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Original Article

Impact of prosthetic rehabilitation on oral health-related quality of life of Saudi Adults: A prospective observational study with pre–post design

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ABSTRACT

This study aimed to assess the impact of prosthetic treatment on the quality of life of partially/completely edentulous patients through the Oral Health Impact Profile-14 (OHIP-14) scale. This pre-post observational study was conducted in the College of Dentistry, Imam Abdulrahman Bin Faisal University, Saudi Arabia, between November 2022 and September 2023. Eligible participants were those aged between 26 and 80, in need of prosthetic treatment, and able to complete the questionnaire voluntarily. The questionnaire presented to the patients had two sections; the first included demographic and dentures-related variables, and the second included the OHIP-14 questionnaire. Differences in overall OHIP-14 scores after treatment about demographic and prosthesis-related factors were assessed using the Mann-Whitney *U* test/Kruskal Wallis test with a significance level of 0.05. Out of 108 participants, 65 were males, and 43 were females with an average age of 52 years with different prosthetic treatments (13.9 % fixed prostheses, 43.5 % removable partial, and 42.6 % complete dentures). 59.3 % brushed their teeth twice or more daily, and only 36.1 % checked them regularly. Comparison between the OHIP-14 items before and after treatment revealed that subjects exhibited improvement in all the domains. OHIP-14 scores did not differ significantly in terms of age, gender, and education after treatment. OHIP-14 score was considerably higher for patients with medical conditions ($P = 0.007$) and among complete denture wearers compared to patients with fixed prostheses ($P = 0.025$). Prosthetic treatment positively impacts oral health-related quality of life (OHRQoL), which improved after treatment, particularly in the social domain. There was an association between patients' medical condition, prosthesis type, and OHIP-14 score.

1. Introduction

Edentulism affects individuals' speech, mastication, esthetic, and psychological well-being (Ozdemir et al., 2006). Accordingly, dental professionals are required to design a proper treatment plan to fulfill patients' chief complaints and meet their expectations with an acceptable dental prosthesis (Tabassum et al., 2017).

OHRQoL is a multidisciplinary concept that assesses biological and psychological situations linked to oral health. Information extracted from the OHRQoL concept is helpful in developing patient-focused treatment plans in the clinical field. In the educational aspect, it teaches health personnel to consider the patient's specific needs and problems rather than a treatment problem or outcome (Campos et al., 2021). Moreover, the dental field would rely on improving the population's health rather than focusing only on developing an innovative dental technique or dental treatment (John, 2021).

Several indicators were recognized by the World Health Organization to assess the OHRQoL, but the most comprehensive indicator is the Oral Health Impact Profile (OHIP) (Slade and Spencer, 1994). The OHIP-14 questionnaire is a concise index developed from the extensive OHIP-45 items measure (Locker, 1988). Previous studies assessed the correlation between OHIP-14 parameters and tooth loss (Rodakowska et al., 2022; Rocha et al., 2016; Bortoluzzi et al., 2012). Anbarserri et al. (2020) and Imam (2021) reported adverse effect of tooth loss on

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OHRQoL.

Multiple factors affect treatment selection and OHRQoL including the demographic variables, patients' experience of wearing dentures, technique of denture fabrication, dentists' clinical expertise, and patient-dentist relationship (Oweis et al., 2022). The lack of literature discussing this topic in Saudi Arabia enhanced the author's search for the contributing factors affecting OHRQoL among the Saudi population.

The current study aims to assess the impact of prosthetic treatment on the quality of life of partially and completely edentulous patients through the OHIP-14 scale. The null hypothesis states that sociodemographic variables and prosthetic treatment will not significantly affect the oral health quality of participants' lives.

2. Materials and methods

2.1. Study sample and design

This pre-post observational comparative study was conducted in the College of Dentistry, Imam Abdulrahman Bin Faisal University, Saudi Arabia, between November 2022, and September 2023. The study was granted ethical approval from the Institutional Research Ethics Board prior to initiating it (IRB-2022-02-468). Moreover, eligible patients signed an informed consent before undergoing the examination procedure and answering the survey questions. The consent form included a statement mentioning that the patients' participation is voluntary and they can withdraw their consent at any time. The consent form also included the name of the investigators, the study title, and the aim of the study.

