity, hypertension, high triglyceride and low HDL cholesterol levels. Some studies suggest that uric acid may be a consequence of the presence of hyperinsulinemia and/or oxidative stress which is present in patients with metabolic syndrome. Serum uric acid level is associated with the individual components of metabolic syndrome such as obesity, dyslipidemia. Various components of diabetic dyslipidemia including raised LDL cholesterol, low HDL cholesterol and raised triglycerides were independently associated with hyperuricemia in type II diabetes mellitus. Serum uric acid has been shown to be associated with oxidative stress and production of tumor necrosis factor-α which are both related to the development of diabetes. Hyperuricemia is a metabolic consequence originating with a wide range of etiology concerned with production and excretion of uric acid and also as a combination of both. By definition, hyperuricemia is the increase in urate concentration >420μmol/ L (7.0 mg / dl) in blood. Hyperuricemia is said to be a mediator of proinflammatory endocrine imbalance in the adipose tissue which may be one of the factors for dyslipidemia and the inflammatory process leading to atherogensis. The association of uric acid with almost all risk factors for CVD has made it very difficult to determine whether uric acid has a causal role in these conditions or whether it is simply a marker for individuals at increased risk [2].

High uric acid

Hyperuricemia (high levels of uric acid), which induces gout, has various potential origins:

- Diet may be a factor. High intake of dietary purine, high-fructose corn syrup, and table sugar can increase levels of uric acid.
- Serum uric acid can be elevated by reduced excretion via the kidneys
- Fasting or rapid weight loss can temporarily elevate uric acid levels.
- Certain drugs, such as thiazide diuretics, can increase blood uric acid levels by interfering with renal clearance [6].

MAGEMENT OF HYPERURECEMIA [7]

Lifestyle Modification

Since hyperurecemia requires long-term management, it is essential that patients should be informed about their diagnosis and educated aboutgout to achieve good patient compliance. Some certain dietary patterns influence the risk of developing gout by causing hyperuricemia. The association between a chronic purine-rich diet, mainly of animal origin, and hyperuricemia or incident gout is well established [7]. Alcohol (including wine, beer, and liquor), sugar-sweetened soft drinks and, fructose consumption were found to be associated with an increased risk of hyperurecemia. Some foods and beverages are reported to have protective effects against gout. Dairy products, cherry consumption, or vitamin C intake are reported to decrease serum uric acid and the frequency of gout flares. The intake of purine-

rich vegetables was not associated to plasma uric acid .By the reason of these proven dietary risk factors, lifestyle modifications should be recommended in combination with urate-lowering medications to help maintain serum urate levels below 6 mg/dL to prevent crystal formation. Obesity and weight gain are known to be risk factors for gout both in men and women.

Diabetic patients with type 2 diabetes mellitus are at greater risk of developing vascular diseases because of lipid changes. It has been well observed that controlling uric acid and lipid levels provide great benefit to diabetic patients. Impaired function of endothelium is an early indicator of cardiovascular disease. A normal endothelium is defined as blood flow response to a vasodilator which is denoted as increased vascular risk. Lipid abnormalities in type 2 diabetic patients with increased serum triglycerides, very low density lipoproteins, low density lipoproteins and lowering of high density lipoproteins. Insulin resistance syndrome has been widely found that it is associated with type 2 diabetes mellitus in which high density lipoprotein is quite reduced and chances of cardiovascular complication [4].

Obesity and type 2 diabetes are always complicated by insulin resistance; obesity is also associated with a state of chronic, low-grade inflammation that contributes to insulin resistance, type 2 diabetes, and increased risk for hyperuricemia and gout. Many clinical studies have shown a separate impact of fat distribution on insulin action, and an accumulation of fat in abdominal viscera has been reported to be strongly associated with insulin resistance independent of total adiposity. In both humans and animal studies, inflammatory cells accumulate in adipose tissue with increasing body weight, and evidence is mounting that implicates these inflammatory cells as significant contributors to obesity-associated insulin resistance. The most widely used method to gauge obesity is the body mass index (BMI)which is equal to weight/ height^2(in kg/m^2) [5]. This study was conducted to evaluate the correlation between serum uric acid and triglyceride level with BMI in type2 diabetic patients [3].

MATERIALS AND METHODS

Aim

To evaluate the correlation between serum uric acid and triglyceride level and its association with body mass index (BMI) in type 2 diabetic patients.

