

Normative and subjective need for dental prosthesis: accuracy and agreement in a population based-study

Necessidade normativa e subjetiva de próteses dentárias: acurácia e concordância em um estudo populacional

Necesidad normativa y subjetiva de prótesis dentales: precisión y concordancia en un estudio poblacional

Luiz Alexandre Chisini ¹
Hugo Ramalho Sarmiento ¹
Bernardo Lessa Horta ¹
Flávio Fernando Demarco ¹
Marcos Britto Correa ¹

doi: 10.1590/0102-311X0052720

Abstract

The aim of our study was to compare normative need for dental prosthesis (estimated by dentists) with subjective need (self-reported) by testing the accuracy and agreement and comparing direction and magnitude of associations with independent variables using both as outcomes. A representative sample of a birth cohort study (n = 900) was assessed at 31 years of age. Subjective need was obtained from questionnaire. Both normative and subjective need variables were dichotomized in (a) individuals with need for dental prosthesis and (b) without need for dental prosthesis. Accuracy was assessed by sensitivity (SE), specificity (SP), positive (PPV) and negative (NPV) predictive values. Agreement of normative and subjective need was assessed estimating kappa index. Sex, income, educational level, use of dental services and self-reported oral health were used to compare the associations with normative and subjective need. Prevalence of normative need was 48.9% and subjective need was 34.9%. Agreement (kappa: 0.43) and accuracy between normative and subjective need for dental prosthesis was low (SE: 56.5, 95%CI: 50.3-62.6; SP: 85.8, 95%CI: 81.1-89.7; PPV: 79.1, 95%CI: 72.6-84.7; NPV: 67.3, 95%CI: 62.1-72.2). When considering individuals with loss in anterior teeth, results showed a good agreement (kappa: 0.82) and accuracy between normative and subjective need (SE: 93.3, 95%CI: 68.1-99.8; SP: 88.9, 95%CI: 51.8-99.7; PPV: 93.3, 95%CI: 68.1-99.8; NPV: 88.9, 95%CI: 51.8-99.7). Direction and magnitude of associations with normative and subjective need were similar. Thus, normative need for dental prosthesis differs from subjective need in adults, except when anterior losses are present.

Cohort Studies; Oral Health; Tooth Loss

Correspondence

M. B. Correa
Universidade Federal de Pelotas.
Rua Gonçalves Chaves 467, 5^a andar, Pelotas, RS
96015-560, Brasil.
marcosbrittocorrea@hotmail.com

¹ Universidade Federal de Pelotas, Pelotas, Brasil.



Introduction

Despite the significant reduction observed in last decades, burden of tooth loss is still a major public health problem worldwide presenting elevate inequalities in its distribution ^{1,2}. In 2010, 158 million individuals (2.3% of global population) were completely edentate and women commonly present higher prevalence and incidence of severe tooth loss, presenting also important differences in geographic regions ¹. Recent meta-analysis reinforced that individuals with lower income were associated with a prevalence 66% higher of tooth loss ³. Tooth loss reflects the cumulative effect of dental diseases, mainly dental caries and periodontal diseases, and consequently increases with age ⁴. Absence of teeth lead to impairment in daily routine, affecting mastication, nutrition ⁵, phonation and aesthetics, which culminates in high impact on quality of life of individuals ^{6,7,8}. In the *Brazilian Oral Health National Survey* performed in 2010, individuals with need for prosthesis presented an impact 50 higher in their oral health-related quality of life when compared with those individuals without need for prosthesis ⁶. However, higher impact was observed when losses were presented in anterior regions ⁹. These results corroborate a meta-analysis that found that tooth loss was associated with unfavorable oral health-related quality of life scores in all included studies ¹⁰.

The World Health Organization (WHO) recommended a criteria to establish the need for dental prosthesis in populations aiming to assess not only the presence of tooth loss, but also the need for dental rehabilitation ¹¹. This index is well defined and is based on the number of sites and location of tooth loss that need oral rehabilitation, defined by a dentist. Thus, the use of appropriate index allows identification of normative need for dental prosthesis. However, the adoption of these indexes does not consider the effective demand perceived by individuals (subjective need) for dental prosthesis. In last decades, it has been emphasized that the most appropriate judgements of palliative therapeutic interventions come from daily users. Then, the use of patient-reported outcome, or subjective measures in clinical research has increased considerably to assess patients' opinions relating to their well-being ¹². Considering patient's point of view is crucial to determine priorities in terms of public health planning.

Subjective need for prosthesis is influenced not only by the absence of teeth, but mainly by factors such as patient age, comfort, cost of treatment, personal preferences, cultural differences and access to health services ¹³. The aesthetic demand, especially in the most economically developed societies, has assumed greater importance, giving to edentulism ¹³ and masticatory function ¹⁴ minor status. It seems that the cases in which subjective need for dental prosthesis is closest to the normative need would be in complete edentulousness in one or both arches ¹⁵, or even when there is loss of maxillary anterior teeth, directly interfering on aesthetics and functional aspects ^{9,16}. Furthermore, the evaluation of subjective need becomes extremely particular in case of unitary posterior teeth loss ¹⁷.