A total of 108 patients were calculated based on 5 % alpha error, 80 % power, and a change in OHIP-14 score after 1 month of prosthetic rehabilitation, yielding an effect size of 0.284, according to a previous study (Fueki et al., 2015). Adult participants were eligible to participate if they were above 25 years old, needed prosthetic replacement of their partially or completely edentulous jaws, and could complete the questionnaire without assistance. Patients were excluded if they had dementia, a systemic disease that could affect the treatment outcome, such as neuromuscular disorder, temporomandibular joint disorder, or severe bone resorption. Additionally, patients who didn't complete their treatment or did not attend the follow-up appointments were excluded from the study, and the senior staff rated the dental prostheses unacceptable. Patients whose treatment plan included only a single crown were excluded.

2.2. Prostheses fabrication and evaluation

The dental prostheses were fabricated at the prosthodontic clinics of the college of dentistry. The quality of the dental prostheses was evaluated under the supervision of senior prosthodontic specialists, following standardized methods and the rubrics of the corresponding prosthesis. One investigator was responsible for evaluating the removable partial or complete dentures, and another investigator evaluated the fixed partial dentures. The rubrics included all fabrication steps for complete, partial, and fixed dentures. The complete and partial removable dentures were evaluated for adequate retention, stability, occlusion, esthetics, phonetics, vertical dimension of occlusion, and free-way space. On the other hand, fixed partial dentures (FPDs) were considered adequate according to the criteria mentioned in Ryge's guidelines (Crisp et al., 2008; Sulaya and Guttal, 2020). The requirements included in the assessment of FPDs were the anatomical contour, color stability (free of staining), marginal adaptation, shade matching, surface smoothness, pontic ridge design, periodontal health, speech, mastication efficiency, absence of pain, porcelain chipping or fracture. Any dental prostheses the supervisors judged unacceptable according to the previously mentioned criteria were made over for the patient.

2.3. Questionnaire

The questionnaire included two sections, and it was distributed to the patients by a dentist (MG) who didn't participate in the treatment process for any of the patients at any stage. The first section included demographic and dentures-related variables: patients' age, gender, income, education, medical history, smoking habits, and past prosthetic history (number of previous complete or partial dentures and time since current complete dentures).

The second section included OHIP–14; patients were asked to answer the Arabic version of the OHIP-14 questionnaire (Osman et al., 2018; Al Habashneh et al., 2012) before dental treatment on the first admission and at the follow-up session after one month of using the dental prosthesis. OHIP-14 questionnaire comprises 14 items sorted into seven domains (functional limitation, pain, psychological discomfort, physical disability, psychological disability, social disability, and handicap). For each OHIP-14 item, patients were asked how frequently they experienced the impact of that item. A five-point Likert Scale was used to record the participants' responses to the questionnaire: 0, never; 1, hardly ever; 2, occasionally; 3, fairly 4, often; and 5, very often. The total score of the OHIP-14 was calculated by adding all responses and thus ranged from 0 to 56 points. The participants who scored high in OHIP-14 had poor OHRQoL and decreased satisfaction with the dental prosthesis.

2.4. Statistical analysis

At baseline, the internal consistency of OHIP-14 was measured using Cronbach's alpha to capture the extent of agreement among all domains and items. Alpha values > 0.80 indicate a reliable scale, although values > 0.70 indicate an acceptable scale. The normality of OHIP-14 items was checked using the Kolmogorov-Smirnov test, quantile–quantile plots (Q-Q plots), and non-normal distribution was approved. OHIP-14 scores were presented using mean, standard deviation, median, minimum value, maximum value, and interquartile range, while frequency and percentage were used to demonstrate the qualitative variables. Differences in patients' responses before and after treatment were assessed using the Wilcoxon Sign Rank test. After treatment, differences in overall OHIP-14 scores about demographic and prosthesis-related factors were assessed using the Mann-Whitney *U* test or the Kruskal Wallis test. The significance level was set at a P-value of 0.05. All tests were two-tailed. Data were analyzed using the International Business Machine Corporation (IBM) Statistical Package for the Social Sciences (SPSS) statistics for Windows, version 23, Armonk, NY, USA.

3. Results

108 adults completed the study out of 137 participants, with a response rate of 78.8 %. Reliability analysis of the scale's internal consistency showed a Cronbach's alpha value of 0.922, indicating the strong scale's internal reliability. Alpha values for almost all items ranged from 0.722 to 0.820, thus indicating acceptable items (Table 1).

