



**The possible Connection of periodontal diseases (PD) with cardiovascular disease (CVD) and prostatitis in sample of Iraqi patients**

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**Abstract**

Periodontitis is a chronic inflammation that effect the tissue that surround and support the teeth, and this is prevalent cause of teeth loss in adults while prostatitis is a comparatively common issue affecting about 12 percent of men, and it's the most common prostate-related health issue in men under age fifty. Researches showed that the heart diseases spread in the persons that have periodontitis about 25-50% higher than healthy persons. Recent studies have connected periodontal disease with plenty of systemic health risks, including heart disease and prostatitis but their results were varied. The recent study aimed to explore the linking of gum diseases with heart diseases and prostate inflammations. In total, 150 serum samples of four age groups of participants distributed as 100 (66.7%) samples of patients with periodontitis and other 50 (33.3%) samples of control, All patients were attending to Ibn al-Bitar hospital, teaching laboratories – Medical city and Specialized Dental Center \ AL-Alwiya and the diagnosis of all cases based up on patients medical history that evaluated by qualified physicians and some other laboratory investigations. As (38.0%) patients with heart diseases history and (58.6%) patients with prostatitis. Sample were analyzed for Triglycerides, Prostate-specific antigen (PSA) and CRP levels. The abnormal Triglycerides level estimated by (37.3%), while the elevated level of (PSA) was determined by (40.0%). Furthermore, the prevalence of CRP seropositivity in individuals increased by (43.3%). The incidence of periodontal disease (PD) was paralleled with the positivity of tested biochemical markers of cardiovascular disease (CVD) history and prostatitis respectively with high significant differences ( $P= 0.000$ ). Finally, there is significant connection of PD with CVD and prostatitis, but further studies are needed, and the outcomes of this study have limitations, also the current finding encourages to review a large sample size with different age groups in order to clarify this issue.

**Key words:** Periodontitis; Cardiovascular disease (CVD); Prostatitis

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Received 22 October 2018, Accepted 02 February 2019, Available online 07 February 2019.

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## Introduction

Periodontitis (PD) is a chronic inflammation that influence the tissue that surround and support the teeth, and this is prevalent cause of teeth loss in adults. The spread of periodontitis is high and the moderate type influence about 50% of the adults and progressive type influence 5-15% of the adults that caused by multi factors, so in addition to, the presence of bacteria and immune system, there is also the genetic predisposition of the persons [1]. For this reason, scientists saying the bacteria that cause periodontal diseases does not effects on the mouth only but also participate in the development of other systemic diseases in the body like heart diseases which some researchers noticed it spread in the persons that have periodontitis about 25--50% higher than healthy persons [2-3]. Lack the care to the oral health (which is risk factor of periodontitis) and falling of the teeth (which is the result of periodontitis) associated with increased incidence of heart diseases. The investigation illustrates the relationship between heart diseases and periodontal diseases since more than century also it was concluded there were a link between heart problems and viral infections [4]. Prostatitis is Inflammation of the prostate a fairly common problem affecting about 12 percent of males of under age 50 [5]. Numerous reports have connected gum disease or gum inflammation with many of systemic health life-threatening diseases, including heart stroke or even prostatitis, additional current studies launched a clear association between PD and prostatitis [2-3].The PD progresses when adhesive plaque forms on tooth surfaces turns to hard tartar formation, giving an ultimate residence for bacterial infection to hide and reproduce also, due to tartar forms along gum lines where it's hard for teeth brushing, that's permits bacterial agents to move underneath the gum and then into the blood and maybe to the whole body and its organs or tissues, such as the prostate tissues and heart tissues [6-7]. Report from Case Western Reserve University School of Dental Medicine and University Hospitals Case Medical Center supported the hypothesis of controlling and treating the gum disease it may minimize the symptoms of prostate inflammation as some of previous studies that's support this issue [8].

## Materials and Methods

### *Patients*

A prospective study involved (150) serum specimens that belonged to the period from September (2017) to April (2018) collected from Ibn al-Bitar hospital, teaching laboratories -Medical city and Specialized Dental Center\AL-Alwiya. Fifty samples of control and another one hundred samples with periodontitis as a case of study, a questionnaire contains information about each single patient included (Name, age, History of heart and periodontal diseases, prostate checkup and some of important laboratory test like; Triglycerides, CRP

levels and PSA) were included. The diagnosis of all cases based up on patients medical history that evaluated by qualified physician and some other laboratory investigations. The presence of Triglycerides level in serum was determined using the (Linear chemical S.L. Marketed By: Euro Diagnostic Systems kit Pvt. Ltd.,) and CRP level was determined by using “diagnostic automation \ Cortez diagnostics, Inc., CRP Latex test kit and demonstrate the level of antibody specific for Human PSA (ab113327 – PSA (KLK3 \ abcam).