Compared to older people, younger people tend to undervalue posterior tooth loss and perhaps overvalue anterior tooth loss ¹⁸. Thus, we hypothesize that the difference between subjective and normative need is even greater in younger populations. However, studies assessing differences between normative and subjective need for dental prosthesis are mostly performed in older people ^{19,20}, only one study ²¹ comparing subjective and normative need for dental prostheses that includes young adults. This study found a low rate of agreement between normative and subjective need for prosthesis ²¹. There are no studies on the comparison between the normative and subjective need with accuracy and agreement tests, as there are no studies stratifying by the region of loss in young adults. Therefore, our study aimed at comparing subjective and normative need for dental prosthesis in adults aging 31 years old from a population-based birth cohort, testing the accuracy and the agreement as well as comparing the direction and magnitude of associations of independent variables with objective and normative need for dental prosthesis as outcomes.

Materials and methods

Our study was reported according the STROBE guidelines for observational studies ²².

Study design

Our study is a cross-sectional study nested in a population-based birth cohort.

Setting and participants

Our study was nested in a birth cohort, which began in 1982, in the urban area of Pelotas, Rio Grande do Sul State, Brazil. The study started with all 5,914 children born alive in the three maternity hospitals of the city ²³. In 1997, when children were 15 years old, the first oral health study (OHS-97) was performed. A representative sample of 888 individuals was assessed in the OHS-97. These individuals were contacted again in 2006, at 24 years of age, for a new oral health study. Details about the methods of these previous studies were available elsewhere ²⁴.

In 2013, a new assessment of oral health was conducted in this sample. This assessment consisted of a questionnaire application including questions related to self-reported perceptions of individuals' oral health and a clinical examination, which assessed several oral conditions such as dental caries, periodontal disease and need for dental prosthesis.

Variables of interest

The interest variables of our study were the normative and subjective need for dental prosthesis. Normative need for dental prosthesis was assessed using criteria established by WHO ¹¹, which considers the presence of prosthetic spaces and their need for rehabilitation. The same person may be using and, at the same time, requiring prosthesis. Normative need for dental prosthesis was collected using five categories: "0" no need; "1" need for a fixed or removable prosthesis to replace one tooth; "2" need for a fixed or removable prosthesis to replace more than one tooth; "3" need for a combination of prostheses to replace more than one tooth; "4" need for complete denture. Subjective need for dental prosthesis was assessed using the following sentence "Considering your maxillary/mandibular teeth": and five options were presented to complete the phrase: "0" I do not need dental prosthesis; "1" I need a fixed or removable prosthesis to replace one tooth; "2" I need a fixed or removable prosthesis to replace more than one tooth; "3" I need a combination of prostheses to replace more than one tooth, "4" I need a complete denture to replace all teeth. Both normative and subjective needs were collected in separate for maxillary and mandibular arches. To assess the agreement between normative and subjective needs for dental prosthesis, two categorizations were performed with interest variables considering full mouth: (1) the individuals were divided in three groups (no need for prosthesis; need for replacement of one tooth; need for replacement of more than one tooth) and; (2) the variables were dichotomized (no need/ need for replacement of at least one tooth).

Moreover, we stratified tooth loss considering individuals with presence or absence of anterior tooth loss. Presence and location of tooth loss was assessed using DMF-S index ²⁵.

Independent variables

Some independent variables were also collected to compare the factors associated with normative and subjective need for dental prosthesis. The sex of participants was collected at birth. Family income at age 31 was collected as a continuous variable (BRL). This variable was categorized into tertiles (higher tertile, intermediate tertile and lower tertile). Educational level at 31 years of age was collected as a discrete variable in years and categorized into three groups (≥ 12 ; 9 to 11 and ≤ 8 years). Participants were also asked (31 years-old) if used dental service in the last year (yes/no) and about the self-reported oral health was collected by the following question: "compared to people of your age, how do you consider the condition of your teeth, lips, jaws, or mouth?" (good/mild/poor).

Data source/measurement

Dental examinations were conducted by six dentists. Six interviewers/recorders have also participated in fieldwork team. All examiners and interviewers were trained and calibrated according to a previously described methodology²⁴. The inter-examiner reliability for normative assessment of need for dental prosthesis was estimated using weighted kappa. All dentist presented a kappa value ≥ 0.84 .

Individuals were examined sitting under artificial illumination (head lamp) in their households. The examiners were properly dressed, and all safety and biohazard measures were observed. Regarding quality control, 10% of interviews were repeated with a shortened version of the questionnaire.

Collected data were inserted in an electronic spreadsheet drawn up in Excel software (<https://products.office.com/>) during the examination/interview. Data were grouped into a single database and then transferred to the Stata statistical package, version 12.0 (<https://www.stata.com>).

