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Research Article

**ASSESSMENT OF THE RELATIONSHIP BETWEEN
PERIODONTAL DISEASE AND CVS DISORDERS**¹Dr Abdullah Khan, ²Dr Abdul Rehman Khan, ³Dr Muhammad Sabeeh Syed
¹CMH, Lahore.**Article Received:** October 2019 **Accepted:** November 2019 **Published:** December 2019**Abstract:**

Current evidence suggests that periodontal disease may be associated with systemic diseases. This paper reviewed the published data about the relationship between periodontal disease and cardiovascular diseases, adverse pregnancy outcomes, diabetes and respiratory diseases, focusing on studies conducted in the Pakistani population. Only a few studies were found in the literature focusing on Pakistan (3 concerning cardiovascular disease, 7 about pregnancy outcomes, 9 about diabetes and one regarding pneumonia). Although the majority of them observed an association between periodontitis and systemic conditions, a causal relationship still needs to be demonstrated. Further studies, particularly interventional well-designed investigations, with larger sample sizes, need to be conducted in Pakistani populations. Many epidemiological studies have investigated the relationship between periodontal disease (PD) and cardiovascular disease (CVD), but their results were heterogeneous. Previous studies have shown conflicting results as to whether periodontitis (PD) is associated with increased risk of CVD. The aim of my study was to evaluate whether such an association exists or not. Out of 90 patients included in this research the average age was 55.70 ± 12.79 years, in which 68.9% of the patients were male whereas 31.1% were female. Average weight was calculated to be 76.91 ± 15.44 kgs. Mean heart rate of the patients was calculated to be $76.16\% \pm 11.63\%$ with mean systolic and diastolic blood pressure of $129.13 \pm 23.30\%$ and $76.80 \pm 14.64\%$ respectively.

Keywords: Assessment, Relationship, Periodontal Disease, CVS, Disorders.**Corresponding author:****Dr. Abdullah Khan,**
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INTRODUCTION:

The periodontium consists of the investing and supporting tissues of the tooth (gingiva, periodontal ligament, cementum, and alveolar bone). It has been divided into two parts: the gingiva, whose main function is protection of the underlying tissues, and the attachment apparatus, composed of the periodontal ligament, cementum, and alveolar bone [1].

Periodontal disease:

It is an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession or both. Its clinical characteristics include attachment loss, recession, pocket formation and changes in the density and height of subjacent alveolar bone [2].

Risk factors:

Initiation and progression of periodontal infections are clearly modified by local and systemic conditions called risk factors. The local factors can be judged by taking probing depths and by the presence of visible plaque whereas systemic risk factors may include diabetes mellitus, cigarette smoking, cardiovascular disorders, stroke, hematologic disorders and certain genetic disorders [3].

CVS Disorders:**Arteriosclerosis**

In aged individuals, arteriosclerotic changes characterized by intimal thickening, narrowing of the lumen, thickening of the media and hyalinization of the media and adventitia, with or without calcification, are common in vessels throughout the jaws, as well as in areas of periodontal inflammation. Both periodontal disease and arteriosclerosis increase with age, and it has been hypothesized that the circulatory impairment induced by vascular changes may increase the patient's susceptibility to periodontal disease. The recent evidence suggests that individuals with periodontal disease may be at greater risk for heart disease as a result of chronic periodontal infections and inflammation [4].

Ischemic Heart Disease:

Ischemic heart disease is associated with the processes of atherogenesis and thrombogenesis. Increased viscosity of blood may promote major ischemic heart disease and stroke by increasing the risk of thrombus formation [5].

Systemic Infections:

Systemic infections are known to induce a hypercoagulable state and to increase blood viscosity. Fibrinogen levels and WBC counts are often increased in patients with periodontal disease. Individuals with poor oral health may also have significant elevations in coagulation factor VIII: von Willebrand factor antigen, increasing the risk of thrombus formation. Thus, periodontal infection may also promote increased blood viscosity and thrombogenesis, leading to an increased risk for central and peripheral vascular disease [6].

Risk factors:

The risk factors of CVS disorders include smoking, localized infection resulting in a chronic inflammatory reaction, dyslipidemia, hypertension, diabetes [7].