Objectives

1. To estimate the level of serum uric acid and triglyceride in type 2 diabetes patients.
2. To evaluate association between serum uric acid and body mass index (BMI) in type2 diabetes patients.
3. To evaluate the correlation between triglyceride level with body mass index.
4. To evaluate the effect of hypoglycemic drugs on uric acid levels.

METHODOLOGY

Study Design: prospective, experimental study.

Study Population: Patients reported in the department of General medicine. **INCLUSION CRITERIA**

- Type2 diabetes patients.
- Both male and female patients.
- Those who give consent voluntarily to participate in study.

Exclusion Criteria

- patient who are not willing to give consent.
- patients on diuretics or uric acid lowering therapy.
- patients having other co morbidities like chronic hepatic disease, acute infectious diseases, malignancy, hypo/hyperthyroidism.

Study Site: Tertiary care setting. Department of general medicine, at Pushpagiri Medical College Hospital and Pushpagiri College of pharmacy, Thiruvalla.

Sample Sizeof The Study: 80 diabetic patients

EQUATION

$$n = \frac{\left\{ Z_{1-\frac{\alpha}{2}} \sqrt{2\,\bar{P}\,(1-\bar{P})} + Z_{1-\beta} \sqrt{P_1\,(1-P_1) + P_2\,(1-P_2)} \right\}^2}{(P_1 - P_2)^2}$$

α:significance level

1-β: power

Study Period: 6 months

ETHICAL CONSIDERATION

- The study was started only after getting the approval from institutional Ethics committee.
- Informed consent will be obtained from patients before commencing the study.

BRIEF PROCEDURE OF THE STUDY

A prospective experimental study was conducted in Department of General medicine in Pushpagiri Medical College Hospital after getting approval from Institutional Ethics Committee. All patients were given a brief introduction regarding the study and the confidentiality of the data was maintained. A written informed consent will be obtained from the patient or care giver. Patients diagnosed with type 2 diabetes were identified and their hospital record in the department was studied. After obtaining their OP number, name and other demographic details, from the Biochemistry lab residual blood was obtained. Residual blood is the blood remaining after the blood routine analysis in the lab. Blood was not withdrawn directly from the patient and any financial burden was not imposed on the patient. The collected residual blood from the lab was analyzed for Uric acid and Triglyceride using semi auto analyzer in the Pushpagiri College of Pharmacy. The height and weight of patients will be obtained from medical records for calculation of BMI.

Procedure to find out Uric acid

- Blank: Pipette out 1ml Reagent(R).
- Calibrator: Pipette out 1ml Reagent(R) and 25microlitre Calibrator solution.
- Sample: Pipette out 1ml Reagent (R) 25 microlitre serum.
- Mix and incubate for 5 mnt at 37
- Read the Uric acid using semiautoanalyser.

Procedure to find out Triglyceride

- Blank: Pipette out 1ml enzyme reagent.
- Standard: Pipette out 1ml enzyme reagent and 0.01ml standard
- Test: Pipette out 1ml enzyme reagent and 0.01ml of serum.
- Mix well and incubate for 10 mnt at 37 C.
- Read the Triglyceride using semiautoanalyser.

Reagents

R: Uricase	160U/L
Peroxidase	6600U/L
Ascorbate oxidase	1200U/L
4-Aminophenazone (4-AP)	1mmol/L

Uric acid cal: uric acid aqueous calibrator 6 mg/dl

Enzyme reagent:	5*10	2*5	2*100	5*100ml
Standard (200mg%) :	1.0	1.0	1.0	2*1.0ml

RESULTS AND DISCUSSION

In the 6-month study, a total of 80 diabetic patients were enrolled as per inclusion and exclusion criteria. All the patients were from OP department of General medicine, Pushpagiri Medical College Hospital, Thiruvalla.

