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Biochemistry

CORRELATION BETWEEN LIPID PROFILE, BLOOD PRESSURE, GFR AND PROTEINURIA IN TYPE- 2 DIABETES

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ABSTRACT

Background: Diabetic nephropathy (DN) is one of the most common microvascular complication of diabetes. It is the measure cause of the morbidity and mortality in diabetic patients.

Material and method: This Study was conducted at MGM Medical College and Hospital, Navi- Mumbai. 22 patients with diabetic nephropathy and 22 diabetic patients without nephropathy were taken as cases and 22 healthy individuals were taken as controls.

Result: In our study we found significant correlation of urine microalbumin with HbA1C, T. Cholesterol, TG, HDL and GFR in Diabetic patient with nephropathy.

Conclusion: A significant association exists between High HbA1C, hypercholesterolemia, hypertriglyceridemia, low HDL and low GFR with microalbuminuria. Hence, it is recommended that all patients with diabetes should be screened early for the presence of microalbuminuria, dyslipidemia along with uncontrolled glycemic status and therapeutic interventions should be performed to prevent further complications. We conclude that urine microalbumin is a better predictor of nephropathy than GFR in type II diabetes and it may be implemented as an early marker for the same.

KEYWORDS : Diabetes mellitus, glomerular filtration rate (GFR), blood pressure and diabetic nephropathy.

Introduction

Diabetes mellitus is one of the most common chronic diseases across the world and number of diabetic patients is on rise. In 2011 there were 366 million people with diabetes globally, and this is expected to rise to 552 million by 2030[1].The recently published ICMR-INDIAB national study reported that there are 62.4 million people with diabetes and 77 million people with pre-diabetes in India[2].These numbers are projected to increase to 101 million by the year 2030[1].

The long standing elevation of blood glucose causes complication of diabetes - premature atherosclerosis (including cardiovascular diseases and stroke), retinopathy, nephropathy and neuropathy[3]. Diabetic patients are also known to be at increased risk of dyslipidemia which can contribute to the higher morbidity and mortality [4].

Diabetic nephropathy (DN) is one of the most common microvascular complications of diabetes [5]. It is a leading cause of end-stage renal disease (ESRD), and its prevalence is progressively increasing worldwide [5].The early sign of ongoing nephropathy is microalbuminuria (MA). The presence of microalbuminuria predicts worsening of renal disease to overt diabetic nephropathy [6].

Several studies have shown that in both type 2 and type 1 diabetic patients, GFR is elevated in the newly diagnosed patients and is significantly related to the increase in the kidney size. So, GFR is higher than normal in stage 1 of glomerular hypertrophy and hyperfiltration. It may exceed 150ml/min. With the increase in protein excretion there is a tendency of GFR to fall to lower level but not below the normal range during the 2nd and 3rd stage of diabetic nephropathy. With the onset of persistent proteinuria, GFR progressively falls and culminates in the end stage renal disease (ESRD) in months to a year if left untreated [7].

Recent statistics from the World Health Organization (WHO) project, currently, India leads the world with the largest number of diabetic subjects and this is expected to further rise in the coming years. Hence studies on diabetes related complications are essential to assess the burden of diabetes [8]. Thus in this study an attempt has been made to define more precisely the prevalence of microalbuminuria in an unselected population of diabetes mellitus and to evaluate possible relationship among lipid profile, blood pressure, GFR and microalbuminuria.

Aim:

To study correlation between lipid profile, Blood Pressure, GFR and Proteinuria in Diabetes.

Objectives:

1. Estimation and comparison of Fasting and postprandial blood glucose, level in study groups and control group.
2. Determination and comparison of HbA1C, in study groups and control group.
3. Assessment and comparison and lipid profile in study groups and control group.
4. Estimation of GFR and urine microalbumin in study groups and control.
5. Correlation of urine microalbumin levels with HbA1C, lipid profile and GFR in study groups.

Material and Method

A: Place of Study: - Department of biochemistry and Department of medicine, MGM Medical College & Hospital, Kamothe, Navi-Mumbai.

B: Study period: - February 2013- February 2014.

C: **Study design**: - Prospective study.

66 subjects were included in this study and they were divided into 3 groups as follows:-

Group I (Control group):22 healthy age and sex matched individuals were selected

Group II (Diabetes without nephropathy): 22 subjects diagnosed as type 2 diabetes mellitus and under treatment at least for three years.
Exclusion criteria:- chronic smokers ,pregnant women, chronic alcoholics, Patients with chronic illness, Diabetic patients with nephropathy.