Questionnaire:

The questionnaire was composed of two sections:

1. Patient's demographic data.
2. Risk factors and questions related to periodontal disease and CVD.

METHODOLOGY:

A questionnaire-based study was conducted on patients in Cardiology department of Combined Military Hospital, Lahore over a time period of 6 months. The interviewer administered questionnaire included 35 items assessing risk factors of both periodontal and cardiovascular disease, current medical status and current medical treatment, their oral hygiene habits, their diet and their lifestyle.

Statistical Analysis:

The data was analyzed using SPSS IBM 23. Continuous variables were analyzed for mean and standard deviations. Frequencies and percentages were calculated for categorical data. To measure a correlation between our test variables, we used a Pearson Chi square test. The strength of association was measured with Phi value.

RESULTS:

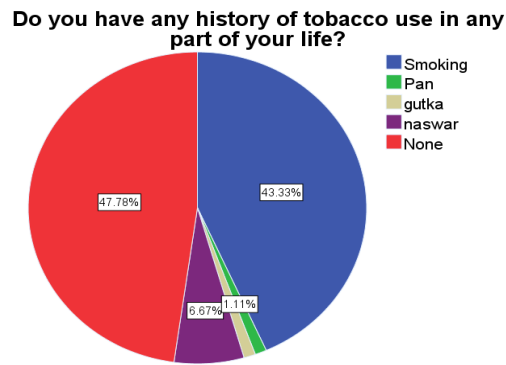
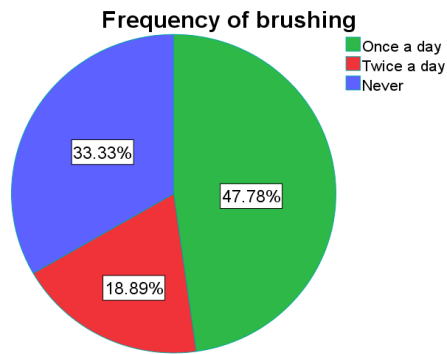
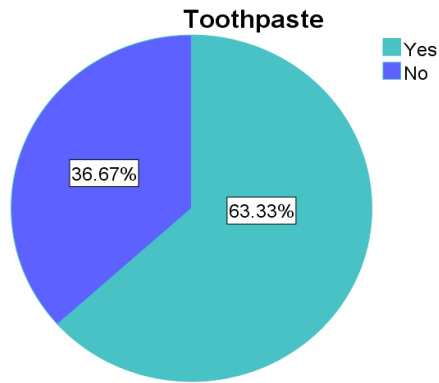
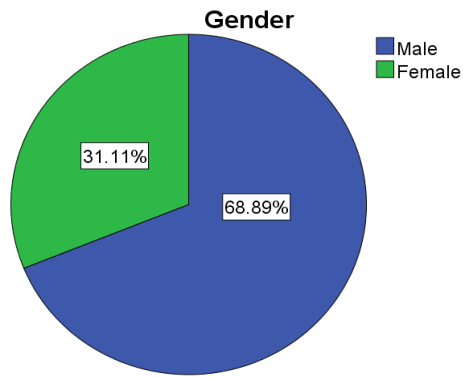
Out of 90 patients included in this research the average age was 55.70 ± 12.79 years, in which 68.9% of the patients were male whereas 31.1% were female. Average weight was calculated to be 76.91 ± 15.44 kgs. Mean heart rate of the patients was calculated to be $76.16\% \pm 11.63\%$ with mean systolic and diastolic blood pressure of $129.13 \pm 23.30\%$ and $76.80 \pm 14.64\%$ respectively. Oral hygiene habits were also analyzed. 63.3% of the participants did use toothpaste whereas 36.7% didn't use any toothpaste. 47.8% of the patients used to brush their teeth once daily, 18.9% brushed their teeth twice a day and 33.3% of the patients never

brushed their teeth. 52.2% of the patients gave a positive history of tobacco use whereas 47.8% didn't. 48.9% participants were physically active whereas 51.1% were not physically active. 76.7% patients had declared diagnosis of IHD whereas 23.3% of the patients didn't had IHD. 75.6% patients had

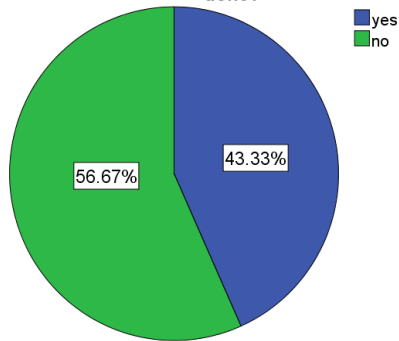
Periodontal disease whereas 24.4% did not had any periodontal disease. Of 90 patients included in the study, a significant correlation between periodontal disease and ischemic heart disease was observed with p value of 0.005. A Phi value of 0.29 showed that the correlation had a moderate strength.

