LIPID PROFILE, UREA, AND URIC ACID SERUM LEVELS IN SUBJECTS WITH DIABETES AND\OR PERIODONTITIS COMPARED TO CONTROLS.

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ABSTRACT

Background: Diabetes mellitus and periodontitis are two conditions that characterized with metabolic, inflammatory and immunologic changes that may lead to serious complications, including infection and cardiovascular diseases. **Aim: To** determine the predictive value of lipid profile, glucose, urea and uric acid in these two conditions alone or in combination in comparison with control. **Study Design:** Prospective case control study. **Materials and Methods:** A total of 226 subjects recruited from Endocrinology Unit, Samara General Hospital during the period from 1st October 2014 to end of October 2015. Their age ranged from 32 to 75 years. The study population depending on their clinical and laboratory findings divided in to **non-** diabetic without periodontitis as control, diabetic, periodontitis without diabetes, and diabetic with periodontitis groups. Blood samples collected from subjects and serum isolated and tested for lipid profile, blood urea and sugar, and serum uric acid using enzymatic methods. **Results:** All tested markers with the exception of HDL were significantly higher in diabetic group and those with periodontitis and diabetic than in control, while HDL was significantly lower in both groups than in control. There was no significant differences in all markers between periodontitis and control groups; in between periodontitis with diabetic and diabetic group. However, there was significant higher value in those with diabetes and periodontitis as compared to subjects with periodontics. HDL was inversely correlated to cholesterol, triglyceride and LDL in control group, while this pattern of correlation not demonstrated in the 3 patients groups, indicating abnormal metabolic changes. **Conclusion:** Both diabetes and periodontitis as present alone or in combination were associated with lipid profile, blood urea, and uric acid disturbances. This finding clarify

the importance of monitoring both conditions for the achievement of good prognosis and prevent complications.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disease with sequences of accumulative complications. To date, all the treatment approaches are palliative and all the therapies are to control the glycaemia and prevent complications[1]. Periodontal disease is an inflammatory and multifactorial disease that affect the connective tissue attachment and supporting bone around the teeth whose initiation and progression depends on the presence of virulent microorganisms capable of causing disease[2,3]. Periodontal disease is etiology is still without clear cut and this may lead to delay in diagnosis[3]. Variable biomarkers are used for diagnosis and monitoring of diabetes and periodontitis.[4,5]

Both diabetes and periodontitis may present together and the patients are prone to develop more and severe complications and both conditions may interact in a bidirectional effects. Thus this study was conducted to determine the predictive value of lipid profile, glucose, urea and uric acid in these two conditions alone or in combination in comparison with control.

MATERIALS AND METHODS

Study design: Prospective case control study.

Study population

A total of 226 subjects recruited from Endocrinology Unit, Samara General Hospital during the period from 1st October 2014 to end of October 2015. Their age ranged from 32 to 75 years. The study population depending on their clinical and laboratory findings divided in to the following groups:

Group I: (50) subjects who were non-diabetic without periodontal disease (apparently healthy) as a control group.

Group II: (56) subjects who were non-diabetic with periodontal disease.

Group III: (120) diabetic subject who were subdivided into:

- Diabetics with periodontitis: (60) subjects.
- Diabetics without periodontitis: (60) subjects.

The study was approved by the Ethical Committee of Tikrit University College of Medicine and informed consent taken from each participant before their inclusion in the study.

Sample collection

Blood samples collected from subjects attended to Endocrine Unit in Samarra General Hospital after an overnight fasting in plain tube in the absence of any anticoagulants, and serum had been harvested by allowing the sample to clot within 30 minutes then centrifugation for 10 minutes at 500 rpm, the sera supernatant of serum and saliva were divided into aliquots and stored at -20 until assayed.

Exclusions criteria

Patients with acute or chronic illnesses apart from diabetes mellitus has been excluded from the study.

Methods

Fasting blood sugar, serum total cholesterol, serum triglycerides, serum High density lipoprotein, blood urea and serum uric acid were determined using enzymatic method kits purchased from Biolabo, France.

Statistical analysis

Data were translated into codes using a specially designed coding sheet, and then converted to computerized database. An expert statistical advice was sought and statistical analyses were done using SPSS (Statistical Package for Social Science) version 22. Frequency distributions for variables were done first and plotted on histograms which fail to show distribution of normality and confirmed by using the chi square test. As no assumption about the normality of distribution of study variables was made, nonparametric methods were used to assess the statistical significant of associations. The statistical significant of difference in means of a quantitative continuous variable between two groups was assessed by Mann-Whitney test, while between more than two groups Kruskall-Wallis test was used. P value less than 0.05 level of significant was considered significant.

RESULTS

Comparison between Diabetic group and Control group.

Fasting blood sugar, Blood urea and Uric acid.

The means value of fasting blood sugar was significantly (P=0.000) higher in Diabetic group (203.87 ±81.99 mg/dl) compared to Control group (92.4±14.98 mg/dl). Also the blood urea and Uric acid were significantly (P=0.000), (P=0.000) higher in Diabetic group (28.27±3.79

mg/dl), (4.81 ±0.86 mg/dl) compared to Control group (18.6±2.76 mg/dl), (3.25± 0.55 mg/dl) respectively, Table 1 and Fig 1.

Lipid Profile Parameters.

The mean values of Serum Cholesterol, Serum Triglycerides, Low density lipoprotein (LDL) were significantly (P=0.000), (P<0.018), (P=0.000) higher in Diabetic group (234.03 ±58.13 mg/dl), (213.9±105.26 mg/dl), (149.37±55.45 mg/dl), compared to Control group (173.3±20.09mg/dl),(128.9±43.83mg/dl),(77.6±21.33mg/dl) respectively. While the mean value of Serum High density lipoprotein (HDL) was significantly (P=0.000) lower in Diabetic group (41.17±11.86 mg/dl) compared to Control group (66.9± 11.76 mg/dl), Table - 2.

Table 1: Mean Fasting blood sugar, Blood urea, and Uric acid in Diabetic group compared to Control group.