Group III (Diabetes with nephropathy): 22 subjects diagnosed as type 2 diabetes mellitus with nephropathy and under treatment at least for three years.

Exclusion criteria:-chronic smokers, pregnant women, chronic alcoholics, Patients with chronic illness

All patients enrolled gave the consent for the study willingly and were able to comply with study protocol. Present and past histories of the patients were collected with the help of pre-test Performa. The Performa included, name, age, sex, dietary habit (vegetarian/non-vegetarian), family history of disease (if any), smoking habit, drinking

habit, socio-economic status, community, and occupation.

Methodology: All the samples are analyzed on Beckman Coulter AU480 biochemistry analyzer. GFR is estimated by Cockcroft and Gault method. For urine microalbumin spot urine sample was collected.

Observation and Results

Table 1:- Comparison of plasma glucose in diabetes without nephropathy (Group II) and control group.

Parameters	Diabetes without nephropathy (n=22) Mean±SD	Control(n=22) Mean±SD	P value
FBS	124.8±31.17	85.46±5.47	<0.001***
PPBS	184.53±53.45	115.04±4.76	<0.001***

****Highly significant*

Table1 shows comparison of plasma glucose level in diabetes without nephropathy and Control subjects. The mean value of FBS (124.8±31.17 mg/dl) and PPBS (184.53±53.45 mg/dl) in diabetes without nephropathy was observed to be significantly ($p < 0.001$) increased as compared to control group.

Table 2:- Comparison of plasma glucose in diabetic with nephropathy (Group III) and control group.

Parameters	Diabetic with nephropathy (n=22) Mean ±SD	Control (n=22) Mean ±SD	P value
FBS	182.81±80.05	85.46±5.47	<0.001***
PPBS	283.34±132.08	115.04±4.76	<0.001***

****Highly significant*

Table 2 Shows comparison of plasma glucose level in diabetes with nephropathy and Control subjects. The mean level of FBS (182.81±80.05 mg/dl) and PPBS (283.34±132.08 mg/dl) in diabetes with nephropathy was significantly (p<0.001) increased as compared to control subjects; FBS (85.46±5.47 mg/dl) and PPBS (115.04±4.76 mg/dl).

Table 3: - Comparison of plasma glucose in diabetic without nephropathy (Group II) and diabetes with nephropathy (Group III).

Parameters	Diabetic without nephropathy (n=22) Mean ±SD	Diabetic with nephropathy (n=22) Mean ±SD	P value
FBS	124.8±31.17	182.81±80.05	0.0028**
PPBS	184.53±53.45	283.34±132.08	0.0022**

***Significant*

Table 3 shows comparison of plasma glucose level in diabetic without nephropathy patients and diabetic with nephropathy patients. The mean level of FBS (182.81±80.05 mg/dl) and PPBS (283.34±132.08 mg/dl) in diabetic with nephropathy patients was significantly increased as compared to diabetic without nephropathy patients; FBS (124.8±31.17 mg/dl) and PPBS (184.53±53.45 mg/dl).

Table 4- Comparison of HbA1C in diabetic without nephropathy (Group III) and control group.

Parameters	Diabetic without nephropathy (n=22) Mean±SD	Control(n=22) MeanSD	P value
HbA1C	6.92±0.99	4.90±0.43	<0.001***

****Highly significant*

Table 4 shows comparison of HbA1C level in diabetic without nephropathy patients and Control subjects. The mean level of HbA1C (6.92±0.99 %) in diabetic without nephropathy patients was significantly (<0.001) increased as compared to control; HbA1C (4.90±0.43%).

Table 5:- Comparison of HbA1C in diabetic with nephropathy patients and control subjects.

	Diabetic with nephropathy (n=22) Mean±SD	Control(n=22) Mean±SD	P value
HbA1C	9.65±2.15	4.90±0.43	<0.001***

****Highly significant*

Table 5 Shows comparison of HbA1C level in diabetic without nephropathy patients and Control subjects. The mean level of HbA1C (9.65±2.15 %) was significantly (<0.001) increased in diabetic with nephropathy patients as compared to control; HbA1C (4.90±0.43%).

Table 6:-Comparison of HbA1C in diabetic without nephropathy patients and diabetic with nephropathy patients.

