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Original Article

Validity of self-report of oral conditions in older people

María Jesús Arenas-Márquez[1], Luísa Helena do Nascimento Tôrres[2], Debora Dias da Silva[3], Juliana Balbinot Hilgert[4], Fernando Neves Hugo[4], Anita Liberalesso Neri[5], Maria da Luz Rosario de Sousa[6,*]

[1] Graduate Program in Gerontology, University of Campinas, Brazil; Department of Oral Rehabilitation, University of Talca, Chile

[2] Department of Stomatology, Federal University of Santa Maria, Brazil

[3] Paulista University, Brazil

[4] Department of Preventive and Social Dentistry, Federal University of Rio Grande do Sul, Brazil

[5] Graduate Program in Gerontology, University of Campinas, Brazil

[6] Department of Social Dentistry, Piracicaba Dental School, University of Campinas, Brazil

Corresponding author:
Maria da Luz Rosario de Sousa
Department of Social Dentistry, Piracicaba Dental School, P.O. Box 52
University of Campinas - UNICAMP
13414-903, Piracicaba, SP, Brazil
email: luzsousa@fop.unicamp.br

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Aim: To verify if self-report is a valid instrument to study the clinical oral condition in older people without cognitive deficit. **Methods:** A Cross-sectional study was conducted with 647 older people from the community, without cognitive deficit, living in Campinas, Brazil. A self-report questionnaire assessing the presence or absence of teeth (edentulism) and use of complete denture was applied, identifying the location of the denture, whether in the upper and/or lower arch. In the same session oral clinical exams were performed, considered the gold standard. The self-report validation was performed by calculating sensitivity, specificity, predictive values, odds ratios and Kappa agreement. **Results:** There were high percentages of sensitivity (95–99%), specificity (84–97%), positive (81–97%) and negative (95–98%) predictive values, obtaining an elevated level of confidence and intrinsic quality of the self-report. Agreement with the clinical examination was excellent for all variables (greater than 0.80). The likelihood ratios showed compelling evidence that with self-report an edentulous individual (+LR 32), non-edentulous (-LR 0.06) and absence of complete denture (-LR 0.01) could be correctly identified, with moderate evidence to identify the presence and location of complete denture use (+LR 6.5 to 6.9). **Conclusion:** Self-report is a valid instrument to study the clinical oral condition in the older people of the community.

Keywords: Reproducibility of results. Self-report. Oral health. Aged.

Introduction

Epidemiological studies are a fundamental source of information to know the state of a population's oral health. They allow us to understand the patterns of diseases, causes, risk factors and their vigilance over time[1]. Considering that the world population continues to age rapidly, epidemiological studies are critical to planning public policies and effective interventions that address the specific needs of this age group[2].

The oral health needs of older people are complex. The final marker of oral diseases burden is edentulism[3]. Its impact on nutrition, quality of life, and its association with disability and mortality[4,5], place it as one of the main public health issues[6]. Despite the decline of edentulism in the last decades, it remains being a highly prevalent reality in old age[7], and the problems derived from this condition are further accentuated when functionality is not restored with dental prostheses[8]. Therefore, it is essential to monitor these conditions in older people population.

The gold standard in oral health research is clinical examination. However, its achievement demands many resources in terms of qualified personnel, training, facilities, time and economic cost[9]. As an alternative, self-report have been frequently used[10], since it offers among its advantages, the obtaining of reliable, quicker and cheaper data collection[1]. Also, it allows to reach more distant populations or with mobility limitations, since its application can be done both in person, by telephone or by mail[11].