Variable	Diabetic group N=60		Control group N=50		P-value
	Mean	**SD**	**Mean**	**SD**	
Fasting Blood Sugar (mg/dl)	203.87	81.99	92.40	14.98	**0.000**
Blood urea (mg/dl)	28.27	3.79	18.60	2.76	**0.000**
Uric acid (mg/dl)	4.81	0.86	3.25	0.55	**0.000**
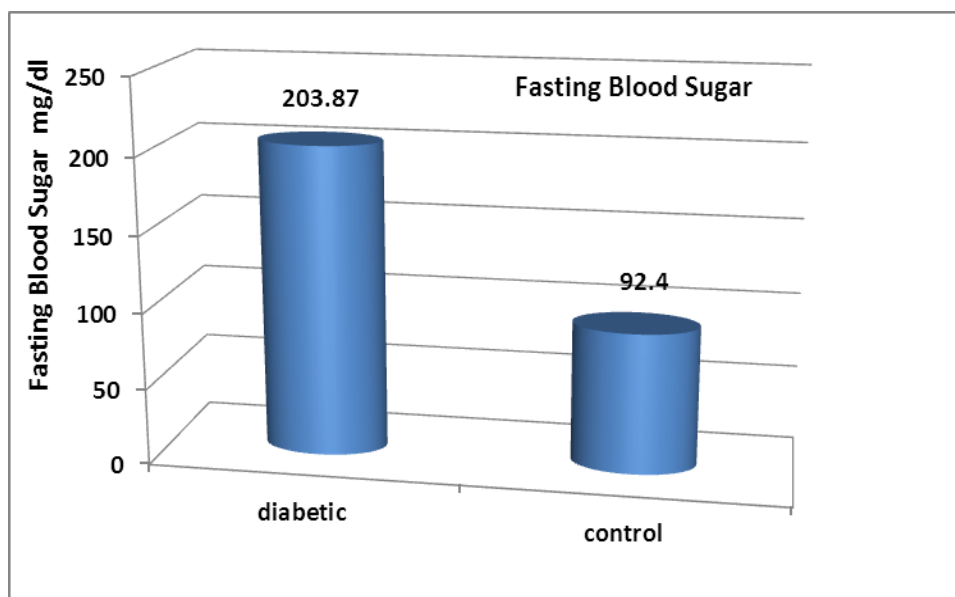
Figure.1: Mean Fasting blood sugar in Diabetic group compared to Control group.

Table -2: Mean Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein (LDL) in Diabetic group compared to Control group.

Variable	Diabetic group N=60		Control group N=50		P-value
	Mean	SD	Mean	SD	
Cholesterol (mg/dl)	234.03	58.13	173.30	20.09	**0.000**
Triglycerides (mg/dl)	213.90	105.26	128.90	43.83	**0.018**
HDL (mg/dl)	41.17	11.86	66.90	11.76	**0.000**
LDL (mg/dl)	149.37	55.45	77.60	21.33	**0.000**

Comparison between Diabetic with periodontitis group and control group.

Fasting blood sugar, Blood urea and Uric acid.

The means values of Fasting blood sugar, Blood urea and Uric acid were significantly (P=0.000), (P=0.000), (P=0.000) higher in Diabetic with periodontitis group (219.3 ±115.93 mg/dl), (28.33±2.76 mg/dl), (4.93 ±1.03 mg/dl) compared to control group (92.4±14.98 mg/dl), (18.6±2.76 mg/dl), (3.25± 0.55 mg/dl) respectively, Table 3 and Fig. 2.
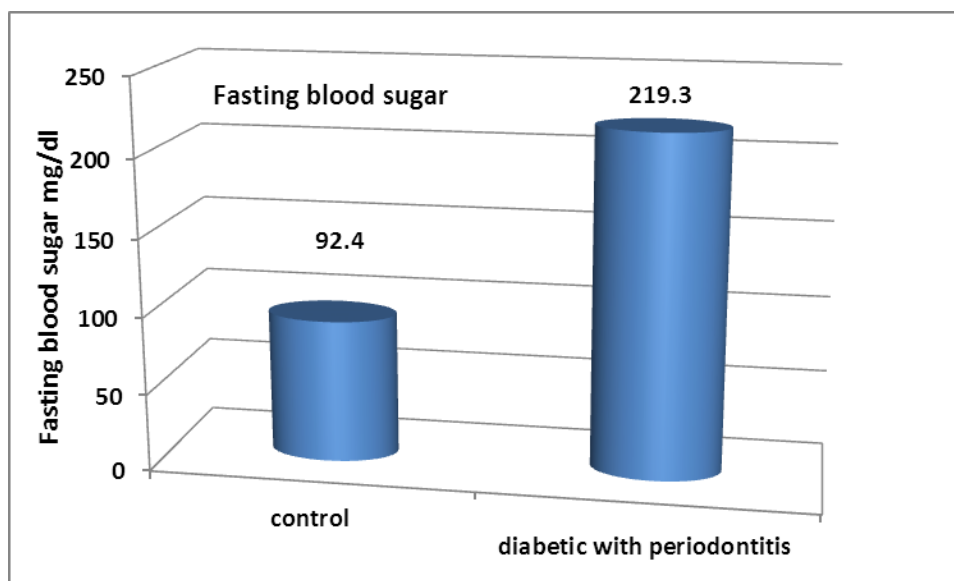
Table 3: Mean Fasting blood sugar, Blood urea, and Uric acid in Diabetic with periodontitis patients compared to Control group.

Variable	Diabetic with periodontitis group N=60		Control group N=50		P- value
	Mean	SD	Mean	SD	
Fasting Blood Sugar (mg/dl)	219.3	115.93	92.40	14.98	**0.000**
Blood urea (mg/dl)	28.33	2.76	18.60	2.76	**0.000**
Uric acid (mg/dl)	4.93	1.03	3.25	0.55	**0.000**

Lipid Profile Parameters.

The means of serum Cholesterol was significantly(P<0.006) higher in Diabetic with periodontitis group (221 ±49.77 mg/dl) compared to Control group (173.3±20.09 mg/dl). Also Triglycerides and Low density lipoprotein (LDL) were significantly (P<0.014), (P=0.000) higher in Diabetic with periodontitis group (187±66.6 mg/dl), (132.1±45.05 mg/dl) compared to control group (128.9±43.83 mg/dl), (77.6± 21.33 mg/dl) respectively. While High density lipoprotein (HDL) was significantly (P=0.000) lower in Diabetic with

periodontitis group (36.14±10.09 mg/dl) compared to Control group (66.9± 11.76 mg/dl), Table 4.

Figure.2: Mean Fasting blood sugar in Diabetic group with periodontitis group compared to Control group.

Comparison between Control group and Periodontitis group.

Fasting blood sugar, Blood urea and Uric acid.

There was no significant differences between the means of Fasting blood sugar, Blood urea and Uric acid in Control group compared to Periodontitis group, Table 5.

Lipid Profile Parameters.

The means of Serum cholesterol was significantly(P=.000) higher in Control patients (173.3 ±20.09 mg/dl) compared to periodontitis group (120.14±39.93 mg/dl). High density lipoprotein (HDL) was significantly (P<0.024) higher in Control group (66.9±11.76 mg/dl) compared to Periodontitis group (51.60± 19.26 mg/dl). Also LDL serum mean value was significantly (P< 0.02) higher in control group(77.6±21.33) as compared to those with periodontitis(64.79±32.69), Table 6.

Table 4: Mean Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and low density lipoprotein (LDL) in diabetes with periodontitis.

Variable	Diabetic with periodontitis group N=60		Control group N=50		P-value
	Mean	SD	Mean	SD	
Cholesterol (mg/dl)	221.00	49.77	173.30	20.09	**0.006**
Triglycerides (mg/dl)	187.00	66.60	128.90	43.83	**0.014**
HDL (mg/dl)	36.14	10.09	66.90	11.76	**0.000**
LDL (mg/dl)	132.10	45.05	77.60	21.33	**0.000**

Comparison between Diabetic group and Periodontitis group.

