

# Self-reported questionnaire on periodontal condition validated for use in Brazil

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**Declaration of Interests:** The authors certify that they have no commercial or associative interest that represents a conflict of interest in connection with the manuscript.

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**Abstract:** There is a current expectation of instruments for periodontal condition surveillance worldwide. The present study aimed to validate the Oral Health Questions Set B (OHQB) for the Brazilian Portuguese and evaluate its temporal stability. This is a sequential mixed-method investigation. After the forward-backward translation process to the Brazilian Portuguese, the OHQB Brazil (OHQB-Br) was applied to 156 participants ( $39.5 \pm 14.14$  years; 51.9% males). In sequence, through a full-mouth six-sites/teeth examination and in accordance with the original instrument, the periodontal diagnosis was obtained (March 2020). In January 2021, the OHQB-Br was reapplied ( $n = 71$ ). Ordinal alpha and McDonald's omega tested the internal consistency of the OHQB-Br. Temporal stability was investigated [Spearman correlation, intraclass correlation coefficient (ICC), and the Bland-Altman]. The concurrent validity was also verified, considering the periodontal clinical diagnosis (Kruskal Wallis). The ordinal alpha (0.69) and McDonald's omega (0.73) coefficients showed an adequate internal consistency of the OHQB-Br. The OHQB-Br temporal stability was high, as demonstrated by the Spearman coefficient (0.80) and ICC (0.79) and by the Bland-Altman plot. A concurrent validity showed a direct relationship between the OHQB-Br and the clinical condition of no periodontitis, mild, moderate, and severe periodontitis ( $p < 0.05$ ). Because the OHQB-Br shows internal validity, temporal stability, and adequately identifies periodontal health and moderate/severe periodontitis, the instrument might represent an important tool, at the public level or other settings, for periodontal surveillance in Brazil.

**Keywords:** Validation Study; Epidemiology; Sentinel Surveillance; Periodontal Diseases.

## Introduction

The prevalence of periodontal diseases in different populations worldwide is a matter of concern for public health services. Gingival inflammation is ubiquitous in the population.<sup>1</sup> Different studies estimate that periodontitis affects around 40% of the population, while prevalence and severity increase with age. It is estimated that approximately 34% of those affected present moderate forms, and 10% to 15% are affected by the more severe forms.<sup>2</sup> The chronic presence of periodontal inflammation has been

<https://doi.org/10.1590/1807-3107bor-2022.vol36.0060>

Submitted: August 10, 2021  
Accepted for publication: January 12, 2022  
Last revision: January 26, 2022



associated with different systemic diseases such as diabetes, cardiovascular diseases, and obesity, among others.<sup>3</sup> Advanced forms may result in substantial tooth mortality and loss of function and are of particular concern due to the need for rehabilitation.

A major problem in epidemiological studies for disease estimation is the implementation of periodontal examinations. It is well known the difficulties in selecting appropriate diagnostic methods to describe the distribution of periodontal diseases at the populational level. Thorough periodontal examinations include clinical recordings of oral hygiene, the presence of bleeding, periodontal probing depth, levels of attachment, the radiographic determination of bone levels by well-trained professionals, not to mention the recognized challenge of reaching satisfactory calibration levels.<sup>4-8</sup> Because the full-mouth periodontal examinations (i.e., in six sites per tooth) that are currently considered the standard method have inherent time and labor intensive difficulties, different simplification methods have been proposed.<sup>9</sup> Such a protocol is challenging, and different forms of simplifying it have been proposed. Partial protocols have been tested and used since 1950. Thirty-two partial-mouth periodontal examinations are available. Even though such systems are sought in order to streamline the process of identifying subjects at risk, they still require specialized personnel and clinical settings.<sup>10</sup>

In public health terms, identifying individuals with severe forms of periodontitis is essential for a more accurate stratification. This can facilitate the study of determinants of susceptibility and provide information for a better allocation of therapeutic resources when implementing secondary prevention strategies.<sup>11</sup> In this context, instruments for surveillance in periodontology would be of the utmost importance and, as opposed to clinical examinations, could reach a much larger study population.<sup>12</sup> One potential approach for the surveillance of health-related events is self-reported data. Self-report is used widely to monitor health behaviors, such as tobacco use and physical activity, and for the use of cancer screening and other health conditions like high blood pressure or arthritis.<sup>3</sup> In such a system, a representative sample of the target population is selected and is asked about diseases,

health-related behaviors, or other characteristics. Compared with other approaches for surveillance of health conditions, the primary advantages of self-reports are that they are much less expensive, can yield a more representative sample of the target population than sentinel site-based surveillance, and have simpler logistics. Self-reports for many health behaviors and health status can be collected with high reliability and validity.<sup>13</sup>

