International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

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Periodontal, oral and denture hygiene status of removable partial denture wearers and non-denture wearers

Olubunmi Omotunde Onigbinde [1, *], Olugbenga Adetokunbo Adenuga-Taiwo [2], Abimbola Yusuf [3], Adenike Ololade Awotile [2], Modupeore Ekua Sorunke [1] and Olatubosun Sunday Salami [3]

[1] *Department of Preventive Dentistry, Faculty of Dentistry, LASUCOM, Ikeja, Lagos State, Nigeria.*
[2] *Department of Restorative Dentistry, Faculty of Dentistry, LASUCOM. Ikeja, Lagos State, Nigeria.*
[3] *Department of Restorative Dentistry, (LASUTH) Ikeja, Lagos, Nigeria.*

International Journal of Science and Research Archive, 2025, 14(02), 1243-1251

Publication history: Received on 30 December 2024; revised on 10 February 2025; accepted on 13 February 2025

Article DOI: https://doi.org/10.30574/ijsra.2025.14.2.0412

Abstract

The use of dentures is believed to worsen oral health if not properly maintained. Good oral hygiene regime and regular dental visits can promote oral health and reduce the risk of periodontal diseases.

Aim: This study was conducted to assess the periodontal, Oral and denture hygiene status, of denture wearers and non-denture wearers.

Methods: This cross-sectional study was conducted at the Prosthodontic clinic of the department of Restorative dentistry in the Dental Centre of the Lagos State University Teaching Hospital, Ikeja, Lagos. Periodontal, Oral and Denture hygiene status of 135 participants were assessed after they had filled in the questionnaires. Data was collected, entered and analyzed using SPSS version 26 (IBM SPSS Armonk, New York).

Results: Both prosthesis wearers and non-wearers have similar periodontal conditions. The prevalence of periodontal disease of the participants was 54%. Gingivitis was a major contributor (49.6%) to periodontal disease and the prevalence of periodontitis was 4.4%. The proportion with good oral hygiene was higher in the denture wearers while poor oral hygiene was more prevalent in the non-denture wearers. The denture wearers had only good 54(61.4%) and fair 34(38.6%) denture hygiene.

Conclusions: The results indicate that the participants, especially the RPD's wearers, should be motivated for extra adequate oral hygiene practices and dental visits.

Emphasis should be placed on tooth brushing twice daily, with medium bristled toothbrush and fluoridated toothpaste, usage of interdental aids and visiting the dentist twice a year.

Keywords: Periodontal Status; Oral Hygiene Status; Denture Hygiene; Denture Wearers; Non-Denture Wearers

1. Introduction

Periodontitis is a chronic infection that destroys the tooth's supporting tissues [1].

It is characterized by the development of periodontal pockets, loss of clinical attachment, alveolar bone loss, or a combination of these changes, which leads to tooth loss, if left untreated [2]. Periodontal disease includes gingivitis and

* Corresponding author: Olubunmi Omotunde Onigbinde

periodontitis; gingivitis is inflammation of the gingiva without loss of supporting tissues, whereas periodontitis is characterized by attachment loss and bone loss [2]. Gingivitis is caused by poor oral hygiene and can be reversed with proper oral hygiene [2]. Periodontitis has been identified as the leading cause of tooth loss in adults, with periodontal deterioration being irreversible [3].

Periodontal diseases are regarded as the most prevalent oral diseases globally, with periodontitis ranking as the sixth most common chronic disease in the world [4,5].

Multiple factors contribute to the aetiology of periodontitis [6]. Dental plaque is regarded as the primary cause of gingival and periodontal disease development and progression [6].

Studies have indicated that there is an increase in accumulation of calculus and plaque, which results in poor oral hygiene, with the wearing of Removable Partial Dentures (RPDs) [7]. Hence, poor oral hygiene due to RPDs raised the risk of gingivitis, periodontitis, dental stomatitis, and oral malodour [8,9]. Previous studies have shown a correlation between RPDs and the increased risk of periodontal diseases [10,11].

