

Research Article

Uncovering Risks: Periodontal Health and General Wellness in Pakistan

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ABSTRACT

Background: Periodontal disease is a common chronic inflammatory disease known not only to cause a decline in oral health but also to be associated with systemic diseases like obesity, high blood pressure, and diabetes mellitus. Understanding this association is crucial for integrated healthcare approaches.

Objective: To determine the association between periodontal health and general wellness measures.

Methods: This was a cross-sectional study and a total of 160 participants aged ≥ 18 years were recruited using consecutive sampling. Periodontal health was determined by the Community Periodontal Index (CPI) and the indicators of overall wellness were body mass index (BMI), blood pressure, and self-reported history of diabetes mellitus. The SPSS version 24 was utilized to analyze the data and Chi-square was performed to determine the associations. A p-value ≤ 0.05 was considered statistically significant.

Results: The proportion of participants with healthy periodontium was only 18.8%, and 26.3% had gingival bleeding, 22.5% had calculus, and 32.5% with shallow or deep periodontal pockets. There was a significant association of periodontal disease with increased BMI ($p = 0.01$), hypertension ($p = 0.02$) and diabetes mellitus ($p = 0.01$).

Conclusion: Periodontal disease is very common amongst adults in Pakistan and is closely related to obesity, hypertension, and diabetes. These results emphasize the need to incorporate oral health assessment as part of general medical care, to encourage preventive oral care, and to enhance interdisciplinary cooperation to enhance the overall health outcomes.

Keywords: Periodontal disease, Obesity, Hypertension, Diabetes mellitus, General wellness, Pakistan

INTRODUCTION

Oral health is a part of overall health and well-being, and it determines how a person is capable of eating, talking, and socializing without suffering or illness.[1] Periodontal disease is one of the oral diseases that is a chronic inflammatory disease in the supporting structures of the teeth, such as the gingiva, the periodontal ligament, and the alveolar bone.[2] It is widely recognized not only as a leading cause of tooth loss but also as a condition with systemic implications.[3] New evidence points to a close relationship between periodontal disease and systemic disease, including diabetes mellitus, cardiovascular

diseases, respiratory disorders, and poor pregnancy outcomes, so the interdependence between oral and general health is highlighted.[4, 5].

Periodontal diseases are a major public health issue in the world, with a sizeable percentage of the adult population bearing the burden.[6] The World Health Organization has indicated that oral diseases affect billions of individuals all over the world and periodontal diseases are one of the most common chronic illnesses.[7] The burden is especially high in developing countries such as Pakistan because of the low awareness levels, bad oral hygiene habits, and lack of access to dental

care services.[8] Research has shown that oral diseases have a great effect on the quality of life, which is a source of pain, functional disability, and diminished productivity.[9]

Periodontal disease is one of the most important but widely overlooked public health problems in Pakistan. A systematic review reported that periodontitis has different prevalence rates among the provinces, with an estimated prevalence of about 37% in Punjab, 40% in Sindh, and 20% in Khyber Pakhtunkhwa, which means that the prevalence of periodontitis is high in the country.[10] Other oral health issues, including dental caries, also impact over half of the population, around 56.6%, which further demonstrates poor oral health conditions in the nation.[11] Despite such frightening statistics, oral health is not a primary concern in the health care system of Pakistan, and its correlation with the overall health is not recognized in clinical practice, as well as in the health policy of the population.

Periodontal health and general wellness are interrelated in a complex and two-way relationship.[12] Persistent inflammation of the periodontium may lead to an inflammatory load in the body, which may worsen other disorders, such as diabetes and cardiovascular diseases. On the other hand, systemic conditions can affect the prognosis and the course of the periodontal disease. Nevertheless, within the Pakistani setting, the literature on the in-depth study of this interrelationship is lacking, especially regarding the identification of risk factors associated with it and the overall health outcomes.[13]

Although the problem of periodontal disease in Pakistan is extremely serious, and there is a possibility of its connection with other health systems, little evidence is available locally to investigate the relationship between periodontal health and general wellness. The majority of the available research is on isolated oral conditions without incorporating systemic health parameters. Knowledge of this relationship is vital for early risk detection, prevention measures, and comprehensive patient care. Thus, this research filled this knowledge gap by exploring the correlation between periodontal health status and general wellness indicators, which will help to improve healthcare planning and patient outcomes. The present study aimed to assess the association between periodontal health and general wellness.