Several studies in the past have tested self-report questionnaires for the surveillance of periodontal diseases in the populations. Blicher et al.,<sup>14</sup> in a systematic review, summarized 16 studies published between 1966 and 2004 and suggested a combination of questions to help develop an adequate surveillance instrument. In 2003, the Centers of Disease Control (CDC) initiated the CDC Periodontal Disease Surveillance Project in collaboration with the American Academy of Periodontology (AAP) to address the population-based surveillance of periodontal disease at the local, state, and national levels.<sup>15</sup> According to Eke et al.,<sup>16</sup> periodontal disease surveillance is essential to describe the burden, distribution, and trends of periodontal disease in the US adult population. Also, these instruments help to identify persons and populations at high risk; measure the attributable risk; elucidate relationships between periodontal disease and other chronic diseases at the population level; develop interventions, strategies, and programs and evaluate their effectiveness in preventing and controlling periodontal disease; and evaluate the social and economic effects of periodontal disease in adults. This joint effort resulted in an 8-item questionnaire for the surveillance of periodontitis<sup>15</sup> following an interim analysis performed in Australia.<sup>17</sup> The CDC/AAP Questionnaire has been extensively validated in local and national populations in the United States of America, Australian National Survey, France, and China with acceptable performance.<sup>17-25</sup>

In Brazil, there is an ongoing oral health survey named SB-Brasil<sup>26</sup> in which a partial clinical record system is used to determine the periodontal condition of the population. It is known that partial examinations have a low validity for surveillance and research. Periodontitis is not symmetrically distributed in the mouth, which impairs a proper definition of the

population's periodontal condition using a partial record system.<sup>27</sup> Despite the possible limitations of the National Brazilian Oral Health Surveys, such as being a partial clinical record system, they follow rigorous examination criteria for all the oral health conditions, including periodontal diseases; and these criteria are largely used for comparability of the results with other national health surveys, and in local settings. As with other countries, Brazilian public health services will benefit from validating the CDC/AAP Questionnaire. This validation has not yet taken place, even though the questionnaire has been previously used.<sup>24,28</sup>

Validation is an essential step for the use of the questionnaire in countries with different languages and cultures. It assures confidence based on inferences made about investigated participants on their scores from a health measurement scale, being the first step for investigations with larger samples.<sup>29</sup> The present study aims were two-fold: 1) to validate the OHQB to the Brazilian Portuguese (OHQB-Br) and 2) to test the instrument's temporal stability.

## Methodology

This study is a sequential mixed-method investigation and was ethically conducted according to the Helsinki Declaration and approved by Research Ethics Committee/UFRGS (CAAE: 19391519.0.0000.5347). All participants signed an informed consent form before their inclusion in the study.

### OHQB Translation process

The translation of OHQB from English into Brazilian Portuguese was performed through the "forward-backward" process.<sup>30</sup> Initially, it was translated from English into Brazilian Portuguese by two native English speakers fluent in Brazilian Portuguese. Then, these versions were back-translated into English by a third translator (an English native-speaker fluent in Brazilian Portuguese) and a fourth translator (professor of Periodontology, Brazilian Portuguese native-speaker, fluent in English). These professionals were unaware of the original questionnaire. In sequence, the translated and back-translated versions in English were compared and

discussed by two periodontists (RPP and SCG) who are native speakers in Brazilian Portuguese and fluent in English. Finally, the back-translated version in English was back-translated into the Brazilian Portuguese.

In sequence, a pilot test was performed with a convenience sample (n = 26, not composing the study sample) to assess the accuracy (conceptual equivalence), clarity (understandable expressions), and popularity (to avoid technical terms) of the questionnaire. The questionnaire was considered final when no issue arose from the pilot and was named OHQB-Br.

### Sample size and composition

OHQB comprises eight closed questions and the literature suggests including at least 5 up to 10 individuals per question.<sup>31</sup> Thus, it was estimated a sample of at least 80 participants was needed for the present study.