Poor denture hygiene increases the risk of tooth decay, periodontal disease, dental stomatitis, and halitosis [12]. Therefore, there is an increased incidence of dental caries and gingival diseases in denture wearers with poor denture and oral hygiene [13].

A previous study has shown that 92% of people with poor dental hygiene also have poor oral hygiene standards [14].

The use of removable dentures does not increase the risk of periodontal diseases, if periodontal health is excellent before dentures are placed, oral and dental hygiene practices can be maintained and strictly followed [13].

Regular denture hygiene is an important component of overall good oral health. Therefore, proper use and care of dentures is an important part of maintaining the health of periodontal supporting tissues and the denture [14]. Also essential for prevention of periodontal problems, dental caries, and denture stomatitis [12].

High standards of oral hygiene and dental hygiene, a regular recall system, are essential for maintaining the oral health and the clinical longevity of the prosthesis [7,13, 15].

The purpose of this study is to assess the periodontal status, the oral and denture hygiene of removable partial dentures and non-denture wearers in Lagos state university teaching hospital, Ikeja Lagos.

2. Materials and methods

2.1. Study Design

This is a hospital based cross sectional descriptive study conducted from August to October 2024 at the Prosthodontics clinic of the Restorative Department in the Dental Centre of the Lagos State University Teaching Hospital, Ikeja, Lagos.

Approval for this study was obtained from the Ethical committee of LASUTH Ikeja.

2.2. Sample size

Sample size was determined using the formula for sample size calculation for descriptive studies as stated below: [16].

$$n = z^2 P q/d^2$$

(n = Sample size, z = Standard normal deviation = 1.96 at 95% Confidence limit,
P = Prevalence rate = 8.6%,
q = 1 – P, = 1–8.6% = 1-0.086 = 0.914,
d = Error margin = 5%.
No response or drop-outs rate =10%

Documented brushing for the remaining natural teeth twice daily was 8.6% from a previous study [17]. This was substituted in the above equation giving a minimum sample size of 121. Therefore, from the above sample size n=121+12=133.

2.3. The selection criteria

All the patients attending the Prosthodontics clinic above 18 years of age were screened after they consented. The patients that met the inclusion criteria were included in the study.

- **The inclusion criteria**: a patient aged over 18 years that wore RPDs or have some missing teeth that have not been replaced; had scaling and polishing done more than 6 months before the date of this study and that consented to take part in the study.
- **The exclusion criteria**: a patient that had no missing or had no remaining teeth; a patient that was wearing an immediate RPD; had scaling and polishing done less than 6 months before the date of this study, and that did not consent to be part of the study.

The study consisted of a structured questionnaire and oral clinical examinations. The questionnaire included questions on the participants' sociodemographic characteristics, dental visitations habits, and oral hygiene habits. Specific questions investigated the oral hygiene practices, including tooth-brushing frequency, interdental cleaning, denture cleansing and removal of dentures at night. Dentate/edentulous status and the presence of removable prostheses were also recorded. The participants were asked whether they have had scaling and polishing done less than 6 months before the date of this study.

The examination was done with the participants seated in a dental chair, with mouth mirrors and explorers, under natural light.

- **The Simplified Oral Hygiene Index of Greene and Vermillion** [18] was used to measure oral hygiene status.

Simplified Oral Hygiene Index (OHI- S), is a composite index of oral debris score and calculus score which assesses the oral debris and calculus accumulation.

The scores are on a graded scale of 0- 3 using six surfaces of six index teeth, 16, 11, 26, 31, 36 and 46.

The debris scores are assigned as follows:

- 0 - No debris or stain found.
- 1 - Soft debris or extrinsic stain covering not more than 1/3 of the tooth surface.
- 2 - Soft debris or stain covering more than 1/3 but not more than 2/3 of the exposed tooth surface.
- 3 - Soft debris covering more than 2/3 of the exposed tooth surface.

