Original Research Article

TO STUDY THE S. URIC ACID LEVELS AND LIPID PROFILE IN DM SUBJECTS ALONG WITH GLYCATED ALBUMIN.

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Abstract
Background & Methods: The aim of the study is to study the S. Uric acid levels and lipid profile in DM subjects along with glycated albumin. This Observational study was performed in the outdoor patient department (OPD) among 200 subjects diagnosed with T2DM. For the enrollment of subjects, non-probability convenient sampling and a developed inclusion and exclusion criteria was implemented. Subjects with age from 40 years and diagnosed with type 2 diabetes mellitus, and who had no known diseases such as kidney disease, liver disease, or joint disease, were enrolled in the study.
Results: With the Increase in Lipid level, Sugar level also goes up and the correlation between the Lipid level & Sugar level was positive and statistically significant.
Conclusion: The present study demonstrated no gender difference in the prevalence of type 2 diabetes mellitus between male and female diabetic subjects. The present finding validated the other research findings that prevalence of type 2 DM increases with the progression of age in both the genders.
The results of the present study suggested that, the diabetic subjects possess significant high level of uric acid. In case of Pearson correlation among diabetic subjects serum blood glucose level & Lipid level & cumulative research findings are in accordance with present findings which suggested that persistent high blood glucose levels leads to the formation of advanced glycated-end-products culminating to diabetic macro and micro-vascular complications.

Keywords: S. Uric acid, lipid, DM & glycated albumin.
Study Design: Cross sectional Study.

1. Introduction

Type 2 Diabetes Mellitus (T2DM) is a complex clinical condition that presents substantial challenges for every individual living with the condition[1]. Effective selfmanagement of diabetes is critical to the achievement of healthy, independent and flexible day-to-day living but this requires personal motivation and changes in behaviour and routines. Diet and physical activity are critically important in the management of the ABCs (HA1c, Blood pressure and Cholesterol) of T2DM[2]. For the management of Haemoglobin A1C and blood sugar levels, it is important to understand the balance between food intake, physical activity and medication. Making healthy food choices every day has both immediate and long-term

effects. It is noted that with adequate education and awareness programs and assistance from a dietitian or a diabetes educator, it is possible to control diabetes[3].

The Indian Council of Medical Research India Diabetes Study (ICMR-INDIAB study) showed that India had 10.1 crores people with diabetes in 2023 [4]. These numbers are projected to increase to 101.2 million by 2030. The ICMR-INDIAB study showed that the weighted prevalence of diabetes in Tamil Nadu was 10.4%, 8.4% in Maharashtra, 5.3% in Jharkhand and 13.6% in Chandigarh and that overall 10.1 crores people in India had diabetes in 2023. This emphasizes the sheer magnitude of the diabetes epidemic in India[5-7].

Uric acid is p-a heterocyclic compound of carbon, nitrogen, oxygen, and hydrogen with the formula $C_5H_4N_4O_3$. It forms ions and salts known as urates and acid urates such as ammonium acid urate. In humans, uric acid is the final breakdown product of unwanted purine nucleotides. Uric acid is the last product of in purine degradation, because humans lack the enzyme uricase which converts uric acid into allantoin[8].

Uric acid largely exists as urate (the ionized form, pKa is 5.8) at neutral pH. It is the end product of purine metabolism in humans. High serum levels of urate (hyperuricaemia) are causative in gout and urolithiasis, due to the formation and deposition of monosodium urate crystals. Urate is singly charged at neutral pH and at a concentration of 6.8 mg/dL (0.40 mmol/L) in human serum, crystals can form spontaneously. The solubility of urate decreases with increasing local sodium concentration, and decreasing temperature and pH. The latter is an important factor in urate stone-formation in subjects with acidic urine[9].

Lipids play a very important role in the physiologic functions of the body. It includes total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C). Subjects with T2DM have an abnormal lipid profile with high levels of LDL-C, TG and a low level of HDL-C[10].

A few years ago effects on TG were seen as largely irrelevant, as it was thought that the relationship between TG levels and coronary heart disease CHD was weak[11]. However fasting plasma TG concentrations have recently been demonstrated to be an independent risk factor for the development of CHD. In a meta-analysis of 17 population-based studies, TG concentrations were particularly important in relation to CHD risk, where a 1mmol/l increase in plasma TG increased cardiovascular risk by 32% in men and 68% in women.