METHODOLOGY

This was a cross-sectional study design and was conducted in the Dental Outpatient Department in a time frame of six months. The OpenEpi software (Version 3.01) was used to calculate the sample size, and the calculation was made based on an estimate prevalence of periodontal disease of 40%,

with a confidence level of 95% and a margin of error of 8%, the sample size calculated was 144, but to include potential non-response and incomplete data, it was adjusted to 160.[14]

A non-probability consecutive sampling technique was used to recruit participants. The research included all patients who attended the outpatient department within the study period who met the inclusion criteria until the study reached the desired sample size. The inclusion criteria were persons aged 18 years and above who were willing to participate and offered informed consent, regardless of their gender. The respondents had to possess a minimum of 20 natural teeth to be properly periodontally examined. The exclusion criteria were individuals who had undergone periodontal treatment within the past six months, individuals under long-term anti-inflammatory or antibiotic therapy, pregnant women, and those with severe systemic or immunocompromised conditions that could have greatly changed periodontal status.

A pre-tested and structured questionnaire and clinical examination were used to collect data. Upon informed consent, demographic characteristics such as age, gender, education, and socioeconomic status were noted. General wellness parameters that included body mass index (BMI), blood pressure, and history of systemic diseases like diabetes mellitus and hypertension were measured. Community Periodontal Index (CPI) was used to measure periodontal health status, as well as to measure gingival condition and probing pocket depth, which were conducted in standardized conditions by a trained dental professional. The instruments were sterilized, and infection control measures were adhered to.

Statistical Package of Social Sciences (SPSS) version 24 was used to enter the collected data and analyze them. The descriptive statistics were calculated by calculating frequencies and percentages of categorical variables like age groups, gender, education level, periodontal status (CPI categories), body mass index (BMI categories), hypertension status, and diabetes mellitus status. The Chi-square test of categorical variables was used to determine the association between periodontal health and the general wellness variables. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 160 participants were included in the study. Most of the participants were in the age bracket of 31-45 years (40.0%), and then 18-30 years (32.5%). The proportion of the participants aged 46-60 years was 20.0%, and only 7.5% of the participants were aged over 60 years. Gender wise 55.0% were male and 45.0% were females. In

terms of educational level, the majority of the participants (35.0%) were secondary level educated, others were primary level educated (25.0%), and some were graduates or higher (22.5%), and the rest illiterate (17.5%) (Table 1). Participants that had healthy periodontium were only 18.8% with 26.3% having gingival bleeding and 22.5% having deposits of calculus. In addition, the proportion of participants with shallow periodontal pockets (45 mm) was 20.0%, and the proportion of participants with deep periodontal pockets (6 mm) was 12.5%, which means that the study population has a significant proportion of periodontal disease (Table 2).

In terms of body mass index (BMI), there were 33.8% normal participants, 38.8% overweight, and 27.5% obese participants. Hypertension was found in 36.3% and 63.7% were normotensive. Likewise, 28.8% of the participants were diabetic, with 71.3% non-diabetic (Table 3). The normal BMI was more frequent in the group of individuals with

healthy periodontium (60.0%), and overweight (38.5%) and obesity (38.5%) were more frequent in participants with periodontitis. Such a correlation between periodontal condition and BMI proved to be statistically significant ($p = 0.01$). (Table 4).

As the periodontal condition deteriorated, the prevalence of hypertension rose, with the worsening periodontal condition with 50.0% of the periodontitis patients having hypertension compared to 20.0% of the healthy periodontium. This also showed a statistically significant association ($p = 0.02$) (Table 5).