Statistical methods

Descriptive analysis was performed to assess the distribution of interest variables. To assess the accuracy between normative and subjective need for dental prosthesis, the following parameters were estimated: sensitivity, specificity, positive and negative predictive values. Agreement between subjective and normative need was assessed using the percentage agreement and simple kappa (for dichotomous variables) existent. Furthermore, we stratified the analysis considering presence or absence of anterior loss.

To assess differences in the estimation and strength of effect measures when normative or subjective need for dental prosthesis were adopted as outcome, Poisson regression bivariate analysis was conducted considering five independent variables: sex; familiar income at 31 years categorized in tertiles; educational level at age 31; use of dental service in the last year, and self-reported oral health. Prevalence ratios (PR) and 95% confidence intervals (95%CI) were estimated considering both interest variables as outcomes.

Ethical issues

The Ethics Committee of the Medical School of the Federal University of Pelotas (UFPe) has approved this study. All interviews and examinations were conducted after the participants signed an informed consent form.

Results

A total of 538 individuals answered the questionnaire in 2013, representing a 60.6% response rate compared to the first study of oral health conducted in 1997. The number of refusals represented near 5% of the original sample and loss totalized 34%. Thus, the prevalence of normative need was 48.9% and of subjective need was 34.9%. Considering normative need for dental prosthesis, 23.3% (95%CI: 19.7-27.0) of individuals presented need for some type of prosthesis on the maxillary arch, whereas 39% (95%CI: 34.9-43.3) presented need for prosthesis on the mandibular arch. Subjective need indicated that 22.9% (95%CI: 19.4-26.6) and 26.5% (95%CI: 22.9-30.5) self-declared need for prosthesis on the maxillary and mandibular arches, respectively. Table 1 illustrates the findings of agreement between normative and subjective needs for maxillary and mandibular arches. On the maxillary arch, the percent agreement was 84.8% while kappa index was 0.44. The findings were similar for the mandibular arch, being the percent agreement 78.6% and kappa index 0.41.

When the need for dental prosthesis was dichotomized, considering both arches together, kappa index was 0.43 and percent agreement was 71.5%. The sensitivity of the questionnaire to assess normative need for dental prosthesis was 56.5%, whereas the specificity was 85.8%, positive predictive value was 79.1% and negative predictive value was 67.3% (Table 2).

Dichotomized data was subjected to stratified analysis by location of tooth loss (Table 2). It was observed that only 24 individuals presented anterior loss. Considering only individuals with loss

Table 1

Agreement between normative and subjective need for dental prosthesis.

Normative need	Subjective need			% agreement	Kappa
	Do not need	Need for 1 tooth	Need for more than 1 tooth		
Maxillary arch (n = 507)				84.79	0.44
Do not need	354	35	20		
Need for 1 tooth	41	25	5		
Need for more than 1 tooth	18	6	32		
Mandibular arch (n = 536)				78.64	0.41
Do not need	290	16	21		
Need for 1 tooth	62	36	18		
Need for more than 1 tooth	42	7	44		

Table 2

Accuracy and agreement of normative and subjective need for dental prosthesis. Data for total sample (n = 539) and dichotomized for individuals with (n = 24) and without (n = 513) anterior tooth losses.

Normative need	Subjective need					
	Do not need	Need	Do not need	Need	Do not need	Need
Do not need	235	39	8	1	228	38
Need	114	148	1	14	113	134
	Total		With anterior losses		Without anterior losses	
% agreement	71.46		91.7		70.6	
Kappa	0.43		0.82		0.40	
Sensitivity (95%CI)	56.5 (50.3-62.6)		93.3 (68.1-99.8)		54.3 (47.8-60.6)	
Specificity (95%CI)	85.8 (81.1-89.7)		88.9 (51.8-99.7)		85.7 (80.9-89.7)	
PPV (95%CI)	79.1 (72.6-84.7)		93.3 (68.1-99.8)		77.9 (71.0-83.9)	
NPV (95%CI)	67.3 (62.1-72.2)		88.9 (51.8-99.7)		66.9 (61.6-71.8)	

95%CI: 95% confidence interval.

% Agreement: (number of individuals with diagnostic agreement/total number of individuals)*100; NPV: negative predictive value (number of correct non-cases of subjective need/total number of negative cases of subjective need)*100; PPV: predictive positive value (number of correct cases of subjective need/total number of positive cases of subjective need)*100; Sensitivity: (prevalence of correct cases of subjective need/prevalence of cases with normative need)*100; Specificity: (prevalence of correct non-cases of subjective need/prevalence of non-cases with normative need)*100.

in anterior teeth, the kappa between subjective and normative need was excellent (0.82) and percent agreement was 91.7%. The sensitivity of self-report compared to oral examination was 93.3%, specificity was 88.8% positive predictive value was 93.3% and negative predictive value was 88.9%. Considering dichotomized data for individuals with loss only on posterior region, kappa value was moderated (0.40) and percentage agreement was 70.6%. Sensitivity was 54.3%, specificity was 85.7%, positive predictive value 77.9% and negative predictive value 66.9% (Table 2).