Glycated Albumin (GA) is a Ketamine formed via a non-enzymatic glycation reaction of serum albumin and it reflects mean glycemia over two to three weeks. GA is a useful marker for the screening of diabetes in a medical evaluation. Glycated Proteins form of reactions particular, hemoglobin (PDB ID: 1BBB) and albumin (PDB ID: 1AO6)their main glycation sites for each of them have been bound between N-terminal valine of the β-chains of hemoglobin, and lysine and arginine residues of albumin and finaly produed the formation of irreversible compounds as advanced glycation end-products (AGEs) Advanced glycation is involved in the cause of diabetic complications such as neuropathy, nephropathy, and retinopathy its concentration extracellular proteins such as albumin have higher then intracellular ones, such as hemoglobin, due to increase level of blood glucose.

2. Material and Methods

This cross sectional study was analysed in the central pathology lab L.N. medical college Bhopal among 200 subjec diagnosed with T2DM from OCT 2022 –DEC 2023 data analysed non-probability convenient sampling and a developed inclusion and exclusion criteria was implemented. Subjects with age from above 40 years and diagnosed with type 2 diabetes mellitus, and who had no known diseases such as kidney disease, liver disease, or joint disease, were enrolled in the study. While, those who had an age below 40 years, any cancer

and any psychiatric diseases, were excluded. From all the participants before the data collection, informed consent was acquired. Lipid profile and GA performed by immunoassay techniques such as enzyme-linked immunosorbent assay (ELISA), GA is currently measured with enzymatic kits at lab. Data was obtained and applying by statistical analysis.

Inclusion Criteria

1.) Individuals in the age group of > 40 years and above suffering from type 2 diabetes mellitus, which is defined through fasting glucose concentration >= 126 mg/dL.

2.) Includes both men & women.

3.) Diagnosed type 2 diabetes mellitus subjects taking oral hypoglycaemic medications or insulin for treatment.

Exclusion Criteria

1.) Individuals having type 1 diabetes mellitus

2.) Subjects who suffered from gout, liver, & kidney diseases

3.) Those with acute complication of diabetes mellitus

4.) Those with a history of acute infections

5.) Age < 40 Years.

Data Collected from Medicine OPD, LNMC, Bhopal

Analyzed:

Central Pathology Lab.

5ml venous sample was drawn from ante-cubical vein under fasting conditions.

Lipid Profile & Uric Acid, Blood Glucose were analyzed in the fully automatic instrument (Mindray, CL 900i)*

Glycated albumin was analyzed using automated enzymatic assay (Lucid, GA-L, Kit, Tokyo, Japan)

Statistical Analysis

SPSS 23 software was used to analyze the data. The mean and standard deviation was obtained for summarizing the quantitative variables, while the categorical variables were tabulated using frequencies and percentage. Pearson Correlation Coefficient was also employed. Chi square test was used for testing variables. P-value ≤ 0.05 was considered significant.

3. **Result**

**Table 1: Demographic characteristics of study subjects**

S. No.	Parameter	Male (113)	Female (87)	P Value
1	Age (years)	45.6±4	47.9±1	
2	Height (cm)	161.9±2	157.6±2	
3	Weight (kg)	66.2±1	59.2±1	
4	BMI (m/kg^2)	25.34±4	26.85±4	
5	Waist Circumference (cm)	95.2±9	96.8±8	<0.0001
6	Waist-to-height ratio	0.59±7	0.64±9	

We studies 200 subjects DM Type1, Females had higher age than males. The height and weight were higher in males; however, BMI was higher in females. Although the waist

circumference was significantly different, the WHR was higher in females & other parameters.

Fig 1: Demographic characteristics of study subjects
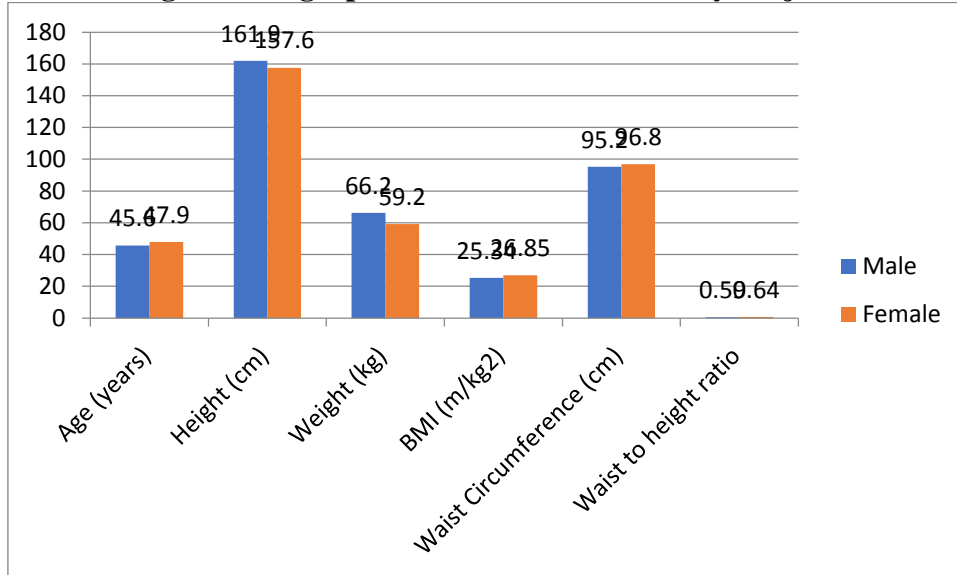
Table 2: Lipid Profile & Serum uric acid in DM subjects