The calculus scores are assigned as follows:

- 0 - No Calculus present.
- 1 - Supragingival calculus covering not more than 1/3 of the exposed tooth surface.
- 2 - Supra gingival calculus covering more than 1/3 but not more than two-thirds of the exposed tooth surface or the presence of individual flecks of subgingival calculus around the cervical portion of the tooth or both.
- 3 - Supra gingival calculus covering more than 2/3 of the exposed tooth surface or a continuous heavy band of sub gingival calculus around the cervical portion of tooth or both. The sum of the points given for every separate tooth was divided by the number of teeth to give the score for the individual.

The sum of the Simplified Calculus index (CI- S) and the Simplified Debris index (DI- S) gives the Simplified Oral Hygiene index (OHI- S) score for the individual.

The categorization of debris index and calculus index was as follows:

- 0.0–0.6 = Good,
- 0.7–1.8 = Fair,
- 1.9–3.0 = Poor

While that of oral hygiene status was as follows:

- 0.0–1.2 = Good,

- 1.3–3.0 = Fair,
- 3.1–6.0 = Poor

The Community Periodontal Index (CPI) [19] was used to assess periodontal health. Ten index teeth (17, 16, 11, 26, and 27 in the maxilla, and 47, 46, 31, 36, and 37 in the mandible) were assessed for each participant, the worst condition for each sextant was considered. The highest score was recorded as follows:

- Code 0 - healthy periodontium, no signs of disease.
- Code 1- gingival bleeding after gentle probing
- Code 2- presence of supra or subgingival calculus or other plaque retentive factors.
- Code 3 - shallow (4 or 5 mm) periodontal pockets.
- Code 4 - deep periodontal pockets (6 mm and above)

The CPI scores were grouped as follows.

- Code 0 = healthy periodontium,
- Codes 1 and 2 = gingivitis and
- Codes 3 and 4 = periodontitis

The level of prosthesis hygiene was assessed using the Budzt-Jorgensen & Bertram

Method [20] ranked in categories, namely,

Good (no plaque or calculus),

Fair (plaque or calculus covering less than one-third of the prosthesis), or

Poor (plaque and calculus covering one-third or more of the prosthesis).

2.4. Data Analysis

Data analysis was carried out using SPSS 26 (IBM SPSS Armonk, New York). For categorical descriptive variables, simple frequencies and percentages were determined. Chi-square test and Fisher's Exact test were used to test for association. Test for significance was set at ($p<0.05$).

3. Results

Table 1 Sociodemographic characteristics of study participants. (n=135)

Variables	Denture wearers Freq (%)	Non-Denture wearers Freq (%)	Freq (%)	P value
Sex				
Females	45(51.1)	23(49.0)	68 (50.4)	
Males	43(48.9)	24(51.0)	67 (49.6)	
Age				
<60	48(54.5)	29(61.7)	77(57.0)	
>60	40(45.5)	18(38.3)	58(43.0)	
Education				
Primary	9(10.2)	5(10.6)	14(10.4)	
Secondary	19(21.6)	13(27.7)	32(23.7)	
Tertiary	46(52.2)	20(42.6)	66(48.9)	
Postgraduate	14(16.0)	9(19.1)	23(17.0)	
Total	**88(100)**	**47(100)**	**135(100)**	

A total of 135 participants participated in this study, 68(50.4%) were females and 67(49.6%) were males. The age ranged from 18 to 90 years, with a mean age of 52.2 ± 19.1years, and most of them were in the below 60 years age group. Concerning the level of education, 14(10.4%) of the participants completed primary school education, and 23(17.0%) held postgraduate education. Table 1.

