

# Oral Hygiene, Periodontal Health and Dental Utilization Pattern Among Dental Patients in a Nigerian Tertiary Hospital

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## ABSTRACT

**Objectives:** To assess the periodontal health and oral hygiene status of participants who attended University of Port Harcourt Teaching Hospital (UPTH), Rivers State. Also, to evaluate the association between dental service utilization with periodontal health and oral hygiene status of the participants.

**Methods:** This was a cross-sectional study conducted among one hundred and thirty-six participants selected using convenience sampling method. Data was collected using semi-structured, self-administered questionnaire. The questionnaire had two sections: section A included information on socio-demographic characteristics (age, gender, marital status, highest education) and section B included intraoral examination to determine the simplified oral hygiene status (OHIS) and community periodontal index (CPI).

**Results:** One hundred and thirty-six participants (63 males and 73 females) participated in the study, with a M: F ratio of 1:1.16. Mean age was  $42.3 \pm 17.3$  years. Ninety (66.2%) participants had fair OHI-S, while 26 (19.1%) presented with poor OHI-S. Sixty-five (47.8%) and 38 (27.9%) of the participants presented with CPI 2 and 3 respectively. Most of the participants; 81 (59.6%) had gingivitis and 51 (37.5%) presented with periodontitis, while only 4 (2.9%) participants had healthy periodontium. Good oral hygiene was more common among the younger age group, while the older age group presented with poor oral hygiene, ( $p = 0.190$ ). Comparing CPI across the age groups, most of the younger age group had CPI 0, while more older age group had CPI 4. Thirty-seven (27.21%) of the participants had never visited the dental clinic before, while 99 (72.8%) participants had visited the dental clinic before. There were weak negative correlations, between dental visitation and CPI ( $r = -0.108$ ,  $p = 0.211$ ) and periodontal health ( $r = -0.148$ ,  $p = 0.085$ ). While there was a very weak linear relationship, between dental visitation and OHI-S ( $r = 0.018$ ,  $p = 0.831$ ).

**Conclusion:** Most of the participants had fair oral hygiene status, CPI 2 and gingivitis, only few participants had healthy periodontium. Most of the younger age group had good oral hygiene status, CPI 2 and gingivitis. Regarding gender, more males presented with good OHI-S, while females had fair OHI-S. There was a weak negative correlation between dental service utilization and CPI and periodontal health, but a very weak linear relationship with OHI-S.

**Keywords:** Dental utilization, Periodontal health, Oral hygiene

**Received:** 12<sup>th</sup> February, 2024.

**Revision:** 25<sup>th</sup> April, 2024.

**Accepted:** 15<sup>th</sup> May, 2024

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**Citation:** Alade GO, Orikpete EV. Oral Hygiene, Periodontal Health and Dental Utilization Pattern Among Dental Patients in a Nigerian Tertiary Hospital. *Nig J Periodontal Res* 2024; 5(2):35-43.

## CLINICAL IMPLICATIONS

Periodontitis is a disease which affects the tooth's supporting structures, resulting in periodontal pocketing, clinical attachment loss and alveolar bone damage leading to tooth mobility and ultimately resulting in tooth loss. Recently, periodontitis has been considered a public health problem, as it not only leads to tooth loss but has been linked to several systemic diseases. Hence, appropriate assessment is required for its accurate diagnosis. Patients who utilise dental services regularly were reported to present with less severe forms of periodontitis, as it can be diagnosed early and managed appropriately.

## INTRODUCTION

Oral diseases are common chronic diseases, which are now considered as important public health problems, because of their increasing prevalence and their impact on individuals and society at large.<sup>1</sup> Periodontal disease is one of the commonest oral diseases.<sup>2</sup> Plaque biofilm is the main aetiology of periodontal disease,<sup>3</sup> while the risk factors for periodontal disease include tobacco use, excessive alcohol consumption, poor diet and nutrition, obesity, psychological stress and insufficient personal/oral hygiene.

