Original Article

Self-perceived oral health: a study with patients wearing removable dentures

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Aim: This study aimed to investigate the relationship between self-perceived oral health and the prosthetic status of individuals who seek care in prosthodontics clinics. **Methods:** Self-perceived oral health was analyzed through the Geriatric Oral Health Assessment Index (GOHAI). Abutment tooth mobility was assessed, and denture status was determined by clinical assessment of stability, retention, occlusal balance, vertical dimension, and integrity of dentures. The frequency of individuals in each variable was determined for the low and very low GOHAI conditions. Chi-square, Pearson, and stepwise logistic regression tests were used for the statistical analyses (α = 0.05). **Results:** Ninety wearers of removable dentures with a mean age of 55.1±9.1 years were evaluated. None of the variables was related to GOHAI values (p > 0.05). The regression analysis showed that age predicts (p = 0.006) the variation of GOHAI conditions (OR = 0.924, CI = 0.873-0.978), showing only 7.6% protective effect against very low GOHAI. Unsatisfactory stability showed the opposite effect (p = 0.034) and the individuals with this characteristic are more likely (OR = 3.055) to have very low GOHAI scores (CI = 1.085-8.602). **Conclusions:** The self-perceived oral health of wearers of removable dentures worsens with age and unsatisfactory stability of dentures.

Keywords: Self concept. Oral health. Dental prosthesis. Rehabilitation.

Introduction

Despite the advent of new forms of dental treatments and materials as well as oral health prevention strategies, edentulism is still prevalent in the Brazilian population (3.9%) and significantly higher than the global mean (2.3%), according to Kassebaum et al[1]. (2014). Although edentulism is not exclusive of older people, it has been related to the ageing of the population[1].

Tooth loss gradually generates a decrease in the ability to select and grind food due to changes in oral stereognosis or in the ability to distinguish physical characteristics of food[2], and in masticatory movement control resulting in the loss of periodontal afferents responsible for sensory feedback[3]. Thus, the masticatory performance is altered due to the decrease in the occlusal area where the force generated by the masticatory muscles is applied[4], implying increased swallowing and number of masticatory cycles required to compensate for an inefficient masticatory function[5]. Moreover, the occlusal instability produced by tooth loss can determine the posterization of condylar positioning[6] and greater risk of signs and symptoms of temporomandibular disorder[7]. Tooth loss can also cause problems in social interactions, shame, and social embarrassment, due to phonetic and masticatory difficulties, physical appearance, and the presence of pain, generating possible emotional disorders[8].

Oral rehabilitation using complete dentures (CD) or removable partial dentures (RPD) is intended to replace lost teeth by restoring occlusal support and an efficient masticatory function[9,10] and can restore the patient's lost confidence after tooth loss[11-13]. CD or RPD can be considered the first choices of prosthetic treatment due to their cost-effectiveness ratio[14]. They are non-invasive alternatives for treatments involving attachments, conventional fixed dentures, and implant-supported or implant-retained dentures[15].

The successful performance of CD or RPD is influenced by prosthetic factors such as retention, stability, support, and longevity of the materials[16]. Physiological factors, such as age, decreased sensitivity of the mucous, and less capacity for transmitting masticatory force through artificial teeth may reduce the satisfaction and adaptation[17] and consequently the success of CD or RPD.

The satisfaction of individuals with removable dentures has been associated with aesthetics, personality, physical and social adaptation[16]. The self-perception of individuals rehabilitated with CD or RPD is fundamental for the success of the treatment[13]. The General Oral Health Assessment Index (GOHAI) was developed to measure self-perception of oral health and can even be considered as an indicator of oral-health related quality of life (OHRQoL), measuring oral difficulties that affect patients with a removable prosthesis in three dimensions: physical functions, psychological functions, and pain and discomfort[18]. According to the values obtained based on the responses to the questionnaire, individuals can be categorized as presenting low, moderate, and high self-perception of oral health[19].

However, although the GOHAI has been used to determine the need for rehabilitation treatment[19], the evidence on which of the prosthetic factors affect it most is still

limited and there is no consensus regarding the association of some factors with OHRQoL[19-22]. Thus, this study aimed to investigate the relationship between self-perceived oral health and the prosthetic status of individuals who seek care at the Removable Prosthesis Clinic of the State University of Ponta Grossa. The null hypothesis of this study is that the individual's self-perception of oral health is not influenced by the prosthetic status.