Table 2 Periodontal and oral hygiene status of study participants. (n=135)

Variables	Denture wearers Freq (%)	Non-Denture wearers Freq (%)	Total Freq (%)	P value
CPI score				
Healthy	40 (45.5)	22 (46.8)	62(46.0)	
Bleeding	26 (29.5)	3 (6.4)	29(21.5)	
Calculus	18 (20.5)	20 (42.6)	38(28.1)	
Pocket	4 (4.5)	1 (2.1)	5(3.7)	
Deep pocket	0 (0.0)	1 (2.1)	1(0.7)	0.002*
CPI Grouped				
Healthy	40(45.5)	22(46.8)	62(46.0)	
Gingivitis	44(50.0)	23(48.9)	67(49.6)	
Periodontitis	4(4.5)	2(4.3)	6(4.4)	0.227
OHI Score				
Good	62 (70.5)	29 (61.7)	91(67.4)	
Fair	25 (28.4)	14 (29.8)	39(28.9)	
Poor	1 (1.1)	4 (8.5)	5(3.7)	0.096
Total	**88(100)**	**47(100)**	**135(100)**	

*Significant

In our study, prosthesis wearers and non-wearers had almost similar periodontal conditions. The prevalence of periodontal disease was 54.5 % and 53.2 % in the denture and non-denture wearers, respectively. Bleeding was higher in denture wearers. It was found that calculus was highest, and deep pockets were present only in the non-denture wearers. The difference between the 2 groups was statistically significant. *P*=0.002. Most of the denture wearers 70.5%, and 61.7% of the non-denture wearers had good oral hygiene. Poor oral hygiene was higher in the non-denture wearers. Table 2.

Table 3 Oral hygiene habits of participants (n=135)

Variables	Denture wearers Freq (%)	Non-Denture wearers Freq (%)	Total Freq (%)	P value
Toothbrushing Frequency				
Once	50(56.8)	26(55.3)	76 (56.3)	
Twice	36(40.9)	21(44.7)	57 (42.2)	
Thrice	2(2.3)	0(0.0)	2(1.5)	0.748
Toothbrushing Tools				
Toothbrush	82(93.2)	42(89.4)	124(91.8)	
Chewing stick	1(1.1)	1(2.1)	2(1.5)	
Both	5(5.7)	4(8.5)	9 (6.7)	0.651

Interdental Aids				
Dental floss	40(45.4)	19(40.4)	59(43.7)	
Toothpick	21(23.9)	11(32.4)	32(23.7)	
Interdental brush	8(9.1)	1(2.1)	9(6.7)	
None	19(21.6)	16(33.1)	35(25.9)	0.254
Scaling and Polishing				
Yes	25(28.4)	9(19.1)	34(25.2)	
No	63(71.6)	38(80.9)	101(74.8)	0.166
Dental Visits				
6-12months	10(11.4)	1(2.1)	11(8.1)	
Occasional	45(51.1)	19(40.4)	64(47.4)	
When in pain	26(29.5)	17(36.2)	43(31.9)	
Never	7(8.0)	10(21.3)	17(12.6)	0.035*
Total	**88(100)**	**47(100)**	**135(100)**	

*Significant

About 76(56.3%) of the participants brush their mouth once a day. Toothbrushes were the common tools for brushing. Dental floss was used by 59(43.7%) of the participants. 25.2% of the participants had scaling and polishing done. 11.4% of the RPDs and 2.1% of non RPDs visited the dentist every 6-12months. The difference of the dental visits between the denture wearers and non-denture wearers was statistically significant. *P*=0.035. Table 3.

Table 4 Dentures' hygiene habits among denture wearers (n =88)

Variables	**Freq**	**%**
Frequency of denture cleaning		
Once	64	72.7
Twice	17	19.3
Thrice	7	8.0
Denture cleaning tools		
Toothpaste	51	58.0
Denture cleaning Tablets	6	6.8
Mild soap and water	31	35.2
Removing denture overnight		
Yes	49	55.7
No	39	44.3
Denture hygiene level		
Good	54	61.4
Fair	34	38.6
Total	**88**	**100**

Most 64(72.7%) of participants cleaned their dentures once a day. More than half 51(58.0%) of the participants used toothpaste and toothbrushes to clean their dentures. Most 49(55.7%) of the denture wearers removed their dentures at night. The participants had only good 54(61.4%) and fair 34(38.6%) denture hygiene. Table 4.

4. Discussion

In this study, all subjects, presented with periodontal disease with a prevalence of 53% [gingivitis (49.6%) and periodontitis (4.4%)]. The prevalence of periodontitis was lower than the previously reported range of periodontitis (15% - 57%) in Nigeria [21].