After being invited by media sources, 156 individuals showed up to be examined by the research team. To be included, participants should be 18 years or older, not undergone periodontal treatment in the last three months, and have at least two teeth. A convenience sample was composed of outsourced employees, staff, students, and faculty professors from the Campus do Litoral Norte, UFRGS and patients seeking attendance by the dental faculty from UFRGS.

Because all individuals satisfied the inclusion criteria, 156 participants were included in the following categories, according to the classificatory system proposed in 2012 and used in the original questionnaire study:<sup>32</sup> no periodontitis (NoP: no evidence of periodontitis), mild periodontitis (MiP:  $\geq 2$  interproximal sites with clinical attachment loss (CAL)  $\geq 3$  mm, and  $\geq 2$  interproximal sites with periodontal probing depth (PPD)  $\geq 4$  mm, not on the same tooth, or one site with PPD  $\geq 5$  mm), moderate periodontitis (MoP:  $\geq 2$  interproximal sites with CAL  $\geq 4$  mm, not on the same tooth, or  $\geq 2$  interproximal sites with PPD  $\geq 5$  mm, not on the same tooth), and severe periodontitis (SeP:  $\geq 2$  interproximal sites with CAL  $\geq 6$  mm, not on the same tooth, and  $\geq 1$  interproximal sites with PPD  $\geq 5$  mm).

## Experimental procedures

In March 2020 (M1), one trained periodontist (RPP) interviewed the participants concerning demographic data, presence of diabetes, and smoking habits categorized in two groups: smokers or non-smokers, in which never smokers and former smokers with at least 2 years cessation were grouped. In the sequence, the participants answered the questions of the OHQB-Br.

At the end of the interviews, a complete periodontal examination was carried out by a calibrated periodontist (RPP: ICC = 0.83 for clinical attachment loss) in all participants (n = 156). In six-sites from all teeth present (except third molars), the periodontal probing depth and clinical attachment loss in millimeters, and the presence or absence of bleeding on probing, were measured with a Williams Probe (Hu-Friedy, Rio de Janeiro; RJ). In addition, the marginal inflammation, by means of the Gingival Bleeding Index (Ainamo and Bay, 1975), was evaluated.

In January 2021 (M2), the OHQB-Br was conducted by the same professional via telephone (n = 71)

## Statistical analysis

Initially, the answers to OHQB-Br were scored 0-1 or 0-1-2 (according to Figure 1). An exploratory factor analysis with oblique rotation was used to assess the underlying factor structure of the scale. Factors with an eigenvalue higher than one were considered.

Reliability was evaluated by internal consistency analysis, using ordinal alpha and McDonald's omega. The study of temporal stability, i.e., repeatability of the results over time (test-retest reliability), was carried out over a 10-month interval (test in March 2020 and retest in January 2021). The Spearman rank correlation coefficient assessed the relationship between the scores. The intraclass correlation coefficient (ICC) and the Bland-Altman graph evaluated the agreement between the scores.

The concurrent validity was assessed by relating the OHQB-Br score to the clinical periodontal diagnosis using Kruskal-Wallis with Dunn's test multiple comparison procedure and the respective effect size.

The analyses, considering 5% significance, were performed using the psych (version 2.0.12), blandr

(version 0.5.1), and rstatix (version 0.6.0) packages of the R version 4.0 software.

## Results

156 participants composed the present sample and were subdivided according to the CDC/AAP classification (Table 1). Data regarding the characteristics of the participants, composed mainly of males (51.9%), 18–40 years-old, university educated (complete or incomplete), non-smokers, and non-diabetics are also depicted in Table 1. Absence of tooth loss (41%) or tooth loss up to 5 (38.5%) accounted for most cases.

**Table 1.** Study population characteristics (n = 156).

Variable	n	%
Sex		
Female	75	48.1
Male	81	51.9
Age		
18–40	96	61.5
41–54	30	19.2
55 or more	30	19.2
Education		
Less than high school	62	39.7
High school	72	46.2
University	22	14.1
Smoking*		
Non-smokers	110	70.5
Smokers	46	29.5
Diabetes*		
Yes	4	2.6
No	152	97.4
Periodontal condition**		
No periodontitis	71	45.5
Mild periodontitis	22	14.1
Moderate periodontitis	20	12.8
Severe periodontitis	43	27.6
Tooth loss		
0	64	41.0
1–5	60	38.5
6 or more	32	20.5

\*Self reported; \*\*Center of Disease Control/ American Academy of Periodontology classification system.