Large scale multidisciplinary longitudinal studies have been using self-report to investigate the health status of the population[12], including questionnaires for evaluation of oral conditions. The National Health Interview Survey (NHIS) is recognized as the leading source of US health information, known for obtaining data from household interviews over 50 years[13]. In the same way, in Brazil there are the National Health Survey (Pesquisa Nacional de Saúde - PNS)[14], with focus on older people populations, the Health, Well-Being and Aging study (Saúde, Bem-estar e Envelhecimento - SABE)[15], the Brazilian Longitudinal Study of Aging (Estudo Longitudinal da Saúde dos Idosos Brasileiros - ELSI)[16], and the Frailty in Brazilian Elderly Study (Fragilidade do idoso brasileiro - FIBRA)[17], which are also using this instrument.

Every instrument used to replace another must ensure that the measuring condition is accurate in reference to the gold standard[18], as well as the self-report. A literature review verified the diagnostic validity of self-reported oral diseases in population surveys, revealing that the largest volume of studies were conducted in developed countries[12]. The review found acceptable results for the evaluation of the number of teeth, use and need for a denture, but recognize the need for research that certifies its validity in Brazil[12]. Additionally, with a growing number of studies about aging, such as those already mentioned[15-17], it is necessary to evaluate its validity for Brazilian older people. Thus, the purpose of this study is to verify if self-report is a valid instrument to study the clinical oral condition in older people without cognitive deficit.

Materials and methods

Study design and participants

This cross-sectional study was performed with secondary data from the Frailty in Brazilian Elderly Study (Fragilidade do idoso brasileiro - FIBRA), developed in 2008 and 2009[17]. The Ethics Committee of the School of Medical Sciences of the State University of Campinas (nº 208/2007) approved all the procedures performed.

A representative sample was collected, consisting of 900 older people from Campinas, Brazil. A probabilistic, cluster sample was used, taking into consideration urban census sectors (90 of the 835 in the city) randomly selected. On average, 10 older individuals randomly selected too in each census sector, were invited to take part in the study from their homes. The number of elderly individuals in Campinas was calculated as 82 560 (≥65 y old), corresponding to 7.8% of the city's population. Based on this number, the sample was calculated through the formula of finite population, taking into account the achievement of statistical representativeness to describe the prevalence of frailty, use and need of dental prosthesis, presence of teeth, and oral soft tissue injuries. A detailed description of the methodology has been previously published[17]. In this study were included all participants aged 65 to 97 years, who had complete data for the variables of interest related to their clinical and self-reported oral status. Older people with cognitive deficit, determined by the Mini Mental State Examination (MMSE), were excluded, using cut-off points established for the Brazilian population according to schooling years[19].

Oral clinical condition (Gold standard)

Oral clinical examinations were carried out following the World Health Organization (WHO) criteria for epidemiological studies on oral health[20]. The oral clinical examination was performed by three trained dentists. Examiners were provided with a manual describing the study, the clinical examination protocol and criteria. They were instructed to review the material independently. Afterwards, they had a meeting with a trainer who revised the information, described and explained the criteria, and answered their doubts. No calibration was performed.

The presence and absence of four oral conditions was verified: edentulism, use of complete denture (CD) and its location, if in the upper and/or lower arch.

The edentulism was evaluated by the number of teeth present, being considered edentulism the absence of teeth. Regarding the variables related to CD use, the prosthetic condition of each dental arch was examined individually, as established by WHO[20]. The CD as use was considered in its presence at the time of the clinical examination, and the non-use, the absence of CD, or the use of another type of denture. This criterion was also used to evaluate the location of CD.

Self-reported oral condition

In the same session, a self-report questionnaire with structured answers was applied, which evaluated the same four variables measured in the clinical examination. For

edentulism it was asked: "Do you have any natural teeth?" For the variables related to the use and location of CD(s), the following was asked: "Do you wear dentures?" and "In which arch do you wear dentures?" The answers to this last question (upper, lower, both and not used) were subdivided to create the two variables that specified the location of the CD: use in the upper arch (yes: upper use/both; no: only lower/not use) and use in the lower arch (yes: lower use/both; no: only upper/not use).

Finally, it was registered whether older people had used dental services during the past year, and how they evaluate their oral health. This last question was dichotomized as positive (great/good evaluation) and negative (bad/regular evaluation).