By analyzing the results of factors associated with both normative and subjective need for dental prosthesis (Table 3) we observed that effect measures and significant associations were similar. Lower family income tertile was associated with both objective and subjective need for dental prosthesis (PR = 1.56; 95%CI: 1.22-1.99 and PR = 1.49; 95%CI: 1.09-2.03, respectively); Individuals with lower educational level also showed higher prevalence of normative (PR = 1.93; 95%CI: 1.53-2.48) and

Table 3

Factors associated with normative and subjective need for dental prosthesis in adults at age 31. Rio Grande do Sul State, Brazil (n = 539 individuals). Crude Poisson regression analysis.

Variables	Need for dental prosthesis			
	Normative		Subjective	
	PR (95%CI)	p-value	PR (95%CI)	p-value
Sex		0.168		0.657
Man	1.00		1.00	
Woman	0.88 (0.74-1.05)		0.95 (0.75-1.20)	
Familiar income at age 31		0.009		0.006
Higher tertile (BRL 3,120 to BRL 25,000)	1.00		1.00	
Intermediate tertile (BRL 1,751 to BRL 3,119)	1.39 (1.09-1.79)		1.21 (0.88-1.67)	
Lower tertile (BRL 85 to BRL 1,750)	1.56 (1.22-1.99)		1.49 (1.09-2.03)	
Educational level at age 31 (years)		0.028		0.016
≥ 12	1.00		1.00	
9-11	1.91 (1.53-2.43)		1.70 (1.28-2.27)	
Up to 8	1.93 (1.53-2.48)		1.71 (1.26-2.33)	
Use of dental service in the last year		0.295		0.176
Yes	1.00		1.00	
No	1.10 (0.92-1.31)		1.17 (0.93-1.48)	
Self-reported oral health		0.022		< 0.001
Good	1.00		1.00	
Mild	1.65 (1.37-1.98)		1.50 (1.15-1.95)	
Poor	1.93 (1.57-2.38)		2.46 (1.90-3.17)	< 0.001

95%CI: 95% confidence interval; PR: prevalence ratio.

subjective (PR = 1.71; 95%CI: 1.26-2.33) need of prosthesis. However, worse self-perception of oral health was associated with normative (PR = 1.93; 95%CI: 1.57-2.38) and subjective (PR = 2.46; 95%CI: 1.90-3.17) need for prosthesis.

Discussion

The findings of our study indicate that correspondence between subjective need for dental prosthesis – self-reported by individuals – and normative need – accessed by dentists using the method proposed by the WHO¹¹ – was poor in the present sample of young adults. The only exception was in individuals presenting loss on anterior teeth. In these situations, self-reported measures exhibited high sensitivity, specificity positive and negative predictive values to detect normative need. These findings indicate that tooth loss in aesthetic regions are crucial to individuals, being perceived as a loss to be restored. Moreover, it is important to emphasize that both normative and subjective need for dental prosthesis presented similar association with individuals variables in regression model. This result seems to indicate that both measurements can be used to assess risk factors associated with need for dental prosthesis.

Our study have some limitations. Despite presenting data from a birth cohort, the oral health studies investigated a random sample of the cohort at 31 years, following 539 individuals, which represents a relatively small sample; however, considering stratified analysis in anterior loss, only 24 individuals were included. Furthermore, the generalizability of our findings should be limited to population with similar socioeconomic profile in Brazil. On the other hand, it is necessary to emphasize that our study is the first to test the agreement and accuracy of normative and subjective need for dental prosthesis in a population-based sample with young adults. Also, presented data were collected

in a birth cohort, examined periodically since 1982, so participants are aware of the importance of accurate responses, which makes the study less susceptible to information bias.

Previous study comparing normative and subjective need for dental prosthesis have investigated older adults and found objective need in 93 individuals that have not perceived any need for prosthetic treatment¹⁹. Differences between normative and self-perceived need for prosthesis were also observed in individuals with age ranging from 15 to 74 years (normative need 81% and subjective need 13%)²¹. Considering these findings, we hypothesize that anterior loss could present more accurate findings, which was confirmed in our analysis.

Considering full mouth and dichotomization of interest variables, sensitivity was around 50%, which means that the probability of detecting individuals with normative need by the questionnaire was low. It also indicates that many people disagree with normative need reported by dentists, corroborating the literature that has evidencing different perceptions between patients and dentists²⁶. These differences present a vital importance when dentist formulate a treatment planning, which should consider the needs, expectations, and autonomy of the patients – together with the perception of the dentists.