Periodontal diseases are oral diseases affecting the periodontium, most often presenting as gingivitis and periodontitis. While gingivitis is a reversible inflammation of the gingivae, periodontitis affects the supporting structures of the tooth, resulting in periodontal pocketing, clinical attachment loss and alveolar bone damage, leading to tooth mobility and ultimately resulting in tooth loss.<sup>4</sup> Periodontitis is a public health problem,<sup>5</sup> as it has been linked to a number of systemic diseases and conditions, such as diabetes, HIV, atherosclerotic vascular disease, rheumatoid arthritis, adverse pregnancy outcomes, obesity, and metabolic syndrome,<sup>6-10</sup> hence it is imperative to appropriately assess the presence of periodontitis in an individual. Periodontitis can be assessed clinically as well as radiographically; periodontal pocketing and loss of attachment can be assessed clinically using periodontal probes such as Williams periodontal probe and CPITN probes, while alveolar bone loss is assessed radiographically using intraoral radiographs.<sup>11</sup>

The prevalence of periodontitis has also been linked to dental service utilization. Dental service utilization has been defined as the percentage of the population who access dental services over a 12 months period.

<sup>12</sup> It is determined by the use of dental services and as such can be expressed in terms of dental visits made and services received over a specified period. A recent 2023 survey by Zhang et al,<sup>13</sup> from National Health and Nutrition examination Survey from 2011-2014 for 892 participants with diabetes reported that individuals who utilized preventive dental services were 46% less likely to have periodontitis. Hence, it will be interesting to evaluate the association between dental service utilization and periodontal health among Nigerian patients, as there is paucity in the literature of the studies on the impact of dental service utilization on the periodontal health of patients in Rivers State. The aim of this study, therefore, was to assess the oral hygiene status, community periodontal index (CPI), and periodontal health of participants who attended a tertiary hospital in Rivers State, Nigeria. Also, to evaluate if there is any association between dental service utilization and these variables among the participants.

## MATERIALS AND METHODS

This was a cross-sectional study conducted among patients who attended the Periodontology clinic at the University of Port Harcourt Teaching Hospital (UPTH), Port Harcourt, Rivers State, between June and November 2022. Ethical approval was obtained from the Health Research and Ethics Committee of the Institution (UPTH/ADM/90/S.II/VOL.XI/1620). Participants' consents were obtained before being enrolled in the study. A non-probability sampling method (convenience sampling) was used to select participants attending the clinic. Data was collected using a semi-structured, self-administered questionnaire. The questionnaire had two sections: section A included information on socio-demographic characteristics (age, gender, marital status, highest level of education, occupation) and section B included intraoral examination to determine the simplified oral hygiene status (OHIS) and community periodontal index (CPI). Inclusion criteria for the study was any healthy individual between the age group of 17 years and 80 years with a minimum of 20 teeth, who gave consent. Participants with uncontrolled systemic conditions, pregnant and lactating mothers were excluded from the study.

The simplified oral hygiene index was assessed using the Greene and Vermillion Oral hygiene index.<sup>14</sup>

Periodontal health status was assessed using Community Periodontal Index (CPI) modified.<sup>15</sup> The examination of signs of periodontal disease was performed with the aid of standardized CPITN-C probe and mouth mirror. The CPITN-C probe has a ball tip of 0.5 mm diameter, and black band markers between 3.5 mm to 5.5 mm from the tip and at 8.5 mm and 11.5 mm from the tip.

CPI Pocket scores

0= Healthy

1= Bleeding on probing

2= Presence of supragingival and subgingival calculus

3= Pocket depth of 4-5mm

4= Pocket depth  $\geq$ 6mm

Measurement of Community periodontal index was carried out by dividing mouth into six sextants: 18-14, 13-23, 24- 28, 34-38, 33-43 and 43-48. It was recorded only for index teeth, and the index teeth in each sextant were examined by running the CPI probe around the whole circumference of the tooth. Pocket depths were measured at six sites per tooth (mesio-buccal, mid-buccal, disto-buccal, mesio-, mid-, and disto-lingual/palatal). Using CPI code, the participants with Code 0 (Healthy) were categorized as healthy periodontium, participants with code 1 (Bleeding on probing) and code 2 (Calculus detected

during probing) were categorized as having gingivitis and code 3 (Pocket of 4-5 mm depth) and code 4 (Pocket 6 mm or more) were considered to be periodontitis. Cohen's kappa coefficient for inter examiners variation was 0.84.