Sociodemographic information

Age, gender, race/color, schooling and household income were registered. The race/color was dichotomized as whites and not whites (category that included blacks, biracial, oriental and indigenous). Schooling was dichotomized, according to the years of study, as up to four years and five years or more. Household income was classified according to the minimum wage (MW), valued at R$415.00 / US$ 231.00 in 2008, being dichotomized in up to three MW, and four or more MW.

Statistical Analysis

The study population was characterized using descriptive statistics. For the validation, the self-reported and clinical variables were dichotomized as yes or no, whose equivalences are presented in Table 1. Subsequently, a contingency table was created with the distribution of self-report responses according to the clinical oral condition, to calculate the percentages and confidence intervals of: sensitivity, specificity, positive predictive values (PPV) and negative predictive values (NPV). Values greater than 80% were considered valid, and the sum of sensitivity plus specificity is equal to or greater than 160%[12].

Additional information on the quality of the self-report were obtained by calculating the positive likelihood ratio (+LR) and negative likelihood ratio (-LR), where values ≥ 10 and ≤ 0.10 were respectively considered as strong evidence that self-report is a good indicator of the clinical oral condition[21]. Finally, the agreement level between the

Table 1. Equivalences between clinical examination and self-report issues to assess oral health condition.

Condition	Clinical Protocol (gold standard)	Self-report issues
Edentulism	Number of teeth • n = 0 = edentulous • n ≥ 1 = not edentulous	Do you have any natural teeth? • No = edentulous • Yes = not edentulous
Use of CD	Prosthetic condition • Uses upper and/or lower CD • Does not use, uses FDP and/or RPD	Do you wear dentures? • Yes • No
Use of upper CD	Condition of upper prosthetic • Uses maxillary CD • Does not use, uses FDP and/or RPD	In which arch do you wear dentures? • Uses upper/both • Do not use/uses lower
Use of lower CD	Condition of lower prothesis • Uses mandibular CD • Does not use, uses FDP and/or RPD	In which arch do you wear dentures? • Use lower/both • Do not use/uses upper

CD, complete denture; FDP, fixed dental prosthesis; RPD, removable partial denture.

self-reported and clinical variables was evaluated using the kappa coefficient, considering values above 0.80 as excellent[22]. All analyses were performed with SPSS version 23 (IBM SPSS®, Armonk, NY, USA).

Results

Characteristics of participants

From the 900 participants in the FIBRA survey, 647 older people without cognitive deficit had complete data for validation (Table 2). The mean age was 72.2 (± 5.3) years, women were predominant (69%), as well as older individuals with up to four years of schooling (72.1%), and approximately half used dental services in the last year (51%).

Table 2. Characteristics of participants (N = 647)

Variables	n (%)
Age (mean ± SD*)	72.2 (± 5.3)
Gender	
Male	200 (31)
Female	447 (69)
Color	
White	477 (74)
Not white	168 (26)
Education level	
Up to 4 years of study	466 (72.1)
5 years of study or more	181 (27.9)
Household income*	
Up to 3 MW	262 (46.1)
4 MW or more	306 (53.9)
Use of odontological services in the last year	
Yes	327 (51)
No	314 (49)
Self-assessment of oral health	
Positive	460 (71.9)
Negative	180 (28.1)
Edentulism**	
Yes	309 (47.8)
No	338 (52.2)
Use of complete denture**	
Yes	423 (65.4)
No	224 (34.6)
Use of complete upper denture**	
Yes	418 (64.6)
No	229 (35.4)
Use of complete lower denture**	
Yes	248 (38.3)
No	399 (61.7)

*MW, minimum wage in 2008: 3 MW = R$1245.00/on average US$693.00.
** Oral Conditions evaluated clinically.
SD, Standard deviation.