Question and answer options composing the OHQB-Br final version, together with the OHQB, are depicted in Figure 1.

Factor analysis suggested a one-dimensional structure. The psychometrics of the OHQB-Br reliability, Ordinal alpha, and McDonald’s omega are shown in

OHQB (Eke & Genco, 2007)	OHQB-Br	Answer	Coding OHQB-Br
Do you think you might have gum disease?	Você acha que pode ter doença na sua gengiva?	OHQB: Yes, No, Refused, Don't Know	
¿Piensa usted que tal vez sufra de la enfermedad de las encías?		OHQB-Br Sim, Não, Recusa, Não sabe	(2) Sim, (0) Não, (1) Não sabe
Overall, how would you rate the health of your teeth and gums?	De modo geral, como você diria que está o estado de saúde dos seus dentes e gengiva?	OHQB: Excellent, Very good, Good, Fair, Poor, Refused, Don't Know	
En general, ¿cómo diría que es el estado de salud de sus dientes y encías?		OHQB-Br: Excelente, Muito boa, Boa, Razoável, Ruim, Recusa, Não sabe	(0) Excelente/ Muito boa/Boa, (1)Razoável/ Ruim
Have you ever had treatment for gum disease such as scaling and root planing, sometimes called “deep cleaning”?	Alguma vez, você recebeu tratamento para doença na gengiva, como raspagem e alisamento das raízes, às vezes chamada de “limpeza profunda”?	OHQB: Yes, No, Refused, Don't Know	
¿Alguna vez ha tenido usted tratamiento de las encías tipo raspado o alisado de las raíces, que a veces se conoce como “limpieza profunda”?		OHQB-Br: Sim, Não, Recusa, Não sabe	(1) Sim, (0) Não
Have you ever had any teeth become loose on their own, without an injury?	Você teve algum dente que ficou mole ou caiu sem motivo aparente?	OHQB: Yes, No, Refused, Don't Know	
¿Alguna vez se le ha aflojado algún diente por sí solo sin haber tenido una lesión?		OHQB-Br: Sim, Não, Recusa, Não sabe	(1) Sim, (0) Não
Have you ever been told by a dental professional that you lost bone around your teeth?	Algum dentista já disse que havia perda óssea ao redor dos seus dentes?	OHQB: Yes, No, Refused, Don't Know	
¿Alguna vez le ha dicho un profesional de la salud dental que usted ha perdido hueso alrededor de los dientes?		OHQB-Br: Sim, Não, Recusa, Não sabe	(1) Sim, (0) Não
During the past three months, have you noticed a tooth that doesn't look right?	Nos últimos 6 meses, percebeu que algum dente parece não estar bem?	OHQB: Yes, No, Refused, Don't Know	
En los últimos tres meses, ¿ha notado usted un diente que no parece verse bien?		OHQB-Br: Sim, Não, Recusa, Não sabe	(1) Sim, (0) Não
Aside from brushing your teeth with a toothbrush, in the last seven days, how many times did you use dental floss or any other device to clean between your teeth?	Além de usar a escova de dentes, nos últimos sete dias, quantas vezes você usou fio dental, ou algum outro método para limpar entre os seus dentes?	OHQB: ___ : Number of days, 77 = Refused	
Aparte del cepillado de sus dientes, ¿cuántas veces ha usado la seda/hilo dental o algún otro medio o utensilio para limpiarse entre los dientes en los últimos siete días?		OHQB-Br: Número de dias, Recusa	(1) 0 a 3 dias, (0) 4 a 7 dias
Aside from brushing your teeth with a toothbrush, in the last seven days, how many times did you use mouthwash or other dental rinse product that you use to treat dental disease or dental problems?	Além de usar a escova de dentes, nos últimos 7 (sete) dias, quantas vezes você usou bochechos, ou outro produto antisséptico para tratar doenças ou problemas dentários?	OHQB: ___ : Number of days, 77 = Refused	
Aparte del cepillado de sus dientes, ¿cuántas veces ha usado un enjuague bucal u otro producto líquido para el tratamiento de enfermedades o problemas dentales en los últimos siete días?		OHQB-Br: Número de dias, Recusa	(1) 0 a 3 dias, (0) 4 a 7 dias

Figure 1. OHQB and OHQB-Br questionnaire: questions and answers options

Table 2. The internal consistency observed is adequate. The test-retest reliability data is depicted in the same table, with a high Spearman coefficient. The ICC values (Table 2) and Bland-Altman plot (Figure 2; Left) showed good agreement, without relevant bias (-0.24).