Statistical analysis was done using the Statistical Product and Service Solution, (SPSS) version 25.0 (IBM SPSS Inc. Chicago, Illinois). Continuous variables were expressed as means and standard deviation, while categorical variables were expressed as frequencies with accompanying percentages. Differences between groups were compared using the Chi-square tests for categorical variables. P values < 0.05 was considered statistically significant.

## RESULTS

### Sociodemographic characteristics of participants

One hundred and thirty-six out of 200 questionnaires were returned and correctly filled, giving a response rate of 68%. The participants comprised 46.3% (63) males and 53.7% (73) females, and a M: F ratio of 1:1.16. The mean age was  $42.3 \pm 17.3$  years, and an age range of 17 -76 years. Half of the participants were married, and majority had tertiary education. (Table 1)

Table 1: Sociodemographic characteristics of participants

Variables		Frequency	Percentage
<b>Age group (years)</b>	< 20	8	5.9
	20-29	34	25.0
	30-39	23	16.9
	40-49	22	16.2
	50-59	20	14.7
	60-69	18	13.2
	70-79	11	8.1
<b>Gender</b>	Female	73	53.7
	Male	63	46.3
<b>Education</b>	Primary	6	4.4
	Secondary	30	22.1
	Tertiary	100	73.5
<b>Marital status</b>	Single	56	41.2
	Married	68	50.0
	Separated	2	1.5
	Widow	10	7.4
	Total	136	100.0

### Distribution of OHIS, CPI and Periodontal health among participants

Table 2 shows the distribution of OHIS, CPI and Periodontal health among participants.

Concerning Simplified oral hygiene index (OHI-S), majority; 90 (66.2%) had fair OHI-S, while 26 (19.1%) presented with poor OHI-S. For Community periodontal index (CPI), 65 (47.8%) and 38 (27.9%) of the participants presented with CPI 2 and 3 respectively. Most of the participants; 81 (59.6%) had gingivitis and 51 (37.5%) presented with periodontitis, while only 4 (2.9%) participants had healthy periodontium.

### Age-wise distribution of OHI-S, CPI and periodontal health among participants

Table 3 shows the age-wise distribution of OHI-S, CPI and periodontal health among participants. Comparing OHIS across age groups, 5(25.0%), 4(20.0%), 1(5.0%) participant in 20-29, 40-49-, and 70-79-years age groups presented with good oral hygiene, while 1(3.8%), 3(11.5%) and 6(23.0%) participants in <20-, 30-39-, and 60-69-years age groups had poor oral hygiene. This finding was not statistically significant, ( $p = 0.190$ ). Comparing CPI across the age groups, 1(25.0%), 2(50.0%) and 1(25.0%) participant in 30-39, 40-49 and  $\geq 70$  age groups had healthy CPI (CPI 0) respectively. 19(29.2%), 13(20.0%), 5(7.7%) participants in the 20-29, 40-49 and 60-69 age groups respectively presented with CPI 2. 4(30.8%), 3(23.1%) and 3(23.1%) participants in 20-29, 50-59, and  $\geq 70$  age groups presented with CPI 4. These findings were statistically significant ( $p=0.010$ )

Regarding periodontal health, 27(33.3%), 9(11.1%), 7(8.6%), 2(2.5%) participants in 20-29, 50-59, 60-69 and  $>70$  age group presented with gingivitis respectively, while 2(3.9%), 7(13.7%) and 11(21.6%) participants in 20-29, 30-39 and 50-59 age groups respectively presented with periodontitis. These findings were statistically significant ( $p= 0.006$ ).

