

## SERUM LIPIDS ABNORMALITIES AMONG ADULT PATIENTS WITH CHRONIC PERIODONTITIS: A CASE-CONTROL STUDY

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*(Received: November 26, 2022; Accepted for Publication: December 24, 2023)*

### ABSTRACT

**Background and objective:** Periodontitis is a chronic inflammatory condition following bacterial colonization of the gingiva. Both dyslipidemia and chronic periodontitis share common characteristics as both have multifactorial etiology and share the association with chronic systemic inflammation. The current study aimed to evaluate lipid profile levels in chronic periodontitis patients.

**Methods:** A case-control study was conducted at a dental health polyclinic in Duhok city, Kurdistan region, Iraq. The study involved 181 individuals, 89 patients with chronic periodontitis and 92 as a control group were healthy individuals. The study duration was 4 months intervals from January 2022 to April 2022. Fast blood sample has been collected A venous blood sample has been obtained after 12 hour fasting period to measure serum lipid profile, including serum cholesterol, triglyceride, low-density lipoprotein- cholesterol (LDL-C) and high-density lipoprotein- cholesterol(HDL-C) for both groups by Cobas 6000 (Hitachi, Roch).

**Results:** A significant difference was found in serum lipid profile of among chronic periodontitis patients as compared to healthy control (p-value < 0.0001). Moreover, a positive correlation was found between clinical attachment level score and serum cholesterol, triglyceride, and low-density lipoprotein-cholesterol, while there was a negative correlation between high-density lipoprotein-cholesterol (p-value < 0.0001).

**Conclusion:** The mean level of serum cholesterol, triglyceride, and low-density lipoprotein-cholesterol were two times higher in patients with chronic periodontitis with lower mean levels of high-density lipoprotein-cholesterol compared to healthy control.

**KEYWORDS:** Chronic Periodontitis, Dyslipidemia, Clinical Attachment Level

### INTRODUCTION

Periodontitis is one of the most frequent chronic inflammatory conditions clinically characterized by pain, gums bleeding and gingival recession and caused by gingival bacterial colonization (mostly porphyromonas gingivalis) that results in deterioration of the connective tissues between the teeth and the alveolar bone (periodontal tissue) leading to teeth loss.<sup>1</sup> Periodontitis is a major oral health condition affects 5% to 15% worldwide <sup>2</sup>.

Dyslipidemia is regarded as an abnormal metabolic disease with a major risk for cardiovascular disease development. It could be a combination of reduced serum HDL-C concentration, elevated serum cholesterol concentration, serum LDL-C, and serum triglyceride concentration resulting in peroxidation of lipids and systemic inflammation <sup>3</sup>.

Both dyslipidemia and chronic periodontitis (CP) share common characteristics as they are both caused by multifactorial etiology, and share the association with chronic systemic inflammation and the development of cardiovascular disorders. Moreover, patients with chronic periodontitis had a 25% higher risk for developing cardiovascular diseases than those without periodontitis, mostly related to platelets aggregation, formation of thrombosis and high blood viscosity <sup>4</sup>.

As the studies on Since the correlation between chronic periodontitis and hyperlipidemia were deficient. As well as the serum lipid profile levels were still controversial among periodontitis patients with chronic periodontitis 5, 6, 7. Thus, the study aimed to ascertain the association of the serum lipid profile in chronic periodontitis patients and assess the correlation of clinical attachment

level (CAL) with lipid profile level among the same patients.

### Material and methods

A case-control study conducted at Dental Health Polyclinic in Duhok city, Kurdistan area, north of Iraq. This study involved 181 individuals with a mean age of  $41.78 \pm 5.31$  years (ranging between 35 and 55 years), 106 were males, and 75 were females. 89 patients with periodontitis CP and 92 as a control group were healthy individuals. The study duration was performed four months intervals from January 2022 to April 2022. All the recruited participants were informed to attend Dental Health polyclinic, and there were examined. Measurement of CAL was determined according to Willam periodontal probe <sup>8</sup>. The research excluded patients with systemic disorders, those who had previously taken medication for hyperlipidemia, pregnant women, drinkers, obese people, those with diabetes, and smokers <sup>9</sup>.

The College of Medicine's Scientific Committee gave the study protocol its seal of approval for ethical evaluation. Participants who met the eligibility requirements and expressed a willingness to take part in the study provided written informed permission.

All participants were recruited to attend at Duhok Laboratory Health Centre, Clinical Biochemistry Department in the morning after 12 hours fasting. Venous blood sample was obtained from all participants for measurement of lipid profile level, including serum cholesterol, triglyceride, LDL-C, and HDL-C by

Cobas 6000 (Hitachi, Roch) using enzymatic colorimetric methods. The Cutoff points of lipid profile depended upon American Heart Association and the average values as follows: serum triglyceride  $\leq 150$  mg/dl; serum cholesterol  $\leq 200$  mg/dl; serum HDL-C  $\geq 50$  mg/dl for females and  $\geq 40$  mg/dl for males; and LDL-C  $\leq 130$  mg/dl <sup>10</sup>.

