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Prosthodontic Care and Its Impact on Daily Performance of Patients with Removable Partial Dentures

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A B S T R A C T

Objectives: This study assessed the impact of prosthodontic care on daily performance of patients with removable partial dentures (RPDs).

Materials and Methods: This longitudinal study was conducted on consecutive patients over 20 years of age who required RPDs presenting to an outpatient prosthodontic clinic over a 2-year period (2022-2023). Data on socio-demographics, history of tooth replacement/denture use, maintenance practices, attendance to recall visits, and impact on daily activities were recorded after using the RPDs by the participants. Data were also collected over the course of recall appointments using structured questionnaires according to the American College of Prosthodontists' denture care and maintenance guidelines and the oral impacts on daily performance (OIDP) questionnaire. Comparisons were made by the Kruskal Wallis and student t tests and multiple logistic regression (alpha=0.05).

Results: A total of 332 participants with a mean age of 45.69±17.90 years were evaluated, including 49.7% males and 50.3% females. The highest percentage of recall visits was at 1 week (26.8%). Attendance at recall appointments (P=0.00) and sleeping with RPD (P=0.001) were significantly associated with OIDP scores. Sleeping with RPDs (P=0.001) was significantly related to, and acted as a predictor of OIDP score [$X^2(4)=15.46$, $P<0.04$].

Conclusion: Recall attendance was low, and overnight denture use and frequent recall visits had a greater impact on daily activities than other factors. Sleeping with dentures was a predictor of impact of denture use on daily performance.

Keywords: Activities of Daily Living; Denture; Partial; Removable, Longitudinal Studies

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INTRODUCTION

Removable partial dentures (RPDs) are commonly used for replacement of the lost teeth because of their affordability [1]. They are usually made of materials such as metal, acrylic resin, and flexible/Valplast® materials. Although RPDs have various advantages such as improvement of esthetics and function, and maintaining the integrity of dental arch [2-4], they also have drawbacks such as increased risk of plaque and oral biofilm accumulation that can lead to periodontal disease or dental caries, and could subsequently result in tooth loss [5]. The acrylic resin type of RPDs is most commonly used [6], but has the tendency of adversely affecting the periodontal tissue in contact with the resin denture base [5]. To overcome this drawback, and to reduce the risk and improve outcome, attention is placed on the design of prosthesis as well as development of a maintenance protocol [7,8]. The concept of long-term maintenance

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protocol ensures the durability of restoration and enhancement of oral health [9]. There are two major clinical practice guidelines, traditional and modern, that provide clinicians with directions to diagnosis, treatment planning, and decision-making [10,11]. The former is based on knowledge and experience of health experts; while, the latter is based on methodical and transparent method of analysis of scientific evidence, along with regular updates and modifications based on the most recent scientific evidence [10,11]. It is important to ensure the concept of maintenance in management of patients with acrylic RPDs.

Prosthetic care involves both self-care and professional care [12]. The self-care practices involve tooth brushing, denture cleaning, and denture storage [12]. Professional care involves routine recall visits that encompass oral examination, denture examination, professional denture cleaning, and repair or replacement of prosthesis [13].

The American College of Prosthodontists published a clinical practice guideline for the recall and maintenance of patients with prostheses in 2016 [14]. This guideline recommends recall intervals minimally every 6 months for professional examination; while, those at higher risk (age, inability to clean) should have shorter intervals between recalls [14]. Despite the recommendations of this clinical practice guideline, evidence shows that many treatments yielding favorable results do not necessarily have scientific evidence [9]. A Routine recall visit is advised to prevent adverse complications, restoration damage, and oral tissue problems in patients with tooth-borne restorations [15]. Damaged restorations and oral tissue complications can impact on daily performance and lifestyle [15]. The question is, what impact does the prosthetic care of dentures have on daily performance of denture wearers?