Fasting blood sugar, Blood urea and Uric acid.

The means value of Fasting blood sugar was significantly (P=0.000) higher in diabetic group (203.87 ±81.99 mg/dl) compared to periodontitis group (90±5.16 mg/dl). Also blood urea and uric acid were significantly (P=0.000), (P=0.000) higher in diabetic group (28.27±3.79 mg/dl), (4.81 ±0.86 mg/dl) compared to periodontitis group (19.29±2.2 mg/dl), (3.05± 0.43 mg/dl) respectively, Table 7 and Fig.3.

Table -5: Mean Fasting blood sugar, Blood urea and Uric acid in Periodontitis group compared to Control group.

Variable	Control group N=50		Periodontitis group N-56		P- value
	Mean	SD	Mean	SD	
Fasting Blood Sugar (mg/dl)	92.40	14.98	90.00	5.16	0.637
Blood urea (mg/dl)	18.60	2.76	19.29	2.2	0.505
Uric acid (mg/dl)	3.25	0.55	3.05	0.43	0.325

Lipid Profile Parameters.

The means of Serum Cholesterol was significantly (P=0.000) higher in diabetic group (234.03 ±58.13 mg/dl) compared to periodontitis group (120.14±39.93mg/dl). Also serum triglycerides and low density lipoprotein (LDL) were significantly (P=0.000), (P=0.000) higher in diabetic group (213.90±105.26 mg/dl), (149.37±55.45 mg/dl) compared to periodontitis group (120.36±19.14 mg/dl),(64.79± 32.6 mg/dl) respectively. While High

density lipoprotein (HDL) was significantly lower(P<0.015) in diabetic group(41.17±11.86) compared to periodontitis group (51.60±19.26), Table -8.

Table -6: Mean Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein (LDL) in Periodontitis group compared to Control group.

Variable	Control group N=50		Periodontitis group N=56		P- value
	Mean	SD	Mean	SD	
Cholesterol (mg/dl)	173.30	20.09	120.14	39.93	**0.000**
Triglycerides (mg/dl)	128.90	43.83	120.36	19.14	0.574
HDL (mg/dl)	66.90	11.76	51.60	19.26	**0.024**
LDL (mg/dl)	77.60	21.33	64.79	32.59	**0.02**

Table -7: Mean Fasting blood sugar, Blood urea and Uric acid in Diabetic group compared to Periodontitis group.

Variable	Diabetic group N=60		Periodontitis group N-56		P-value
	Mean	SD	Mean	SD	
Fasting Blood Sugar (mg/dl)	203.87	81.99	90.00	5.16	**0.000**
Blood urea (mg/dl)	28.27	3.79	19.29	2.2	**0.000**
Uric acid (mg/dl)	4.81	0.86	3.05	0.43	**0.000**
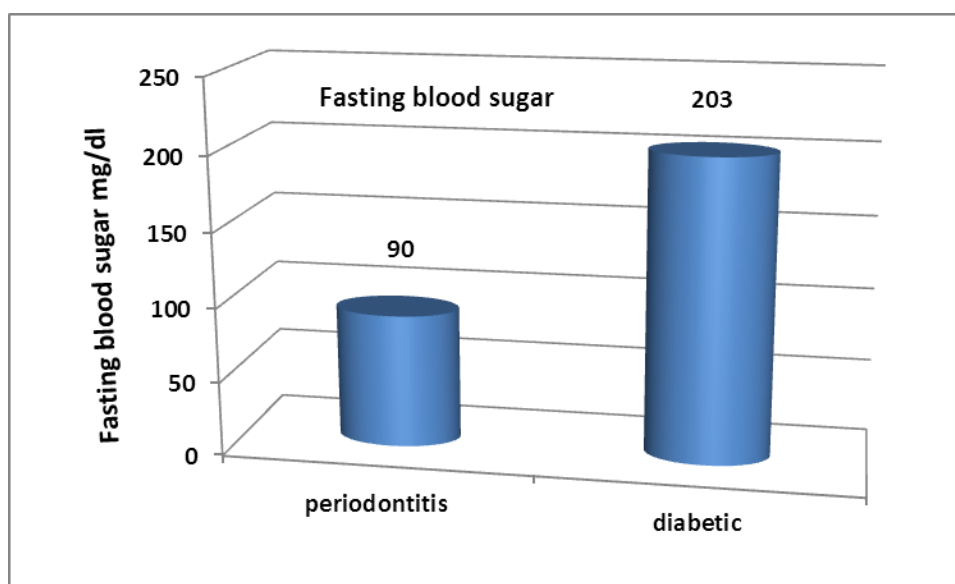
Figure.3: Mean Fasting blood sugar in Diabetic group compared to Periodontitis group.

Table -8: Mean Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein (LDL) in Diabetic group compared to Periodontitis group.

| Variable	Diabetic group N=60		Periodontitis group N=56		P-value
	Mean	SD	Mean	SD	
Cholesterol (mg/dl)	234.03	58.13	120.14	39.93	**0.000**
Triglycerides (mg/dl)	213.90	105.26	120.36	19.14	**0.000**
HDL (mg/dl)	41.17	11.86	51.60	19.26	**0.015**
LDL (mg/dl)	149.37	55.45	64.79	32.6	**0.000**

Comparison between Diabetic with periodontitis group and Periodontitis group.

Fasting blood sugar, Blood urea and Uric acid.

The means of Fasting blood sugar was significantly (P=0.000) higher in diabetic with periodontitis group (219.30 ±115.93 mg/dl) compared to periodontitis group (90±5.16 mg/dl). Blood urea was significantly (P=0.000) higher in diabetic with periodontitis group (28.33±2.76 mg/dl) compared to periodontitis (19.29±2.2 mg/dl). Uric acid was significantly (P=0.000) higher in diabetic with periodontitis group (4.93 ±1.03 mg/dl) compared to periodontitis group (3.05± 0.43 mg/dl), Table -9 and Figure 4.

Table -9: Mean Fasting blood sugar, Blood urea, and Uric acid in Diabetic with periodontitis group compared to Periodontitis group.

