

Prevalence of Periodontal Disease in a Tertiary Care Centre of Madhesh Province, Nepal

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ABSTRACT

Introduction: Periodontal diseases are common chronic oral conditions and a major cause of tooth loss in adults. Their prevalence varies according to oral hygiene practices, socio-demographic factors, and diagnostic criteria.

Objective: To determine the prevalence and severity of periodontal diseases at a tertiary care centre in Birgunj, Nepal.

Methods: A hospital-based cross-sectional study was conducted among 310 patients attending the Outpatient Department (OPD) of Periodontology and Oral Implantology at National Medical College, Birgunj, Nepal from June 2024 to August 2025. Socio-demographic data were collected using a structured questionnaire. Clinical examination included Plaque Index (PI), Gingival Index (GI), Clinical Attachment Loss (CAL), Probing Pocket Depth (PPD), and Bleeding on Probing (BOP). Periodontal diagnosis was established according to the 2017 World Workshop Classification of Periodontal and Peri-Implant Diseases and Conditions. Data were analysed using SPSS version 21.0. Descriptive statistics and independent t-tests were applied, and $p < 0.05$ was considered significant.

Results: The mean age of participants was 37.69 ± 14.89 years. Of 310 participants, 18(5.8%) had healthy periodontium, 50(16.1%) had gingivitis, and 242(78.1%) had periodontitis. Stage II periodontitis was most prevalent 101(32.6%), followed by Stage I 62(20.0%), Stage III 51(16.5%), and Stage IV 28(9.0%). Participants aged ≥ 36 years had significantly higher PI, GI, CAL, and PPD than those aged ≤ 35 years ($p < 0.05$).

Conclusion: Periodontal diseases were highly prevalent, with periodontitis being the predominant condition. Stage II periodontitis was the most common form. Older age was associated with poorer periodontal parameters, highlighting the importance of preventive oral health measures and routine periodontal screening.

Keywords: Gingivitis; Nepal; periodontal diseases; periodontitis; prevalence.

INTRODUCTION

Periodontal disease is a chronic inflammatory condition affecting the supporting structures of the teeth, including the gingiva, periodontal ligament, cementum, and alveolar bone. In its early stage, the disease presents as gingivitis, characterised by gingival inflammation and bleeding on probing. If left

untreated, gingivitis may progress to periodontitis, resulting in irreversible destruction of the periodontal ligament and alveolar bone, ultimately leading to tooth loss.^{1,2}

Periodontal diseases are among the most common oral health problems worldwide and constitute a significant public health concern. Beyond their oral manifestations, periodontal diseases have been associated with several systemic conditions, including diabetes mellitus, cardiovascular disease, adverse pregnancy outcomes, rheumatoid arthritis, and chronic obstructive pulmonary disease.^{3,4} These associations emphasise the importance of prevention, early diagnosis, and appropriate periodontal care.

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Citation

Email: Shah R, Shah HK, Singh HM, Singh KK, Singh A. Prevalence of Periodontal Disease in a Tertiary Care Centre of Madhesh Province, Nepal. J Nepal Soc Perio Oral Implantol. 2025 Jul-Dec;9(18):92-8.



The prevalence of periodontal disease varies considerably across populations due to differences in demographic characteristics, socio-economic status, oral hygiene practices, access to dental services, and diagnostic criteria used in epidemiological studies. Globally, the prevalence of periodontal disease has been reported to range from 20-50%.² However, data regarding the burden of periodontal diseases in Nepal remain limited.

Therefore, the present study aimed to determine the prevalence and severity of periodontal diseases among patients attending a tertiary care dental centre in Birgunj, Nepal, and to examine their distribution according to selected socio-demographic characteristics.

METHODS

A hospital-based analytical cross-sectional study was conducted among patients attending the Outpatient Department (OPD) of Periodontology and Oral Implantology at a National Medical College in Birgunj, Parsa, Madhesh Province, Nepal from June 2024 to August 2025. Ethical approval was obtained from the Institutional Review Board of National Medical College (Reference number: F-NM/696/080-081) on 14 June 2024. Written informed consent was obtained from all participants prior to enrolment.

Patients aged 18 years and above who attended the OPD during the study period were included using a consecutive sampling technique until the required sample size was achieved. Patients with systemic conditions such as diabetes mellitus, bleeding disorders, pregnancy, and those who had received periodontal therapy within the previous six months were excluded.

The sample size was calculated using a single proportion formula based on a reported prevalence of gingivitis from a previous study,⁵ with a 95% confidence interval and 5% margin of error. In addition, 90% study power was considered, and the minimum required sample size was 280, which was increased to 310 after adding a 10% non-response rate.