This impact on daily performance and lifestyle can be evaluated using socio-dental indicators [16]. Over the years, different socio–dental indicators have been advocated to capture people's perceptions of factors that are significant in their daily activities and also match conventional clinical assessments [16]. One of the most commonly used socio-indicators is the oral impact on daily performance (OIDP) inventory. It demonstrates strong theoretical coherence, reduces the double scoring of the same oral impacts on different levels, and covers physical, psychological, and social dimensions of daily performance [16]. Its reliability and validity are affected by cultural differences in attitudes, beliefs, and values; thereby, requiring revalidation of its psychometric properties for its applicability in different socio-cultural contexts [17]. This socio-dental indicator has been validated in Nigeria [18]. This study aimed to determine the impact of prosthetic care on daily oral performance of patients with RPDs. The null hypothesis of the study was that an increase in self and professional care would have no significant effect on the OIDP score or daily performance.

MATERIALS AND METHODS

Study design:

This study was carried out as a descriptive longitudinal study over a 2-year period on adult patients who sought and had RPDs for their missing teeth. The study was carried out in accordance with the criteria for observational studies provided in the STROBE guidelines [19].

Study location/population:

This study included all consecutive consenting adults seen at the prosthetic dentistry clinics of two teaching hospitals, Lagos University Teaching Hospital and the University of Maiduguri Teaching Hospital.

Using Open Epi (https://www.openepi.com/SampleSize/SSPropor.htm), the minimum required sample size was calculated to be 310 participants, assuming an estimated annual patient number of less than 10,000 seen in the three clinics with a confidence interval of 95%, a design effect of 1 for cluster sampling, and a 10% attrition rate. Participants had to be partially dentate without uncontrolled systemic disorders, and had to provide consent to participate in the study.

Data collection:

Data collection was carried out by two trained

and calibrated investigators (kappa 0.90–0.96), one at each center, using two uniform and standardized questionnaires. At baseline, one interviewer administered questionnaire 1 with a section that sought information on demographics and socioeconomic factors, while the second questionnaire was a self-administered, validated OIDP questionnaire (questionnaire 2). The OIDP consists of 9 items/questions, and each individual question was individually rated using a 4-point Likert scale as 0=never affected, 1=less than once a month, 2=once or twice a week, 3=three to four times a week, 4=every/nearly every day. The minimum score for each participant was 0, and the maximum score was 36. The questions sought to determine the frequency of the occurrence of factors such as difficulty in chewing, being comfortable, speaking/pronouncing words, cleaning teeth, speaking and relaxing, smiling, maintaining an emotional state, carrying major work, and socializing with others. Data collection continued at recall visits of 24 hours, 1 week, 3 months, 6 months, and 1 year after acrylic RPDs were fabricated and fitted for the participants. All RPDs were fabricated using similar laboratory processes and materials. The second section of the questionnaire 1 was used to record information on prosthetic care, recall regimen [20], and denture storage [21]; while, the OIDP questionnaire was also administered at these recalls. Participants who did not show up for the recall session were contacted by phone.

Data analysis:

Data were analyzed using SPSS version (IBM Corp., Version 20 Armonk, NY, USA: IBM Corp.) The intragroup comparison was performed using the Kruskal-Wallis test as the data was positively skewed (0.70). Student t-test was used to compare means of daily oral performance scores. Multiple logistic regression was used to assess the impact of prosthetic care on oral daily performance. The level of significance was set at 0.05. Considering the WHO age grouping [22] and also the life expectancy of the population in Nigeria, age was grouped into 3 categories: <35 years (youth), 35-59 years (middle age), and ≥60 years (elderly).

Ethical considerations:

Ethical approval (ADM/DCST/HREC/APP/3503) was obtained from the Health Research and Ethics Committee of the Lagos University Teaching Hospital before the commencement of the study. The conduct of the study also followed all the principles of the Declaration of Helsinki [23].

RESULTS

A total of 332 participants between 16 to 98 years with a mean age of 45.69±17.90 years were evaluated in this study. The gender distribution of the participants was approximately equal (49.7% males/50.3% females). Most participants (n=142, 43.4%) were in the age group of 35–59 years.