Variable	Diabetic with periodontitis group N=60		Periodontitis group N-56		P-value
	Mean	SD	Mean	SD	
Fasting Blood Sugar (mg/dl)	219.30	115.93	90.00	5.16	**0.000**
Blood urea (mg/dl)	28.33	2.76	19.29	2.2	**0.000**
Uric acid (mg/dl)	4.93	1.03	3.05	0.43	**0.000**
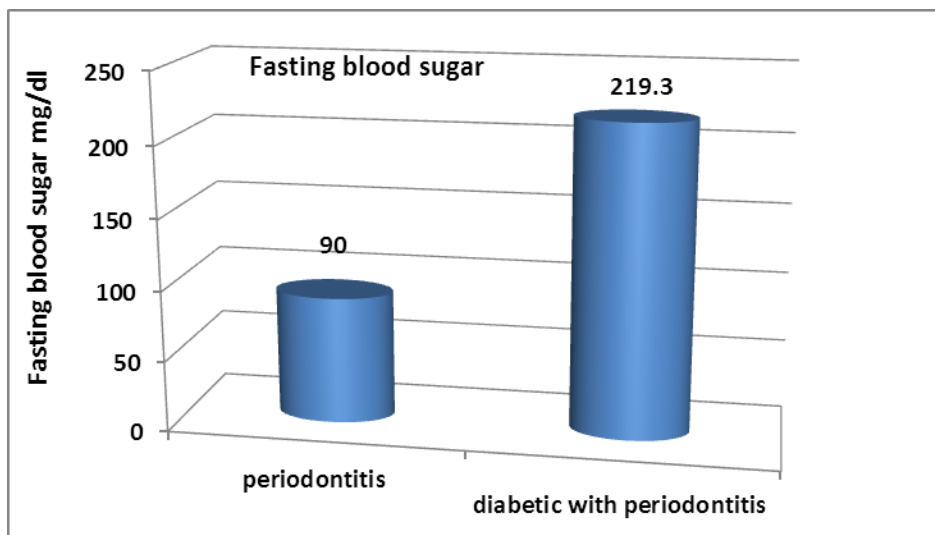
Figure.4: Mean Fasting blood sugar in Diabetic with periodontitis group compared to Periodontitis group.

Lipid Profile Parameters.

The means of Serum Cholesterol was significantly (P=.000) higher in Diabetic with periodontitis group (221 ±49.77 mg/dl) compared to Periodontitis group (120.14±39.93 mg/dl). Serum Triglycerides was significantly (P=0.000) higher in Diabetic with periodontitis group (187±66.6 mg/dl) compared to Periodontitis group (120.36±19.14 mg/dl). High density lipoprotein (HDL) was significantly (P<0.001) lower in Diabetic with periodontitis group (36.14± 10.09 mg/dl) compared to Periodontitis group (51.6±19.26 mg/dl). Low density lipoprotein (LDL) was significantly (P=0.000) higher in Diabetic with periodontitis group (132.1±45.05 mg/dl) compared to Periodontitis group (64.79± 32.6 mg/dl), Table -10.

Table (4-10): Mean Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein (LDL) in Diabetic with periodontitis group compared to Periodontitis group.

Variable	Diabetic with periodontitis group N=60		Periodontitis group N=56		P-value
	Mean	**SD**	**Mean**	**SD**	
Cholesterol (mg/dl)	221.00	49.77	120.14	39.93	**0.000**
Triglycerides (mg/dl)	187.00	66.60	120.36	19.14	**0.000**
HDL (mg/dl)	36.14	10.09	51.60	19.26	**0.001**
LDL (mg/dl)	132.10	45.05	64.79	32.6	**0.000**

Comparison between Diabetic group and Diabetic with periodontitis group.

Fasting blood sugar, Blood urea and Uric acid.

There was no significant differences between the means of fasting blood sugar, blood urea and Uric acid in diabetic group compared to Diabetic with periodontitis group, Table -11.

Lipid Profile Parameters.

There was no significant differences between the means of lipid profile parameters between diabetic group compared to Diabetic with periodontitis group as shown in table -12.

Correlation Study.

Correlation within Control group.

Correlation between lipid profile parameters.

A correlation study between Serum Cholesterol, Triglycerides, High density lipoprotein (HDL), and Low density lipoprotein (LDL) within the Control group show a significant positive correlation between serum Triglycerides with serum Cholesterol. Also there was a significant negative correlation between (HDL) with both serum triglycerides and serum(LDL)within control group as shown in table -13, figures .5, 6 and .7.

Correlation between Fasting blood sugar, Blood urea and Uric acid.

A correlation study between Fasting blood sugar, Blood urea Uric acid within the Control group show a significant positive correlation between Fasting blood sugar and uric acid, Table -14.

Table -11: Mean Fasting blood sugar, Blood urea, and Uric acid in Diabetic group compared to Diabetic with periodontitis group.

Variable	Diabetic group N=60		Diabetic with periodontitis group N=60		P-value
	Mean	**SD**	**Mean**	**SD**	
Fasting Blood Sugar (mg/dl)	203.87	81.99	219.30	115.93	0.554
Blood urea (mg/dl)	28.27	3.79	28.33	2.76	0.938
Uric acid (mg/dl)	4.81	0.86	4.93	1.03	0.646

Correlation within Periodontitis group.

Correlation between lipid profile parameters.

A correlation study between Serum Cholesterol, Triglycerides, High density lipoprotein (HDL), and Low density lipoprotein (LDL) within the Periodontitis group show a significant negative correlation between serum Cholesterol and serum Low density lipoprotein (LDL), Table -15 and figure .8.

Table -12: Mean Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and low density lipoprotein (LDL) in Diabetic group compared to Diabetic with periodontitis group.

| Variable	Diabetic group N=60		Diabetic with periodontitis group N=60		P-value
	Mean	SD	Mean	SD	
Cholesterol (mg/dl)	234.03	58.13	221.00	49.77	0.355
Triglycerides (mg/dl)	213.90	105.26	187.00	66.6	0.242
HDL (mg/dl)	41.17	11.86	36.14	10.09	0.178
LDL (mg/dl)	149.37	55.45	132.10	45.05	0.191

Correlation between Fasting blood sugar, Blood urea and Uric acid.

A correlation study between Fasting blood sugar, Blood urea and Uric acid within the periodontitis group didn't show any significant positive or negative correlation, Table .16.
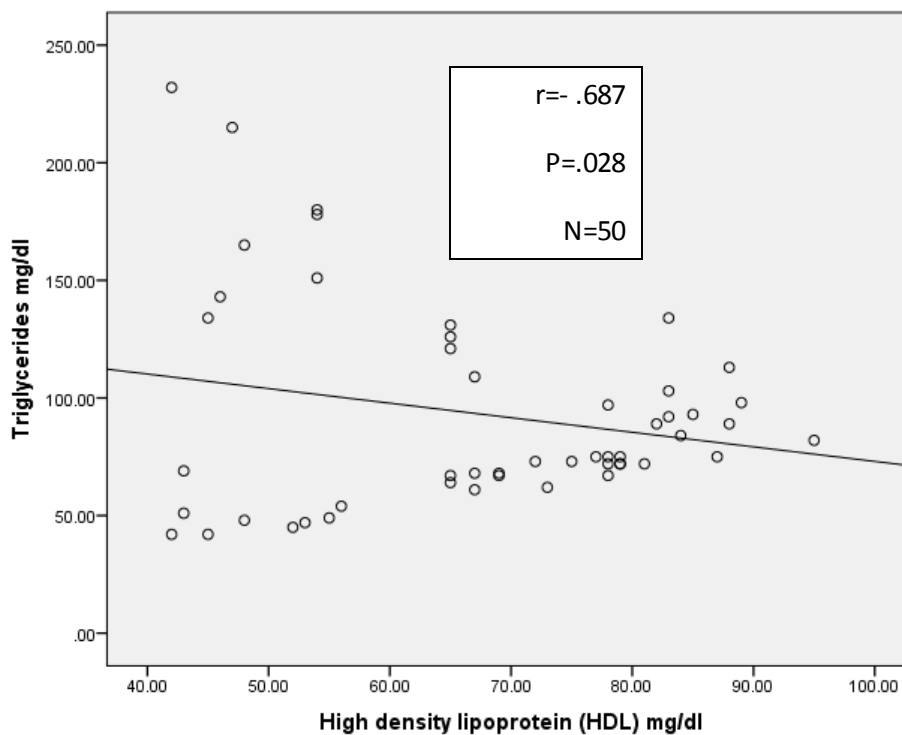
Table -13: Correlation between Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein (LDL) within Control group.