Regarding the oral condition of the participants (Figure 1), the clinical prevalence of edentulism was 47%, and the use of CD 65% (in the upper arch 64% and in the lower arch 38%). Estimates made by self-report were equivalent in edentulism and overestimated between 5 and 7% in the variables related to denture use.

As to the distribution of self-report responses according to the clinical oral condition (supplementary table), a high number of true positives and false negatives and a small number of true negatives and false positives are observed in all variables.

Validation of oral condition self-report.

Table 3 revealed that the self-report of older people is valid when compared with the clinical examination. Sensitivity and specificity analyzes showed that clinical oral condition was reflected by self-report. From older people who reported having any of the oral conditions evaluated, there was a high percentage that truly had it (sensitivity 95–99%). Thus, among older people who reported not having the conditions, a high percentage did not have them (specificity 84–97%).

Predictive values revealed high odds that the self-report agrees with clinical reality. The four measured variables showed that the probability of truly having a condition when reported was between 81–97% (PPV), and the probability of not having a condition when it was informed so was between 95–98% (NPV).

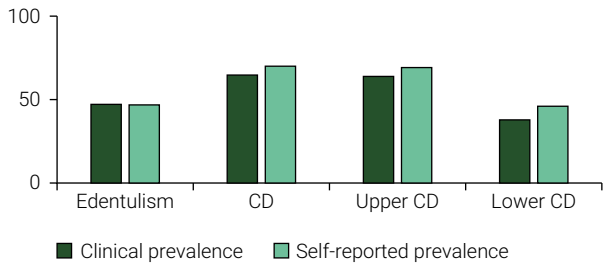

Figure 1. Prevalence of oral conditions. Estimates made by clinical examination and self-report are similar. CD, complete denture.

Table 3. Validation of self-reported oral health condition according to clinical oral condition in older people without cognitive deficit.

	Edentulism	Use of CD	Use of upper CD	Use of lower CD
Sensitivity* (CI)	94.5 (91.3 - 96.8)	99.3 (97.9 - 99.8)	99.3 (97.9 - 99.8)	97.2 (94.3-98.9)
Specificity* (CI)	97 (94.6-98.6)	84.4 (79.7 - 89.3)	84.7 (79.4 - 89.1)	86 (82.2 - 89.2)
PPV* (CI)	96.7 (94.1 - 98.2)	92.3 (89.8 - 94.2)	92.2 (89.7 - 94.1)	81.1 (77.1 - 84.6)
NPV* (CI)	95.1 (92.4 - 96.8)	98.5 (95.5 - 99.5)	98.5 (95.4 - 99.5)	98 (95.9 - 99)
+LR Value (CI)	31.9 (17.33 - 58.85)	6.61 (4.87 - 8.97)	6.50 (4.79 - 8.81)	6.92 (5.43 - 8.84)
-LR Value (CI)	0.06 (0.04 - 0.09)	0.01 (0.00 - 0.03)	0.01 (0.00 - 0.03)	0.03 (0.02 - 0.07)
Kappa coefficient**	0.92	0.87	0.87	0.80

PPV, Positive Predictive Value; NPV, Negative Predictive Value; +LR, Positive likelihood Ratio; -LR, Negative likelihood Ratio; CI, Confidence Interval; CD, Complete Denture.
* Values expressed as percentages.
** $p < 0.0001$ in chi-square or Fisher's exact tests for all variables.

The likelihood ratio expressed the practicality of self-report as a measure of the true clinical oral condition. The values showed compelling evidence that an edentulous individual (+LR = 32), not edentulous (-LR = 0.06) and that does not use CD (-LR = 0.01) can be properly identified with the self-report. However, it is moderate to identify the presence and location of CD (+LR 6.5 to 6.9).

Finally, self-report agreement with clinical reality was higher than 0.80 in all variables (Kappa coefficient).