The association between periodontal health status and diabetes mellitus is shown in Table 6. There was a steadily growing pattern of increasing prevalence of diabetes with worsening periodontal conditions, with 38.5% of periodontitis patients having diabetes as opposed to just 13.3% of healthy people. This relationship was found to be statistically significant ($p = 0.01$) (Table 6).

Table 1: Demographic Characteristics of Participants (n = 160)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
18–30	52	32.5
31–45	64	40.0
46–60	32	20.0
>60	12	7.5
Gender		
Male	88	55.0
Female	72	45.0
Education Level		
Illiterate	28	17.5
Primary	40	25.0
Secondary	56	35.0
Graduate & above	36	22.5

Table 2: Distribution of Periodontal Health Status (CPI Index)

CPI Score	Periodontal Status	Frequency (n)	Percentage (%)
0	Healthy	30	18.8
1	Gingival bleeding	42	26.3
2	Calculus	36	22.5
3	Shallow pockets (4–5 mm)	32	20.0
4	Deep pockets (≥ 6 mm)	20	12.5

Table 3: General Wellness Indicators among Participants

Variable	Frequency (n)	Percentage (%)
BMI		
Normal	54	33.8
Overweight	62	38.8
Obese	44	27.5
Hypertension		
Yes	58	36.3
No	102	63.7
Diabetes Mellitus		
Yes	46	28.8
No	114	71.3

Table 4: Association between Periodontal Status and BMI

Periodontal Status	Normal n (%)	Overweight n (%)	Obese n (%)	p-value
Healthy	18 (60.0%)	8 (26.7%)	4 (13.3%)	0.012
Gingivitis	14 (33.3%)	18 (42.9%)	10 (23.8%)	
Calculus	10 (27.8%)	16 (44.4%)	10 (27.8%)	
Periodontitis	12 (23.1%)	20 (38.5%)	20 (38.5%)	

Table 5: Association between Periodontal Status and Hypertension

Periodontal Status	Hypertension		p-value
	Yes n (%)	No n (%)	
Healthy	6 (20.0%)	24 (80.0%)	0.021
Gingivitis	12 (28.6%)	30 (71.4%)	
Calculus	14 (38.9%)	22 (61.1%)	
Periodontitis	26 (50.0%)	26 (50.0%)	

Table 6: Association between Periodontal Status and Diabetes Mellitus

Periodontal Status	Diabetes		p-value
	Yes n (%)	No n (%)	
Healthy	4 (13.3%)	26 (86.7%)	0.013
Gingivitis	10 (23.8%)	32 (76.2%)	
Calculus	12 (33.3%)	24 (66.7%)	
Periodontitis	20 (38.5%)	32 (61.5%)	

DISCUSSION

The current research has examined the relationship between periodontal health and general wellness measures, such as BMI, hypertension, and diabetes mellitus, among the Pakistani population. The results were that periodontal disease was found to be very prevalent, with very few participants having a healthy periodontal status. Additionally, there were substantial correlations between deteriorating periodontal status and higher rates of obesity, hypertension, and diabetes mellitus.

The general occurrence of periodontal disease in this study is in line with the latest world and regional literature. A cross-sectional study on adult populations has also reported that periodontal disease is one of the most widespread chronic inflammatory diseases in the world, with a considerable percentage of adults being afflicted by periodontal disease.[15] Likewise, an in-depth examination (2023) also pointed to the fact that periodontal disease is very common and can be linked to systemic inflammatory load, especially in developing nations. These results confirm the heavy burden in the present study.

The current research indicated that there was a strong correlation between periodontal disease and a high BMI, with overweight and obese patients showing a higher prevalence of periodontitis. This finding is in agreement with previous research. A 2023 review of metabolic syndrome indicated that obesity and periodontal disease have similar inflammatory pathways, which promote the development of the disease. Moreover, the risk of getting diabetes in individuals with periodontitis was altered by the BMI (2021), which proved the

strong interdependence between obesity and periodontal health. The findings of these studies support the results of the current study, indicating that obesity is an important factor that worsens periodontal disease.[16]

The association between periodontal disease and hypertension observed in this study was also statistically significant. Patients having severe periodontal disease had a higher prevalence of hypertension than healthy periodontal patients. This observation aligns with a large, population-based study (2023), which indicated that individuals with periodontal disease were at a significantly increased risk of hypertension, and a positive trend was found with worse oral health.[17] This implies that protracted inflammation related to periodontal illness can lead to vascular malfunction and high blood pressure.