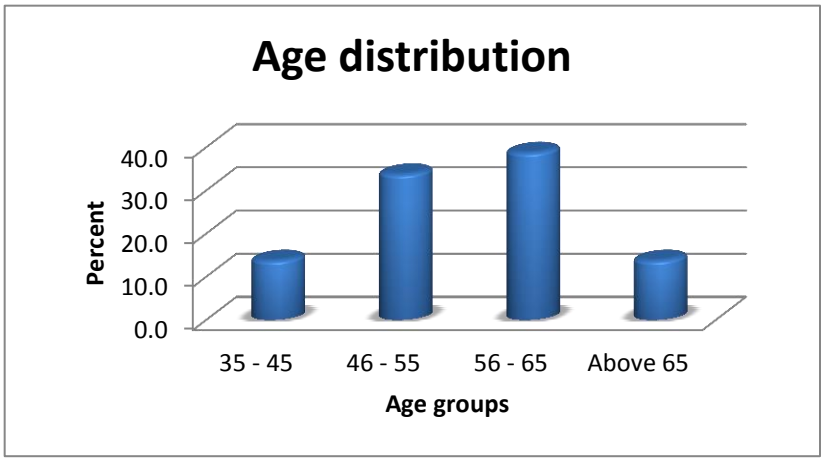

Figure 1: Distribution of patients based on age

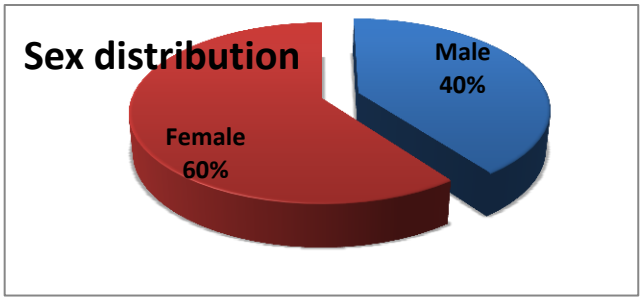

Figure 2: Distribution of Patients Based On Gender

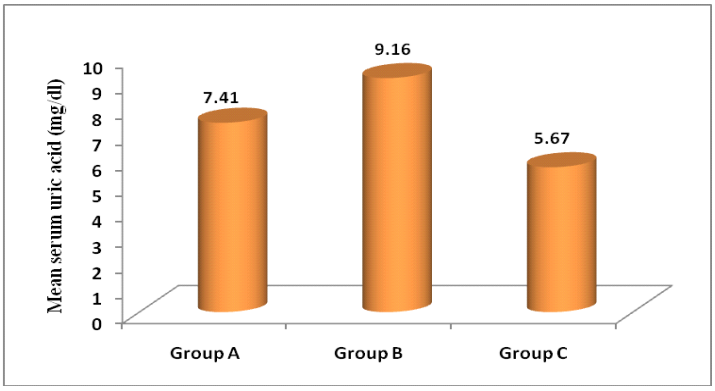

Figure 3: Serum Uric Acid in Differebt Levels of Hba1

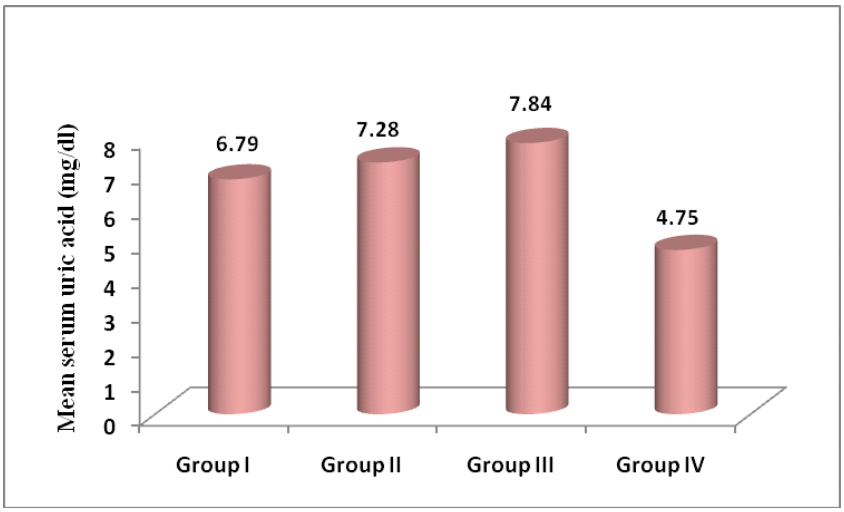

Figure.4: Serum uric acid level in cases at different levels of fasting blood sugar