|		Cholesterol	Triglycerides	HDL	LDL
Cholesterol	r- value	1	**.768**[**]	.480	.206
	P- value		**.010**	.160	.568
Triglycerides	r- value	**.768**[**]	1	**-.687**[*]	-.364
	P- value	**.010**		**.028**	.302
HDL	r- value	**-.790**[**]	**-.687**[*]	1	**-.638**[*]
	P- value	**.007**	**.028**		**.047**
LDL	r- value	.206	-.364	**-.638**[*]	1
	P- value	.568	.302	**.047**	
**. Correlation is significant at the 0.01 level (2-tailed).					
*. Correlation is significant at the 0.05 level (2-tailed).					
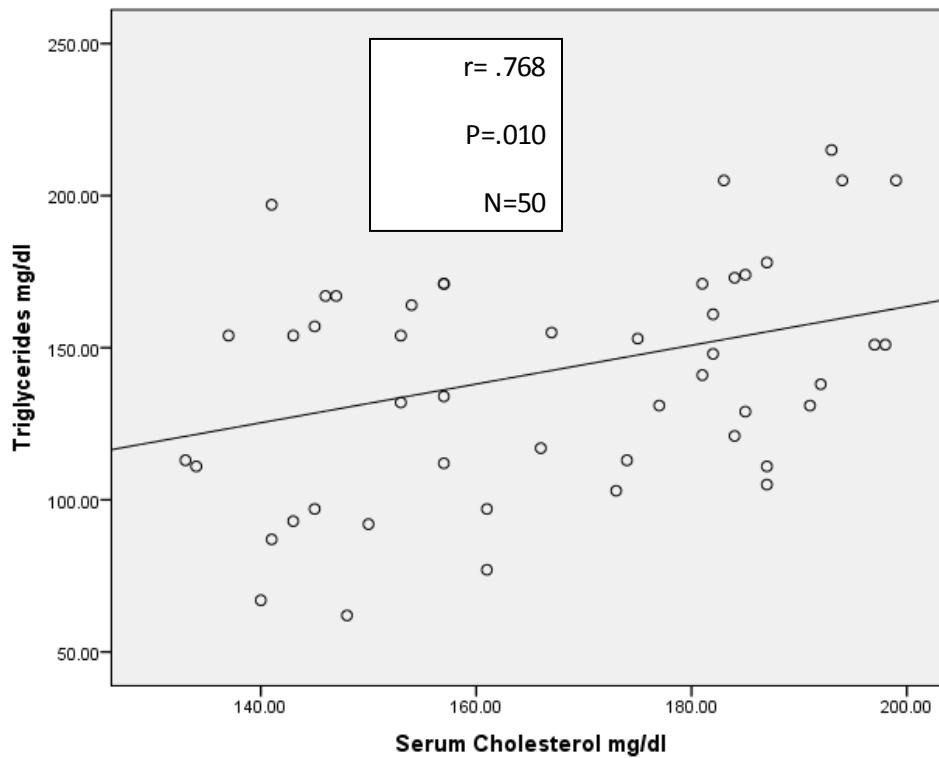
Figure.5:   Correlation   between   Serum   Cholesterol   and   Serum   Triglycerides   within Control group.

Figure. 6:   Correlation   between   Serum   Triglycerides   and   Serum   High   density lipoprotein (HDL) within Control group.
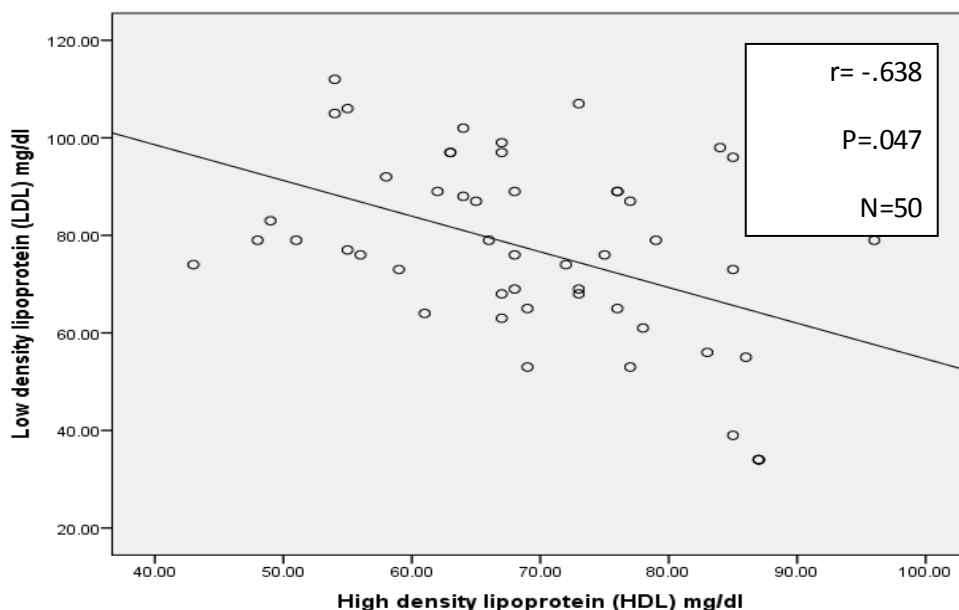
Figure .7: Correlation between Serum Low density lipoprotein (LDL) and Serum High density lipoprotein (HDL) within Control group.

Correlation within Diabetic group.

Correlation between lipid profile parameters.

A correlation study between serum Cholesterol, Triglycerides, High density lipoprotein (HDL), and Low density lipoprotein (LDL) within the Diabetic group show a significant positive correlation between serum Cholesterol and serum low density lipoprotein (LDL), Table.17 and figure .9.

Table -14: Correlation between Fasting blood sugar, Blood urea Uric acid within the control group.

Variable		Fasting blood sugar	Blood urea	Uric acid
Fasting blood sugar	r- value	1	.084	.596
	P- value		.817	.05
Blood urea	r- value	-.084	1	.362
	P- value	.817		.305
Uric acid	r- value	-.596	.362	1
	P- value	.05	.305	

Correlation between Fasting blood sugar, Blood urea and Uric acid.

A correlation study between Fasting blood sugar, Blood urea and Uric acid within the Diabetic group didn't show any significant positive or negative correlation as shown in table (4-18).

Table -15: Correlation between Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein (LDL) within Periodontitis group.

