Impact of oral health status and removable dental prosthesis on masticatory performance, body mass index and oral health related quality of life(OHRQoL)

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Abstract

Aim:

The aim of this study is to evaluate the relationships between oral health status and removable dental prostheses (RDPs) on masticatory performance, body mass index (BMI), and oral health-related quality of life (OHRQoL) among patients attending the outpatient prosthodontics department at M. A. Rangoonwala College of Dental Sciences and Research Center, Pune.

Materials and Methods:

The study included approximately 196 participants which was rounded off to 200 divided into three groups based on their prosthetic rehabilitation type: complete denture (CD), removable partial denture (RPD), and fixed partial denture (FPD). Oral health status was assessed through clinical examination to record the number of natural teeth (NT) and posterior occluding pairs (POP), and a validated questionnaire for self-reported oral health status. Masticatory performance was evaluated subjectively, BMI was calculated using standard anthropometric measurements, and OHRQoL was measured using the Oral Health Impact Profile (OHIP-14). Statistical analysis was performed to determine the relationships between these variables.

Results:

Preliminary results suggest that oral health status, masticatory performance, and BMI significantly influence OHRQoL across all prosthetic groups. Participants with FPDs reported better OHRQoL compared to those with RPDs and CDs. Higher masticatory performance and greater numbers of POP and NT were associated with improved OHRQoL and BMI. Conversely, complete denture wearers demonstrated lower masticatory performance and poorer OHRQoL.

Conclusion:

The type of prosthetic rehabilitation plays a crucial role in oral health and overall quality of life. Fixed prostheses are associated with better functional and quality-of-life outcomes compared to removable options. These findings emphasize the importance prosthodontic care to improve patient satisfaction and health outcomes.

Keywords: Oral health status, removable dental prostheses, masticatory performance, body mass index,oral health related quality of life.

1.Introduction

Tooth loss is mainly cause by Dental caries and periodontal diseases(1),that leads to impaired masticatory performance(2) and declined oral health related quality of life(3) . Because of impaired masticatory performance patients tend to alter their dietary intake and reduce overall nutritional intake, which may place them at higher risk for developing systemic diseases like cardiovascular disease and diabetes(4).Loss of teeth, particularly molar can

significantly impair masticatory performance ,because it plays a crucial role in grinding food and their absence can lead to inadequate chewing. Oral health related quality of life denotes the effect of oral health on patient's daily functioning .oral health related quality of life considers how oral health affects the person's functioning like biting, chewing, speaking, sensation of pain/discomfort and psychological (appearance, self esteem)as well as social well being[5].Poor oral health Can cause chronic pain and discomfort , significantly reducing quality of life[6]. To improve masticatory functions and oral health related quality of life dental prosthesis are necessary[7]. Body mass index is measure of body fat based on height and weight and is an indicator of nutritional status and health.Poor masticatory performance can affect dietary choices and nutritional intake, potentially leading to changes in body mass index. Individual with impaired chewing ability may prefer softer food,often less nutritious foods which can contribute to weight gain or malnutrition[8] .Individuals with well functioning prosthesis are more likely to consume a healthier diet,which can positively influence a body mass index[9].chewing ability is important for both oral health and general health, therefore prosthodontics rehabilitation is required to restore masticatory functions[10].After prosthodontics rehabilitation there is decrease in oral related problem such as difficulty in eating, speaking[10]. Therefore, assessing masticatory performance is important to maintain their masticatory functions and providing patients satisfactory oral health related quality of life[11].Decreased in numbers of natural teeth can have poor impact on patient's general health[12].There is potential association between tooth loss and body mass index[13].Reduced masticatory performance can lead to dietary restriction potentially affecting nutritional status and body mass index[14].

By understanding relationship between oral health status and type, quality of dental prosthesis we can improve patients masticatory performance and oral health related quality of life. The aim of our study is to determine the impact of oral health status and removable dental prosthesis on masticatory performance, body mass index and oral health related quality of life.

2. Methodology

This cross-sectional study was conducted at M. A. Rangoonwala College of Dental Sciences and Research Center, Pune, among the participants who were recruited from the outpatient department of prosthodontics. Participants were divided into three groups: complete denture (CD)group, removable partial denture (RPD)group, and fixed partial denture (FPD)group. After taking a brief history of any other existing medical condition,participants were included who have at least one removable dental prosthesis
(either complete or partial), a history of tooth loss, and ready to provide informed consent.

Patients with severe systemic diseases affecting nutrition, such as uncontrolled diabetes, individuals with neurological disorders affecting masticatory performance, and patients currently undergoing orthodontic treatment were excluded from the study. The sample size was calculated using the formula $n=1.962\times p(1-p)\times DEFF/d2n=1.962\times p(1-p)\times DEFF/d2$

, where p represents the expected proportion, and d is the desired level of absolute precision. Assuming a current prevalence of the outcome to be at least 15% and a 5% confidence limit, a sample size of approximately 196 which was rounded off to 200 was determined.

Data collection includes clinical findings and oral health related quality of life questionnaire, body mass index and masticatory performance.