	Diabetic without nephropathy (n=22) Mean±SD	Diabetic with nephropathy (n=22) Mean±SD	P value
HbA1C	6.92±0.99	9.65±2.15	<0.001***

****Highly significant*

Table 6 shows comparison of HbA1C level in diabetic without nephropathy patients and diabetic with nephropathy patients. The mean level of HbA1C (9.65±2.15 %) in diabetic with nephropathy patients was significantly (<0.001) increased as compared to diabetic with nephropathy patients; HbA1C (6.92±0.99 %).

Table 7:- Comparison of lipid profile in diabetic without nephropathy patients and control subjects.

	Diabetic without nephropathy (n=22) Mean±SD	Control(n=22) Mean±SD	P Value
T. Chol	183.90±35.94	149.13±24.53	<0.001***
TG	153.09±32.48	117.04±33.46	<0.001***
HDL	42.09±8.64	44.81±3.63	0.1796*
LDL	105.95±38.82	79.99±22.04	0.0092**

**Non-significant, **significant, ***highly significant.*

Table 7 shows Comparison of lipid profile in diabetic without nephropathy patients and control subjects. The mean level of total cholesterol (183.90±35.94 mg/dl), TG (153.09±32.48 mg/dl), LDL (105.95±38.82 mg/dl) in diabetic without nephropathy patients were significantly increased as compared to control subjects; total cholesterol (149.13±24.53 mg/dl), TG (117.04±33.46mg/dl), LDL (79.99±22.04 mg/dl). While mean level of HDL (42.09±8.64 mg/dl) in diabetic without nephropathy patients was non-significantly decreased (p=0.1796) as compared to control (44.81±3.63).

Table 8:- Comparison of lipid profile in diabetic with nephropathy patients and control subjects.

	Diabetic with nephropathy(n-=22) Mean±SD	Control(n=22) Mean±SD	P value
T. Chol	188.09±37.34	149.13±24.53	<0.001***
TG	211.54±97.94	117.04±33.46	<0.001***
HDL	35.27±7.15	44.81±3.63	<0.001***
LDL	111.20±37.45	79.99±22.04	0.0016**

***Significant, ***highly significant*

Table 8 Shows Comparison of lipid profile in diabetic without nephropathy patients and control subjects. The mean level of total cholesterol (188.09±37.34 mg/dl), TG (211.54±97.94 mg/dl), LDL (111.20±37.45 mg/dl) in diabetic with nephropathy patients were significantly increased as compared to control subjects; total cholesterol (149.13±24.53 mg/dl), TG (117.04±33.46mg/dl), LDL (79.99±22.04 mg/dl). While mean level of HDL (35.27±7.15 mg/dl) in diabetic with nephropathy patients was non-significantly decreased as compared to control (44.81±3.63).

Table 9:- Comparison of lipid profile in diabetic without nephropathy patients and diabetic with nephropathy patients.

	Diabetic without nephropathy(n-=22) Mean±SD	Diabetic with nephropathy(n-=22) Mean±SD	P value
T. Chol	183.90±35.94	188.09±37.34	0.707
TG	153.09±32.48	211.54±97.94	0.011**
HDL	42.09±8.64	35.27±7.15	0.0067**
LDL	105.95±38.82	111.2±37.45	0.6506

** Significant

Table 9 Shows Comparison of lipid profile in diabetic without

nephropathy patients and diabetic with nephropathy patients. The mean level of total cholesterol (188.09±37.34 mg/dl) and LDL (111.2±37.45 mg/dl) in diabetic with nephropathy patients were non-significantly increased as compared to diabetic without nephropathy patients; T.chol (183.90±35.94mg/dl), LDL (105.95±38.82). The mean level of TG (211.54±97.94 mg/dl) in diabetic with nephropathy patients was significantly increased as compared to diabetic without nephropathy patients; TG(153.09±32.48) . While mean level of HDL (35.27±7.15 mg/dl) in diabetic with nephropathy patients was non-significantly decreased as compared to diabetic without nephropathy patients (42.09±8.64mg/dl).

Table 10:- Comparison of urine microalbumin in diabetic without nephropathy patients and control subjects.

	Diabetic without nephropathy (n=22) Mean±SD	Control(n=22) Mean±SD	P value
Urine Micro Alb.	17.68±6.25	11.34±6.5	0.002**

** *Significant*

Table 10 shows comparison of urine microalbumin in diabetic without nephropathy patients and control subjects. The mean level of urine microalbumin (17.68±6.25 µg albumin/mg creatinine) in diabetic without nephropathy patients was significantly (p=0.002) increased as compared to control; urine microalbumin (11.34±6.5 µg albumin/mg creatinine).

Table 11:- Comparison of urine microalbumin in diabetic with nephropathy patients and control subjects.