On the other hand, the specificity observed was high, i.e., individuals that reported requiring prosthesis has a high probability of having normative need. Whereas in the maxillary arch the differences were lower, higher disagreements were observed on mandibular arch, in which subjective need underestimated normative need. These disagreements may happen because mandibular teeth of young adults normally are less visible during usual function like speak and eat²⁷, which can lead the individuals to an absence of perception of need for replacement. Also, it is important note that when prosthetic space is closed by mesialization of neighbor tooth, normative need is not registered according to the index¹¹.

Also considering dichotomized data from full mouth, our findings showed a concordance of 71.46% of subjective with normative need. However, considering that part of this agreement may have occurred by chance, there was a moderate²⁸ kappa value of only 0.43. Similarly, there is a tendency to greater differences in these parameters when younger people are assessed mainly regarding the posterior teeth. This can be explained because aesthetics is more critical and important than function for most people in this age²⁹. Hence, subjects that have free and removable partial dentures usually do not take them because subjective need is lower than the normative¹⁸.

The opposite happened for anterior loss, since aesthetic factor gains importance and a single tooth loss, regardless of whether maxillary or mandibular, is important to be replaced¹⁸. Our findings indicate high sensitivity (93.3%) and specificity (88.9%) for subjective need regarding the anterior loss. The positive predictive value of 93.3% indicates that, among those identified with normative need, most actually had the condition. The negative predictive value indicates that, among those identified as not having normative need, 88.9% were confirmed as really not reporting subjective need. According to data from previous studies, many patients accept edentulous spaces in the posterior areas of the mouth but consider the maxillary anterior teeth essential^{26,30,31}.

In this background emerges the shortened arch concept^{32,33}, primarily reflecting need reported by partially edentulous individuals. This concept considers a dentition with no loss of anterior teeth and one or more loss of posterior teeth. Shortened arch theory considers different levels of functional requirements according to age and other individual factors. According to this concept, a tooth lost should be replaced by prosthetic rehabilitation only when there is deficiency in function, aesthetic, comfort or occlusal stability³⁴. Nevertheless, shortened arch concept has not been extensively employed in clinical practice³⁵, although some studies – including a population-based study³⁶ and a systematic review of randomized controlled trials³⁷ – have encouraged the application of shortened dental arch concept, mainly due to their cost-effectiveness.

Our findings reinforce these findings and give significant repercussions for oral health care at population level. The cost of providing rehabilitation treatment with removable partial dentures in people with shortened dental arch could be used in preventive, diagnostic and restorative measures, which will maintain remaining natural teeth healthy. However, the contrasts existent between the indication of use of reduced arch and their low clinical use³⁵ can be explained by differences in professional environment and context, which seems to be influenced by economic factors – mainly in the private services^{35,38}. This may occur more frequently in countries with a high number of den-

tists, similar to Brazil, which present around 20% of all the world's dentists and a competitive labor market ³⁹. Moreover, dentist's treatment decision-making is not only influenced by the patients' oral condition, being influenced by cost of treatments and patients characteristics, such as skin color and economic status ^{40,41,42,43}.

Regarding associated factors, our findings showed that both subjective and normative needs presented similar results, being individual variables, such as socioeconomic characteristics associated with both normative and subjective need for dental prosthesis. This result corroborates previous findings in this cohort ⁴⁴ and suggests that self-reported measures can be indicated when the aim of the study is to assess risk factors for need for dental prosthesis. The quality of information derived from our study should be emphasized, since the data come from a sample of individuals of a well characterized cohort. The study of patient-based outcomes has been encouraged in the last years to complement conventional clinical measures, which have been the main focus of oral health research ⁴⁵. There is a recognition that traditional normative measures of health need to be supplemented by data from patients, capable to capture their own concerns ⁴⁶. Studies like ours helps to break with clinical beliefs that consider that every missing tooth should be replaced by a prosthesis, showing the importance of subjective measurements of oral health ⁴⁴. The perception of individual is crucial to determine the need for treatment. Should a missed tooth be replaced without being perceived? Thus, our findings are significant to public dental health and could be considered on planning of dental services, mainly to adult population. Establishing priority to those that really have a rehabilitation demand and need for prosthesis could result in expanding access to prosthetic treatment and better use of public resources.

In conclusion, normative need for dental prosthesis differs from subjective need in adults, except when anterior loss are present. These findings reinforce the need for considering individual opinions when planning dental treatments. However, considering decisions at the level of public health and the great demand for prosthetic treatments of the Brazilian population, perhaps subjective needs should be considered and prioritized over normative ones, since not all normative needs are perceived by patients, impacting less in their life. Thus, it seems that rehabilitation of anterior losses can be prioritize over single posterior losses.

Contributors

L. A. Chisini participated in the study conception and design and data acquisition, analysis and interpretation; wrote and reviewed the manuscript. H. R. Sarmento participated in the study conception and design; wrote and reviewed the manuscript. B. L. Horta participated in the study conception and design; reviewed the manuscript. F. F. Demarco participated in the study design and data analysis and interpretation; reviewed the manuscript. M. B. Correa participated in the study conception and design and data analysis and interpretation; wrote and reviewed the manuscript. All authors approved the final version.