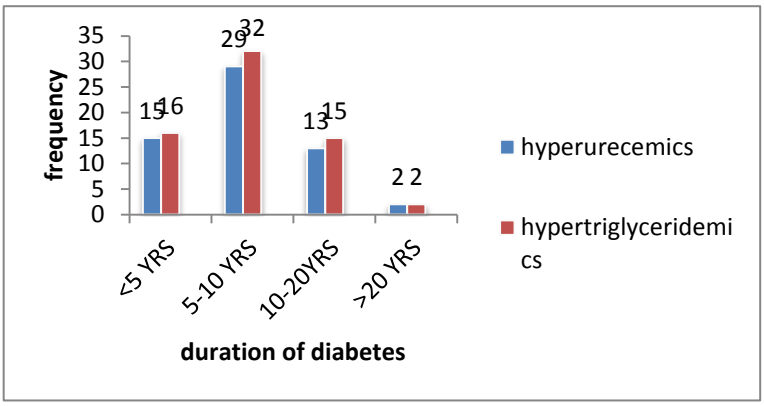

Figure 5: Bar chart showing duration of diabetes hyperurecemiaand hypertrglyceridemia.

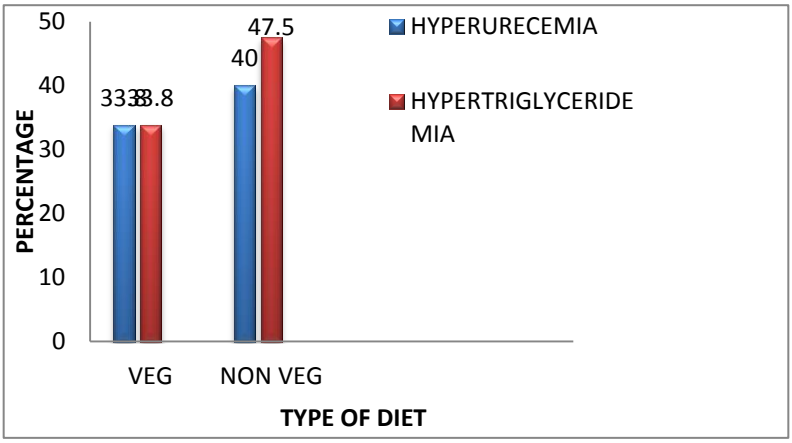

Figure 6: Bar chart showing diet*hyperurecemia and hypertriglyceridemia

.