Material & Methods

Sample

This cross-sectional study included a convenience sample composed of wearers of removable dentures who seek care at the Removable Prosthesis Clinic of the State University of Ponta Grossa. The study was developed for four months. Individuals who had good general health, complete or partial edentulism, and who had at least one type of removable denture (CD or RPD) in one of the jaws were considered to participate. The exclusion criteria were the presence of systemic disease or neuro-muscular disability (reported in the patient's anamnesis). This study was approved by the Research Ethics Committee of the State University of Ponta Grossa, under Opinion 13/2010, protocol number 13319/09. Patients who were accepted to participate were submitted to examination for application of inclusion or exclusion criteria, and all volunteers received instructions about the evaluation procedures and signed a free and informed consent form.

Assessment of Self-perception of OHRQoL – GOHAI instrument

The approach and clinical evaluations of the patients were carried out individually. Data collection was performed by a single duly trained examiner, under artificial light. The validated Brazilian version of GOHAI was applied[23]. For each of the twelve questions in the questionnaire, the answer options that the individuals provided were cataloged as: always, sometimes, or never. Each answer was given a score: 1 for "always", 2 for "sometimes" and 3 for "never". The sum of the scores for each patient was obtained. The higher the sum was, the better the individual's self-perceived oral health. Values ranged from 12 to 36, in which a range of 34 to 36 was considered high, between 31 and 33 moderate, and less than 30 low.

Oral characteristics

Clinical data were collected to verify the type of removable dentures (CD or RPD), number of abutment teeth, tooth mobility, occlusal balance, vertical dimension of occlusion, stability, retention, and integrity of removable dentures. For RPD, the mobility of the abutment teeth was measured with Periotest® (Siemens, Gulden-Medizintechnik, Bensheim, Germany), without the denture in the oral cavity. The Periotest® pen was placed perpendicular to the buccal face of the abutment tooth, close to the center of the crown. When there were carious lesions or restoration, the tip of the pen was directed laterally towards a healthier dental structure, as recommended by the manufacturer. Periotest® provides a Periotest® Value (PTV), which ranges from -8 to 50, representing dental mobility. These values were

converted to the Miller index ranging from 0 to 3, as follows: 0: perceptible but not quantifiable mobility (PTV = from -8 to 9), 1: perceptible mobility (PTV = from 10 to 19), 2: mobility up to 1 mm in a horizontal direction (PTV = from 20 to 29), and 3: mobility > 1 mm in any direction (horizontal, vertical, rotation; PTV = from 30 to 50)[24].

Prosthetic status

The prosthetic status was analyzed with the dentures positioned in the oral cavity. The stability of the CD was considered satisfactory when only light movements were obtained by light bilateral digital pressure in the premolar region. The stability of the RPD was satisfactory if there was no movement when gentle digital pressure was applied. The retention of the CD was considered satisfactory if the prosthesis remained in place during a moderate mouth opening. The retention of the RPD was satisfactory if the clamps provided resistance to the removal of the denture in the opposite direction to the insertion. The occlusal balance was considered satisfactory if the prostheses did not move when occluding slowly. The vertical dimension was determined based on facial harmony, being categorized as very low, acceptable, and very high. The loss of integrity or apparent structural defect of the dentures was considered if they had broken flanges, missing or fractured teeth, or loss of large fragments of the base[18].

Statistical analysis

The data were explored using the IBM® SPSS® Statistics 20 program, and all statistical inferences were performed with two-tailed operations assuming a significance level of 5%. The intra-examiner agreement was moderate for the variable mobility (Kappa = 0.5), high for retention (Kappa = 0.7) and GOHAI (Kappa = 0.8), and perfect for stability, occlusal balance, vertical dimension, and integrity of the dentures (Kappa = 1.0). The frequency of individuals in each category of variables was determined for the conditions of low (≥ 24) and very low (< 24) GOHAI scores (value dichotomized using median splits)[25]. The Chi-square test was conducted to associate the GOHAI conditions to categorical variables – sex, type of removable prosthesis, abutment mobility, and stability, retention, occlusal balance, vertical dimension, and integrity of the prosthesis. For this purpose, the final values of the variables stability, retention, and integrity were determined considering the condition of the dentures in both jaws. To compare the type of removable dentures with the GOHAI conditions, the Chi-square test was adjusted for all pairwise comparisons in the rows of each innermost sub-table using the Bonferroni correction.