	Diabetic with nephropathy (n=22) Mean±SD	Control(n=22) Mean±SD	P value
Urine Micro Alb.	133.73±55.74	11.34±6.50	<0.001***

*** *Highly significant*

Table 11 shows comparison of urine microalbumin in diabetic with nephropathy patients and control subjects. The mean level of urine microalbumin (133.73±55.74 µg albumin/mg creatinine) in diabetic with nephropathy patients was significantly (p<0.001) increased as compared to control; urine microalbumin (11.34±6.5 µg albumin/mg creatinine).

Table 12:- Comparison of urine microalbumin in diabetic without nephropathy patients and diabetic with nephropathy patients.

	Diabetic with nephropathy (n=22) Mean±SD	Diabetic without nephropathy (n=22) Mean±SD	P value
Urine Micro Alb.	133.73±55.74	17.68±6.25	<0.001***

*** *Highly significant*

Table 12 show comparison of urine microalbumin in diabetic without nephropathy patients and diabetic with nephropathy patients. The mean level of urine microalbumin (133.73±55.74 µg albumin/mg creatinine) in diabetic with nephropathy patients was significantly (p<0.001) increased as compared to Diabetic without nephropathy; urine microalbumin (11.34±6.5 µg albumin/mg creatinine).

Table 13:- Comparison of GFR in diabetic without nephropathy patients and control subjects.

	Diabetic without nephropathy (n=22) Mean±SD	Control(n=22) Mean±SD	P value
GFR	115.58±15.92	114.13±10.54	0.7233

Table 13 Shows comparison of GFR in diabetic without nephropathy patients and control subjects. The mean level of GFR (115.58±15.92 ml/min) in diabetic without nephropathy patients was non-significantly (p=0.7233) increased as compared to control; GFR (114.13±10.54 ml/min).

Table 14:- Comparison of GFR in diabetic with nephropathy patients and control subjects.

	Diabetic with nephropathy (n=22)Mean ±SD	Control(n=22) Mean ±SD	P value
GFR	80.51±8.22	114.13±10.54	<0.001***

*** *Highly significant*

Table 14 shows comparison of GFR in diabetic with nephropathy patients and control subjects. The mean level of GFR (80.51±8.22 ml/min) in diabetic with nephropathy patients was significantly (p<0.001) decreased as compared to control; GFR (114.13±10.54 ml/min).

Table15:-Comparison of GFR in diabetic with nephropathy patients and diabetic without nephropathy patients.

	Diabetic with nephropathy (n=22)Mean ±SD	Diabetic without nephropathy (n=22) Mean ±SD	P value
GFR	80.51±8.22	115.58±15.92	<0.001***

*** *Highly significant*

Table 15 shows comparison of GFR in diabetic with nephropathy patients and diabetic without nephropathy patients. The mean level of GFR (80.51±8.22 ml/min) in diabetic with nephropathy patients was significantly (p<0.001) decreased as compared to diabetic without nephropathy patients; GFR (115.58±15.92 ml/min).

Table 16:- Comparison of BP in diabetic without nephropathy patients and control subjects.

	Diabetic without nephropathy (n=22)Mean±SD	Control(n=22) Mean±SD	P value
Systolic BP	129.81±12.04	115.27±5.91	<0.001***
Diastolic BP	86.59±10.73	78.63±5.6	0.0036**

** *Significant,* *** *highly significant.*

Table 16 shows comparison of BP level in diabetic without nephropathy patients and Control subjects. The mean level of systolic BP (129.81±12.04 mmHg) and diastolic BP (86.59±10.73mmHg) in diabetic without nephropathy patients was significantly increased as compared to control subjects; systolic BP (115.27±5.91mmHg) and diastolic BP (78.63±5.6mmHg).

Table 17:- Comparison of BP in diabetic with nephropathy patients and control subjects.

	Diabetic with nephropathy (n=22) Mean±SD	Control(n=22) Mean±SD	P value
Systolic BP	133.81±13.09	115.27±5.91	<0.001***
Diastolic BP	90.72±13.53	78.63±5.60	0.0003***

*** *highly significant.*

Table 17 shows comparison of BP level in diabetic with nephropathy patients and Control subjects. The mean level of systolic BP (133.81±13.09 mmHg) and diastolic BP (90.72±13.53 mmHg) in diabetic with nephropathy patients was significantly increased as compared to control subjects; systolic BP (115.27±5.91 mmHg) and diastolic BP (78.63±5.6 mmHg).

