Comparing Oral Health-related Quality of Life (OHIP-14) and Masticatory Efficiency with Complete Denture Treatment

Kiran Fatima Mehboob Ali Bana[1], Sumaira Shadab[2], Saman Hakeem[2] and Farnaz Ilyas[2]

[1]Department of Health Professionals Education (Dental Section), Bahria University Medical and Dental College, Karachi, Pakistan
[2]Department of Prosthodontics, Bahria University Medical and Dental College, Karachi, Pakistan

ABSTRACT

Objective: To measure impact of oral health in complete denture wearers and its effects on masticatory efficiency with new complete dentures over the period of three months.

Study Design: Experimental study design.

Place and Duration of study: Department of Prosthodontics, Bahria University Medical and Dental College, Karachi, Pakistan from September 2019 to December-2019.

Methodology: Oral health impact profile (OHIP) was used to measure the oral health impact; and chewing gum method was used to measure the masticatory efficiency in this study. All participants were old denture wearers having the experience of at least 3 years and requiring new set of complete dentures. A total of 31 patients were asked to chew the gum from the routine site of mastication for 20 seconds. The weight reduction corresponded to the masticatory efficiency. The OHIP-14 score and masticatory efficiency was recorded at baseline and after three months of complete denture treatment. The data was analysed on SPSS version 23.

Results: The average values of masticatory efficiency were significantly reduced from median (IQR) value 1.20 (1.20-1.30) to 0.90 (0.70-0.90), respectively (p <0.001). There was a moderate positive correlation for physical pain and disability (0.407 and 0.455) at baseline and strong positive correlation (0.771 and 0.825) after 3 months of complete denture treatment with p-value <0.001 on OHIP-14 scale.

Conclusion: Statistically significant improvement was observed in both quality of life and masticatory efficiency after 3 months of treatment with conventional complete dentures. Masticatory efficiency was highly correlated with all subscales of OHIP-14 after treatment.

Key Words: Complete denture treatment, Masticatory efficiency, Oral health impact profile-14 (OHIP-14).

INTRODUCTION

Complete denture treatment is a challenge for prosthodontists, especially restoration of the masticatory function, which is the outcome of rehabilitation dentistry. The loss of teeth negatively impacts the nutritional status, function, physical/social wellbeing and self-esteem of an individual.[1] The complete denture treatment addresses function by increasing the muscular forces and maximal bite force gradually to improve masticatory efficiency.[2] Thereby, quality of life is also promoted.

The oral-health related quality of life (OHRQoL) is most widely used to measure the influence of dental care on overall wellbeing and social sphere.[3] It is comprised of 49 items divided into 7 subscales, and was designed by Adulyanon and Sheiham.[3] Oral Health Impact Profile-14 (OHIP-14) is a modified and abbreviated version of OHRQoL, and is valid instrument to evaluate the impact of dental care.[4] It is comprised of 14 questions; and subsequently, these items are divided into seven subscales, according to framework of conceptual oral health. This tool evaluates the basic functions of oral health (chewing, pain, food choice, speech), social consequences and psychological responses.[3] Score for each subscale is from 0-4; depending upon the extent of patient's disability on the specific domain.

There are various methods reported in literature[2,5-8] to measure the masticatory efficiency such as sieving method, chewing gum, silicone impression, gummy jelly, bagged almonds, capsulated and paraffin wax.[9]

Table I: Median, Q1 and Q3 values for masticatory efficiency at baseline and after 3 months of complete denture treatment (g).

	Baseline data			After 3 months			p-value
	Median	Q1	Q3	Median	Q1	Q3	
Masticatory efficiency	1.20	1.20	1.30	0.90	0.70	0.90	<0.001*

*P <0.05 (Wilcoxon signed rank test).

Table II: Median and quartiles for total score of OHIP-14 and individual domain scores within 7 domains at baseline and after 3 months.

	Baseline data			After 3 months			p-value
	Median	Q1	Q3	Median	Q1	Q3	
Functional limitation	3.0	0.0	5.0	6.0	4.0	6.0	0.001
Physical pain	4.0	4.0	6.0	6.0	4.0	8.0	0.002
Psychological discomfort	5.0	3.0	8.0	6.0	4.0	8.0	0.087
Physical disability	8.0	6.0	8.0	6.0	4.0	8.0	0.016
Psychological disability	6.0	4.0	6.0	6.0	4.0	8.0	0.240
	Mean*	SD*+		Mean*	SD*		p-value
OHIP-Total score	32.87	11.05		37.03	11.06		0.022
Social disability	3.8	2.4		5.5	2.26		<0.001
Handicap	4.0	2.1		3.3	1.7		0.051

Q_1: first quartile, Q_3: third quartile: Wilcoxon sign-rank test;   *Mean, SD: Paired t-test

Table III: Spearman correlation coefficients for the relationship between masticatory efficiency and parameters of OHIP-14 at baseline and after 3 months of complete denture treatment.