*Statistics*

The Chi-square used to detect the degree of significance differences among the studied variables of the recent study. By using SPSS ver.18.0. The significance differences among variables (*p-value*) in any test was: S\ Significant difference ( $p < 0.05$ ), NS\ Non - significant difference ( $p > 0.05$ ), HS\ highly significant difference ( $p < 0.0001$ ).

**Results**

**Table 1.**

Clinico-pathological characters according to study groups

Clinico-pathological Factors		Number (%)	
		No.	%
Study Groups	Control	50	33.3 %
	PD	100	66.7 %
	Total	150	100 %
Age Categories (Years)	≤ 30	50	33.3 %
	(31 – 40)	40	26.7 %
	(41 – 50)	36	24 %
	≥ 51	24	16 %
	Total	150	100 %
Heart Disease	No	93	62 %
	Yes	57	38 %
	Total	150	100 %
Prostatitis	Mild	40	26.6 %
	Moderate	25	16.7 %
	Severe	23	15.3 %
	None	62	41.3 %
	Total	150	100 %

Table (1) showed the distribution of study groups according to the studied Clinico-pathological characters as 50 (33.3%) of controls and 100 (66.7%) of PD patients as cases of the recent study, the age categories of the selective study groups were with higher percentage about 50 (33.3 %) of ( $\leq 30$  years) followed by (31 – 40 years) as 40 (26.7 %) of age groups. Furthermore, the heart diseases history it was in 57 (38%) of them and 93 (62%) individuals without it, while 88 (58.6%) of patients had prostatitis which distributed clinically into mild 40 (26.6%), moderate 25 (16.7%) and sever scales 23 (15.3%).

**Table 2.**

Results of Biochemical Tests among study groups

Biochemical Tests		Study Groups			<i>p. value</i>
		Control	PD	Total	
PSA Levels	Elevated Levels	0 (0%)	60 (40%)	60 (40%)	0.000 HS
	Normal Limits	50 (33.3%)	40 (26.7%)	90 (60%)	
	Total	50 (33.3%)	100 (66.7%)	150 (100%)	
CRP Levels	Negative	40 (26.7%)	45 (30%)	85 (56.7%)	0.000 HS
	Positive	10 (6.6%)	55 (36.7%)	65 (43.3%)	
	Total	50 (33.3%)	100 (66.7%)	150 (100%)	
Triglyceride Levels	Abnormal	4 (2.7%)	52 (34.6%)	56 (37.3%)	0.000 HS
	Normal	46 (30.6%)	48 (32.1%)	94 (62.7%)	
	Total	50 (33.3%)	100 (66.7%)	150 (100%)	

Table (2) showed the results of biochemical tests among the study groups. 60 (40%) of patients had elevated levels of PSA and 40 (26.7%) had been with normal limits, positive CRP levels were 55 (36.7%) while the negative CRP levels were 45 (30%) in periodontitis patients. Furthermore, the abnormal levels of Triglyceride were 52 (34.6%) and the normal levels were 48 (32.1%) in PD patients. with high significant differences among them ( $p < 0.001$ ).

**Table 3.**

Distribution of clinical diseases according to the study groups

Clinical Diseases		Study Groups			<i>p.value</i>
		Control	PD	Total	
Heart Diseases History	No	50	43	93	0.000 HS
		33.3%	28.7%	62.0%	
	Yes	0	57	57	
		0.0%	38.0%	38.0%	
	Total	50	100	150	
		33.3%	66.7%	100.0%	
Prostate Inflammation	Mild	8	32	40	0.000 HS
		5.3%	21.3%	26.6%	
	Moderate	0	25	25	
		0.0%	16.7%	16.7%	
	Severe	0	23	23	
		0.0%	15.3%	15.3%	
	None	50	12	62	
		33.3%	22.7%	56.0%	
	Total	50	100	150	
		33.3%	66.7%	100.0%	

Table (3) showed 43 (28.7%) individuals with periodontitis had no heart diseases history of total 93 (62%), while all of the total of 57 (38%) individuals that had heart diseases history complain of periodontitis. According to prostate inflammation there were 32 (21.3 %) and 25 (16.7%) with mild and moderate inflammation respectively had periodontitis with high significant difference ( $p < 0.001$ ).