Table 18:- Shows comparison of BP level in diabetic with nephropathy patients and diabetic without nephropathy patients.

	Diabetic with nephropathy (n=22) Mean±SD	Diabetic without nephropathy(n=22) Mean±SD	P value
Systolic BP	133.81±13.09	129.81±12.04	0.2977
Diastolic BP	90.72±13.53	86.59±10.73	0.2676

Table 18 shows comparison of BP level in diabetic with nephropathy patients and diabetic without nephropathy patients. The mean level of systolic BP (133.81±13.09 mmHg) and diastolic BP (90.72±13.53 mmHg) in diabetic with nephropathy patients was significantly increased as compared to diabetic without nephropathy patients; systolic BP (129.81±12.04 mmHg) and diastolic BP (86.59±10.73 mmHg).

Table 19:- Correlation of urine microalbumin with other parameters in Control Group.

	Parameters	r value
Urine microalbumin	HbA1C	0.0276
	T. Chol	0.1343

	TG	0.0516
	HDL	0.0235
	LDL	0.2056
	GFR	-0.0419
	Systolic BP	0.0047
	Diastolic BP	0.0984

Table 20:-Correlation of urine microalbumin with other parameters in diabetes without nephropathy group.

	Parameters	r value
Urine microalbumin	HbA1C	0.4810
	T.Chol	0.2211
	TG	0.3667
	HDL	-0.2386
	LDL	0.2119
	GFR	-0.3096
	Systolic BP	0.2286
	Diastolic BP	0.1872

Table 21:-Correlation of urine microalbumin with other parameters in diabetic with nephropathy group.

	Parameters	r value
Urine microalbumin	HbA1C	0.6336**
	T.Chol	0.5648**
	TG	0.7608**
	HDL	-0.6988**
	LDL	0.4617
	GFR	-0.8520**
	Systolic BP	0.3276
	Diastolic BP	0.3358

** *Significant*

Discussion

Diabetes is a group of metabolic diseases characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. Diabetes mellitus is associated with microvascular, macrovascular and non-vascular complications the chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and failure of different organs, especially the eyes, kidneys, nerves, heart, and blood vessels[9]. It is continuing to become a health problem because the prevalence of DM has increasesd dramatically over the past two decades [10]. Patients with diabetes mellitus (DM) have higher susceptibility to develop a variety of chronic complications of these the most common is nephropathy, which is the major risk factor for end stage renal disease (ESRD)[5].Diabetic nephropathy is one of the most common microvascular complications of diabetes. The pathogenesis of Diabetic nephropathy is multi-factorial. The present study was mainly conducted to further understand the role of those risk factors in the diabetic nephropathy, which may provide new strategies for monitoring diabetic patients before the onset of this disease.

In our study we estimated plasma glucose levels in both fasting and PP state and found that FBS and PPBS level was significantly increased in study groups as compared to control group as can be seen from table 1 and 2. However the level of FBS and PPBS were significantly increased in diabetes with nephropathy (group III) as compared to diabetes without nephropathy (group II) as shown in table 3.

HbA_{1c} level levels were estimated and compared between study group and control group; they were found to be significantly increased in study group as compared to control subjects (Table 4 and 5). The levels of HbA_{1C} in diabetic patients with nephropathy (group II) were significantly increased as compared to diabetic patients without nephropathy (Group II) (Table 6).

When we estimated and compared the levels of total cholesterol, triglycerides and LDL cholesterol in study groups and control group we found that a significant elevation of all these parameters in study groups as compared control group as can be seen from table 7 and 8. Highly significant increase in triglyceride levels was observed in diabetic patients with nephropathic complications (group III) as compared to diabetes without nephropathy (Group II) as shown in table 9. We also assessed HDL cholesterol levels and compared them between study groups and control group. We found a significant decrease in HDL levels in study groups as compared to control group as can be seen table 7 and 8. HDL cholesterol levels were significantly decreased in Group III as compared to Group II (table 9). Thus our result agree with those observed by Suchitra MM et al [11] who concluded that Type II Diabetes and diabetic nephropathy are associated with dyslipidemia which was more pronounced in diabetic nephropathy.

In our study we estimated and compared urine microalbumin levels in study groups and control groups and we found a significant elevation of urine microalbumin in study groups as compared to control group as shown in table 10 and 11. We found a significant increase in urine microalbumin levels in group III as compared to group II as seen in table 12.