	R value at baseline	R value after 3 months
Masticatory efficiency	-.011	.051
Domain scores		
Functional limitation	.739**	.665**
Physical pain	.407**	.771**
Psychological discomfort	.866**	.833**
Physical disability	.455**	.825**
Psychological disability	.771*	.836**
Social disability	.728**	.904**
Handicap	.739**	.731**

**P <0.001

Leles *et al.* reported that masticatory efficiency enhanced among complete denture wearers by the method of chewing gum, which was considered appropriate among as surface resin did not stick to the gum.[10]

There is a dearth of studies conducted by using oral health impact profile (OHIP-14) after complete denture treatment in Pakistan.

Therefore, this study was aimed to measure the impact of oral health in complete denture wearers and its effects on masticatory efficiency with new complete dentures over the period of three months.

METHODOLOGY

This experimental study was conducted at Department of Prosthodontics, Bahria University Medical and Dental College, Karachi, Pakistan from September 2019 to December-2019, among 31 complete denture wearers.[11] The ERC was obtained from Institutional Review Board (42/2019) before commencement of the study. All participants were old denture wearers having the experience of at least 3 years, now requiring new set of complete dentures.

Participants above 65 years were excluded. These new dentures were fabricated by two experienced prosthodontists having clinical experience of over 15 years. All participants were briefed about the aim and rationale of the study before treatment, and written consent obtained to publish the data.

To assess the masticatory efficiency; the test food used was a sugar-free chewing gum weighing 1.4 gms/piece. The patients were asked to chew gum from the habitual site of mastication for 20 seconds.[11] After chewing, the gum was kept in dry environment for 4 days in a box for the process of dehydration. It was then measured using digital weighing scale by placing in petri dishes. Dehydration process ensured the removal of any salivary residue, which can hamper the results. This procedure was performed (at the time of delivery of new set of denture) and (after 3 months of using complete denture) by same investigator. The weight reduction of gum corresponded to increase masticatory efficiency.

The OHIP-14 is divided into seven domains including physical pain, functional limitation, psychological discomfort, social disability, psychological discomfort, physical disability and

handicap. For each domain, two questions were asked as how frequently the participants were experiencing this event in last month. The responses were recorded from 0-4 scale (0=never, 1=hardly ever, 2=occasionally, 3=fairless often, 4=very often).[3] Final score was obtained by calculating individual domain to measure OHIP-14 for specific domain. It was filled by the prosthodontists through a structured interview. The responses were recorded as baseline and after 3 months.

The data was analysed on SPSS version 23. The variables were expressed as mean, median, SD and quartiles. Shapiro-Wilk test was used to check the normality of data. Paired t-test and Wilcoxon signed-rank test was used to compare the mean and median score of OHIP-14 and masticatory efficiency, while Spearman correlation was performed to correlate OHIP-14 and masticatory efficiency at baseline and after 3 months. The p-value < 0.05 was considered as statistically significant.

RESULTS

There were a total of 31 patients, in which 16 (51.6%) were females and 15 (48.4%) were males. The mean age of the subjects was 56.54 ± 6.13 years. The average values of masticatory efficiency at baseline and after 3 months of complete denture treatment were significantly reduced from median (IQR) value, *i-e*. 1.20 (1.20 – 1.30) to median (IQR) value, *i-e*. 0.90 (0.70 – 0.90), respectively and p-value was <0.001 (Table I). The individual domain scores of OHIP-14 after 3 months of treatment were also significantly lower than the scores obtained before treatment (Table II). The masticatory efficiency was significantly correlated with all OHIP domains at baseline and after 3 months of treatment with complete dentures. The obtained 'r' value for psychological discomfort, functional limitation, handicap, social and psychological disability denoted a strong positive correlation between total OHIP score at baseline and after 3 months; and the obtained p-value was statistically significant (<0.05.) On the other hand 'r' value for physical pain and disability (0.407 and 0.455) denoted a moderate positive correlation at baseline and strong positive correlation (0.771 and 0.825) after 3 months with a p-value of <0.001 (Table III).

