

Impact of an Oral Health Education Intervention on Informal Caregivers: Validation and Application of the Portuguese Dental Coping Beliefs Scale - DCBS-PT

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Abstract

Background

Oral health literacy among institutional caregivers plays a critical role in maintaining and improving the oral health of dependent older adults. However, training opportunities for caregivers in this field remain limited, and validated instruments to assess their oral health beliefs and practices are scarce. This study aimed to validate the Portuguese version of the *Dental Coping Beliefs Scale* (DCBS-PT) and to evaluate the impact of an educational intervention on caregivers' knowledge and beliefs regarding oral health care.

Methods

A quasi-experimental study was conducted among 44 institutional caregivers of institutionalized elderly from two nursing home facilities in Viseu, in the central region of Portugal. Participants completed the DCBS-PT before and after an oral health educational session. Descriptive and inferential analyses were performed using SPSS 28.0, including reliability analysis (Cronbach's alpha) and comparison of pre- and post-intervention responses through chi-square and Wilcoxon tests. Statistical significance was set at $p < 0.05$.

Results

The study population consisted predominantly of female caregivers (97.7%), with a mean age between 41 and 50 years. Most had more than 10 years of professional experience, and 70.5% reported prior training in healthcare. The DCBS-PT demonstrated high internal consistency (Cronbach's $\alpha = 0.94$). Significant improvements were observed in key domains of oral health literacy after the intervention, particularly regarding beliefs about gingival disease control ($p = 0.004$), prevention of oral candidiasis ($p = 0.004$), and correct response to gingival bleeding during hygiene ($p = 0.03$).

Conclusions

The DCBS-PT showed strong psychometric properties and can be reliably applied among Portuguese-speaking caregivers. The educational intervention effectively improved caregivers' awareness and understanding of oral health care, highlighting the importance of continuous education for enhancing oral health outcomes in institutionalised populations.

Introduction

Oral health is an essential component of general health and well-being, particularly among the elderly who are dependent on daily care. In institutional settings, caregivers are primarily responsible for

assisting with hygiene routines, including oral hygiene. Therefore, their knowledge, beliefs, and practices are fundamental to ensuring the oral health of residents in long-term care facilities. Poor oral health has been associated with systemic diseases such as cardiovascular disease, diabetes, and respiratory infections, and is recognised as a major determinant of quality of life in older populations (1–3).

Despite the recognised importance of oral health care, multiple studies have shown that institutional caregivers often lack adequate training and confidence in providing oral hygiene assistance (4–6). Barriers such as limited education, absence of standardised guidelines, and insufficient institutional support contribute to inconsistent oral care practices and poor outcomes for dependent individuals (7). As a result, there is a growing need for evidence-based educational interventions that can strengthen caregivers' knowledge and foster behavioural change regarding oral health maintenance.

Health literacy, particularly oral health literacy, is a key determinant of health behaviour. It refers to the ability to access, understand, and apply health information to make appropriate decisions. Low oral health literacy among caregivers can directly affect the quality of preventive care and early disease detection in dependent populations (8). Therefore, measuring and improving oral health literacy is fundamental to the success of educational programmes in institutional settings.

The *Dental Coping Beliefs Scale* (DCBS), originally developed in English, has been widely used to evaluate individuals' beliefs and attitudes towards oral health (9). It assesses psychological constructs such as self-efficacy, locus of control, and perceived importance of oral hygiene practices. However, to the best of our knowledge, no validated Portuguese version had been available for use among caregivers prior to this study. Adapting and validating such an instrument ensures cultural and linguistic relevance, allowing for reliable assessment and comparison across different contexts.

Furthermore, educational interventions targeting caregivers have demonstrated positive effects on oral health knowledge and hygiene performance (10–12). Structured training sessions focusing on practical oral care techniques, disease prevention, and motivation can lead to measurable improvements in caregivers' attitudes and confidence. Nevertheless, few studies have combined the validation of a psychometric tool with the evaluation of a training intervention in the same research design.