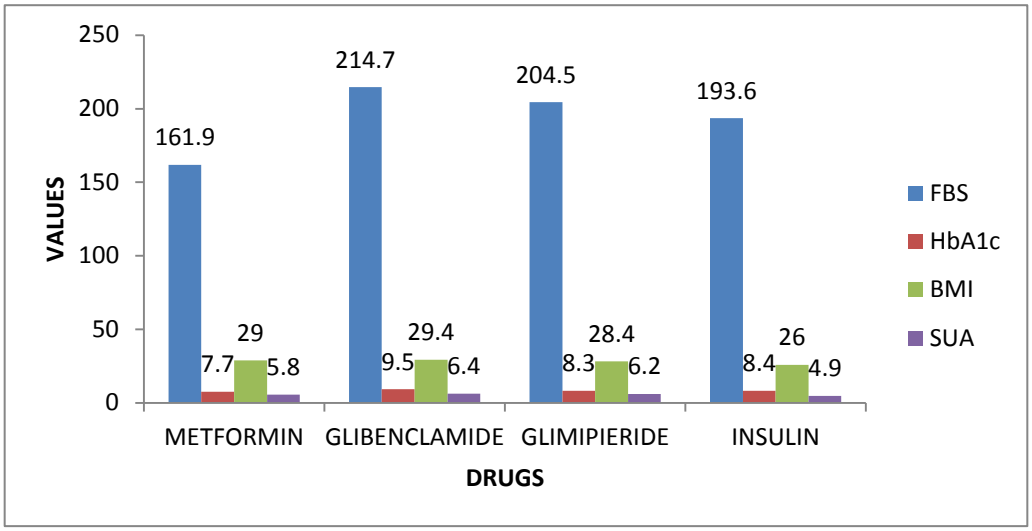

Figure 7: Mean of Bmi and Biochemical Parameters on Hypoglycemic Treatments

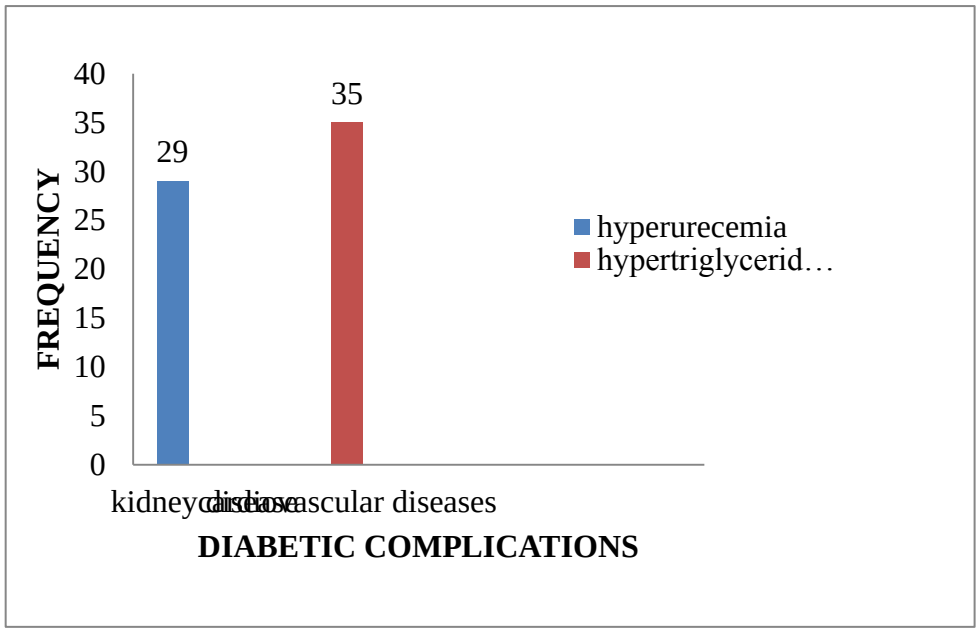

Figure 8: Barchart Showing Diabetic Complications and Hyperurecemia and Hypertriglyceridemia

Among the study population 29 hyperurecemic patients found to have kidney disease and 35 hypertriglyceridemic patients found to have cardiovascular disorders

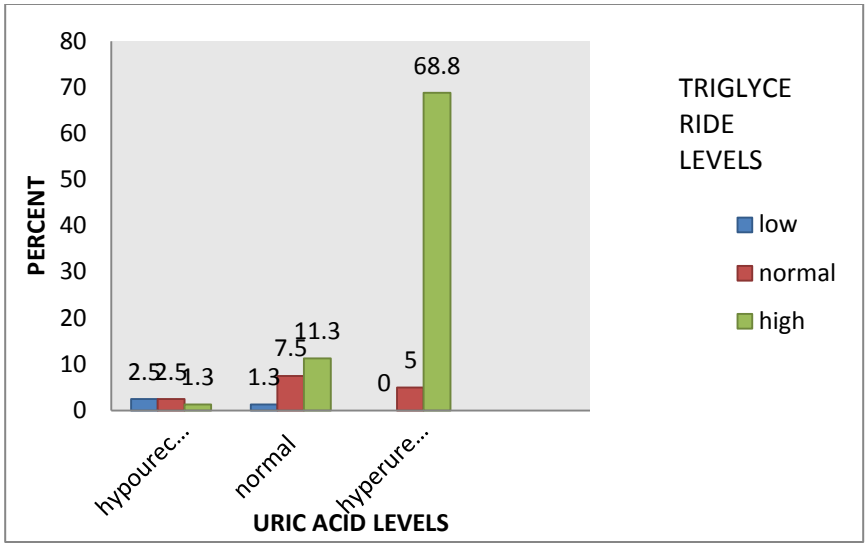

Figure.9: Barchart showing uric acid triglyceride

Among the study population 55(68.8%) of hyperuricemia patients were found to be hyper triglyceridemic.