Likewise, the current research revealed that there was a significant relationship between diabetes mellitus and periodontal disease. The incidence of diabetes rose steadily with the aggravation of periodontal conditions, which is in line with various recent investigations. A meta-analysis and systematic review (2021) documented that there is a high correlation between hyperglycemia and periodontal disease, and that the odds of periodontitis were higher in diabetics.[18] Moreover, more recent studies (2025) have highlighted the reciprocal association between diabetes and periodontal disease, where one condition worsens the other. The relationship between periodontal parameters and glycemic control was also shown to be clinically important,

indicating that periodontal parameters can predict glycemic control.[19]

The systemic implications of periodontal disease, in general, have also been considered in recent literature. In a cross-sectional study (2025), periodontal disease was significantly linked to systemic biomarkers, including the number of white blood cells and serum albumin, suggesting the presence of systemic inflammatory processes.[15] Likewise, a study conducted in 2025 emphasized that patients with diabetes and periodontitis are at a higher risk of cardiovascular complications, which further confirms the systemic effects of periodontal disease.[20] These results are consistent with the existing ones that have shown correlations between periodontal health and various systemic diseases.

A systematic review (2025) found that periodontal disease can be a cause of insulin resistance and is risky to gestational diabetes mellitus. A recent case-control study (2025) also exhibited a strong correlation between periodontal inflammation and gestational diabetes via inflammatory mechanisms.[21] These results also support the idea that periodontal disease is not a local oral disease but a systemic health issue.

The findings of this study have important clinical and public health implications. Firstly, the strong association between periodontal disease and other systemic diseases, such as obesity, hypertension, and diabetes, implies the need to implement a multidisciplinary approach to healthcare, which may speak about oral health as a crucial component of overall health. This can be done by regularly screening patients who have a metabolic or cardiovascular risk factor with periodontal screening, which may allow early detection and treatment of systemic disorders, and potentially decrease morbidity. Second, the importance of preventive dentistry and patient education is highlighted in the study. Dentists and primary care physicians are encouraged to encourage oral health and lifestyle changes, especially in those individuals who are vulnerable to systemic diseases. Periodontal assessment as a part of a general medical examination may enhance comprehensive care and decrease the chronic disease burden. Finally, findings show that dental and medical practitioners should collaborate

interdisciplinarily in the management of patients with comorbid conditions. Periodontal disease as a marker of systemic inflammation may help clinicians to prioritize patients who are at risk of cardiovascular and metabolic diseases and tailor their intervention plans.

Despite the strengths of this study, it should also be said that there were several limitations to this study. Firstly, due to the cross-sectional design, causality between periodontal disease and systemic health conditions cannot be established; the relationships found are not a direct cause-and-effect relationship but a correlation. The study involved clinical assessment and self-reported systemic health information, which may bring about reporting bias and error in measurement. Systemic health data, such as conditions such as diabetes or hypertension, were not biochemically validated, a fact that could affect the validity of systemic health data. Also, the study was conducted in one tertiary care hospital, which may not be representative of the rest of the population or the rural areas with a different socioeconomic and healthcare access scenario. It is proposed that these findings can be confirmed with future multicenter studies with larger populations that are more representative and expound on the causal processes.

CONCLUSION

This study showed the high prevalence of periodontal disease in adults and its close connection with systemic health outcomes, such as obesity, hypertension, and diabetes mellitus. The results emphasized the importance of oral health in assessing overall health and justify the inclusion of periodontal assessment in regular healthcare. Some of the measures that can help to early detect and treat systemic cases include promoting preventive oral care and patient education and interdisciplinary cooperation between the dental and the medical specialists, which will eventually lead to a better overall health outcome. These results back the need to have measures to enhance oral health within the community as part of holistic healthcare.

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