Descriptive Statistics

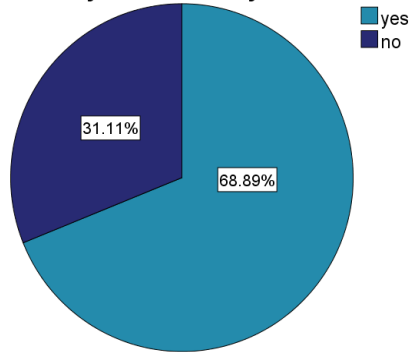
	N	Minimum	Maximum	Mean	Std. Deviation
Age	90	23	80	55.70	12.793
Weight	90	38	150	76.91	15.437
Heart Rate	90	44.00	106.00	76.1667	11.63031
Systolic BP	90	75.00	180.00	129.1333	23.29064
Diastolic BP	90	50.00	113.00	76.8000	14.64808
No. of teeth present	90	0	30	18.84	6.939
Valid N (listwise)	90				



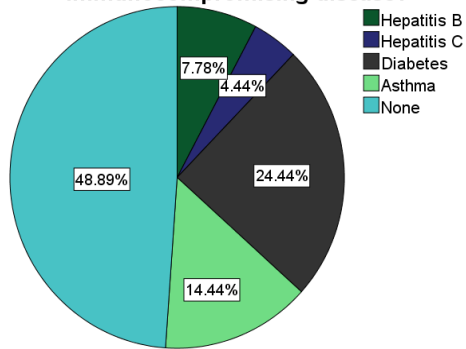
Do you ever had any dental restoration of any type done?



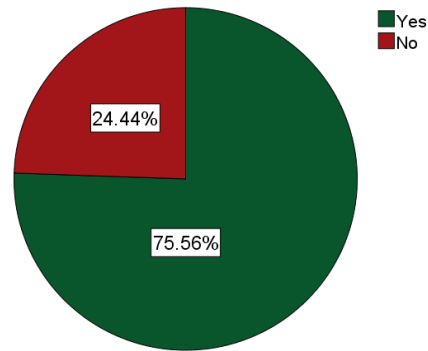
Have you ever had any extractions done?



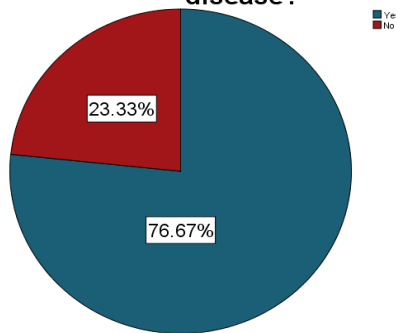
Are you suffering from any immunocompromising disease?



History of periodontal disease?



Do you have any cardiovascular disease?



Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
History of periodontal disease? * Do you have any cardiovascular disease?	90	100.0%	0	0.0%	90	100.0%

History of periodontal disease? * Do you have any cardiovascular disease? Crosstabulation

		Do you have any cardiovascular disease?		Total	
		Yes	No		
History of periodontal disease?	Yes	Count	57	11	68
		Expected Count	52.1	15.9	68.0
		% within History of periodontal disease?	83.8%	16.2%	100.0%
		% within Do you have any cardiovascular disease?	82.6%	52.4%	75.6%
		Standardized Residual	.7	-1.2	
No	No	Count	12	10	22
		Expected Count	16.9	5.1	22.0
		% within History of periodontal disease?	54.5%	45.5%	100.0%
		% within Do you have any cardiovascular disease?	17.4%	47.6%	24.4%
		Standardized Residual	-1.2	2.1	
Total		Count	69	21	90
		Expected Count	69.0	21.0	90.0
		% within History of periodontal disease?	76.7%	23.3%	100.0%
		% within Do you have any cardiovascular disease?	100.0%	100.0%	100.0%
		Standardized Residual			