Table 1
Internal consistency of the OHIP-14.

	Corrected item – total correlation	Cronbach's Alpha if item deleted
Functional limitation	0.738	0.911
Physical pain	0.722	0.919
Physical disability	0.820	0.903
Psychological discomfort	0.777	0.909
Psychological disability	0.780	0.907
Social disability	0.778	0.908
Handicap	0.740	0.911
All items (Cronbach's Alpha)	0.922	

The participants mean age was 51.82 ± 13.12 years, 60.2 % were males, 95 % were married, 40.7 % were school graduates, 38 % had monthly income more than 1000 SAR and 56.5 % had a family size of 5 to less than ten members. Most of the participants were non-smokers (74.1 %) and were not suffering from any medical conditions (62 %) (Table 2). Fig. 1 represents prosthesis-related factors and oral health behaviors. Among the participants, 13.9 %, 43.5 %, and 42.6 % had fixed prostheses, removable partial or complete dentures, respectively. 28 % wore dentures longer than one year, and 31.5 % of the patients had no previous dentures. 59.3 % brushed their teeth twice or more daily, and only 36.1 % checked them regularly.

Although the comparison between the OHIP-14 items before and after treatment revealed that subjects exhibited improvement in all the domains, only the social impact domain showed a significant reduction in social disability and handicap scores (P = 0.012, and 0.012, respectively) (Table 3).

There were no significant differences in OHIP-14 scores following treatment regarding age, gender, and education. However, it was observed that male patients under 50 with an education level below high school reported a more significant impact on their oral health. Similarly, patients having two or more dentures had higher OHIP-14 scores (4.29 ± 4.44), followed by those with one denture (3.69 ± 4.57), compared to individuals who were new denture wearers (3.33 ± 6.51), but the difference was not significant.

The OHIP-14 score was significantly higher for patients with medical conditions (P = 0.007) and those wearing complete dentures than those with fixed prostheses (P = 0.025). Patients who exhibited infrequent tooth brushing and irregular dental check-ups demonstrated higher yet insignificant OHIP-14 scores than those who regularly brushed their teeth and underwent dental examinations (Table 4).

4. Discussion

The present study evaluated the influence of various dental prostheses on the oral health impact profile among adult patients. The study's null hypothesis was partially accepted because the sociodemographic factors did not significantly affect the OHIP-14 scores. At the same time, the type of dental prosthesis and medical condition significantly affected the oral health quality of patients' lives.

The results showed a decrease in OHIP-14 total score and in all domains after treatment, significantly reducing social disability and handicap scores. Similar findings were reported by Nunez et al. (2015) and Regis et al. (2013) when evaluating the quality of life (QoL) related to oral conditions using the Brazilian version of the OHIP-Edentulous scale after treatment with conventional and simplified complete denture (CD) during short-term follow-up until 6-months. In line with the present findings, Martins et al. (2022) showed improved OHRQoL among patients having CD for at least three months either in single or both arches, and the positive impact was maintained for one year of usage.

The patients' score for OHIP-14 was highest for complete dentures, followed by removable partial dentures and fixed partial dentures, which showed the lowest score with significant differences. Previous studies reported high patient satisfaction with fixed dental prostheses (Albaqawi et al., 2023; Kashbur and Bugaighis, 2019). It could be attributed to the patients' feeling of fixed prostheses like natural teeth, unlike removable dentures, in addition to the superior esthetics and function of fixed dental prostheses compared to removable ones. However, the results of the present study showed improvement in patients' scores on OHIP-14 after treatment with all tested dental prostheses, which agrees with previous studies. (Shrestha,et al., 2020; Montero et al., 2012; Preciado et al., 2013a).

The 'Physical pain' subscale showed the highest scores before and after treatment among the OHIP-14 domains in line with the literature. The reason could be that it is the most integral component for a decline in the self-perceived OHQoL with complete removable prostheses. 'Psychological disability' and 'Social disability' subscales are essential causes of the general patients' concern (Meijer et al., 2003). The results showed a significant reduction of the subscales 'Social disability', and 'Handicap' after treatment. Similarly, the total score was reduced after treatment with no statistical difference.