Variable		Cholesterol	Triglycerides	HDL	LDL
Cholesterol	r-value	1	.114	.451	**.898**[**]
	P-value		.698	.106	**.000**
Triglycerides	r-value	.114	1	.291	.055
	P-value	.698		.312	.852
HDL	r-value	.451	.291	1	.106
	P-value	.106	.312		.718
LDL	r-value	**.898**[**]	.055	.106	1
	P-value	**.000**	.852	.718	

. Correlation is significant at the 0.01 level (2-tailed).

Correlation within Diabetic with periodontitis group.

Correlation between lipid profile parameters.

A correlation study between serum Cholesterol, Triglycerides, High density lipoprotein (HDL), and Low density lipoprotein (LDL) within the Diabetic with periodontitis group show a significant positive correlation between Serum Cholesterol with both serum Triglycerides and serum low density lipoprotein (LDL), Table -19, figures .10 and .11.
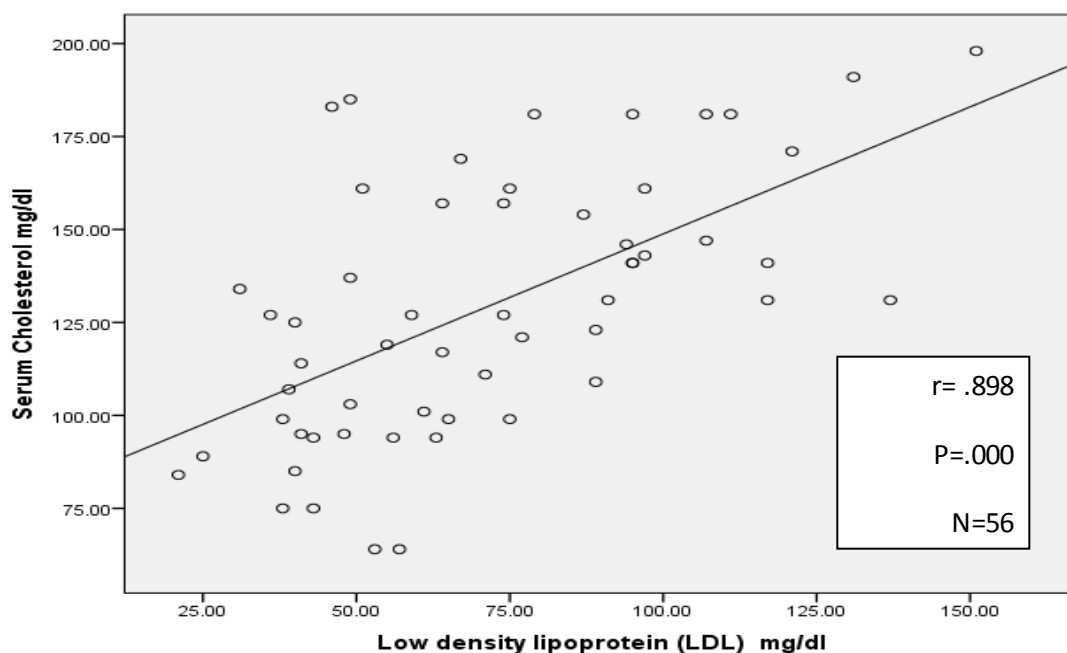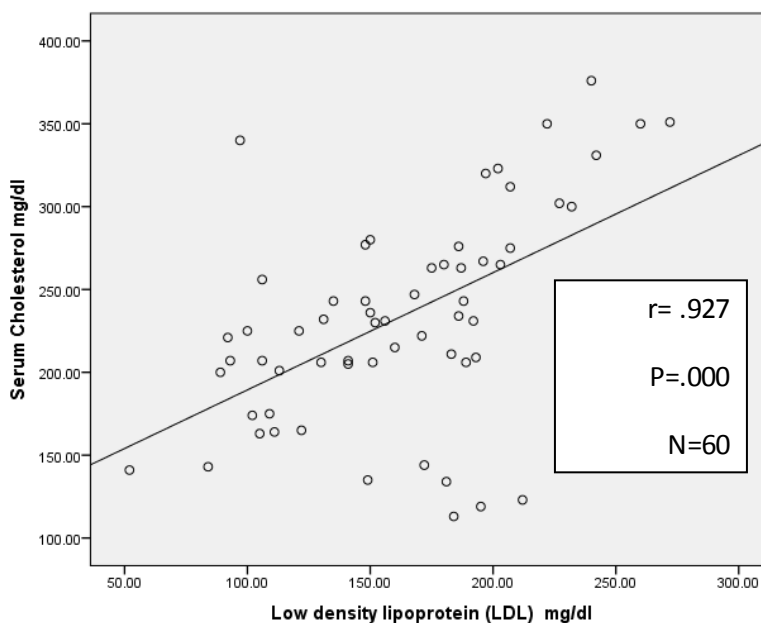

Figure 4.8: Correlation between Serum Low density lipoprotein (LDL) and Serum Cholesterol within Periodontitis group.

Correlation between Fasting blood sugar, Blood urea and Uric acid.

A correlation study between Fasting blood sugar, Blood urea and Uric acid within the Diabetic with periodontitis group didn't show any significant positive or negative correlation, Table -20.

Table -16. Correlation between Fasting blood sugar, Blood urea and Uric acid within the periodontitis group.

Variable		Fasting blood sugar	Blood urea	Uric acid
Fasting blood sugar	r- value	1	-.027	-.021
	P- value		.927	.943
Blood urea	r- value	-.027	1	.278
	P- value	.927		.335
Uric acid	r- value	-.021	.278	1
	P- value	.943	.335	

Figure. 9: Correlation between Serum Low density lipoprotein (LDL) and Serum Cholesterol within Diabetic group.

Table -17: Correlation between Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein (LDL) within Diabetic group.

Variable		Cholesterol	Triglycerides	HDL	LDL
Cholesterol	r-value	1	.299	.064	**.927**[**]
	P-value		.109	.737	**.000**
Triglycerides	r-value	.299	1	-.263	-.008
	P-value	.109		.160	.968

HDL	r-value	.064	-.263	1	-.060
	P-value	.737	.160		.753
LDL	r-value	.927**	-.008	-.060	1
	P-value	.000	.968	.753	

**. Correlation is significant at the 0.01 level (2-tailed).

Table -18. Correlation between Fasting blood sugar, Blood urea Uric acid within the Diabetic group.