**Table 4.**

Connection between Heart diseases history and PSA levels

Heart Diseases History	PSA Levels		Total
	Elevated Levels	Normal Limits	
No	28 18.7%	65 43.3%	93 62.0%
Yes	32 21.3%	25 16.7%	57 38 %
Total	60 40 %	90 60 %	150 100 %
0.002 S			

Table (4) Explained high percentage as 32 (21.3 %) of individuals were with history of heart diseases that had been with elevated PSA levels from the total of 57 (38%) and in contrast there was high percentage as 65 (43.3 %) of them had a normal limits of PSA without history of heart diseases from the total of 93 (62%), with a significant difference ( $p < 0.05$ ) between PSA levels & heart diseases history.

**Table 5.**

Association of Biochemical Tests and PSA Levels

Biochemical Tests		PSA Levels			<i>p.value</i>
		Elevated Levels	Normal Limits	Total	
Triglyceride Levels	Abnormal	41	15	56	0.03 S
		27.3%	10.0%	37.3%	
	Normal	19	75	94	
		12.7%	50.0%	62.7%	
Total		60	90	150	
		40 %	60 %	100 %	
CRP Levels	Negative	28	57	85	0.2 NS
		18.7%	38.0%	56.7%	
	Positive	32	33	65	
		21.3%	22.0%	43.3%	
Total		60	90	150	
		40 %	60 %	100 %	

Table (5) Figured out 41 (27.3 %) of participants with elevated levels of PSA had abnormal level of Triglyceride in contrary of 19 (12.7%) of them were with normal Triglyceride level with significant difference ( $p < 0.05$ ), the positive level of CRP was 65 (43.3%) with 32 (21.3%) patients with elevated PSA levels with no significant difference between them ( $p > 0.05$ )

**Table 6.**

Association of Prostatitis and Triglyceride Levels

Prostatitis	Triglyceride Levels		Total
	Abnormal	Normal	
Mild	22	18	40
	14.6%	12 %	26.6 %
Moderate	6	19	25
	4 %	12.7%	16.7%
Severe	16	7	23
	10.7%	4.7%	15.3%
None	12	50	62
	8 %	33.3 %	41.3 %
Total	56	94	150
	37.3%	62.7%	100 %
0.000 HS			

Table (6) showed four categories of prostatitis patients, 40 (26.6%) with mild inflammation had been 22 (14.6%) with abnormal level of triglyceride, 23 (15.3 %) in patients with severe prostatitis followed by 25 (16.7%) in moderate prostatitis patients had 16 (10.7 %) and 6 (4%) abnormal level of triglyceride respectively with high significant difference ( $p < 0.001$ ).

### Discussion

This study was subject to numerous restrictions. First, selection bias of study sample which include study design and selected patients who visited restricted hospitals and dental clinics and who were diagnosed with periodontitis with prostatitis and heart problems. Moreover, this study did not investigate follow-up period of periodontitis and prostatitis in cohort dental records or even heart diseases, which limited the ability to diagnose the outcomes and severity of the selected cases. Lastly, since the documents were collected from a varied

group of dental and medical specialties, unreliable diagnostic standards were likely to have been applied.

Our study tested the influence of the periodontitis on the heart diseases also and the consequence showed that the periodontitis may have strong impact on heart health as shown in table 2 and table 3. There is a lot of proofs that highlight on this strong relationship. For instance, the ischemic heart disease. There are sharing risky issues between heart diseases and periodontitis that increase the happening of these diseases include: age, male sex, diabetes, hypercholesterolemia, tobacco, obesity, and chronic infection [9]. Another signal is the inflammation caused by bacteria of dental plaque can cause inflammation in any part of the body as confirmed by increase in the C - reactive protein (CRP) as shown in table 2. This information makes the link between periodontitis and heart health more clear, since there are a lot of revisions tell that there is individual with high cholesterol and triglyceride levels and heart diseases also have periodontitis. It is clear that the periodontitis effect on the heart diseases but it is not clear if the periodontitis is the crucial cause of heart diseases as noticed in table 2b [10].

Atherosclerosis it a serious condition that makes blood flowing hard to reach the heart and causes heart attack or stroke. Inflammation as a sure sign of periodontitis that's may raises the concern for heart problems because it permits bacteria and other bacterial toxins to extent underneath the gum lines [11]. Inflammation also cause damage to blood vessels, including those of the heart, in addition to, gums are very vascular, filled of blood vessels as mouth too. If it disrupts the gum layer even a little bit, that's make more bacteria in the bloodstream, and trigger inflammation throughout any part of the body [10-11].