Conflict of interest

The authors declare that they have no conflict of interest.

Acknowledgments

The Brazilian National Research Council (CNPq) support this work. This study was conducted in a Graduate Program supported by the Brazilian Graduate Studies Coordinating Board (CAPES).

Additional informations

ORCID: Luiz Alexandre Chisini (0000-0002-3695-0361); Hugo Ramalho Sarmento (0000-0001-6877-2478); Bernardo Lessa Horta (0000-0001-9843-412X); Flávio Fernando Demarco (0000-0003-2276-491X); Marcos Britto Correa (0000-0002-1797-3541).

References

1. Kassebaum NJ, Bernabe E, Dahiya M, Bhan-dari B, Murray CJ, Marcenes W. Global burden of untreated caries: a systematic review and metaregression. *J Dent Res* 2015; 94:650-8.
2. Peres MA, Macpherson LMD, Weyant RJ, Daly B, Venturelli R, Mathur MR, et al. Oral diseases: a global public health challenge. *Lancet* 2019; 394:249-60.
3. Singh A, Peres MA, Watt RG. The relationship between income and oral health: a critical review. *J Dent Res* 2019; 98:853-60.
4. Paulander J, Axelsson P, Lindhe J, Wennstrom J. Intra-oral pattern of tooth and periodontal bone loss between the age of 50 and 60 years: a longitudinal prospective study. *Acta Odontol Scand* 2004; 62:214-22.
5. Aquilanti L, Alia S, Pugnaloni S, Coccia E, Mascitti M, Santarelli A, et al. Impact of elderly masticatory performance on nutritional status: an observational study. *Medicina (Kaunas)* 2020; 56:130.
6. Azevedo MS, Correa MB, Azevedo JS, Demarco FF. Dental prosthesis use and/or need impacting the oral health-related quality of life in Brazilian adults and elders: results from a national survey. *J Dent* 2015; 43:1436-41.
7. Haag DG, Peres KG, Balasubramanian M, Brennan DS. Oral conditions and health-related quality of life: a systematic review. *J Dent Res* 2017; 96:864-74.
8. Schierz O, Baba K, Fueki K. Functional oral health-related quality of life impact: a systematic review in populations with tooth loss. *J Oral Rehabil* 2020; [Online ahead of print].
9. Ilha L, Martins AB, Abegg C. Oral impact on daily performance: need and use of dental prostheses among Brazilian adults. *J Oral Rehabil* 2016; 43:119-26.
10. Gerritsen AE, Allen PF, Witter DJ, Bronkhorst EM, Creugers NH. Tooth loss and oral health-related quality of life: a systematic review and meta-analysis. *Health Qual Life Outcomes* 2010; 8:126.
11. World Health Organization. Oral health surveys: basic methods. 4th Ed. Geneva: World Health Organization; 1997.
12. Fitzpatrick R, Davey C, Buxton M, Jones D. Evaluating patient-based outcome measures for use in clinical trials. *Health Technol Assess* 1998; 2:1-74.
13. Narby B, Kronstrom M, Soderfeldt B, Palmqvist S. Prosthodontics and the patient: what is oral rehabilitation need? Conceptual analysis of need and demand for prosthodontic treatment. Part 1: a conceptual analysis. *Int J Prosthodont* 2005; 18:75-9.
14. Miranda SB, Possebon A, Schuster AJ, Marcello-Machado RM, de Rezende Pinto L, Faot F. Relationship between masticatory function impairment and oral health-related quality of life of edentulous patients: an interventional study. *J Prosthodont* 2019; 28:634-42.
15. Souza JG, Souza SE, Sampaio AA, Silveira MF, Ferreira EF, Martins AM. Self-perception of the need for full dental prosthesis among toothless elderly Brazilians. *Ciênc Saúde Colet* 2016; 21:3407-15.
16. Vilela EA, Martins AM, Barreto SM, Vargas AM, Ferreira RC. Association between self-rated oral appearance and the need for dental prostheses among elderly Brazilians. *Braz Oral Res* 2013; 27:203-10.
17. Narby B, Kronstrom M, Soderfeldt B, Palmqvist S. Prosthodontics and the patient. Part 2: need becoming demand, demand becoming utilization. *Int J Prosthodont* 2007; 20:183-9.
18. Elias AC, Sheiham A. The relationship between satisfaction with mouth and number and position of teeth. *J Oral Rehabil* 1998; 25:649-61.
19. Colussi CF, De Freitas SF, Calvo MC. The prosthetic need WHO index: a comparison between self-perception and professional assessment in an elderly population. *Gerodontology* 2009; 26:187-92.
20. Moreira RS, Nico LS, Sousa MLR. Fatores associados à necessidade subjetiva de tratamento odontológico em idosos brasileiros. *Cad Saúde Pública* 2009; 25:2661-71.
21. Walter MH, Wolf BH, Rieger C, Boening KW. Prosthetic treatment need in a representative German sample. *J Oral Rehabil* 2001; 28:708-16.
22. von Elm E, Altman DG, Egger M, Pocock SJ, Gotsche PC, Vandenbroucke JP, et al. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Lancet* 2007; 370:1453-7.
23. Victora CG, Barros FC, Lima RC, Behague DP, Gonçalves H, Horta BL, et al. The Pelotas birth cohort study, Rio Grande do Sul, Brazil, 1982-2001. *Cad Saúde Pública* 2003; 19:1241-56.
24. Peres KG, Peres MA, Demarco FF, Tarquinio SBC, Horta BL, Gigante DP. Oral health studies in the 1982 Pelotas (Brazil) birth cohort: methodology and principal results at 15 and 24 years of age. *Cad Saúde Pública* 2011; 27:1569-80.
25. World Health Organization. Oral health surveys: basic methods. 5th Ed. Geneva: World Health Organization; 2013.
26. Tortopidis D, Hatzikyriakos A, Kokoti M, Menexes G, Tsiggos N. Evaluation of the relationship between subjects' perception and professional assessment of esthetic treatment needs. *J Esthet Restor Dent* 2007; 19:154-62.
27. Van der Geld P, Oosterveld P, Kuijpers-Jagtman AM. Age-related changes of the dental aesthetic zone at rest and during spontaneous smiling and speech. *Eur J Orthod* 2008; 30:366-73.
28. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics* 1977; 33:159-74.