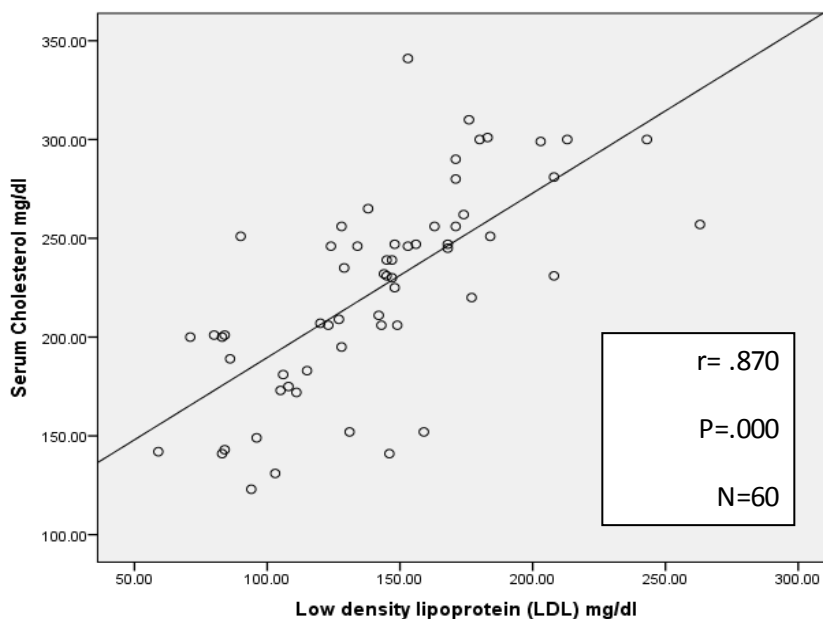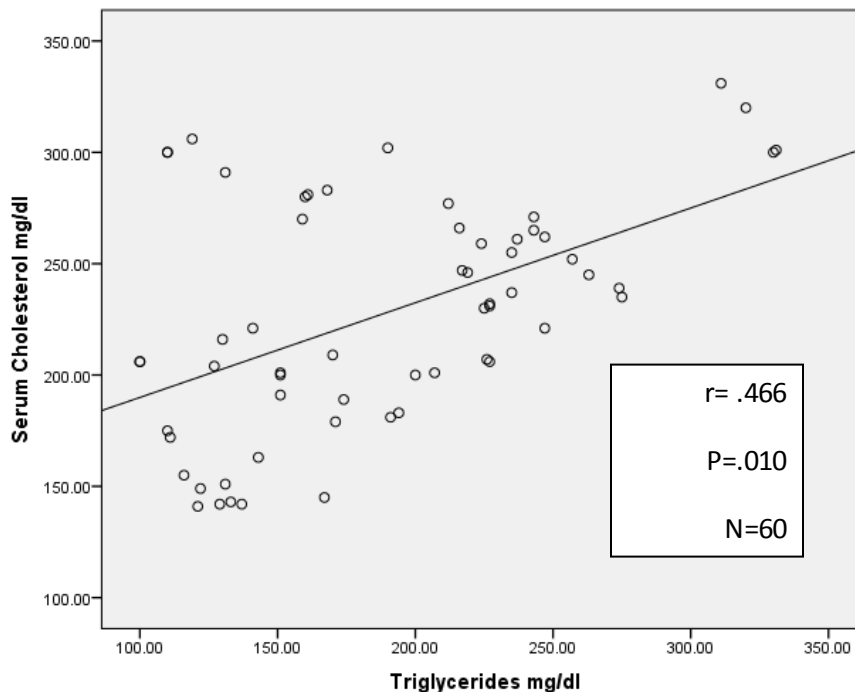| Variable		Fasting blood sugar	Blood urea	Uric acid
Fasting blood sugar	r- value	1	.005	.253
	P- value	30	.978	.177
Blood urea	r- value	.005	1	.018
	P- value	.978		.925
Uric acid	r- value	.253	.018	1
	P- value	.177	.925	

r= .870

P=.000

N=60

Figure.10: Correlation between Serum Low density lipoprotein (LDL) and Serum Cholesterol within Diabetic with periodontitis group.

Table -19: Correlation between Serum Cholesterol, Triglycerides, High density lipoprotein (HDL) and Low density lipoprotein (LDL) within Diabetic with periodontitis group.

Variable		Cholesterol	Triglycerides	HDL	LDL
Cholesterol	r-value	1	.466**	.225	.870**
	P-value		.010	.232	.000
Triglycerides	r-value	.466**	1	.106	.173
	P-value	.010		.577	.359

HDL	r-value	.225	.106	1	-.211
	P-value	.232	.577		.263
LDL	r-value	**.870**[**]	.173	-.211	1
	P-value	**.000**	.359	.263	
**. Correlation is significant at the 0.01 level (2-tailed).					

Figure.11: Correlation between Serum Triglycerides and Serum Cholesterol within Diabetic with periodontitis group.

Table -20. Correlation between Fasting blood sugar, Blood urea Uric acid within the Diabetic with periodontitis group.

Variable		Fasting blood sugar	Blood urea	Uric acid
Fasting blood sugar	r- value	1	.273	-.117
	P- value		.144	.538
Blood urea	r- value	.273	1	.004
	P- value	.144		.983
Uric acid	r- value	-.117	.004	1
	P- value	.538	.983	

DISCUSSION

Diabetes is a chronic metabolic disease which is with bad prognosis if not well controlled through treatment and monitoring. The present study indicated a highly significant differences in some biomarkers in patients with diabetes as compared to non-diabetic subjects. Unfortunately, the mean of glucose in diabetic group was not well controlled and

exceeded the standard normal value of 100 mg/dl for fasting and 140 mg/dl post-meal value[6]. In addition, blood urea mean value was highly significant higher in diabetic subjects than in control non-diabetic individuals. However, the mean value still lower than normal upper limit value of 40 mg/dl. Furthermore, uric acid mean value was significantly higher in diabetic individuals than in control group, however, the mean value still lower than standard normal upper limit value of 7.2 mg/dl[7].

The higher level of blood urea and serum uric acid in this study cohort may be attributed to metabolic changes that occurs as a sequences of uncontrolled diabetes. Blood urea is a predictive biomarker of renal dysfunction and thus their increase in our study cohort indicated an association between diabetes and nephropathy[8].

This study shows that serum cholesterol, triglycerides, and LDL mean values were significantly higher in diabetic subject than in non-diabetic controls. While serum HDL mean value was significantly lower in diabetic group than in non-diabetic controls. However, serum HDL in diabetic group still within the accepted limit of ≥ 40 mg/dl.

Khare *et al*[9] concluded from their study that mean serum uric acid was higher in diabetic subject than in control and it was more in those with long history as compared to newly diagnosed cases. However, Al-Rawi *et al*[10] reported lower mean concentration of serum uric acid as compared to control, but the difference was not significant. Other studies indicated an increased serum/plasma levels in subject with diabetes as compared to non-diabetic control[9,11,12].

Ashakiran *et al*[13] suggest that the trend of serum uric acid levels in diabetic patients with complication differ from that without complications. They found that serum uric acids was significantly lower in diabetic patients without retinopathy as compared to controls group and diabetic with retinopathy.

Bhole *et al*[14] in a prospective study suggest that high serum uric acid is a risk factor for type 2 diabetes development. In addition Baldwin *et al*[15] in animal model found that hyperuricemia lead to proiflamatory endocrine imbalance which may attribute to cell surface morphological changes in vascular smooth muscles and adipose tissue and insulin resistance.

The present study shows a high mean serum level of uric acid and blood urea indicating that they were with predictive value biomarkers for diabetic renal complication.