### STATISTICAL ANALYSES

The overall data of the patients and controls are shown as mean, standard deviation, or number and %. The homogeneity of the age and gender between cases and controls was performed by an independent t-test or Pearson chi-squared test. The comparisons of lipid plan measurements and clinical attachment level scores between cases and controls were examined in an independent t-test. The correlations of clinical attachment level with lipid plan parameters were examined in a bivariate regression model and were presented in a matrix scatter plot. A p-value of less than 0.05 was used to assess the difference's significance level. JMP pro 14.3.0 was used to carry out the statistical computations.

### RESULT

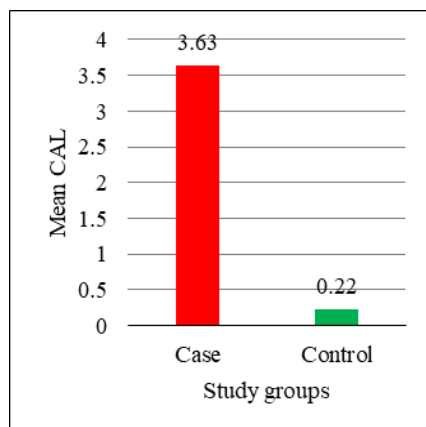
A significant difference was found when comparing in the mean level of serum lipid profile of patients with chronic periodontitis patients as compared to with healthy control, p-value  $< 0.0001$  as shown in table 2

**Table (2):- Comparisons of lipid profile between patients and controls**

Characteristics	Mean $\pm$ SD		P-value
	Case (n=89)	Control (n=92)	
Cholesterol (mg/dl)	353.96 $\pm$ 103.97	169.23 $\pm$ 17.78	<b>&lt;0.0001</b>
LDL-c (mg/dl)	184.65 $\pm$ 53.24	81.74 $\pm$ 8.29	<b>&lt;0.0001</b>
HDL-c (mg/dl)	47.66 $\pm$ 4.85	56.59 $\pm$ 7.20	<b>&lt;0.0001</b>
Triglyceride (mg/dl)	293.83 $\pm$ 98.20	128.02 $\pm$ 8.08	<b>&lt;0.0001</b>

There was a significant difference in clinical attachment level score between periodontitis

patients and control, mean of case 3.63 while for control 0.22 as shown in fig.1



**Fig. (1):** -Comparisons of clinical attachment level mean between periodontitis patients and controls, p- value < 0.0001

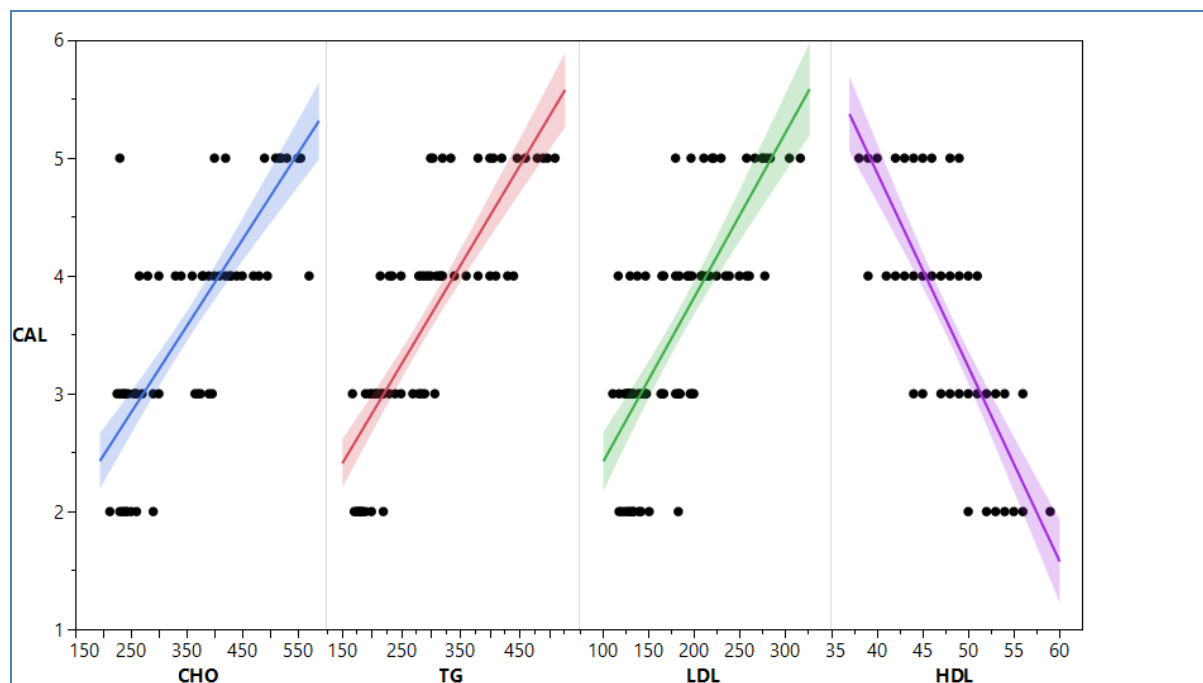
A significant correlation was found between clinical attachment level and lipid parameters level. A positive correlation was found between serum cholesterol, triglyceride and LDL-C with