29. Silva FBD, Chisini LA, Demarco FF, Horta BL, Correa MB. Desire for tooth bleaching and treatment performed in Brazilian adults: findings from a birth cohort. *Braz Oral Res* 2018; 32:e12.
30. Schuurs AH, Duivenvoorden HJ, Thoden van Velzen SK, Verhage F, Makkes PC. Value of the teeth. *Community Dent Oral Epidemiol* 1990; 18:22-6.
31. Akeel R. Attitudes of Saudi male patients toward the replacement of teeth. *J Prosthet Dent* 2003; 90:571-7.
32. Ferreira RC, Kawachi I, Souza JGS, Campos FL, Chalub L, Antunes JLF. Is reduced dentition with and without dental prosthesis associate with oral health-related quality of life? A cross-sectional study. *Health Qual Life Outcomes* 2019; 17:79.
33. Faggion Jr. CM. The shortened dental arch revisited: from evidence to recommendations by the use of the GRADE approach. *J Oral Rehabil* 2011; 38:940-9.
34. Witter DJ, de Haan AF, Kayser AF, van Rossum GM. A 6-year follow-up study of oral function in shortened dental arches. Part I: occlusal stability. *J Oral Rehabil* 1994; 21:113-25.
35. Abuzar MA, Humplik AJ, Shahim N. The shortened dental arch concept: awareness and opinion of dentists in Victoria, Australia. *Aust Dent J* 2015; 60:294-300.
36. Tan H, Peres KG, Peres MA. Do people with shortened dental arches have worse oral health-related quality of life than those with more natural teeth? A population-based study. *Community Dent Oral Epidemiol* 2015; 43:33-46.
37. Khan S, Musekiwa A, Chikte UM, Omar R. Differences in functional outcomes for adult patients with prosthodontically-treated and -untreated shortened dental arches: a systematic review. *PLoS One* 2014; 9:e101143.
38. Chisini LA, Conde MC, Correa MB, Dantas RV, Silva AF, Pappen FG, et al. Vital pulp therapies in clinical practice: findings from a survey with dentist in southern Brazil. *Braz Dent J* 2015; 26:566-71.
39. San Martin A, Chisini L, Martelli S, Sartori L, Ramos E, Demarco F. Distribution of dental schools and dentists in Brazil: an overview of the labor market. *Rev ABENO* 2018; 18:63-73.
40. Brennan DS, Spencer AJ. Longitudinal comparison of factors influencing choice of dental treatment by private general practitioners. *Aust Dent J* 2006; 51:117-23.
41. Brennan DS, Spencer AJ. Factors influencing choice of dental treatment by private general practitioners. *Int J Behav Med* 2002; 9:94-110.
42. Chisini LA, Noronha TG, Ramos EC, Dos Santos-Junior RB, Sampaio KH, Faria ESAL, et al. Does the skin color of patients influence the treatment decision-making of dentists? A randomized questionnaire-based study. *Clin Oral Investig* 2019; 23:1023-30.
43. Chisini LA, Collares K, Bastos JLD, Peres KG, Peres MA, Horta BL, et al. Skin color affect the replacement of amalgam for composite in posterior restorations: a birth-cohort study. *Braz Oral Res* 2019; 33:e54.
44. Slade G. Oral health-related quality of life is important for patients, but what about populations? *Community Dent Oral Epidemiol* 2012; 40:39-43.
45. Tsakos G, Allen PF, Steele JG, Locker D. Interpreting oral health-related quality of life data. *Community Dent Oral Epidemiol* 2012; 40:193-200.
46. Wiklund I. Assessment of patient-reported outcomes in clinical trials: the example of health-related quality of life. *Fundam Clin Pharmacol* 2004; 18:351-63.