### Gender distribution of OHI-S, CPI and Periodontal health among participants

Seven (35.0%), 54(60.0) and 12(46.2%) females presented with good, fair and poor oral hygiene status respectively, while 13(65.0%), 36(40.0%) and 14(53.8%) males presented with good, fair and poor oral hygiene status respectively, ( $p = 0.089$ ). Only 1(25%) female and 3 (75%) males had healthy CPI (CPI 0); 21(55.3%) females and 17 (44.7%) males had CPI 3, while 6(46.2%) females and 7(53.8%) males had CPI 4. This however, is not statistically significant ( $p = 0.720$ ).

One participant (25.0%), 45(55.6%) and 27(52.9%) females presented with healthy, gingivitis and periodontitis respectively, while 3(75.0%), 36(44.4%) and 24(47.1%) males presented with healthy, periodontitis and gingivitis respectively, ( $p = 0.519$ ). (Table 4).

### Dental visitation of participants

Thirty-seven (27.21%) of the participants had never visited the dental clinic before, while 99 (72.8%) participants had visited the dental clinic before; of which 30 (22.06%) had visited the dental clinic < 6 months ago, 18 (13.24%) visited 6-12months ago and 51(37.50%) had visited the dental clinic > 1 year ago. (Figure 1)

Table 2: Distribution of OHI-S, CPI and Periodontal health among participants.

Variables		Frequency	Percentage
<b>Oral Hygiene Status (OHI-S)</b>	Good	20	14.7
	Fair	90	66.2
	Poor	26	19.1
<b>Community Periodontal Index (CPI)</b>	0(Healthy)	4	2.9
	1(Bleeding on Probing)	16	11.8
	2(Calculus)	65	47.8
	3(Pocket 4-5mm)	38	27.9
	4(Pocket $\geq 6$ mm)	13	9.6
<b>Periodontal Health</b>	Healthy	4	2.9
	Gingivitis	81	59.6
	Periodontitis	51	37.5
	Total	136	100.0

### Correlation between dental visitation and OHI-S, CPI and Periodontal health

Table 5 shows the correlation between dental visitation of the participants with their simplified oral hygiene status (OHI-S), community periodontal index (CPI) and periodontal health using Pearson's correlation. There were weak negative correlations,

which was not statistically significant between dental visitation and CPI ( $r = -0.108$ ,  $p = 0.211$ ) and periodontal health ( $r = -0.148$ ,  $p = 0.085$ ). While there was a very weak linear relationship, which was not statistically significant between dental visitation and OHI-S ( $r = 0.018$ ,  $p = 0.831$ )

Table 3: Age distribution of OHI-S, CPI and Periodontal health among participants

Variables			Age group (years)							p value
			<20 n(%)	20-29 n(%)	30-39 n(%)	40-49 n(%)	50-59 n(%)	60-69 n(%)	≥70 n(%)	
<b>Oral Hygiene Status (OHI-S)</b>	Good		0(0.0)	5(25.0)	6(30.0)	4(20.0)	0(0.0)	4(20.0)	1(5.0)	0.190
	Fair		7(7.8)	25(27.8)	14(15.6)	14(15.6)	16(17.8)	8(8.9)	6(6.7)	
	Poor		1(3.8)	4(15.4)	3(11.5)	4(15.4)	4(15.4)	6(23.1)	4(15.4)	
<b>Community Periodontal Index (CPI)</b>	0(Healthy)		0(0.0)	0(0.0)	1(25.0)	2(50.0)	0(0.0)	0(0.0)	1(25.0)	0.010*
	1(Bleeding on Probing)		2(12.5%)	8(50.0)	4(25.0)	0(0.0)	0(0.0)	2(12.5)	0(0.0)	
	2(Calculus)		4(6.2)	19(29.2)	13(20.0)	13(20.0)	9(13.8)	5(7.7)	2(3.1)	
	3(Pocket 4-5mm)		2(5.3)	3(7.9)	4(10.5)	6(15.8)	8(21.1)	10(26.3)	5(13.2)	
	4(Pocket ≥6mm)		0(0.0)	4(30.8)	1(7.7)	1(7.7)	3(23.1)	1(7.7)	3(23.1)	
<b>Periodontal Health</b>	Healthy		0(0.0)	0(0.0)	1(25.0)	2(50.0)	0(0.0)	0(0.0)	1(25.0)	0.006*
	Gingivitis		6(7.4)	27(33.3)	17(21.0)	13(16.0)	9(11.1)	7(8.6)	2(2.5)	
	Periodontitis		2(3.9)	7(13.7)	5(9.8)	7(13.7)	11(21.6)	11(21.6)	8(15.7)	