The socio-demographics didn't significantly influence the OHIP score after prosthetic treatment. Similar findings were reported previously, where patients' age and gender did not show a significant influence on their quality of life following the use of dental prostheses (Shrestha,et al., 2020; Niakan et al., 2024; Perea et al., 2015a; Preciado et al., 2013a). It could be explained by the worldwide increase in health awareness targeting a vast population. Another reason could be the close conditions of the patients in this study, who were all treated at the same University Hospital. In agreement, Poljak-Guberina et al. (2005) found that sociodemographic factors did not significantly affect patients' satisfaction with dental prostheses Furthermore, the educational level did not substantially impact OHIP scores after the treatment. This finding aligns with prior studies demonstrating the lack of association between education and the outcome measure (Preciado et al., 2012; Preciado et al., 2013b). However, Deeb et al. (2020) stated that the OHIP in individuals receiving removable dental prostheses is significantly affected by smoking, socioeconomic position, educational attainment, and health.

Nevertheless, the elderly participants in this study exhibited comparatively lower OHIP scores than their younger counterparts, without any statistically significant disparities. This observation may be attributed to the fact that older individuals often encounter numerous medical conditions, leading them to tolerate dental problems (Perea et al., 2013; Perea et al., 2015b; Preciado et al., 2012; Preciado et al., 2013a).

In the present study, patients' history of denture wear did not significantly affect overall satisfaction. The results also showed lower scores for patients who used dentures for more than one year compared to those with no experience or less than one year, but the difference was not significant, which comes in agreement with previous studies (Erić et al., 2017; Marin et al., 2014; Oweis et al., 2022). Patients' previous experience with denture wear might have improved their adaptation and satisfaction with the new denture (Asli et al., 2021).

Patients who suffered from medical illnesses reported higher OHIP-14 scores. Limited data is available on the correlation between complete denture treatment and OHRQoL in patients with systemic conditions. However, previous studies investigated the association between diabetes mellitus and periodontal diseases and its impacts on the OHRQoL. Diabetes mellitus is accompanied by different oral mucosal

Table 2
Demographic characteristics of the study participants.

Variables		N = 108
Age: Mean (SD)		51.82 (13.12)
Age groups	≥50 years	53 (49.1 %)
	<50 years	55 (50.9 %)
Gender: n (%)	Males	65 (60.2 %)
	Females	43 (39.8 %)
Marital Status: n (%)	Single	13 (12 %)
	Married	95 (88 %)
Educational levels: n (%)	Less than high school	21 (19.4 %)
	High School	44 (40.7 %)
	University and above	27 (25 %)
Monthly family Income (SAR): n (%)	1000–<5000	14 (13 %)
	5000–<10000	16 (14.8 %)
	≥1000	11 (10.2 %)
Size of Family members: n (%)	1–≤5	24 (22 %)
	5–≤10	61 (56.5 %)
	>10	16 (14.8 %)
Smoking: n (%)	Yes	28 (25.9 %)
	No	80 (74.1 %)
Medical conditions: n (%)	Yes	40 (37 %)
	No	67 (62 %)