The condition of each dental arch (upper or lower) was categorized as rehabilitated with CD or RPD or dentate/edentulism without any prosthesis. The presence of abutment mobility was recorded if the individual had a degree greater than or equal to 2 for this variable in any of the jaws[26]. After checking for normal distribution using the Shapiro-Wilk and analyzing the skewness and kurtosis parameters (-2 - +2), the numerical variables GOHAI, age and number of abutments were correlated to very low GOHAI values using the Pearson's test. Binary logistic regression analysis was used to assess the influence of the investigated variables on the presence of very low GOHAI. Initially, the Enter method was applied to analyze all variables in an input

block using a single step. Backward stepwise selection was then applied based on Wald's statistical probability. Thus, at each step, the least significant variable was removed until all the remaining variables made a significant contribution to the regression model.

Results

The sample consisted of ninety individuals aged 38-80 years (mean age = 55.1 ± 9.1 years). Sixty-two patients were female. In the sample, 85 individuals (94.4%) presented low GOHAI, and 06 patients (5.6%) showed medium or high GOHAI. As a methodological resource, the cutoff point (< or ≥ 24) for the conditions of low and very low GOHAI was determined considering the median split (24.7) of all values obtained[25]. When analyzing the characteristics of the individuals in each GOHAI category (Table 1), none of the variables in isolation showed any significant relationship with the GOHAI values ($p > 0.05$).

Table 1. Frequency of variables according to GOHAI conditions (n = 90).

| Categorical variables | Low GOHAI | | Very low GOHAI | | Statistical | |
| | n = 56 | | n = 34 | | | |
	n	%	n	%	X^2	p
Sex					0.549	0.459
Female	37	41.1	25	27.8		
Male	19	21.1	9	10.0		
Maxillary occlusal status					0.283	0.868
CD	34	37.8	21	23.3		
RPD	17	18.9	11	12.2		
Absence of prosthesis	5	5.6	2	2.2		
Mandibular occlusal status					5.424	0.066
CD	9	10.0	4	4.4		
RPD	23	25.6	7	7.8		
Absence of prosthesis	24	26.7	23	25.6		
Stability					2.979	0.084
Poor	12	13.3	13	14.4		
Satisfactory	44	48.9	21	23.3		
Retention					0.588	0.810
Poor	36	40.0	21	23.3		
Satisfactory	20	22.2	13	14.4		
Occlusal balance					0.071	0.790
Poor	33	36.7	21	23.3		
Satisfactory	23	24.5	13	14.4		

Continuation

Vertical dimension					1.765	0.184
Very low	14	15.6	13	23.3		
Acceptable	42	46.7	21	14.4		
Very high	0	0	0	0		
Prosthetic integrity					0.071	0.790
Present	25	27.8	21	23.3		
Absent	31	34.4	13	14.4		
Mobility					0.610	0.435
Present	6	6.7	2	2.2		
Absent	50	55.6	32	35.6		
Numerical variables	**Mean**	**SD**	**Mean**	**SD**	**R**	**p**
Age	57.0	9.5	52.0	7.5	0.202	0.057
Number of abutments	1.89	2.1	1.24	1.5	0.159	0.135

SD: Standard Deviation
CD: Complete Dentures
RPD: Removable Partial Dentures

The logistic regression analysis showed that age was a variable capable of significantly predicting (p = 0.028) the variation in GOHAI conditions (Table 2). However, age covered only 7.2% of the protective effect against very low GOHAI. For the variable unsatisfactory stability, the effect was the opposite (p = 0.042), showing that individuals with this characteristic were more likely (OR = 4.395) to present a very low GOHAI. This model showed 85.7% specificity (ability to classify individuals in the category of low GOHAI), and 61.8% sensitivity (ability to recognize individuals with a very low GOHAI), presenting a correct overall classification rate of 76.7%.

After applying the step-by-step method (Table 3), the variables mentioned above were again the only ones were able to predict a variation in GOHAI condition. Age (p = 0.06) again showed a 7.6% protective effect, and individuals with unsatisfactory stability (p = 0.034) presented greater chance of having very low GOHAI (OR = 3.055). The specificity of the model increased to 87.5%, but the sensitivity decreased to 35.3%, and the correct overall classification rate was 67.8%.

Table 2. Logistic regression model for very low GOHAI using the Enter method (n = 90).