\*- Significant

Table 4: Gender distribution of OHI-S, CPI and Periodontal health among participants

Variables		Gender		P Value
		Female (%)	Male (%)	
<b>Oral hygiene status (OHI-S)</b>	Good	7(35.0)	13(65.0)	0.089
	Fair	54(60.0)	36(40.0)	
	Poor	12(46.2)	14(53.8)	
<b>Community Periodontal Index (CPI)</b>	0 (Healthy)	1 (25.0)	3 (75.0)	0.720 <sup>#</sup>
	1(Bleeding on probing)	10 (62.5)	6 (37.5)	
	2 (Calculus)	35 (53.8)	30 (46.2)	
	3 (Pocket 4-5mm)	21 (55.3)	17 (44.7)	
	4 (Pocket ≥ 6mm)	6 (46.2)	7 (53.8)	
<b>Periodontal Health</b>	Healthy	1(25.0)	3(75.0)	0.519
	Gingivitis	45(55.6)	36(44.4)	
	Periodontitis	27(52.9)	24(47.1)	

#- Fischer's exact

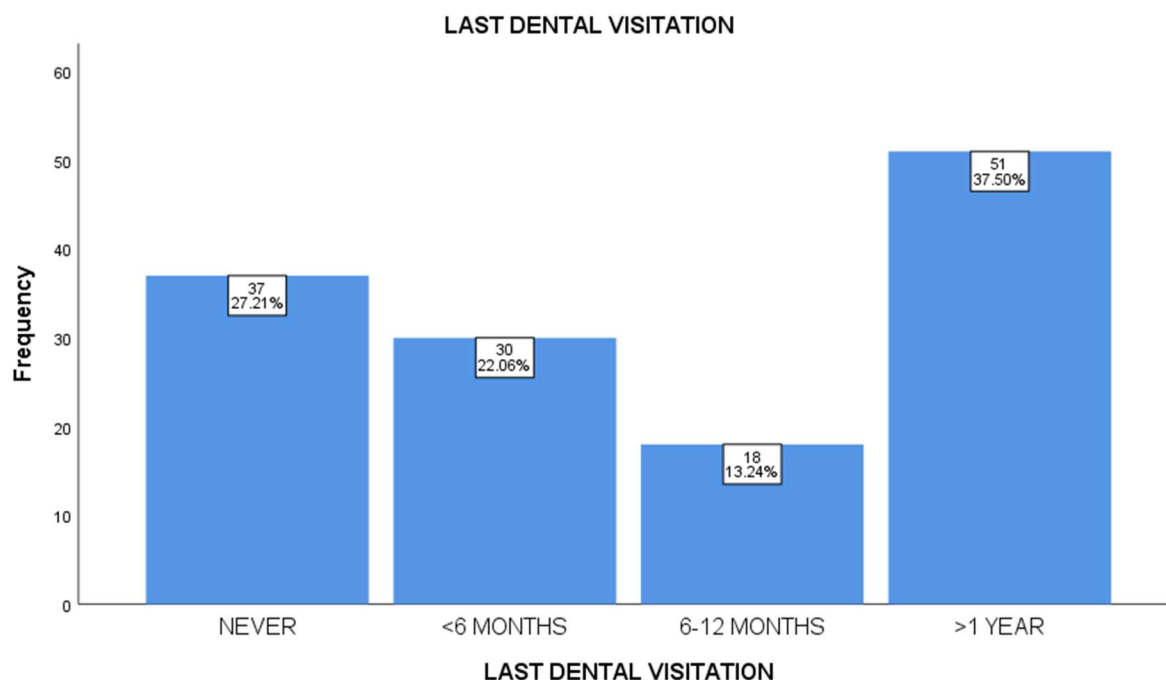


Figure 1: Last dental service visitation of participants

Table 5: Correlation between dental visitation and OHI-S, CPI and Periodontal health

Variables		OHI-S	CPI	PERIO HEALTH	Last dental visitation
<b>Simplified Oral Hygiene Status (OHI-S)</b>	Pearson correlation	1			
	Sig. (2-tailed)				
	N	136			
<b>Community Periodontal Index (CPI)</b>	Pearson correlation	0.310**	1		
	Sig. (2-tailed)	0.000			
	N	136			
<b>Periodontal health</b>	Pearson correlation	0.287**	0.890**	1	
	Sig. (2-tailed)	0.001	0.000		
	N	136			
<b>Dental visitation</b>	Pearson correlation	0.018	-0.108	-0.148	1
	Sig. (2-tailed)	0.831	0.211	0.085	
	N	136	136	136	

\*\* . Correlation is significant at the 0.01 level (2-tailed).

## DISCUSSION

In this study, we investigated the oral hygiene status and periodontal health of participants who attended a tertiary hospital in Port Harcourt, Rivers State, and also evaluated the association between regular

dental service utilization and the oral hygiene status and periodontal health.

Most of the participants had fair oral hygiene and very few had good oral hygiene, which is in tandem with a previous community-based study conducted in Port Harcourt, Rivers state by Olabisi et al,<sup>16</sup> as well

as a previous study conducted among dental patients in Benin city.<sup>17</sup> This finding is however in contrast to the finding from a recent study conducted in Obio Akpor local government area of Port Harcourt, in which most of the participants had poor oral hygiene.