DISCUSSION

In this study, OHIP-14 was used to measure the oral health impact profile of dental care and gum method was used to evaluate the masticatory efficiency at the baseline and after 3 months of wearing new set of complete dentures among old denture wearers. This study showed significant decrease in overall OHIP scores after treatment with complete dentures signifying improvement in quality of life. The same results have been achieved by many other studies regardless of the measuring tool used.[11-12] A study done in Brazil by Voila *et al.* reported significant improvements in

OHIP scores after treatment in all domains.[13] A recent study done by Yamamoto *et al.* in complete denture wearers used OHIP-14 and showed improvement in all seven domains except for social disability and handicap after treatment.[11] Similarly, Haris *et al.* also showed no difference in terms of social disability; whereas, all other domains improved.[12] National studies also showed improvement in quality of life with removable prosthesis.[1,2] This study showed statistically significant results in all seven domains with greater improvement in physical disability similar to most of the above mentioned studies. *Albeit*, it reported highly significant p-value for social disability, which is in contrast to other studies.[12-15] The reason may be an experienced skill set, which is believed to have a strong correlation with quality of life in general.

In contrast, Kuo *et al.* reported significant improvements in functional limitation and psychological discomfort only.[16] The insignificant results in other domains may be due to inclusion of new denture wearers in the study sample, who have greater difficulty in adaptation to such prosthesis. Forgei *et al* . did not report significant difference as well, which may be due to low skill set of undergraduate students in their study.[17]

This study reported a statistically significant improvement in masticatory efficiency after treatment. The improvement in masticatory efficiency has been reported in a great many studies, regardless of the methodology.[6,8,10] Leles *et al.* used two-colour chewing gum and reported overall increase in masticatory efficiency, which was positively correlated with continuous denture wearing and younger age groups.[10] In contrast, Cardosa *et al.* didn't report any significant results.[8] They utilised a capsulated test food evaluated by colorimetric method, which has a hard texture thereby difficult to chew.

This study also showed strong correlation of masticatory efficiency with subscales at baseline and after 3 months; except for physical pain and disability, which showed moderate correlation with quality of life at baseline. This implied that pain or physical disability, affected the masticatory efficiency to a lesser extent. Sun *et al*. treated patients with maxillary complete dentures and found that total OHIP score, functional limitation, pain and physical disability to be highly correlated with masticatory efficiency with previous denture and only functional limitation after treatment.[18] The absence of pain due to well-adjusted new dentures may have led to no correlation between the two. Cardosa *et al.* compared conventional complete dentures (CD) with implant retained overdentures (IOD) in terms of OHIP and masticatory efficiency.[8] He found positive correlation between the two in the CD group, though only after treatment. This may be attributed to the inclusion of only satisfied denture patients in the sample. Positive

correlations at baseline in this study, in contrast, may be due to inclusion of patients who demanded new dentures, implying that they were not fully satisfied with present prosthesis.

The variation in results of different studies is believed to be affected by different measuring methods of masticatory efficiency, age, satisfaction of patients with their previous dentures, adaptability, experience of the clinician and technical quality of the dentures.[19] In this study, masticatory efficiency was recorded after 3 months of newly provided dentures to ensure adaptation as documented by Haris et al.[12] Due to the oral stereognostic ability present in the oral mucosa, fresh memory patterns need to be learnt for new contours of polished surfaces requiring at least 3 to 8 weeks. The habitual side was used for 20 seconds as validated by other researcher.[11]

Considering the limitations of this study, the reasons for new dentures demand were not identified among recruited patients. Their satisfaction level also was not taken into consideration before inclusion in the study. These may have adversely affected the results. Moreover; the cuspal morphology is also a confounding variable, which was not controlled in this study.[20] The dentures were fabricated by experienced clinicians so it can be fairly assumed that the technical quality of the dentures was optimal and did not negatively affect the results relating to quality of life. Whereas, in regard to masticatory efficiency, technical quality of dentures is believed to have no effect as deduced by Torres et al.[19]

Elderly patients were not part of this sample, hence the significant improvement in masticatory efficiency was reported in this study.[21] Other limitations of the study were the small sample size and variables like age, and comorbidities were not assessed.

CONCLUSION

Within the limitations of the study, it was concluded that there was a statistically significant improvement in both quality of life and masticatory efficiency at baseline and after 3 months of complete denture treatment. Masticatory efficiency was highly correlated with all subscales of OHIP after treatment. In the age of implant dentistry, conventional CD is still a valid treatment option in completely edentulous patients; as this study has highlighted considerable improvement in quality of life and oral function. It is of greater value in a developing country like Pakistan where majority of CD patients belonged to low socio-economic strata.

ETHICAL APPROVAL:
The ERC was obtained from Institutional Review Board of Bahria University Medical and Dental College; No. 42/2019 before commencement of the study.

PATIENTS' CONSENT:
All participants were briefed about the aim and rationale of the study before treatment; and obtained written consents to publish the data

CONFLICT OF INTEREST:
The authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
KFMAB: Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; drafting the entire work.
SS: Substantial contributions to design and literature search.
SH: Revising it critically for important intellectual content; and final approval of the version to be published.
FI: Revising it critically.

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