Socio-demographic information was collected using a structured questionnaire. Clinical periodontal

examination included assessment of Plaque Index (PI), Gingival Index (GI), Probing Pocket Depth (PPD), Clinical Attachment Loss (CAL), and Bleeding on Probing (BOP). Clinical parameters were recorded following established periodontal indices.⁶⁻⁸ Gingivitis was diagnosed when BOP was present at $\geq 10\%$ of sites in the absence of clinical attachment loss. Periodontitis was diagnosed according to the 2017 World Workshop Classification of Periodontal and Peri-implant Diseases and Conditions. Staging was based primarily on interdental CAL, with Stage I (1–2 mm CAL), Stage II (3–4 mm CAL), Stage III (≥ 5 mm CAL), and Stage IV representing advanced disease with severe attachment loss and functional impairment.⁹

All clinical examinations were performed by a single calibrated examiner using a University of North Carolina-15 (UNC-15) periodontal probe (Hu-Friedy, Illinois, USA). Measurements were recorded at four sites per tooth: mesiofacial, midfacial, distofacial, and palatal/lingual. Mean PI, GI, PPD, and CAL values were calculated for each participant.

Data were entered into Microsoft Excel 2013 and analysed using IBM SPSS Statistics version 21.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics including mean, standard deviation, frequency, and percentage were calculated. Independent t-test was used to compare continuous variables between periodontal disease and non-periodontal disease groups. A p-value of <0.05 was considered statistically significant.

RESULTS

A total of 310 participants were included in the study. The mean age of the participants was 37.69 ± 14.89 years, with an age range of 18-76 years. The distribution of socio-demographic and behavioral characteristics are tabulated (Table 1). The study population showed a slight male predominance, and most participants were literate and Hindu. Regarding oral hygiene practices, the majority reported brushing once daily, while the use of auxiliary oral hygiene aids was uncommon. Tobacco use and smoking were reported by a considerable proportion of participants.

Table 1: Socio-demographic Characteristics of the Study Population (N = 310).

Variables	Frequency (%)
Sex	
Male	176 (56.8)
Female	134 (43.2)
Education	
Illiterate	35 (11.3)
Literate	203 (65.5)
Graduate	68 (21.9)
Postgraduate	4 (1.3)
Religion	
Hindu	231 (74.5)
Muslim	79 (25.5)
Occupation	
Unemployed	37 (11.9)
Employed	156 (50.3)
Housewife	64 (20.6)
Student	53 (17.1)
Brushing Frequency	
Once daily	222 (71.6)
Twice daily	22 (7.1)
Datiwan use	62 (20.0)
Occasional brushing	4 (1.3)
Auxiliary Oral Hygiene Aids	
No	304 (98.1)
Yes	6 (1.9)
Alcohol Consumption	
No	243 (78.4)
Yes	67 (21.6)
Tobacco Use	
No	203 (65.5)
Yes	107 (34.5)
Smoking	
No	243 (78.4)
Yes	67 (21.6)
Residence	
Urban	157 (50.6)
Rural	153 (49.4)

Table 2: Periodontal Diagnosis Distribution of the Study Population (N = 310).

Periodontal Status	Frequency (%)
Healthy periodontium	18 (5.8)
Gingivitis	50 (16.1)
Stage I periodontitis	62 (20.0)
Stage II periodontitis	101 (32.6)
Stage III periodontitis	51 (16.5)
Stage IV periodontitis	28 (9.0)
Total periodontitis cases	242 (78.1)

Based on periodontal examination, 18 (5.8%) participants had a healthy periodontium and 50 (16.1%) had gingivitis. Periodontitis was diagnosed in 242 (78.1%) participants. Among the periodontitis cases, Stage II periodontitis was the most prevalent (32.6%), followed by Stage I (20.0%), Stage III (16.5%), and Stage IV (9.0%) disease (Tables 2).

The mean age of the participants was 37.69 ± 14.89

years. The mean PI, GI, CAL, and PPD were 1.33 ± 0.65 , 1.12 ± 0.62 , 2.44 ± 1.89 mm, and 2.97 ± 1.12 mm, respectively (Table 3).

Comparison of clinical parameters between males and females revealed a statistically significant difference only in GI scores ($p=0.015$). No statistically significant differences were observed in PI, CAL, or PPD between the sexes (Table 4).

Table 3. Clinical Characteristics of the Study Population

Variable	Mean $\pm$ SD	Minimum	Maximum
Age (years)	37.69 ± 14.89	18	76
Plaque Index	1.33 ± 0.65	0.20	2.98
Gingival Index	1.12 ± 0.62	0.00	2.86
Clinical Attachment Loss (mm)	2.44 ± 1.89	0.00	7.64
Probing Pocket Depth (mm)	2.97 ± 1.12	2.00	8.00

Table 4. Comparison of Clinical Parameters According to Sex

Variable	Male (n=176) Mean $\pm$ SD	Female (n=134) Mean $\pm$ SD	p-value*
Plaque Index	1.39 ± 0.65	1.26 ± 0.66	0.947
Gingival Index	1.15 ± 0.57	1.09 ± 0.69	0.015
Clinical Attachment Loss (mm)	2.64 ± 1.82	2.16 ± 1.95	0.201
Probing Pocket Depth (mm)	3.10 ± 1.25	2.81 ± 0.89	0.130

*Independent t-test; $p < 0.05$ considered statistically significant.