Several Studies demonstrate that the bacteria found in periodontitis including *Streptococcus sanguis* that takes a part in strokes which disseminate to the heart. In the lack of periodontal diseases, there is significantly less amount of these bacteria in the heart [12]. Research proposes that the more bacteria get from periodontal diseases, the thicker carotid arteries formed then prevent the blood flow into the brain which can cause a stroke consequently [13].

Somewhat, the more bacterial load in the body, the more the chance of the heart will be affected. If it can decrease the long-existing of bacteria in bodies, it will lower the risk co-factors to heart problems [12-13]. Periodontitis is obviously linked with immune dysregulation and systemic inflammation, which are both etiological Co-factors in systemic inflammation maybe [14]. Nevertheless, the etiological agents and bidirectional causes relations between periodontitis and prostatitis persist as unclear association, with slight knowing about their fundamental mechanisms. Consequently, further researches of the biological probability and the gathering of clinical and epidemiological proofs are needed to



both reinforce and comprehend the association between periodontitis with prostatitis and consequences of heart risk factors as shown in table 3 [15, 25].

Periodontitis may interfere with elevated PSA level in patients with prostatitis as explored in table 2. In our research, it examined 100 males, most of them had prostate inflammation i.e, either mild, moderate or a severe form as confirmed and evaluated by qualified clinical urological physician. Furthermore, some laboratory tests such as prostate-specific antigen (PSA) levels. Those studied had not continuously received dental care with obvious dental problems based on gum examination. The studied groups divided into two populations, including high PSA levels group and limited PSA levels group. It's established that in patients with both severe prostatitis problem and PD issues, their PSA levels after estimation were significantly higher than those with only periodontal issues or prostatitis alone [15-16-17].

Our data tells, patients with periodontal disease that have high PSA levels in the bloodstreams were higher than the normal range in those of controls group. Depend up on this observation, its established that PSA levels is not a a screening or indicative marker or for prostatitis only, but perhaps also its action like an inflammatory marker like others common markers in the body, such as cytokines (ILs) and C-reactive proteins (CRP), which are both of them good markers for the existence of systemic inflammatory diseases in the whole body [17-18].

A recent assessment established a noteworthy connection between erectile dysfunction with periodontal disease. The attack of oral pathogenic-bacteria, particularly *Porphyromonas gingivalis*, may convince irritation of the epithelium and mucosa with traumatic injury and subsequent inflammations [19]. This study found a strong relationship between PD and vasculogenic erectile dysfunction in a nationwide population-based NHIS-HEC. Though the indication is not definitive, these outcomes recommend that a diagnosis of periodontal disease is connected into high risk of prostatitis [20].

Recently, researches have finger out that cardiovascular diseases (CVD) connected to prostate-specific antigen (PSA) [18], many researches have exposed that PSA is correspondingly expressed outside of prostate glands such as many of female tissues including; ovarian, breast tissue and endometrial tissues) in addition to, body fluids like; breast milk, amniotic fluids and breast cyst fluids). Reviews displayed that many heart diseases elevated PSA levels. Also, a fresh study by Durmaz *et al* in Turkey, determined that, there may be a link between PSA of serums and free PSA levels and diagnosis of extent of coronary artery disease (CAD) and acute coronary syndrome (ACS) [21].

Insufficient revisions have noticed the connection of prostate cancer PC with PD with heart problems. One study based on (Follow-Up) of prospective-cohort module of the health professionals it was establish that periodontitis was linked with a minor but significant

increase in the risk of systemic cancer of the body, but PD was also inversely correlated with PC. Hiraki *et al.* presented a case–control large-scale revision of Japanese patients that revealed of increased tooth loss linked with a diminished risk of prostate cancer after modifying for potential confounding factors and teeth treatment [22-28].

Further studies are needed to conclude interconnection by determination of which one comes first: prostatitis or PD? Or a study delivers more actual answers regarding to the relation between prostatitis and inflammation of mouth periodontia and significances of heart diseases consequences, and treating for chronic periodontal disease, would this have an influence on (1) reducing the signs and symptoms of the prostatitis (2) lowering the PSA level (3) does that effect of the heart health or not?

### Conclusions

According to the resent study results, it was a possible the connection of periodontal disease (PD) with cardiovascular disease (CVD) and prostatitis.

### Ethical Approval

The study was approved by the Ethical Committee.

### Conflicts of Interest

The authors declare that they have no competing interests.

### Authors' Contributions

Both authors shared in conception, design of the study, acquisition of data, and manuscript writing, the critical revising and final approval of the version to be published.

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