S. No.	Parameter	Male (113)	Female (87)	P Value
1	Fasting blood sugar (mg/dL)	177.1±9	162.5±6	
2	Serum uric acid (mg/dL)	8.5±3	8.4±9	
3	Total Cholesterol (mg/dL)	145.3±4	162.5±7	
4	Triglyceride (mg/dL)	148.6±8	171.3±3	
5	Low-density lipoprotein-cholesterol (mg/dL)	69.3±7	82.4±	0.037
6	High-density lipoprotein-cholesterol (mg/dL)	38.2±4	39.6±7	
7	Glycated Albumin	28.3±2	26.1±9	

The mean serum uric acid level was 8.5 and 8.4 in males and females, respectively. Showed gender difference with Chi Square ($P = 0.037$). Mean value glycated albumin was 28.3 (Male), 26.1 (Female), ranges from (23.0)

Table 3: Pearson correlation analysis between Sugar level and Lipid level

S. No.	Parameter	Correlation Coefficient (r)	P Value
1	Fasting blood sugar (mg/dL)		
2	Serum uric acid (mg/dL)		
3	Total Cholesterol (mg/dL)		
4	Triglyceride (mg/dL)	+0.37	0.033
5	Low-density lipoprotein-cholesterol (mg/dL)		
6	High-density lipoprotein-cholesterol (mg/dL)		
7	Serum creatinine (mg/dL)		

Increase in Lipid level, Sugar level also goes up and the correlation between the Lipid level & Sugar level was positive and statistically significant.

4. Discussion

In last decades, serum uric acid has emerged as a potential risk factor for type 2 diabetes mellitus (T2DM). Elevated uric acid levels are often found in individuals with the metabolic syndrome, a collection of risk factors for T2DM often found to cluster together and including the following: truncal obesity, hypertriglyeridemia, decreased high density lipoprotein, hypertension, and insulin resistance[12]. In 2006, Niskanen and co-workers conducted a lifestyle intervention study in high risk middle aged subjects with impaired glucose tolerance. They found that baseline uric acid and its changes predicted a twofold increase in the likelihood of developing type 2 diabetes.

Hyperuricemia can be the consequence of increased uric acid production or decreased excretion. Any cause for decreased glomerular filtration, tubular excretion or increased reabsorption would result in an elevated SUA (Serum Uric Acid). Increased SUA has been found to predict the development of renal insufficiency in individuals with normal renal function. In T2DM hyperuricemia seems to be associated with MS and with early onset or increased progression to overt nephropathy, whereas hypouricemia was associated with hyper filtration, and a later onset or decreased progression to overt nephropathy[13]. Association between increasing serum uric acid and diabetes mellitus may be reported to the inhibition of uric acid reabsorption in the proximal tubule by high glucose levels in diabetic.

Canadian Diabetes Association states that 80-90% of Diabetes Mellitus subjects in the world are overweight or obese. Obesity is a powerful predictor for development of type 2 diabetes. Obesity is a frequent concomitant of T2DM, and in many longitudinal studies has been shown to be a powerful predictor of its development. Obesity has increased rapidly in many populations in recent years because of an interaction between genetic and environmental factors[14]. These include: metabolic characteristics; physical inactivity; habitual energy intake in relation to expenditure; and macronutrient composition of the diet. An integrated approach that includes reducing excess body weight, increased physical activity along with a balanced dietary regime to regulate blood glucose levels will not only be advantages in T2DM management, but will benefit the health of the population and limit the increasing worldwide incidence of T2DM[15].

5. Conclusion

The present study demonstrated no gender difference in the prevalence of type 2 diabetes mellitus between male and female diabetic subjects. The present finding validated the other research findings that prevalence of type 2 DM increases with the progression of age in both the genders.

The results of the present study suggested that, the diabetic subjects possess significant high level of uric acid. In case of Pearson correlation among diabetic subjects Sugar level and Lipid level. Cumulative research findings are in accordance with present findings which suggested that persistent high blood glucose levels leads to the formation of advanced glycated-end-products culminating to diabeticmacro and micro-vascular complications.

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