Table 5. Comparison of Clinical Parameters According to Age Category

Variable	≤35 Years (n=167)	≥36 Years (n=143)	p-value*
	Mean ± SD	Mean ± SD	
Plaque Index	0.99 ± 0.48	1.73 ± 0.61	<0.001
Gingival Index	0.88 ± 0.56	1.41 ± 0.57	<0.001
Clinical Attachment Loss (mm)	1.19 ± 1.20	3.89 ± 1.47	0.009
Probing Pocket Depth (mm)	2.57 ± 0.66	3.44 ± 1.35	<0.001

*Independent t-test; p<0.05 considered statistically significant.

Participants were categorized into two age groups: ≤35 years (n=167) and ≥36 years (n=143). Comparison of clinical periodontal parameters revealed that participants aged ≥36 years had significantly higher mean Plaque Index (PI), Gingival Index (GI), Clinical Attachment Loss (CAL), and Probing Pocket Depth (PPD) values than those aged ≤35 years. The differences in PI (p<0.001), GI (p<0.001), CAL (p=0.009), and PPD (p<0.001) were statistically significant. These findings indicate poorer periodontal health and greater periodontal destruction among older participants. The comparison of clinical periodontal parameters according to age category were also observed (Table 5).

DISCUSSION

Periodontal diseases remain an important public health concern due to their high prevalence and potential impact on oral and systemic health. The present study assessed the prevalence and severity of periodontal diseases among patients attending a tertiary care dental centre in Birgunj, Nepal, using the 2017 World Workshop Classification of Periodontal and Peri-Implant Diseases and Conditions. The findings demonstrated a high burden of periodontal disease, with periodontitis being the most common condition.

Only 18 (5.8%) of participants presented with a healthy periodontium, while 50 (16.1) % had gingivitis and 242 (78.1) % had periodontitis. These findings are broadly consistent with previous studies reporting a high prevalence of periodontal disease in South Asian populations.¹⁰ Differences in prevalence compared to other international studies may be attributed to variations in oral hygiene practices, access to dental

care, and population characteristics.¹¹⁻¹³ This also reflects the global burden of periodontal diseases, which remains substantial and continues to pose a major public health challenge worldwide.

Smoking prevalence in the present study was 21.6%. Although smoking was not analyzed as an independent risk factor in the current analysis, it is well established in the literature as a significant contributor to periodontal destruction through its effects on immune response and periodontal healing.^{14,15} This background may partially explain the observed disease burden.

Oral hygiene practices were generally suboptimal, with most participants reporting once-daily brushing and very low use of adjunctive oral hygiene aids. Poor toothbrushing habits have been associated with increased plaque accumulation and periodontal inflammation, as well as higher systemic inflammatory burden.^{16,17} These findings are consistent with earlier reports from Nepal and other populations indicating inadequate oral hygiene practices in the general population.

Male participants demonstrated relatively poorer periodontal parameters compared to females, which is in agreement with previous studies.^{14,18} This may be related to differences in oral hygiene practices and higher tobacco use among males. Similarly, older participants showed significantly worse periodontal parameters, suggesting cumulative disease progression with age and prolonged exposure to risk factors.¹¹

Preventive approaches remain essential in reducing periodontal disease burden. Long-term evidence has

demonstrated that sustained plaque control and structured preventive programs can significantly reduce the incidence and progression of periodontal disease over time.¹⁹

The present findings should be interpreted with caution. As this was a hospital-based cross-sectional study, selection bias is possible, as individuals attending a tertiary care centre are more likely to present with existing oral health problems. This may have resulted in an overestimation of periodontal disease prevalence compared to the general population. Additionally, exclusion of patients with systemic diseases, although methodologically necessary, may limit external validity, as such conditions are known to influence periodontal status. Therefore, the findings may not be fully generalisable to the community level.

Despite these limitations, the study provides useful clinical insight into the periodontal health status of patients attending a tertiary care centre in Nepal and highlights the need for improved preventive oral health measures.

CONCLUSIONS

Within the limitations of this hospital-based cross-sectional study, periodontal diseases were highly prevalent among patients attending a tertiary care dental centre in Birgunj, Nepal, with periodontitis being the predominant condition. Stage II periodontitis was the most frequently observed stage. Increasing age and poorer oral hygiene were associated with adverse periodontal status. These findings underscore the importance of oral health education, improved oral hygiene practices, and regular periodontal screening. Further community-based studies are needed to provide more representative estimates of periodontal disease burden in Nepal.

ACKNOWLEDGEMENT

The author would like to acknowledge the patients for their valuable time.

Conflict of interest: None.

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