Discussion

This research confirms the reliability of self-report for Brazilian older people, correctly identifying edentulism and CD use, essential indicators in oral health studies in old age. The high level of confidence and intrinsic quality of the self-report is evidenced by the excellent agreement with the clinical examination, which together with high percentages of sensitivity, specificity and predictive values justify the validity of self-report in individuals without cognitive deficit.

The likelihood ratios also confirm this finding. There is strong evidence that self-report can correctly identify presence or absence in most of the evaluated oral conditions. However, the evidence is moderate to identify the presence and location of CD. It is suggested as a hypothesis, maybe due to the clinical criterion used to consider the use or not of CD (presence or absence of CD at the time of oral examination), because even with a denture, some older people only use it occasionally, when feeding, for example. Thus, it could be that self-report is measuring reality and clinical judgment, underestimating its use.

Research on validation of self-report for number of teeth and use of CD has great heterogeneity in the literature. While the majority encompass adult populations[23,24], or adults and older people together[9,25-29], only one study was conducted with older people population exclusively[30]. In this study, the agreement between the number of teeth obtained by clinical examination and the one estimated by self-report was verified through telephone interviews with older people in the United States. The researchers did not find significant differences when comparing averages, concluding that self-report is a valid instrument[30].

Literature is also heterogeneous regarding the tests used to validate self-report. Only five studies were found using universal measures for validation[25-29], and three of them obtained good or excellent values[27-29]. Note that there are no studies conducted in Brazil evaluating these oral conditions or exclusively with older people population. This research contributes to this knowledge, involving a representative sample of older people living in the community[17] and verifying through the MMSE, that the participants had the cognitive capacity to answer the questions.

The self-report use may provide additional benefits, allowing the exploration of interrelationships between health self-assessment, behavior and awareness about it, health service use, and sociodemographic variables[11]. Participants' responses may be influenced by factors, such as the recent use of dental services[31] and educational level[32]. Higher schooling is associated with greater ease in recognizing a health need and seeking care[33]. However, it is considered that these factors were not relevant to the

results obtained in this research, since only a third of them completed the first phase of elementary education and half went to the dentist in the last year.

As a limitation of this study is the exclusion of older people who scored below the cut-off in the MMSE. This fact may have contributed to the achievement of high values in the validation tests, probably limiting its use to those who do not have cognitive deficit but giving greater fidelity to the measured data. Note that the results of this study refer to a population with a high prevalence of the conditions studied, which in Brazil have been stable over the years[34]. However, the evaluation of other oral health conditions, such as the use of other types of denture, periodontal condition and presence of root caries, are frequent in older people and important to consider in future research. Additionally it is suggested to review the language used in the formulation of the questions, since maybe not all older people understand the term "natural tooth" (which when restored may not be considered as a natural tooth by all older people) or the term "denture" (which may confuse a patient with removable partial dentures, leading to classifying this prosthetics as denture). Considering these observations in future research could make it easier for the answers to be even more representative of reality.

Finally, note that WHO recommends countries to establish an oral health information system for follow-up and ongoing evaluation of the national programs[35]. This organization recognizes the importance of self-report for the identification of appropriate approaches in the promotion and prevention of oral health[1]. Thus, the results obtained in this research contribute to the valorization of this instrument in Brazil.

This research verified that the self-reported oral condition reflects the clinical oral condition, since older people without cognitive deficit have accurately identified conditions such as edentulism and denture use. It is confirmed that the self-report is a valid instrument to be used in the Brazilian context, in epidemiological studies that evaluate these oral conditions in this age group.

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Supplementary table. Oral health condition self-reported according to the oral clinical condition.

	Oral clinical condition/Gold standard											
	Edentulism			Use of CD			Use of upper CD			Use of lower CD		
Self-report	Yes	No	Total	Yes	No	Total	Yes	No	Total	Yes	No	Total
Yes	292	10	302	420	35	455	415	35	450	241	56	297
No	17	328	345	3	189	192	3	194	197	7	343	350
Total	309	338	647	423	224	647	418	229	647	248	399	647

CD, complete denture

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