<sup>18</sup> The difference could be due to the fact that the previous study was a community-based study and the participants may be unaware of oral hygiene practices, while this present study was a hospital-based study. This finding shows that the participants had high level of plaque, which had been linked to periodontal disease and dental caries which are the two most common dental diseases.<sup>19</sup> The increased plaque in the participants could be linked to poor oral hygiene practices; however, this was a limitation of this study as oral hygiene practices of the participants was not taken into cognisance.

Many of the participants in this study had CPI 2, which indicates presence of supragingival and subgingival calculus. This is in tandem with previous studies,<sup>20, 21</sup> but is of concern considering that calculus is a retentive factor for plaque. This highlights the need for enlightenment of the population about the implication of poor dental health. In regards to periodontal health, just a little above half of the participants had gingivitis, few had periodontitis, while a small percentage of the participants had healthy periodontium. This shows that most of the participants do not have healthy periodontium. This calls for concern and a need for continuous education of the patients who attend the dental clinic on the importance of maintenance of healthy gingival and periodontal tissues, not just for their oral health but also for their systemic health as well.

It has been reported in the literature, that the oral hygiene status worsens with increasing age.<sup>22</sup> Comparing oral hygiene status across age groups in this study, participants in the younger age groups presented with fair to good oral hygiene status while the elderly presented with poor oral hygiene status. This finding follows the trend from a previous study conducted among rural dwellers in Benin city, where most of the younger participants presented with fair oral hygiene status while majority of the elderly had poor oral hygiene status.<sup>23</sup> The increased poor oral hygiene status observed in the elderly, may be attributed to poor manual dexterity in oral hygiene, leading to increased plaque and calculus accumulation.<sup>24</sup> The finding in this study, however, is in contrast to that of a previous study conducted

among dental patients in Benin city, where most of younger age group and elderly had fair to poor oral hygiene status.<sup>17</sup>