Figure 1 summarizes the proportion of attendance at different recall appointments. Attendance for recall appointments was observed to be low in this cohort. The highest proportion of attendance for recall was seen at 1 week (26.8%) post-insertion of restoration, and decreased to the lowest at 1 year (6.89%).

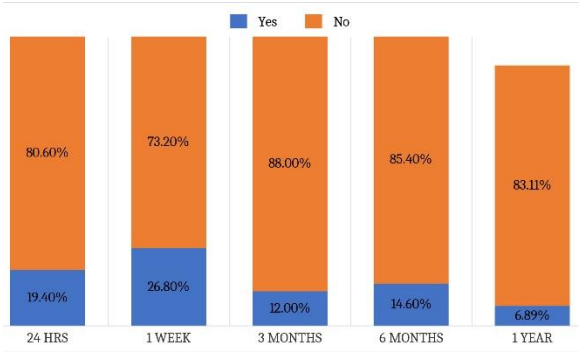


Fig 1. Distribution of participants attending the recall appointments.

Table 1 presents the association between the participants' demographics and clinical factors with recall visits. A higher number of males (41.2%), middle-aged adults (32.6%), those without any oral mucosal changes (38.5%), and those who did not sleep with dentures in their mouth (38.7%) attended recall visits. However, these differences were not statistically significant (P>0.05).

Table 1. Association of socio-clinical characteristics with recall visits

Variable		B Recall		Total	Chi Square	p value
		Yes n (%)	No n (%)			
Gender	Male	68(41.21%)	97 (58.79%)	165(100%)	0.89	0.93
	Female	55(32.93%)	112(67.07%)	167(100%)		
Age	<35 years	40(38.46%)	64(61.54%)	104(100%)	4.01	0.14
	35-59 years	47(32.64%)	97(67.36%)	144(100%)		
	≥60 years	36(42.86%)	48(57.14%)	84(100%)		
Frequency of Daily Tooth Brushing	≤1	56(31.28%)	123(68.72%)	179(100%)	8.69	0.01*
	>1	67(43.79%)	86(56.21%)	153(100%)		
Change in Oral Mucosa	Yes	6(21.42%)	22(78.58%)	28(100%)	3.21	0.52
	No	117(38.49%)	187(61.51%)	304(100%)		
Sleeping with Denture	Yes	27(32.14%)	57(67.86%)	84(100%)	2.29	0.32
	No	96(38.71%)	152(61.29%)	248(100%)		

* Statistically significant (P<0.05); ** reference age group.

Frequency of brushing was observed to be associated with recall visits with a higher proportion of those brushing more than once a day (43.8%) attending recall appointments more frequently (P=0.01).

Table 2 summarizes the association between self and professional prosthetic care and socio-clinical characteristics with daily life scores. Attendance at recall appointments (P=0.00) and sleeping with dentures (P=0.001) were significantly associated with the OIDP scores. Also, 65% (80/123) of the participants attending recall appointments had an OIDP score greater than zero versus 51% (107/209) of non-attenders. A higher number of participants (151/248, 60.89%) who did not sleep with dentures in their mouth had OIDP scores greater than zero than those who slept with their dentures (31/84, 36.9%).

Table 3 shows the participants' variables that were significantly associated with OIDP, frequency of brushing and sleeping with dentures, in a logistic regression model to ascertain their effect on the OIDP score. The logistic regression model generated was statistically significant [$X^2(4)=15.46$, P<0.04]. The model explained 5% (Nagelkerke R^2) variance in OIDP score and correctly classified 60.7% of the cases. Sleeping with denture was significantly (P=0.001) associated with OIDP scores and acted as a predictor of OIDP, but frequency of tooth brushing was not associated with OIDP score (P=0.80) The odds of having OIDP scores>0 were 4.25 times greater in those not sleeping with dentures than those sleeping with dentures.