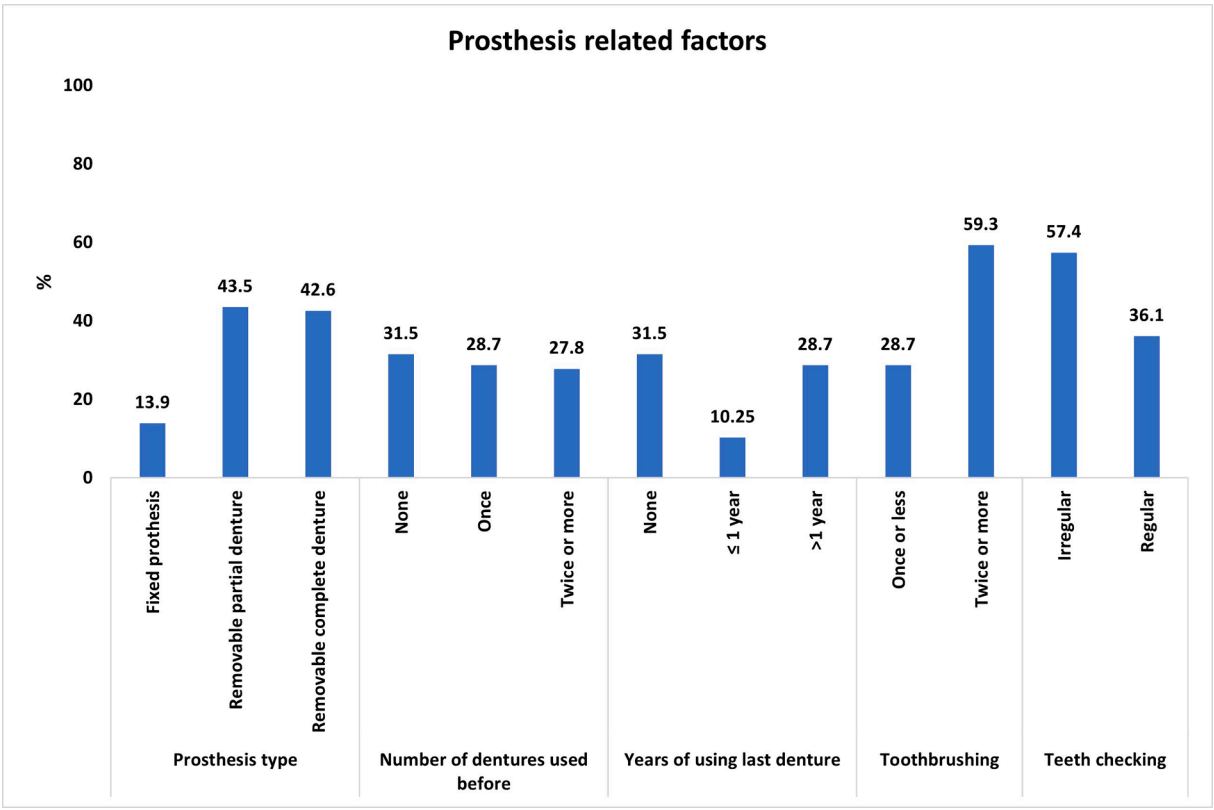


Fig. 1. Prosthesis-related factors and oral health behaviors of the study participants.

Table 3
Comparison between OHIP-14 subscales and overall score before and after treatment.

OHIP-14 items		Before			After			*P* value
		Mean (SD)	Median (IQR)	Min–Max	Mean (SD)	Median (IQR)	Min–Max	
Physical impact	Functional limitation	0.71 (1.80)	0 (0–0)	0–8	0.62 (1.21)	0 (0–1.0)	0–5	0.906
	Physical pain	1.26 (2.18)	0 (0– 2.0)	0–8	0.35 (1.79)	0 (0–3.0)	0–6	0.608
	Physical disability	0.53 (1.63)	0 (0–0)	0–8	0.46 (1.00)	0 (0–0)	0–4	0.730
Psychological impact	Psychological discomfort	0.80 (1.94)	0 (0–0)	0–8	0.49 (0.93)	0 (0–1.0)	0–4	0.245
	Psychological disability	0.97 (1.82)	0 (0–1.75)	0–8	0.61 (1.13)	0 (0–1.0)	0–5	0.135
Social impact	Social disability	0.68 (1.81)	0 (0–0)	0–8	0.24 (0.64)	0 (0–0)	0–3	**0.012***
	Handicap	0.75 (1.91)	0 (0–0)	0–8	0.31 (0.81)	0 (0–0)	0–5	**0.012***
Overall OHIP score		5.69 (11.60)	0 (0–5.75)	0–56	4.08 (5.03)	2.0 (0–7.75)	0–26	0.823

*Statistically significant difference at p-value ≤ 0.05.

problems, including dry mouth, denture stomatitis, and an increase in candida adhesion (Verhulst et al., 2019; Rohani, 2019; Reddy et al., 2017). According to these findings, the authors proposed that the cause of high OHIP-14 scores in diabetic patients might result from denture stability impairment, erythema, and discomfort from deteriorated oral conditions generated from diabetes mellitus. Previous studies found that OHRQoL was lower among healthy patients upon complete denture treatment, confirming the present study's findings (Ganapathy et al., 2013; Nikbin et al., 2014; Radovic et al., 2014).

Examining the impact of various prosthetic types on OHRQoL patients is regarded as a notable aspect of the present study. This aspect aids in predicting the most suitable prosthesis type that is clinically accepted, taking into account individuals' socio-demographic profile and clinical characteristics. Consequently, it can significantly contribute to the decision-making process during discussions on prosthesis type and patient education (Perea et al., 2015a; Perea et al., 2015b).