Gingivitis was a major contributor (49.6%) to periodontal disease in this study. Gingivitis is associated with poor oral hygiene and can be reversible with improved oral hygiene [2]. The results implied that awareness of the study groups should be drawn towards improving their oral hygiene.

The current findings are in accordance with the findings of a previous study, Mansuri et al [22], in which the denture wearers and the non-denture wearers have similar periodontal conditions. This could be due to the fact that the denture wearers seem to be better motivated. However, this was contrary to the report of other studies [7, 23], where worsening of periodontal conditions in prosthesis wearers than in non-wearers were reported.

In our study, 11.4% of the partial denture wearers visited the dentist regularly every six months for a dental check-up. In a similar study [8], only 3.7% of RPD wearers visited regularly every six months. The non-denture wearers fail to visit the dentist on a regular basis and usually seek the dentist only in case of symptomatic complaints. This could be due to the participants' lack of awareness of oral health care which could have affected their periodontal status. Overall, the dental visit of these participants was about 8%, this is in line with what the other studies reported [24,25].

Dental visits done regularly, every 6months, by all the participants, are important for prevention and control of oral diseases. The check-up visit provides the opportunity for oral health assessment, the dentures are examined, the remaining teeth assessed for periodontal diseases, dental caries, and other oral conditions. Early detection, and management of oral diseases is ensured [9]. Also, the instructions on oral and denture hygiene are reinforced [12].

To reduce plaque accumulation and improve oral health, regular examinations must be done, reinstructions and timely reinforcement should be done [7].

Almost all the participants (91.8%) used toothbrushes and paste as their tooth cleaning material. In this study the frequency of oral hygiene practice is inadequate. This is in line with the report by Oremosu and Soroye [23], where less than 50% of the participants brushed up twice daily. Adequate frequency is needed to reduce the risk of periodontal diseases. About 40% of the participants use dental floss or the interdental brush. This is in contrast with a Nigerian study on adults that reported the use of dental floss or other dental care tools by only 10.5% of the participants [24]. The twice daily tooth brushing and the use of interdental aids are the optimal for good oral hygiene practice which is not fully adopted by participants in this study.

Professional cleaning (scaling and polishing) was done by 25.2%, in contrast to the 75% reported from a similar study [23].

Regarding denture cleaning frequency, 72.7% of participants in our study cleaned their dentures once a day, contrary to 92.5% in Italy [26], and 28.5% in Tanzania [27]. Brushing the dentures once a day is recommended [27, 28], but the ideal is twice a day, every morning, and every night before bed [27].

For denture cleanliness in this study, 61.4% of the participants had good denture hygiene. Similarly, a Malaysian study [29], and a Nigerian study [30], reported that 68%, and 78.7% of their study participants had good denture hygiene, respectively. The overall well-being of the partial denture and oral health is supported by maintaining a clean and healthy mouth. Adequate denture hygiene will impact on oral health, leading to reduced risk of dental caries, periodontal diseases, denture stomatitis and halitosis [13].

Hence, the maintenance of good oral hygiene and denture hygiene plays a pivotal role in the overall dental health of these patients, as it directly impacts the condition of the remaining teeth and the effectiveness of retaining the removable appliances [16].

5. Conclusion

The results indicate that the participants, especially the RPD's wearers, should be motivated for extra adequate oral hygiene practices and dental visitations. Regular recall should be part of the routine care of RPDs wearers to reduce the risk of periodontal diseases caused by RPDs.

Emphasis should be placed on tooth brushing twice daily, with medium bristled toothbrush and fluoridated toothpaste, usage of interdental aids and visiting the dentist twice a year.

Compliance with ethical standards

Acknowledgments

All individuals who participated in the study.

Disclosure of conflict of interest

The authors declare no conflict.

Statement of ethical approval

Clearance was obtained from the Health, Research and Ethics Committee of Lagos State University Teaching Hospital (LASUTH), Ikeja

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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