Chi-Square Tests

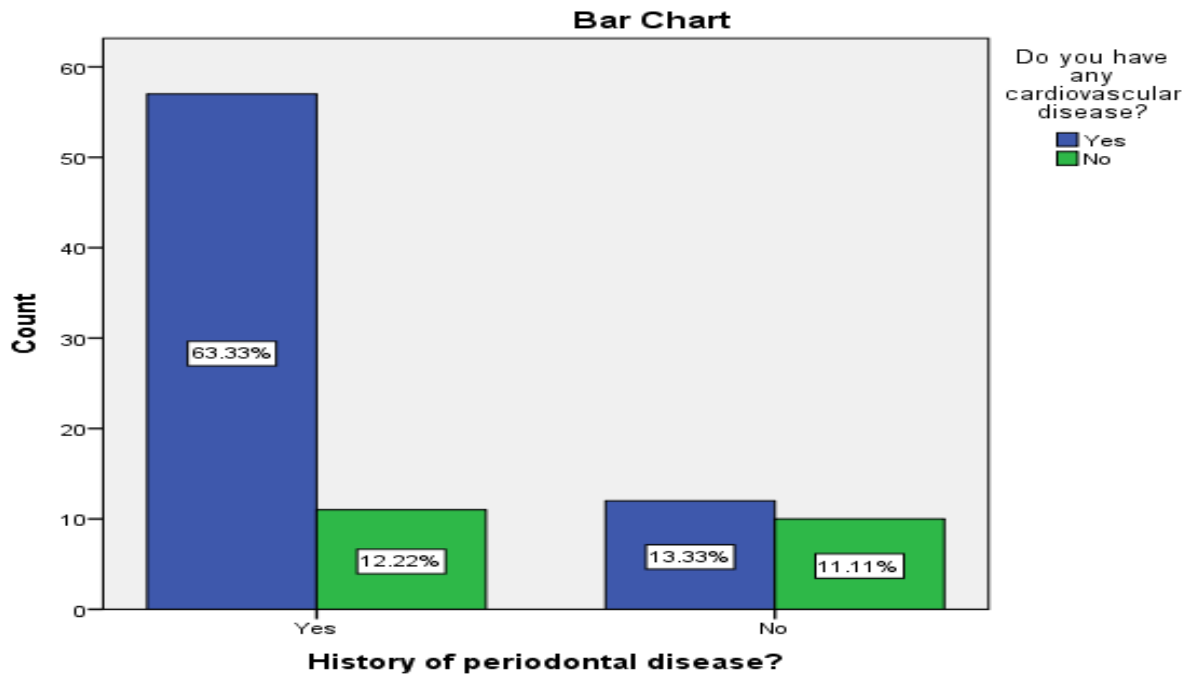
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.965 ^a	1	.005		
Continuity Correction ^b	6.413	1	.011		
Likelihood Ratio	7.281	1	.007		
Fisher's Exact Test				.008	.007
Linear-by-Linear Association	7.877	1	.005		
N of Valid Cases	90				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.13.

b. Computed only for a 2x2 table

Directional Measures			Value	Asymptotic Standardized Error	Approximate T	Approximate Significance
Nominal by Nominal	Lambda	Symmetric	.000	.000	.b	.b
		History of periodontal disease? Dependent	.000	.000	.b	.b
		Do you have any cardiovascular disease? Dependent	.000	.000	.b	.b
	Goodman and Kruskal tau	History of periodontal disease? Dependent	.089	.068		.005c
		Do you have any cardiovascular disease? Dependent	.089	.068		.005c
a. Not assuming the null hypothesis.						
b. Cannot be computed because the asymptotic standard error equals zero.						
c. Based on chi-square approximation						

Symmetric Measures			Value	Asymptotic Standardized Error	Approximate T	Approximate Significance
Nominal by Nominal	Phi	.297				.005
	Cramer's V	.297				.005
Ordinal by Ordinal	Kendall's tau-b	.297	.114	2.422		.015
N of Valid Cases		90				
a. Not assuming the null hypothesis.						
b. Using the asymptotic standard error assuming the null hypothesis.						



Tests of Homogeneity of the Odds Ratio			
	Chi-Squared	df	Asymptotic Significance (2-sided)
Breslow-Day	.000	0	.
Tarone's	.000	0	.