Explanatory variables	B[2]	SE[3]	Wald	p	Odds ratio	95% confidence interval
Age*	-0.075	0.034	4.853	0.028	0.928	0.868 − 0.992
Sex	-0.001	0.595	0.000	0.998	0.999	0.311 − 3.209
Maxillary occlusal status						
CD	−−	−−	0.416	0.812	−−	−−
RPD	-0.574	1.282	0.201	0.654	0.563	0.460 − 6.943
Absence of prosthesis	0.224	1.406	0.025	0.873	1.251	0.800 − 19.666

Continue

Continuation

Mandibular occlusal status						
CD	--	--	0.805	0.669	--	--
RPD	-0.795	0.887	0.804	0.370	0.452	0.079 − 2.569
Absence of prosthesis	-0.349	1.209	0.083	0.773	0.705	0.066 − 7.542
Number of abutments[1]	-0.365	0.449	0.661	0.416	0.694	0.288 − 1.673
Poor stability	1.480	0.727	4.143	0.042	4,395	1.056 − 18.286
Poor retention	-0.273	0.712	0.147	0.702	0,761	0.189 − 3.073
Poor occlusal balance	-0.406	0.798	0.259	0.611	0.666	0.139 − 3.182
Very low vertical dimension	0.424	0.605	0.491	0.483	1.528	0.467 − 5.002
Absence of prosthetic integrity	0.651	0.570	1.302	0.254	1.917	0.627 − 5.865
Present mobility	-0.188	1.147	0.027	0.870	0.828	0.087 − 7.848
Constant	4.132	2.245	3.388	0.066	62.285	--

1. Numerical variables.
2. B = partial regression coefficient.
3. SE = Standard Error.
*Statistical difference
CD: Complete Dentures
RPD: Removable Partial Dentures

Table 3. Logistic regression model for very low GOHAI using the Backward Wald method (n = 90).

Explanatory variables	B[2]	SE[3]	Wald	p	Odds ratio	95% confidence interval
Age[1]	-0.079	0.029	7.505	0.006	0.924	0.873 − 0.978
Poor stability	1.117	0.528	4.472	0.034	3.055	1.085 − 8.602
Constant	3.484	1,539	5.123	0.024	32.575	--

1. Numerical variables.
2. B = partial regression coefficient.
3. SE = Standard Error.

Discussion

This study aimed to determine the factors that have the greatest influence on the variation in self-perception of oral health of patients wearing removable dentures, especially prosthetic factors. The variables did not show any relationship with GOHAI when analyzed in isolation. This can be explained by the fact that self-perceived oral health involves a multidimensional concept that reflects an individual's oral conditions at a given time and that also depends on previous experiences[27], similarly to the quality of life, which is also influenced by multiple factors[28]. Thus, oral health can be influenced by proper prosthetic and physical factors such as age and sex, but in integral comprehensive way, and not by the action of just one specific factor. Cultural, psychological, educational, dietary, and financial factors can interact with the mentioned factors[28,29] and influence GOHAI scores.

Age was one of the variables that influenced the variation in GOHAI scores. Oliveira et al.[30] (2020) (mean age of 77 years), on the other hand, did not find a relationship between GOHAI values, the use of dentures, and age. The mean age in our study was 55 years, and age was not an exclusion criterion, and therefore the results are likely influenced by the exclusion criteria. Netuveli et al.[31] (2006) say that the quality of life can increase with aging, but this relationship cannot be analyzed in isolation, since financial situation, functional limitations and social living are also factors that influence the quality of life.

Individuals with unsatisfactory stability were more likely to have very low self-perception of oral health (OR = 3.055), and this was the only prosthetic factor that influenced GOHAI values. The stability of removable dentures implies resistance to displacement when it is subjected to functional stress in the horizontal and rotational directions[32]. Cosme et al.[33] (2006) determined that the correspondence between chewing, stability, and comfort is related to the satisfaction of users of removable prostheses after five years of use. Inoue et al.[34] (2011) found that aesthetics and stability had a minimal effect on the quality of life of patients with RPD. The possible influence of stability on oral health can be explained by considering that this parameter depends mainly on the quality of the adjustment in the abutment teeth and remaining tissues[32], which can gradually decrease over time.