Community periodontal index has been used over the years to assess periodontal disease. In this study, most of participants in the younger age group presented with CPI 0 to CPI 2, indicating health to presence of calculus, which was be grouped as gingivitis, while the more of the elderly participants presented with worse CPI scores (3 and 4), which indicated periodontitis. This finding is in accordance to that in a previous study, conducted among Urban Population of Kathmandu District,<sup>25</sup> this finding confirms that periodontal disease increases with age.<sup>26</sup> In addition, the elderly could have challenges with dexterity,<sup>27</sup> hence they may not brush adequately.

Comparing oral hygiene status across gender, most of the females presented with fair oral hygiene status, while most males had good oral hygiene. This is in accordance with the findings of a study conducted among dental patients in Benin city, where more males had good oral hygiene status.<sup>17</sup> It however is in contrast to that of a previous study conducted among a screened population in Port Harcourt, in which the females presented with good and fair oral hygiene status while the males had poor oral hygiene.<sup>16</sup> This disparity may be due to the fact that in this study, more females never attended the dental clinic previously compared to males. Also, the males may have had scaling and polishing during their previous dental visits.

Comparing the CPI across gender, it was interesting to find that more males had healthy periodontium compared to the females, while the females had gingivitis. Both males and females presented with periodontitis, though it was a little higher among the females. This finding is contrary to the report in the literature that periodontal disease is more common in males than in females,<sup>28</sup> which has been attributed more to the males' behaviour patterns, habits and attitudes.<sup>29,30</sup>

Majority of the participants in this study did not visit the dental clinic regularly as expected; many of the participants visited the dental clinic over a year ago, while only a smaller percentage of the participants visited the dental clinic less than 6 months ago or between 6 months to one year ago. Few of the participants in this study were visiting the dental clinic for the first time, although this finding is in contrast to a previous study conducted among



patients who attended a tertiary hospital in Nepal, where most of the participants were attending the dental clinic for the first time.<sup>31</sup> A number of reasons have been stated in the literature why patients do not visit the dental clinic regularly, these include cost of dental treatment, shortage of professionals, and lack of awareness.<sup>32</sup> Also, fear of dental injection and feeling of insecurity from the dental operating clinic, were factors reported by Ajayi et al<sup>33</sup> that prevented people from visiting the dental clinic. Regular dental clinic visitation has been linked to reduced incidence of periodontitis and tooth loss.<sup>34,35</sup> This finding was substantiated in this present study, as dental visitation was found to have a negative correlation, though not statistically significant, with community periodontal index and periodontal health, which are important indices of periodontitis, which means that participants who attend the dental clinic regularly, may have reduced incidence of periodontitis, as periodontal diseases can be detected early and promptly treated. However, there was a positive weak correlation between dental visitation and simplified oral hygiene status, this could be due to the fact that oral hygiene status is determined more by individuals' home-care and oral hygiene practices than dental clinic visitation, though the participants' oral hygiene practices were not recorded in this study. However, regular dental clinic visitation is crucial as it has been reported to increase oral literacy among patients, hence improving oral hygiene.<sup>36</sup> Another limitation of this study is that loss of attachment, another index for assessment of periodontitis, was not taken into cognisance. It is recommended therefore, that patients and the society at large be educated on the importance of regular preventive dental service utilization, which will help improve their periodontal health and the general systemic health.

## CONCLUSION

Most of the participants had fair oral hygiene status, CPI 2 and gingivitis, only few participants had healthy periodontium. Most of the younger age group had good oral hygiene status, CPI 2 and gingivitis. Regarding gender, more males presented with good OHI-S, while females had fair OHI-S. Considering periodontal health, more males had healthy periodontium, while more females presented with gingivitis and both genders had periodontitis. There was a weak negative correlation between dental service utilization and CPI and periodontal

health, but a very weak linear relationship with OHI-S.

**Financial support:** None

**Conflict of Interest:** None

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