Tests of Conditional Independence

	Chi-Squared	df	Asymptotic Significance (2-sided)
Cochran's	7.965	1	.005
Mantel-Haenszel	6.341	1	.012

Under the conditional independence assumption, Cochran's statistic is asymptotically distributed as a 1 df chi-squared distribution, only if the number of strata is fixed, while the Mantel-Haenszel statistic is always asymptotically distributed as a 1 df chi-squared distribution. Note that the continuity correction is removed from the Mantel-Haenszel statistic when the sum of the differences between the observed and the expected is 0.

Mantel-Haenszel Common Odds Ratio Estimate

Estimate	4.318
ln(Estimate)	1.463
Standardized Error of ln(Estimate)	.540
Asymptotic Significance (2-sided)	.007
Asymptotic 95% Common Odds Lower Bound	1.498
Confidence Interval Ratio Upper Bound	12.448
ln(Common Odds Lower Bound Ratio)	.404
Upper Bound	2.522

The Mantel-Haenszel common odds ratio estimate is asymptotically normally distributed under the common odds ratio of 1.000 assumption. So is the natural log of the estimate.

CONCLUSION:

Current evidence suggests that periodontal disease may be associated with systemic diseases. This paper reviewed the published data about the relationship between periodontal disease and cardiovascular diseases, adverse pregnancy outcomes, diabetes and respiratory diseases, focusing on studies conducted in the Pakistani population. Only a few studies were found in the literature focusing on Pakistan (3 concerning cardiovascular disease, 7 about pregnancy outcomes, 9 about diabetes and one regarding pneumonia). Although the majority of them observed an association between periodontitis and systemic conditions, a causal relationship still needs to be demonstrated. Further studies, particularly interventional well-designed investigations, with larger sample sizes, need to be conducted in Pakistani populations. Many epidemiological studies have investigated the relationship between periodontal

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APPENDIX
QUESTIONNAIRE

1. Name
2. Age
3. Gender
 - 1) Male
 - 2) Female
4. Weight
5. Heart rate
6. Systolic Blood pressure
7. Diastolic Blood pressure
8. No. of teeth present
9. Oral hygiene
 - 1) Good
 - 2) Fair
 - 3) Poor
10. Toothpaste
 - 1) Yes
 - 2) No
11. Toothbrush
 - 1) Soft
 - 2) Medium
 - 3) Hard
 - 4) None
12. Frequency of brushing
 - 1) Once a day
 - 2) Twice a day
 - 3) Thrice a day
 - 4) More than three times a day
 - 5) Never
13. Dental floss
 - 1) Yes
 - 2) No
14. Dry mouth
 - 1) Yes
 - 2) No
15. How often do you visit a dentist?
 - 1) Frequently
 - 2) Less frequently
 - 3) Very less frequently
 - 4) Never
16. Do you have any history of tobacco use in any part of your life?
 - 1) Smoking
 - 2) Pan
 - 3) Gutka
 - 4) Naswar
 - 5) Bettle nuts
 - 6) None
17. Do you ever had any dental restoration of any type done?
 - 1) Yes
 - 2) No
18. Have you ever had any extractions done?
 - 1) Yes
 - 2) No

19. Are you a mouth breather?
1) Yes 2) No
20. Do you have any rheumatology related disease?
1) Yes 2) No
21. Are you suffering from any immunocompromising disease?
1) Hepatitis B 2) Hepatitis C 3) Diabetes
4) Asthma 5) None
22. Do you have history of any allergic disorder?
1) Yes 2) No
23. Does your diet include fresh fruit, fresh vegetables and salad?
1) Yes 2) No
24. Are you physically active?
1) Yes 2) No
25. Are you suffering from hypertension?
1) Yes 2) No
26. Do you have hyperlipidemia or atherosclerotic diseases in your family?
1) Yes 2) No
27. History of periodontal disease?
1) Yes 2) No
28. Do you have any cardiovascular disease?
1) IHD 2) Other 3) None
29. Describe the age of onset of cardiovascular disease?
-
30. Related intervention for cardiovascular disease?
31. Have you ever suffered with periodontitis or gingivitis before having IHD?
1) Yes 2) No
-
32. What was the frequency of periodontal disease through your childhood and adult life?
1) Frequently 2) Less Frequently 3) Very less frequently 4) None
33. How often you develop gingivitis after a single successfully treated episode of disease?
1) Frequently 2) Less frequently 3) Very less frequently 4) Never
34. After first episode of IHD when did you develop gingivitis?
- Was there any difference in your oral hygiene before and after developing IHD which led to development of gingivitis?
1) Yes 2) No
-