DISCUSSION

The process of RPD fabrication and its fitting denote dedicated planning from diagnosis to actual treatment by professionals [24]. The eventual outcome of denture use is dependent on both patients and dental clinicians [25]. Proper education and guidance on the use of dentures and attendance at recall visits reduce associated problems with the prosthesis, and improve denture success rate [9]. The major contribution of this study was in the description of the association of recall visits by RPD wearers with their socio-clinical characteristics that included gender influences, oral mucosal changes, self and professional care, and the association of these variables with their daily life. The literature is not rich on this aspect of RPD use and management.

The mean age of patients in this study indicated that most of the participants that received RPDs were middle-aged individuals similar to a previous report [26]. This contrasts with the result of another study that reported that the majority of patients were above 65 years of age with a mean age of 52.58±17.84 years

Table 2. Association of socio-clinical characteristics, and self and professional care with oral impacts on daily performance (OIDP) score

Variable		OIDP score ≤0 n (%)	OIDP score >0 n (%)	Total	Chi Square	p value
Gender	Male	74 (44.85%)	91(55.15%)	165(100%)	0.47	0.79
	Female	78(46.71%)	89(53.29%)	167(100%)		
Age	<35 years	50(48.04)	54(51.96%)	104(100%)	2.86	0.83
	35-59 years	59(40.85%)	85(59.15%)	144(100%)		
	≥60 years	36(42.86%)	48(56.96%)	84(100%)		
Recall	Yes	43(34.96%)	80(65.04%)	123(100%)	17.13	0.00*
	No	102(48.80%)	107(51.20%)	209(100%)		
Sleeping with dentures	Yes	53(63.10%)	31(36.90%)	84(100%)	14.57	0.00*
	No	97(39.11%)	151(60.89%)	248(100%)		
Frequency of daily tooth brushing	≤1	80(46.24%)	93(53.76%)	173(100%)	0.45	0.80
	>1	70(44.03%)	89(55.97%)	159(100%)		

* Statistically significant (P<0.05).

Table 3. Logistic regression for the association between socio-demographic characteristics and self-prosthetic care with oral impacts on daily performance (OIDP) score

Variables	Step 1 OR (95% CI)	P value	Wald	Exp	95%CI for EXP	
					Lower	Upper
≤1	1	0.77	0.09	1.071	0.68	1.68
>1	1.1 (0.7-1.7)					
Yes	1	0.001*	10.753	0.425	0.26	0.71
No	2.6 (1.6-4.6)					

Step 1: Model fit Cox and Snell R Square R^2=0.047 model Chi square is 15.46; df=4, P=0.04; * Statistically significant (P<0.05); The overall percentage of correctly classified cases was 60.7%.

majority of patients were above 65 years of age with a mean age of 52.58±17.84 years [27]. This difference may be due to more adults keeping their teeth into older ages [28]. A few Nigerian studies have reported both findings [27,29].

In this study, the rate of recall visits after insertion of restoration was very low, with a higher proportion of recall attendance at 1 week and at 6 months post-insertion, decreasing to the lowest at 1 year. Data for comparison in the literature are very scarce, but over 30 years ago Mericske-Stern et al. [30] reported that less than half of the participants in their study attended recall appointments. Ten years later, another study reported a high compliance with recall attendance in a cohort using implant overdentures [31]. This contrast might suggest regional differences in patients' attitudes and perceived need to care more for implants because of the cost. Few Nigerian studies have reported low recall visits, with one of them reporting very low recall visits, especially at 6 months [27,32]. Placement of denture still involves long-term visits to the dentist and does not end by denture delivery [33]. Special attention is needed by patients during the first few days, post-insertion, and it was noted that the rate of recall visits was higher at 24 hours (85.8%) post-insertion, with a gradual decrease in attendance with subsequent recall visits as reported by Sadr et al. [33]. Another study reported 87% attendance of recall visits at 24 hours post-insertion, with a gradual decrease with subsequent visits [34]. The two latter studies from different regions reported