**Table 2.** Internal consistency and test-retest reliability measurements of the OHQB-Br (n = 156).

Coefficient	Value (95% confidence interval)
Internal consistency	
Ordinal alpha	0.694 (0.612–0.758)
McDonald's omega	0.730
Test-retest reliability*	
Spearman rank correlation	0.793 (0.659–0.878)
Intraclass correlations	0.789 (0.708–0.850)
Bias (Bland-Altman)	-0.244 (0.180–-0.669)

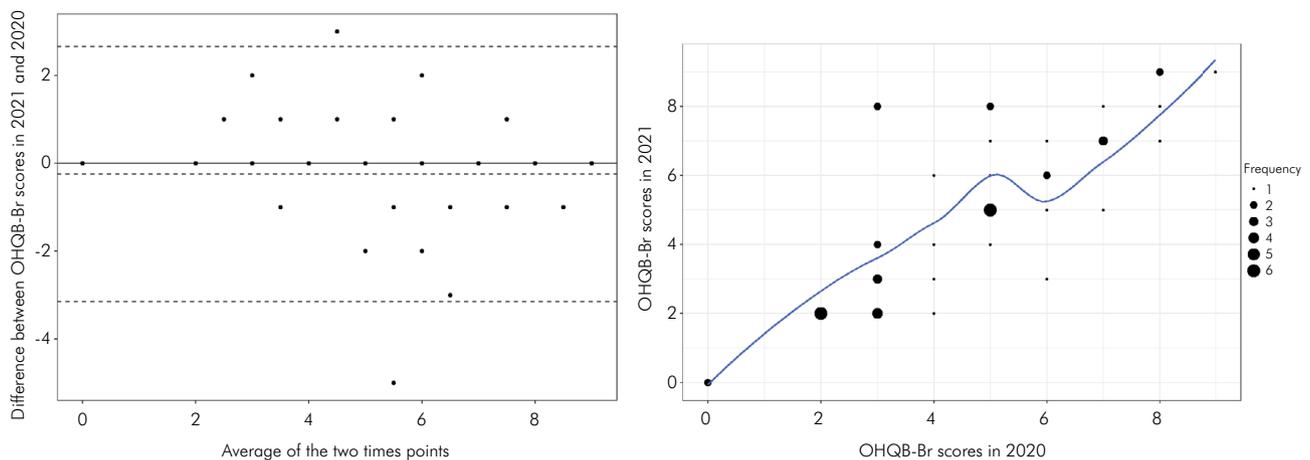
\*For test-retest reliability, 71 participants answered the questionnaire 10 months later.

The dispersion graph between the OHQB-Br scores in 2020 and 2021 is observed in the same figure (Figure 2; Right). The smoothed blue line, calculated using the loess smoothing method, establishes a directly proportional relationship between the scores evaluated at two different time points.

A concurrent validity analysis showed a direct relationship between the OHQB-Br and the clinical periodontal diagnosis because the higher the instrument's scores, the more affected was the tooth support apparatus (Table 3). In this sense, the moderate and severe cases are perceived by the instrument, against the Mild and Periodontal Health strata.

## Discussion

For the first time, the validation process of the CDC/AAP Questionnaire instrument to the Brazilian Portuguese is shown. The process included essential



**Figure 2.** Bland Altman plot (left) and dispersion graph (right) in relation to the OHQB-Br from 2020 and 2021.

**Table 3.** Concurrent validity of the OHQB-Br with the periodontal clinical diagnosis (n = 156).

Clinical periodontal diagnosis	Mean (sd)	Median	First-third quartile	Minimum-Maximum	Missing	Compact letter displays*
No Periodontitis	2.60 (1.29)	2	2–3	0–6	7	a
Periodontitis						
Mild	3.43 (1.54)	3	2–4	1–6	1	ab
Moderate	4.12 (1.41)	4	3–5	2–7	3	b
Severe	4.53 (1.83)	5	3–6	1–8	5	b

\*Different letters show a significant difference at 5% (Kruskal-Wallis with Dunn's test multiple comparison).

steps in line with protocols used in similar studies and showed adequate reliability (internal consistency and repeatability) and concurrent validity.