CAL, while there was a negative correlation between clinical attachment level and serum HDL-C as shown in table 3 and figure 2

**Table (3):-** Correlations of clinical attachment level score with lipid parameters among chronic periodontitis patients

Outcome	Independent factors			
	Cholesterol	Triglyceride	LDL-c	HDL-c
CAL				
r-value	0.7820	0.8280	0.7616	-0.7952
p-value	<0.0001	<0.0001	<0.0001	<0.0001

Bivariate regression was performed for statistical analyses.



**Fig( 2):-** Scatter plot of correlations of clinical attachment level score with serum lipid parameters level among patients

## DISCUSSION

Worldwide, dental pathology is very common, especially chronic periodontitis, which is characterized by a persistent inflammation of the periodontal tissues brought on by an excessive buildup of dental plaque<sup>11</sup>. Moreover, it is regarded as cardiovascular disease independent risk predictor<sup>12</sup>.

In the present current study, we observed that periodontitis patients with CP were highly associated with abnormal mean lipid profile levels. The mean serum cholesterol, triglyceride and LDL-C concentration was significantly higher two times more than healthy control, at the same time; the mean serum HDL-C level was lower significantly lower in periodontitis patients than healthy control. These lipid abnormalities can be explained by the fact that chronic periodontitis caused by exposure to Gram negative lipopolysaccharide related response<sup>13</sup>. This microorganism produces endotoxin that transports through the blood to different tissues of the body, producing inflammation (local or systemic), which result in secretion of tumor necrosis factor- alpha and interleukin 1B<sup>14,15</sup>. These cytokines affect lipid metabolic pathway through production of other cytokines and hormonal changes<sup>16</sup>. Moreover, these changes results in increased synthesis of triglyceride (increase hepatic lipogenesis), decreased the clearance of both triglyceride and low-density lipoprotein-cholesterol (decrease lipoprotein lipase activity), lipids mobilization from sites of synthesis such as adipose tissue and liver, enhance binding of low-density lipoprotein-cholesterol to the surface of endothelium, macrophage up take of oxidized low density lipoprotein-cholesterol (foam cell formation)<sup>17</sup>. Other studies done in different areas in world showed shown the same results of ours as that there was were abnormal lipid profiles in chronic periodontitis patients<sup>18, 19</sup>. Contradictory to our finding, a study done by Machado et al. reported that there was shown no differences of lipid profile levels among patients with CP and healthy control<sup>20</sup>.

In current study, the relation between lipid profile and clinical attachment level (periodontal parameter) among periodontitis patients with chronic periodontitis were statistically significant ( $p < 0.0001$ ), as there was positive association of clinical attachment level with serum cholesterol, triglyceride and LDL-C concentration ( $r$ -value = 0.782, 0.828 and 0.761,

respectively) and negative association with high density lipoprotein-cholesterol concentration ( $r$ -value = - 0.795). These indicate poor periodontal status and more plaque deposition were found among patients with chronic periodontitis and dyslipidemia<sup>21</sup>. The most likely explanation was related to immune system, as there were immune cells dysregulation particularly polymorphnuclear leukocytes which enhance proinflammatory cytokines production and inhibition of macrophage production that impaired wound healing process<sup>3</sup>. A study done by Sayar et al showed shown the same finding as there was positive correlation between clinical attachment level and serum cholesterol, triglyceride and LDL-C, while negative correlation with HDL-C<sup>22</sup>.

It's vital to highlight the fact that treatment of chronic periodontitis patients and increasing the frequency of tooth brushing will results in improvement of in hyperlipidemia particularly hypertriglyceridemia among patients with CP<sup>23</sup>.

## CONCLUSION

The current study concludes that there was a statistically significant difference in lipid profile levels in chronic periodontitis patients as compared to healthy control. The mean level of serum cholesterol, triglyceride, and LDL-C were two times higher in patients with chronic periodontitis patients with lower mean levels of HDL-C as compared to healthy control. Moreover, there was a positive correlation between clinical attachment level with serum cholesterol, triglyceride and LDL-C and negative correlation with HDL-C.

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