However, one of the limitations of this study was that the participants enrolled were solely from a single center. Consequently, it is imperative to employ caution when interpreting the results. Another limitation is the short follow-up period. Furthermore, due to the relatively small number of participants who received different types of prosthetic treatments, it is strongly advised that a multi-center study be conducted. In addition, further studies encompassing a larger sample size and with an extended follow-up period are needed. Moreover, future studies that evaluate the effect of oral rehabilitation of only completely edentulous patients using another questionnaire would be essential to verify the present results.

5. Conclusions

The replacement of missing teeth has a positive effect on the OHRQoL social impact domain. The patient's medical condition and the type of dental prosthesis significantly impact their OHIP score.

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Table 4
Comparison of overall OHIP-14 score after treatment in relation to demographics, denture-related factors, and oral health behaviors.

		After treatment			*p* value
		Mean (SD)	Median (IQR)	Min–Max	
Age	≥50 years	3.30 (6.05)	0.0 (4.0)	0.0–26.0	0.052
	<50 years	4.19 (4.49)	3.0 (8.0)	0.0–16.0	
Gender	Males	4.28 (5.74)	2.0 (8.0)	0.0–26.0	0.836
	Females	2.21 (3.47)	0.0 (3.75)	0.0–11.0	
Marital Status	Single	5.77 (4.48)	5.00 (9.00)	0.00–12.00	0.095
	Married	3.85 (5.08)	1.00 (7.00)	0.00–26.00	
Education	Less than high school	6.64 (5.70)	8.0 (12.0)	0.0–16.0	0.234
	High School	3.46 (4.22)	1.0 (6.75)	0.0–12.0	
	University and above	2.42 (5.89)	0.0 (3.0)	0.0–26.0	
Monthly income	1000–<5000	5.00 (6.09)	2.00 (10.50)	0.00–16.00	0.351
	5000–<10000	7.81 (6.52)	7.50 (8.50)	0.00–26.00	
	≥1000	4.55 (4.74)	2.00 (9.00)	0.00–11.00	
Smoking	Yes	3.95 (4.16)	4.0 (8.0)	0.0–12.0	0.641
	No	3.63 (5.87)	1.0 (6.0)	0.0–26.0	
Medical conditions	Yes	5.18 (4.71)	4.0 (9.0)	0.0–16.0	**0.007***
	No	2.75 (2.75)	0.0 (2.75)	0.0–26.0	
Type of prosthesis	Fixed prothesis	2.42 (7.45)	0.0 (0.75)	0.0–26.0	**0.025*ɣ**
	Removable partial denture	3.17 (3.89)	2.0 (5.50)	0.0–12.0	
	Removable complete denture	4.76 (4.91)	3.0 (9.0)	0.0–16.0	
Number of dentures used before	None	3.33 (6.51)	0.0 (3.0)	0.0–26.0	0.631
	Once	3.69 (4.57)	1.50 (6.75)	0.0–12.0	
	Twice or more	4.29 (4.44)	3.0 (8.50)	0.0–12.0	
Years of using last denture	None	3.33 (6.51)	0.0 (3.0)	0.0–26.0	0.546
	≤1 year	4.73 (4.12)	4.0 (8.0)	0.0–11.0	
	>1 year	3.58 (4.45)	1.0 (8.0)	0.0–12.0	
Frequency of brushing	Once or less	5.19 (7.56)	0.0 (9.50)	0.0–26.0	0.911
	Twice or more	3.13 (3.96)	1.5 (4.25)	0.0–12.0	
Frequency of dental check up	Irregular	4.32 (5.06)	2.0 (8.50)	0.0–16.0	0.242
	Regular	3.24 (5.53)	1.0 (4.0)	0.0–26.0	

*Statistically significant difference at p-value ≤ 0.05.
ɣ Post hoc analysis between fixed prosthesis vs complete denture (P = 0.020).

CRediT authorship contribution statement

Shaimaa M. Fouda: Conceptualization, Methodology, Writing – original draft, Project administration. **Mohammed M. Gad:** Conceptualization, Methodology, Project administration. **Passent Ellakany:** Resources, Investigation, Writing – review & editing. **Mai El Zayat:** Investigation, Reviewing and editing. **Maher AlGhamdi:** Collecting data, Writing draft and revision. **Hams Abdelrahman:** Formal analysis, Software, Validation, Data curation, Writing – review & editing. **Mai Salah El-Din:** Methodology, Writing draft and revision, Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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