It is recognized that such instruments need a proper validation to native languages before being used for different nationalities.<sup>33</sup> The more the questions are easily understandable, the greater the chances of assertive responses.<sup>34</sup> Also, according to Feißt et al.,<sup>35</sup> psychometrics is essential for refining medical research questionnaires. In the present study, the need to adapt terms was noticed. The back-forward translation was adequate and allowed transcultural adaptation as the second step in the process, which is an essential procedure to adjust the questionnaire to native cognition.<sup>36</sup> Thus, “doença gingival” was replaced by “doença na sua gengiva”; “raspagem profunda” by “limpeza profunda,” and “enxaguatórios bucais” by “bochechos” in order to fit participant’s cognition as shown.

At this stage, the internal consistency of the instrument was obtained. Here, the ordinal alpha coefficient and McDonald’s omega were 0.694 and 0.73, which are considered adequate.<sup>37</sup> Previous studies in Brazil<sup>24,28</sup> did not test the internal consistency methods and metrics that reinforced the need for the present investigation. Thus, the present study results agree with the requirements for adaptation to linguistic and cultural aspects, aiming to provide a Brazilian version for surveillance in periodontology. Also, it was possible, for the first time, to test the OHQB-Br repeatability during a validation process. The test-retest (Spearman correlation and the ICC) coefficients showed a high repeatability rate with a significantly low risk of bias.

In the present investigation, the concurrent validity of the instrument, translated and adapted for the Brazilian Portuguese, was calculated. Following the periodontal diagnosis system proposed by the original tool,<sup>32</sup> even aware of the existence of a newer classification, the sample was subdivided into no periodontitis (health + gingivitis participants), and mild, moderate, or severe periodontitis. Overall, the present findings showed that the CDC/AAP Questionnaire adequately identifies moderate/severe periodontitis against MiP and NoP subjects in a Brazilian setting. Eke & Dye<sup>19</sup> and Eke et al.<sup>20</sup>

observed that the CDC/AAP Questionnaire could identify severe periodontitis and total periodontitis (moderate + severe) cases as well. This is a validation study and as such it has some limitations that must be considered. It is a convenience sample and, therefore, the results should not be extrapolated to the wider population without caution.<sup>37,38</sup> When considering the age distribution of our sample, 61.5% were in the age range 18–40 years (mean 30.05 ± 6.42). Loss of attachment is a cumulative measure that increases with age, and one may argue that periodontitis would not be prevalent in this age group. However, surveillance instruments should also be capable of discriminating the presence/absence of periodontitis at earlier stages of the disease. Studies using older age groups have been criticized because the increased severity of periodontal disease may return signs and symptoms easily observed by participants. There is a clear need for large scale populational studies employing the instrument. The validation procedures already present in different parts of the world and now also in Brazil grant that the first step of this initiative is taken.

This ability to discriminate the more severe cases is essential in public health planning, as these cases represent the group with the highest risk of continuous bone and tooth loss.<sup>2</sup> The CDC/AAP Questionnaire is receiving increased attention both in the USA<sup>15</sup> and other parts of the world<sup>18,21,22</sup> in a clear demonstration of the utility of this strategy in public health terms. For now, the instrument is validated to the Brazilian Portuguese and should be tested in larger samples following the newer classification system.

It can be concluded that the validation process of the CDC/AAP Questionnaire to Brazilian Portuguese resulted in a promising tool for periodontal condition surveillance. From now on, it can be used in studies carried out in Brazil with the assurance that their results will be comparable to others from different parts of the world.

## Acknowledgments

The authors would like to thank Patrícia Daniela Melchior Angst for the calibration of the examiners and to our colleague Paulo Savio A. Goes (MS,

PhD; Associate professor at the Federal University of Pernambuco, Brazil) for the final reading and suggestions that helped us improve the manuscript. Also, many thanks to Professor Liane Ludwig Loder,

director of the Litoral Norte Campus of Federal University of Rio Grande do Sul, and all the campus personnel, for kindly supporting the team during the development of the study.

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