Presence of periodontitis with diabetes in the same individual did not effected significantly the level of fasting blood sugar, blood urea, and uric acid as this study indicated. However, periodontitis was without significant effect on fasting blood sugar, blood urea, and uric acid when compared to matched control. Thus periodontitis alone with low impact on the serum level of these three above mentioned biomarkers. The present study finding indicated that diabetes alone, or in combination with periodontitis leads to significant increase in mean serum levels of blood urea and serum uric acid. Thus the local disease such as periodontitis may affect serum levels of blood urea and uric acid, but with lower effect as compared systemic disease.

The total cholesterol increased 17% of the standard international control and 35% of this study non-diabetic control. While triglycerides increased 66% of this study control ad 43% of the international standard. The LDL was much higher for both this study control(92%) and international standard. The HDL reduced 39% in comparison to this study control and 43% to the international standard. The above data collectively indicated that diabeticpatients included in this study was with not well controlled diabetes. Previous studies[16-21] reported increase in serum / plasma total cholesterol, LDL, and triglycerides and decrease level of HDL. The present study findings and that reported in literatures suggest that dyslipidemia was associated with diabetes and may represent a risk factor for cardiovascular disease in subject with diabetes.

The mean serum value of cholesterol, HDL, and LDL were significantly higher in control group than individual with periodontitis, while triglycerides higher in control group but not reach the significant level. This finding indicate that local disease may affect the concentration of lipid profile in patients with periodontitis. However, fasting blood sugar (FBS), blood urea, and uric acid mean serum were not significantly different between patients with periodontitis and control subjects. Gormat *et al*[21] reported that increased serum glucose was associated with significant increase in cholesterol, LDL, and triglicerides and decreased in HDL.

Diabetes and periodontitis are two pathological conditions occurred in human being with bidirectional relationship[22,23]. However, it was uncertain at which direction the effect was driven. The individuals with diabetes and periodontitis co-morbidities were significantly with higher mean serum value of FBS, blood urea, uric acid total cholesterol, triglycerides and

LDL. While HDL was significantly higher in control as compared to diabetic with periodontitis subjects.

The present study finding indicate that presence of periodontitis with diabetes in the same individual may lead to reduction in cholesterol, triglycerides, and LDL and increase in HDL.

Total cholesterol, triglycerides, and LDL mean serum values were higher in individuals with diabetes as compared to those with diabetes and periodontitis. While in subjects with periodontitis were with cholesterol, triglycerides, and LDL lower serum levels than in diabetic group and group of diabetes with periodontitis.

Although, periodontitis reduced mean serum levels of cholesterol, triglycerides, and LDL, however, diabetes was the pathological condition that affect serum levels of lipid profile. In addition, the present study findings indicated that the systemic diseases (e.g. diabetes) affected lipid profile levels more than local diseases(e.g. periodontitis), however, both diseases were with close association[19]. Diabetic xerostomia may complicated periodontitis condition and interfere with local hygiene, immunity, and oxidative stress[25-27].

Comparison between subjects with diabetes and those with periodontitis show a significantly higher FBS, uric acid, cholesterol, triglycerides, and LDL mean serum levels in diabetic group. This finding indicated that periodontitis do affect the serum level of above mentioned biomarkers, however the effect of diabetes was more than that of periodontitis. In addition, mean serum HDL was significantly lower in diabetic patients as compared to those with periodontitis.

Subjects with diabetes and periodontitis show significantly higher FBS, blood urea, uric acid, cholesterol, triglycerides, and LDL than in individuals with periodontitis. However, the presence of periodontitis with diabetes was with minor effect on FBS, blood urea, uric acid and lipid profile mean serum values. This hypothesis was confirmed by the present study finding which indicate a non-significant differences in mean values of FBS, blood urea, uric acid and lipid profile between diabetic subject group and individuals with diabetes and periodontitis.

Previous studies indicated that diabetes is a risk factor for periodontitis[28-31]. Diabetes and periodontitis were reported since 1960s[23] and suggested by later performed studies[30,32,33]. In addition, in subject with uncontrolled diabetes, periodontitis was associated with more

complications than in those with controlled diabetes[34-38]. However, other studies not confirm such association[39-41]. Periodontitis demonstrated impact on diabetes and may increase frequently of diabetic complications[42]. Other studies reported that treatment of periodontal disease attributed to glycemic control in subject with diabetes and periodontitis[43-59]. Diabetes influenced periodontitis by exaggerated inflammatory response, immunological dysfunction, metabolic changes, and oxidant-anti-oxidant disturbances[60-77].

As expected in control subjects, cholesterol was significantly positively correlated with triglycerides and negatively with HDL. However, the correlation between cholesterol and LDL was not significant. In addition HDL was negatively with triglycerides and LDL, but not reach the significant level for LDL.

In periodontal disease group, in contrast to control, a significant correlation demonstrated between cholesterol and LDL only. This may be due to that individuals with periodontitis are with inflammatory, microbial, and immunologic response that may contribute to dyslipidemia. The present study confirm the presence of dyslipidemia as compared to control group.

FBS, blood urea, and uric acid in periodontitis group don't show any significant correlation among each other. This finding may be expected as there was no significant differences in theses biomarkers between periodontitis group and control, indicating a slight changes in theses parameters.

In diabetic group, a significant positive correlation was found between cholesterol and LDL. While in group of diabetes with periodontitis, a positive significant correlation was achieved between cholesterol with triglycerides and cholesterol with LDL. The trend of correlation in diabetic group was similar to that found in periodontitis, while it was markedly different from that in control group and slightly different from that in diabetes with periodontitis group. These data collectively indicated that subjects with diabetes or periodontitis or diabetes with periodontitis are prone to develop dyslipidemia of variable magnitude from each group to others. These dyslipidemia must be considered as an important co-morbidities in diabetes and periodontal disease and may be a risk for cardiovascular diseases in such population.

FBS, uric acid and blood urea do not demonstrated any significant correlation among them in individuals with periodontitis, diabetes and those with diabetes and periodontitis. This finding

may be explained on the mechanisms complexity that associated with such inflammatory, immunologic, microbial and metabolic diseases.

Amarty *et al*[11] found that there was a significant correlation between uric acid and body mass index (BMI); other study[13], show a significant correlation between uric acid and glucose; uric acid and cholesterol; and between uric acid and LDL in diabetic individuals.

In present study serum uric acid was significantly correlated with cholesterol and triglycerides in diabetic patients. While in subjects with diabetic and periodontitis, uric acid significantly positively correlated with serum cholesterol and negatively with HDL, while in control it was negatively correlated with triglycerides. Sarmah and Sharma[78] found a significant positive correlation between uric acid and total cholesterol, uric acid and triglycerides, and uric acid and LDL and negative correlation between uric acid and HDL.

In conclusion, both diabetes and periodontitis as present alone or in combination were associated with lipid profile, blood urea, and uric acid disturbances. This finding clarify the importance of monitoring both conditions for the achievement of good prognosis and prevent complications.

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