The preservation of the remaining tissues is also an important factor in the longevity of removable dentures[9]. Poorly adapted CD with no occlusal balance modifies the distribution of forces on the residual ridge, resulting in greater bone resorption, or may eventually contribute to base fractures due to fatigue in the acrylic resin[35]. The greater the stiffness of the retentive system of the RPD, the lower is the transmission of loads to the fibro-mucosa and alveolar ridge. However, the tension generated in the remaining abutment teeth is also greater, which can, in the long run, damage the periodontium[36] or the metal framework by fatigue[37].

In RPD, an adequate design of the metallic infrastructure and mainly of the type of direct retainer can guarantee stability, despite the possible fatigue of the metal alloys and wear of the acrylic resin of the bases[33]. In CD, stability can be affected mainly by the degree of residual ridge resorption, which can be considered the factor that most affect the degree of dissatisfaction with treatment[29]. Yet, poorly adapted dentures can lead to flaccidity, due to bone resorption or mucosal hypertrophy, which can directly affect stability[38].

Differences in the self-perceived oral health of users of removable dentures in the same status can be explained by possible adaptive events in different ranges that promote the gradual learning of new patterns of muscle movement, determining neuroplastic changes in the sensory-motor facial cortex[39]. Chen et al.[39] (2012) showed that there is a relationship between stability, retention, tongue support, and oral health in patients with CD. The tongue is a multifunctional muscle that acts synergistically with the facial and cervical muscles during speech, chewing, and swallowing. Thus, the tongue can also act as an adjunct factor in the retention and consequent stability of removable dentures.

In patients who wear mucosa-supported dentures and teeth-mucosa-supported dentures, whose stability can be affected by residual ridge resorption over time, as an alternative, conventional fixed implants, implant-supported, or implant-retained overdentures can provide greater satisfaction to wearers of CD with very resorbed ridge due to the greater stability and retention offered[40]. Moreover, the use of implant-supported fixed dentures can offer greater masticatory function and masticatory performance and OHRQoL throughout the time of use[41]. Individuals with implant-supported or retained prostheses are more satisfied than those with conventional removable dentures, and this dental treatment is able to promote the well-being of people with low socioeconomic scores in public health care[42].

In this study, the age and stability of dentures had a protective factor against low self-perceived oral health, indicating that the null hypothesis must be rejected. The subjects participating in this study (comprising patients who sought oral rehabilitation at the university clinic). The authors hypothesized that the research subjects would be dissatisfied with their current removable dentures, presenting consequently low GOHAI values, since sociodemographic (e.g. income and schooling), prosthetic, and oral characteristics (e.g. occlusal pairs) are variables that interfere with self-perception[22]. GOHAI values were predominantly very low or low. The present results should be interpreted with caution, considering that a convenience sample was used in this study, that is, subjects were not chosen through random selection. Therefore, these results should not be extrapolated or be considered representative of all of wearers of removable dentures and/or seeking treatment for oral rehabilitation.

 Further studies simultaneously evaluating the number of occlusal pairs, masticatory performance, swallowing threshold, and stereognosis may offer a better insight into the relationship between oral health and prosthetic status of individuals who seek care, and a more objective comparison of self-perceived oral health. The inclusion of a larger number of individuals in the present study could have offered greater discrimination on the type of removable dentures. However, the regression models employed offer an acceptable capacity to recognize the factors that significantly influence the variation in GOHAI (76.7% and 67.8%). The remaining percentage of influence may be related to the variables mentioned above, complementing the model.

Considering the conditions in which this study was developed, it can be suggested that the low self-perception of oral health in patients with removable prostheses worsens with age and with unsatisfactory denture stability.

Acknowledgments

Conflict of interest

None.

Data availability

Datasets related to this article will be available upon request to the corresponding author.

Author contribution

Solange Schroeder Corrêa: Methodology, validation, formal analysis, investigation, data curation, writing – original draft preparation and reviewing, visualization.

Poliana Alexandra Martinello: Methodology, validation, formal analysis, data curation, writing – original draft preparation and reviewing, visualization.

Dominique Ellen Carneiro: Formal analysis and writing and reviewing.

Alfonso Sanchez Ayala: Conceptualization, methodology, validation, formal analysis, investigation, data curation, writing – original draft preparation and reviewing, visualization.

Nara Hellen Campanha: Conceptualization, methodology, validation, formal analysis, investigation, data curation, writing – original draft preparation and reviewing.

All authors approved the final version of the manuscript.

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