Albuminuria (or elevated urinary albumin excretion) may reflect underlying renal expression of vascular damage, hypertension, endothelial dysfunction and inflammation. Therefore, it has become clear that albuminuria is not only indicator for diabetic renal disease, but also for progress to more advanced stages of the disease. If diabetic renal disease progresses, GFR slowly decreased due to the reduced filtration surface .With decreased GFR, hypertension will develop, which in turn accelerates the filtration process and thereby facilitates albumin leakage from glomerular capillaries into the urine. At first, there will be relatively small amounts of urinary albumin, (also called microalbuminuria which is defined as levels of albumin ranging from 30 to 300 in a 24-hrs urine collection). As the kidney damage progresses the amount of albumin increases and the patient develops macroalbuminuria (also called overt albuminuria or proteinuria) which is defined as levels > 300 mg/24-hrs[5].

We calculated glomerular filtration rate in study groups and control group; we found a non significant increase in diabetic patients without nephropathy as compared healthy individuals, while we observed a highly significant decrease in diabetic patients with nephropathy as compared to control group (table 13 and 14). However GFR decreased significantly in group III as compared to group II as can be seen from (table 15).

We compared systolic and diastolic blood pressures in study groups and control groups and observed a significant increase in systolic as well as diastolic blood pressures in study groups as seen in table 16 and 17. However group III showed a non significant increase in both systolic and diastolic blood pressure as compared to group II (table 18).

Renal function and blood pressure are tightly linked. Physiologically, kidney provides a key mechanism for autoregulation of glomerular blood pressure, whereas elevated blood pressure affects renal function via pressure natriuresis mechanism. Pathophysiologically, long standing hypertension attenuates pressure natriuresi and can cause or at least contribute to renal damage. Therefore, hypertension is one of the imperative contributing factors associated with both causation and progression of renal failure [5].

In our study we correlated urine microalbumin levels with HbA1C, lipid profile, Blood pressure (systolic and diastolic) and GFR in study groups and control groups. We neither found any correlation between urine microalbumin levels and these parameters in control group nor in diabetic patients without nephropathy group (group II) as seen table 19 and 20. However we observed a significant positive correlation between urine microalbumin and HbA1C in diabetic patients with nephropathy as seen from table 21. These findings suggest poor glycemic control causes renal damage. Thus our finding are in agreement with those of Romano Nosadini et al who in his study found that HbA1c levels >7.5 to 8.0% were closely associated with a rapid decay of renal function in type 2 diabetes [12]. Kundu, et al also noted impaired glycemic control associated with significant elevations in urinary microalbumin levels [14].

The risk of hyperglycemia (HbA1C) amplifies the risk of micro-albuminuria conferred by increased systolic blood pressure. Azza M. et al concluded that severe albuminuria was significantly associated with higher levels of HbA1c among diabetic groups with normo-, micro-, and microalbuminuria [5].

Thus our result indicates the importance of both glucose and HbA1C levels as predictors for developing nephropathy status (micro- and

macro- albuminuria) among diabetic patients.

We also observed a significant positive correlation between urine microalbumin and triglyceride levels in group III as seen from table 21.When we correlated urine microalbumin levels with HDL cholesterol levels in diabetes with nephropathy group we observed a significant negative correlation between them (table 21). Similar results were observed by Chin-Hasio Tseng et al who found correlation of urine microalbumin with total cholesterol, TG, HDL and LDL in type 2 diabetic patients [13].

Increased circulating lipids and enhanced glomerular lipid synthesis have been clearly implicated in diabetic glomerulosclerosis [5].Several recent studies, have documented enhanced kidney synthesis of triglycerides and cholesterol in diabetes. This increased lipid synthesis appears to be stimulated in diabetes.

We found a negative correlation between urine microalbumin and GFR in diabetic patients with nephropathy as a complication (table 21). This may be due to damaged glomerular membrane which leads to decrease in filtration rate.

There was no significant correlation found between urine microalbumin versus total cholesterol, LDL cholesterol, systolic blood pressure and diastolic blood pressure. This could be because of low sample size.

Overall microalbumin levels in urine correlated positively with HbA1c and triglycerides while correlated negatively with HDL and GFR.

Conclusion

A significant association exists between High HbA1C, hypercholesterolemia, hypertriglyceridemia, low HDL and low GFR with microalbuminuria. Hence, it is recommended that all patients with diabetes should be screened early for the presence of microalbuminuria, dyslipidemia along with uncontrolled glycemic status and therapeutic interventions should be performed to prevent further complications. We conclude that urine microalbumin is a better predictor of nephropathy than GFR in type II diabetes and it may be implemented as an early marker for the same.

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