•patients oral health status were assessed clinically to record the number of remaining natural teeth(NT) and posterior occluding pairs(POP) . Natural teeth (NT) ranged from 0 to 28 excluding third molar ,whereas posterior occluding pair (POPs) ranged from 0 to 8.Dental status categories into three groups≥4 pop with ≥20 NT, ≤4 pop with ≥20 NT, and≤20 NT. Participants completed a validated oral health questionnaire to evaluate perceived oral health status. Masticatory performance was assessed by asking patients about their denture stability and retention whether denture is acceptable or unacceptable. Height and weight were measured using standardized equipment.

BMI will be calculated using the formula: BMI = weight (kg) / height (m^2).The OHIP-14 (Oral Health Impact Profile-14) is a widely used, shortened version of the original OHIP-49 questionnaire, designed to assess oral health-related quality of life (OHRQoL).

• Demographic data, clinical findings, masticatory performance scores, BMI, and OHRQoL scores were enter into Microsoft Excel for statistical analysis using SPSS 22 software.

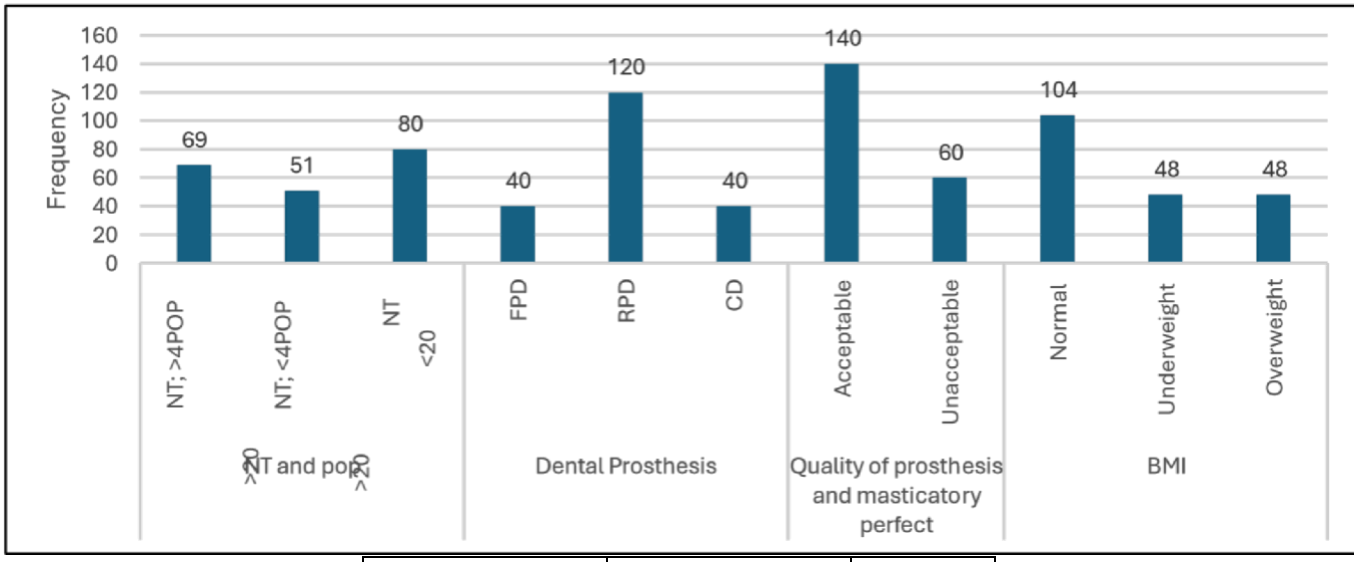
3. Results:

Table 1 shows that mean age of study participants was 53.36 ± 7.79 years and out of total 200 participants 121 were males and 79 were females .Education of the participants were mostly 12^{th} pass and the income was mostly below 20000 per month.Medical condition was present in 63 participants. From Figure 1 it was observed that 69 patients had > 20 NT and > 4 POP, 51 patients had >20 NT and < 4 POP and 80 patients had < 20 NT. A total of 120 patients had RPD as dental prosthesis whereas FPD and CD was present in 40 patients, each. Out of 200 subjects 60 had unacceptable quality of prosthesis and masticatory performance, And 104 patients had normal BMI while underweight and overweight were 48 patients in each category, respectively.

OHRQoL was categorized into low, medium and high with a total of 56, 4 and 140 patients in these categories respectively. The comparison of distribution of OHRQoL with NT and POP showed that maximum patients with better scores (> 20 NT and > 4 POP) had high OHRQoL (n=69). All patients having FPD type of dental prosthesis had high OHRQoL (n-40) and all patients with acceptable quality of prosthesis and masticatory perfomance had again high OHRQoL (n-140) . All these comparison were found significant ($p<0.05$) (Table 2). Similarly, comparison of OHRQoL with BMI was also found significant ($p<0.05$) with all normal patients having high OHRQoL (n=104) (Table 3)

Table 1: Demographics of the study population

Variables		
Mean Age (in years)	53.36 ± 7.79	
Gender	Male	121
	Female	79
Education	≤ 12th	126
	Graduation	84



Income	≤ 20000	104
	> 20000	96
Medical condition	Absent	137
	Present	63
Total	200	

Figure 1: Frequency distribution of various parameters like NT and POP, Dental prosthesis , Quality of prosthesis and masticatory performance and BMI among study population.