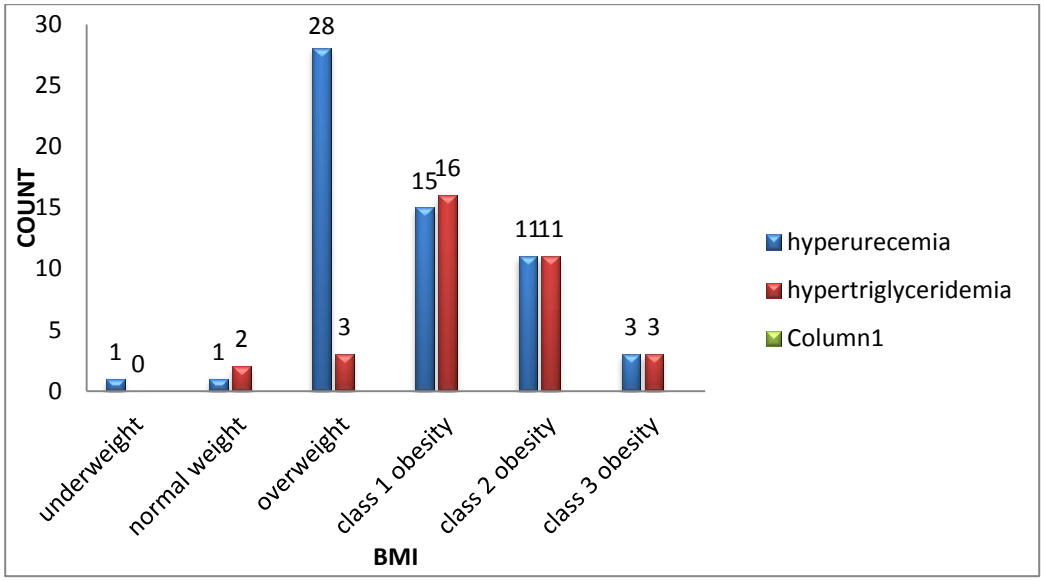

Figure10: Barchart Showing Distribution Ofuric Acid, Triglyceride and Body Mass Index (Bmi)

REGRESSION

Model	Unstandardized Coefficients		Standardized Coefficients	T value	P VALUE
	B	Std. Error	Beta		
Age	-.002	.032	-.005	-.068	.046
Sex	.046	.599	.006	.077	.939
FBS	-.015	.007	.196	1.666	0.01
HbA1c	3.254	.045	.147	2.001	0.01
Hypoglycemics	-.612	.055	.123	-1.005	0.001

Triglyceride	.012	.009	.194	1.333	.010
Body Mass Index(B M I)	1.568	.553	.426	2.837	.001
Duration of Diabetes	-.617	.349	-.132	-1.768	0.05
Diet	2.431	.741	.307	3.279	.002
Diabetic complications	.451	.567	.066	.795	.010

DISCUSSION

This study was done to find the correlation between the serum uric acid and triglyceride and its association with Body Mass Index in type 2 diabetic patients, along with the intention to find out the most common factor responsible. The residual blood sample of the patients were collected from the Biochemistry lab in order to find out uric acid and triglyceride. Uric acid and triglyceride were found out using semi auto analyzer in Pushpagiri Pharmacy College, Thiruvalla. Patient's demographic details were analyzed. Body weight and height were measured and calculated the BMI. The data was collected from General medicine department of Pushpagiri Medical College Hospital, Thiruvalla. Collected data was organized, tabulated and analyzed using statistical methods and described with the help of tables and graphs.

Age

The study population belongs to 35-80 age group and the mean age is 55.85 (±9.12) years. Among these the patients with age group 46-55 and 56-65 were having more hyperuricemia and hypertriglyceridemia.

Gender

Among the study population 29(36.3%) of male diabetic patients and 36 (45.0%) of female patients were found to be hypertriglyceridemic and 25(31.3%) of male patient and 34 (42.5%) of female patients were found to be hyperurecemic.During the study, more female diabetic patients were found to be hyperurecemic and hypertriglyceridemic than male diabetic patients.

Body mass index

Out of this 80 patients 1(11.1%) normal weight patients,28(70%) overweight patients,15(93.8%) class 1 obese patients,11(100%) class 2 obese patients,3(100%) class 3 obese patients and total 59(73.8%) patients are found to be hyperurecemic and hypertriglyceridemic and was statistically significant.(p value<0.01)

Duration of diabetes

More the hyperurecemicpatients having duration of diabetes with 5-10 years(36.3%) and also more hypertriglyceridemic patients having duaration of with 5-10 years(40%).

Diet

Among the study population,52%were nonveg, and 28% were under vegetarian food. More the hyperurecemic patients were under (32%) non vegetarian food and also more hypertriglyceridemic patients were also (38%) non veg.

Life style factors

Among the study population patients with inactive and sedentary life style are seems to more hyperurecemic and hypertriglyceridemic than moderately active and active patients

Similarly occational and regular heavy drinkers are found to be more hyperurecemic and hypertriglyceridemic than non drinkers.Non smokers have low uric acid and triglyceride level compared to smokers

Diabetic complications

Among the study population 29 hyperurecemic patients found to have kidney disease and 35 hypertriglyceridemic patients found to have cardiovascular disorders.