findings that differ from ours regarding low attendance, especially at 24 hours, although there was a slight improvement in attendance one week after the insertion of dentures. If attendance at all other recall periods was higher than at 24 hours, it could be suggested that the RPDs did not require adjustment. Otherwise, it would signify the participants' poor attitude to professional care. There is a suggestive implication of patients' negative attitude to professional care, as successful denture treatment requires long-term professional care such as recall visits. The report also suggests regional differences with a need to develop an interventional method of improving patients' attitudes to post-insertion recall visits. Not keeping recall visits is associated with a risk of poor denture hygiene that subsequently leads to caries, periodontal disease, further tooth loss in partially dentate patients, denture stomatitis, and further impairment of denture function [35]. It was also noted that participants who brushed more than once daily attended the recall visits more frequently than those who brushed once daily or less. This suggests a form of better oral health awareness and motivation of self-oral care among this group as could be expected from their frequency of oral hygiene practice. Those who observe prosthetic self-care are more likely to observe professional prosthetic care. A previous study [36] noted a strong association between oral hygiene habits and denture care. It reported a higher proportion (39.40%) of participants brushing more than once daily having a good level of denture care than the proportion of those brushing once a day (26.34%). It was concluded that the type of verbal or written postoperative advice and oral hygiene habits have a significant impact on denture care [37]. Other factors suggested for denture maintenance success include patients' knowledge of denture care, hygiene habits, and motivation [37].

In the present study, a significant association was found between recall visits, sleeping with dentures, and OIDP scores. The number of participants (65.04%) who came for recall visits and had OIDP scores > 0 was higher than the number of participants (51.20%) who did not come for recall visits. An increase in OIDP score indicates difficulty in OIDP domains. This suggests difficulty in chewing, being comfortable, speaking/pronouncing words, cleaning teeth, speaking and relaxing, smiling, maintaining an emotional state, carrying out major work, and socializing with others. Since it has been established that most patients visit a dentist due to pain or when there is a complaint, the tendency and logical reasoning would be that individuals with RPDs would most likely visit a dentist when there are complaints about their RPD [36].

In this study, a quarter of the participants slept with their dentures, although they had been instructed to wear dentures overnight for only 72 hours post-insertion. This finding is in contrast to a previous study [38] that reported that about half of the participants slept with their dentures overnight beyond the prescribed immediate post-insertion period. The reason for this higher rate was attributed to participants reporting that the dentists instructed them to wear dentures overnight. The majority (63.1%) that slept with dentures had OIDP scores OIDP scores were categorised as $\leqq 0$ or $\geqq 0$(Table 2), which was supported by the regression analysis that showed sleeping with dentures can predict the impact of denture use. This finding might be an indication of acceptability and adaptation to dentures. However, overnight denture use implies plaque accumulation, periodontal disease, positive culture for Candida species, and increased circulating interleukin-6 [39]. A similar study assessing the effect of denture maintenance on the satisfaction level of elderly patients using RPDs found that appropriate education regarding denture use is important because denture maintenance affects the degree of satisfaction. This study, however, established a link between oral care and recall visits and subsequently better OIDP scores [40].

The present study was limited by the scarce data on the association of recall visits for RPD care and oral impacts using the OIDP, which limited

comparisons with other studies. Also, the present study did not assess the effect of denture design and satisfaction on daily activity and recall tendency. The present findings, however, provided a basis for further studies, preferably multicenter, on other patient-related variables, as it was noted that only 5% of the variation in the oral impact (OIDP score) was due to the studied variables.

CONCLUSION

This study determined that attendance at recall appointments by patients using RPDs was significantly better among those who brushed their teeth more than once daily. Those who did not sleep with dentures in their mouth and those with more frequent recall visits reported a significantly higher positive impact on their daily performance. Sleeping with dentures in the mouth was a predictor of the impact of denture use on daily performance as it decreased the impact on daily performance.

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CONFLICT OF INTEREST STATEMENT

None declared.

GENERATIVE AI IN SCIENTIFIC WRITING

None declared.

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