Table 2: Comparison of OHRQoL with various parameters like NT and POP, Dental prosthesis , Quality of prosthesis and masticatory performance and BMI among study population.

OHRQoL	NT and pop			Dental prosthesis			Quality of prosthesis and masticatory perfect		Total
	>20 NT; >4POP	>20 NT; <4POP	<20 NT	FPD	RPD	CD	Acceptable	Unacceptable	
Low	0	20	36	0	40	16	0	56	56
Medium	0	0	4	0	0	4	0	4	4

High	69	31	40	40	80	20	140	0	140
p-value	0.001*			<0.001*			<0.001*		200

Table 3:Comparison of OHRQoL with BMI

OHRQoL	BMI			Total
	Normal	Underweight	Overweight	
Low	0	36	20	56
Medium	0	4	0	4

High	104	8	28	140
p-value	0.001*			200

4.Discussion

Our study demonstrates that the number of remaining natural teeth was positively associated with OHRQoL.Thus,the larger the number of remaining natural teeth, the lower the impact on the OHRQoL and decrease in the number of remaining natural teeth, greater the impact on the OHRQoL.This cross sectional study provides insights into the interplay between oral health status, dental prosthesis, masticatory performance, BMI and OHRQoL .The association of high OHRQoL scores with>20Natural teeth (NT)and >4posterior occluding pair(POP) denotes the importance of physical and functional oral health measures in perceived quality of life. This findings are comparable with the findings from previous studies, such as study conducted by John M.T.et al (2010)[15], which found functional capacity to be a key factor influencing OHRQol.A previous study which are conducted by inukai M,Baba(2008)described a positive correlation between professional rating of removable denture quality and a low OHIP score, indicating a low level of impairment of OHRQoL [16] .The number of remaining Natural teeth was positively associated with OHRQoL; Thus, the larger the number of remaining natural teeth, the lower the impact on the OHRQoL..Participants wearing FPDs had higher quality of life compares with those wearing RPDs and CDs., likely due to the enhanced stability and functionally provided by fixed dentures compared to removable prostheses,as supported by research from Verma et al.(2018)[17],who noted higher satisfaction levels with FPDs..Participant's masticatory performance were assessed by grouping them based on number of remaining natural teeth (NT) and posterior occluding pair (pop),this study provides the importance of occlusal support in maintaining functional masticatory performance. This study indicates that masticatory performance is strongly influenced by the number of remaining natural teeth (NT) and posterior occluding pairs (POP). More NT and POP often lead to improved chewing efficiency, promoting better nutritional intake and overall health[18;19] .

poor masticatory performance among the participants with complete dentures or lesser natural teeth can impair the ability to consume a balanced diet high in fibrous foods, which may result in malnutrition or BMI shifts [20;21]. This can lead patients with less functional dentition to select softer, often less nutritious foods, affecting their BMI either upwards or downwards [22]. Above findings demonstrate the need for integrated prosthodontic care to address both oral and systemic health implications [21].The major strength of this study is its use of both clinical and self-reported measures, which allow a thorough assessment of prosthodontic treatment effects on health [23;24]. Incorporating clinical evaluations like masticatory performance along with self-reported tools such as the Oral Health Impact Profile (OHIP-14) provides a comprehensive view of how dental health impacts broader health outcomes and quality of life[25] .However, the cross-sectional study limits the study's ability to establish causation, as it only provides a snapshot in time without tracking changes in masticatory performance or quality of life longitudinally [26]. Longitudinal studies would be better suited for observing the long term effects of different prosthodontic treatments on patient outcomes [27;28]. Another limitation is the exclusion of participants with severe systemic or neurological conditions, which may reduce the study's generalizability to the broader population of patients needing prosthetic care. For more findings, future research should consider a more diverse sample that reflects various health conditions [29;21].Specific clinical and oral health policy implications can be suggested from our study findings. Since tooth loss can negatively affect general health of an individual, minimal intervention dentistry should be implemented to preserve natural dentition [30]. Since denture quality, particularly retention and stability, can affect both oral general health [31;32], healthcare providers should also focus on dental prostheses periodic follow-ups. Herein, oral and dental prosthesis status were associated with general health parameter, and this indicates the importance of a multi-disciplinary approach to maintain a healthy longevity and quality of life with the aging phenomenon.

5.Conclusion:

This cross-sectional study provides important evidence on the relationship between dental prostheses, body mass index, masticatory function, and quality of life. The data highlights the effect that dental prosthetic stability and the presence of natural teeth can have on both oral and systemic health. These findings should encourage further exploration into treatment modalities that not only restore dental function but also improve the broader health outcomes and well-being.

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