Serum uric acid and glycemic control

Initial increase in Serum Uric acid with hyperglycemia can be due to hyperinsulinemia, paradoxical urate redox shuttle, microvascular injury and/or increase generation and activity of Xanthine oxidase. Decrease in Serum Uric acid with advancing hyperglycemia can be due to glycosuria causing uricosuria and decrease in sodium reabsorption. Hence periodic evaluation of Serum Uric acid can help in early detection and prevention of microvascular complications in Type 2 Diabetes Mellitus.

Hypoglycemics and serum uric acid

Metformin taking group show low uric acid values compared to glimipride and glybenclamide taking group

Among the 80 diabetic enrolled patients the study showed that, as the p-value <0.01 , there exist a correlation between hyperurecemia and hypertriglyceridemia which is a prominent factor for development of cardiovascular and renal complications.

These association had a close link with their BMI. That is, as the BMI increases the chance for development of hyperurecemia and hypertriglyceridemia is very high in overweight, class 1,2,3 obese patients .The study also give an evidence for hypourecemic effect of metformin and other hypoglycemic medications.

Thus the study can be concluded that by stating that a restriction over BMI, uric acid and triglyceride level may reduce the percentage for the development of diabetic complications

Acknowledgements

My dissertation work would be incomplete, if I do not express my sincere thanks to all the people who have helped me to complete my work. First and foremost I would like to thank God Almighty for His immeasurable Grace and blessing upon me throughout this project to complete this work successfully. Next, I wish to thank the Principal of Pushpagiri College of Pharmacy, Prof. Dr. Mathew George, Prof. Dr. Lincy Joseph, Head of the Department, Dept. of Pharmaceutical Chemistry, Pushpagiri College of Pharmacy, Thiruvalla both of them guiding us through this entire year systematically and providing all the facilities necessary for the completion of my thesis. I express whole hearted gratitude to my guide, Mrs.Rani manju, assistant professor, Dept. of Pharmacy Practice, Pushpagiri College of Pharmacy, Thiruvalla for her suggestions and indispensible mentorship, as well as the tremendous encouragement that she offered me at each and every step of this dissertation work.

I owe a debt of heartfelt thanks to my esteemed co-guide, Dr.Rajeev Philip, Department of General Medicine, Pushpagiri Medical College Hospital, Thiruvalla

BIBLOGRAPHY

[1]. J Sarvesh Kumar, Vishnu priyaV ,Gayethri R *et.al*, Relationship between Diabetes mellitus and serum uric acid level: International Journal Of Pharmaceutical Science : Review 39(1), 2016, 101-106.

[2]. Sara Nejatinamini , AsalAtaie –Jafari*et.al* ,Association between serum uric acid level and metabolic syndrome components, Journal of Diabetes And Metabolic disorder 14, 2015, 70.

[3]. SuchethaKumari, AtulKamath *et. al*, Serum uric acid as obesity related indicator in young obese adults , Research Journal Of Pharmaceutical , Biological and Chemical Sciences, ISSN 0975 – 8585.

[4]. Neha Sharma, RajkumariRathore*et al*;**,** Prevalence of Hyperuricemia and Relation of Serum Uric Acid with Diabetic Risk Factors, International Journal of Advanced Research 3(5), 2015, 289-296

[5]. Suryawanshi K.S, Dr.Jagtap P.E *et.al*, To study serum uric acid, serum lipid profile in type II Diabetes Mellites, SSRG International Journal of Medical Science (SSRG-IJMS) – 2(5), 2015.

[6]. Dana StefanaPopescu, AlinCiobica *et al*, Correlations Between Levels Of Serum Uric Acid And Parameters Of The Metabolic Syndrome, Arch. Biol. Sci., Belgrade, 66 (4), 2014, 1609-1615.

[7]. Seema L Jawalekar1, AshaAugusthy*et al*, Association Between Serum And Urine Uric Acid Levels In Patient With Diabetes Mellitus, International Journal of Recent Scientific Research, 7(1), 2016, 8430-8436.

[8]. Uwakwe J.N., Agboghoroma O.F.*et al*, Hyperuricaemia In Obese Type 2 Diabetics In Jos, North Central Nigeria,Jos Journal of Medicine, 8(3), 2015.