Resumo

O estudo teve como objetivo comparar a necessidade normativa de prótese dentária (estimada por dentista) com a necessidade subjetiva (autorrelatada), testando a acurácia e concordância e comparando a direção e magnitude das associações com variáveis independentes, usando necessidade normativa e subjetiva como os desfechos. Foi avaliada uma amostra representativa de uma coorte de nascimentos ($n = 900$), aos 31 anos de idade. A necessidade subjetiva foi obtida com um questionário. As variáveis necessidade normativa e subjetiva foram analisadas dicotomicamente como: (a) com necessidade de prótese dentária e (b) sem necessidade de prótese dentária. A acurácia foi avaliada enquanto sensibilidade (SE), especificidade (SP), valor preditivo positivo (VPP) e valor preditivo negativo (VPN). A concordância entre necessidade normativa e subjetiva foi avaliada com a estimativa do índice kappa. Sexo, renda, escolaridade, uso de serviços de odontologia e percepção da própria saúde oral foram usados para comparar as associações entre necessidade normativa e subjetiva. A prevalência de necessidade normativa era 48,9% e de necessidade subjetiva, 34,9%. A concordância (kappa: 0,43) e acurácia entre as necessidades normativa e subjetiva de prótese dentária eram baixas (SE: 56,5, IC95%: 50,3-62,6; SP: 85,8, IC95%: 81,1-89,7; VPP: 79,1, IC95%: 72,6-84,7; VPN: 67,3, IC95%: 62,1-72,2). Nos indivíduos com perda de dentes anteriores, os resultados mostraram boa concordância (kappa: 0,82) e acurácia entre necessidade normativa e subjetiva (SE: 93,3, IC95%: 68,1-99,8; SP: 88,9, IC95%: 51,8-99,7; VPP: 93,3, IC95%: 68,1-99,8; VPN: 88,9, IC95%: 51,8-99,7). A direção e magnitude das associações com necessidade normativa e subjetiva eram semelhantes. Portanto, a necessidade normativa de prótese dentária difere da necessidade subjetiva em adultos, exceto quando há perda de dentes anteriores.

Estudos de Coortes; Saúde Bucal; Perda de Dente

Resumen

El objetivo de este estudio fue comparar la necesidad normativa de prótesis dental -estimada por los dentistas- con la necesidad subjetiva -autoinformada-, probando la precisión y concordancia, así como comparando la dirección y magnitud de asociaciones con variables independientes, usando ambas como resultados. Se evaluó una muestra representativa de un estudio de cohorte de nacimientos ($n = 900$) a los 31 años de edad. La necesidad subjetiva procede de un cuestionario. Ambas variables necesidad normativa y subjetiva fueron dicotomizadas en (a) individuos con necesidad de una prótesis dental y (b) sin necesidad de una prótesis dental. La precisión se evaluó por sensibilidad (SE), especificidad (SP), valores predictivos positivos (PPV) y negativos (NPV). La concordancia entre necesidad normativa y subjetiva se evaluó estimando el índice de kappa. Sexo, ingresos, nivel educacional, uso de servicios dentales y autoinformados de salud oral se usaron para comparar las asociaciones con necesidad normativa y subjetiva. La prevalencia de necesidad normativa fue 48,9% y la de necesidad subjetiva fue 34,9%. Concordancia (kappa: 0,43) y precisión entre la necesidad normativa y subjetiva de prótesis dental fue baja (SE: 56,5, IC95%: 50,3-62,6; SP: 85,8, IC95%: 81,1-89,7; PPV: 79,1, IC95%: 72,6-84,7; NPV: 67,3, IC95%: 62,1-72,2). Cuando consideramos a individuos con pérdidas de dientes anteriores, los resultados mostraron una buena concordancia (kappa: 0,82) y precisión entre necesidad normativa y subjetiva (SE: 93,3, IC95%: 68,1-99,8; SP: 88,9, IC95%: 51,8-99,7; PPV: 93,3, IC95%: 68,1-99,8; NPV: 88,9, IC95%: 51,8-99,7). La dirección y magnitud de las asociaciones con necesidad normativa y subjetiva fueron similares. Por lo tanto, la necesidad normativa de prótesis dentales difiere de la necesidad subjetiva en adultos, excepto cuando están presentes las pérdidas de dientes anteriores.

Estudios de Cohortes; Salud Bucal; Pérdida de Diente

Submitted on 19/Mar/2020

Final version resubmitted on 16/Jun/2020

Approved on 19/Jun/2020