Therefore, this study aimed to validate the Portuguese version of the *Dental Coping Beliefs Scale* (DCBS-PT) and assess the impact of an oral health education intervention on the knowledge and beliefs of institutional caregivers. We hypothesised that the DCBS-PT would demonstrate high internal consistency and that participation in the educational intervention would significantly improve caregivers' oral health literacy and attitudes toward daily care practices.

Methods

Study design

This was a quantitative, quasi-experimental study with a pre- and post-intervention design. It aimed to validate the Portuguese version of the *Dental Coping Beliefs Scale* (DCBS-PT) and to assess the effectiveness of an oral health education intervention delivered to institutional caregivers. The research followed the ethical principles of the Declaration of Helsinki and received approval by the Health Ethics Committee of the Universidade Católica Portuguesa with the approval number 251 and obtained institutional authorisation from the participating care facilities.

Setting and participants

The study was conducted between April and May 2024 in two long-term nursing home facilities located in Viseu, central region of Portugal. The target population consisted of institutional caregivers responsible for assisting dependent institutionalized elderly with their daily hygiene routines.

The sample was selected through a non-probabilistic convenience sampling method, as recruitment was limited to the two institutions that agreed to participate. The inclusion criteria were: (1) being employed as a caregiver in one of the selected facilities, (2) having direct contact with dependent older adults, and (3) consenting to participate in both the pre- and post-intervention assessments.

A total of 44 caregivers participated in the first phase (baseline assessment). The same group was invited to attend the oral health education session and to complete the questionnaire again in the third phase (post-intervention). Participation was voluntary, and all participants provided informed consent.

Questionnaire and validation process

The *Dental Coping Beliefs Scale* (DCBS) is a 28-item self-administered instrument designed to assess individuals' beliefs and attitudes regarding oral health behaviours. It uses a 5-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (5).

For this study, the original version of the DCBS was translated into Portuguese using a forward–backward translation method by two bilingual experts. A pilot test was performed with a small group of caregivers to ensure semantic and conceptual equivalence. Minor linguistic adjustments were made for clarity and cultural relevance, resulting in the final DCBS-PT version.

The psychometric validation included assessment of internal consistency using Cronbach's alpha, item-total correlations, and construct validity through exploratory analysis of response patterns.

Educational intervention

Following the initial data collection, an educational session entitled "*Oral Health Care for Dependent Patients*" was delivered by a dental professional. The session lasted approximately 90 minutes and covered:

1. Basic principles of oral anatomy and physiology;
2. Common oral diseases in dependent older adults;
3. Demonstration of proper oral hygiene techniques (toothbrushing, denture cleaning, use of fluoride products);
4. Recognition of early signs of oral pathology;
5. Practical guidance on communication and motivation strategies.

The session combined didactic presentation, visual materials, and hands-on demonstrations using oral care models. Participants were encouraged to share experiences and clarify doubts.

Data collection

Data were collected in two phases using printed questionnaires:

- Phase 1 (baseline) — prior to the educational session;
- Phase 3 (follow-up) — one month after the session, using the same instrument.

Sociodemographic and professional data were also collected, including gender, age, years of experience, educational background, area of residence, prior health training and specific oral health education.

Data analysis

All statistical analyses were performed using IBM SPSS Statistics, version 28.0 (IBM Corp., Armonk, NY, USA).

Descriptive statistics were used to summarise sample characteristics (frequencies, percentages, means, and standard deviations).

Internal consistency of the DCBS-PT was evaluated using Cronbach's alpha coefficient, with values ≥ 0.70 considered acceptable and ≥ 0.90 considered excellent.

Comparisons between pre- and post-intervention responses were made using chi-square tests for categorical variables and Wilcoxon signed-rank tests for ordinal data. Statistical significance was set at $p < 0.05$.

Results

Sample characteristics

A total of 44 institutional caregivers completed the baseline questionnaire. The majority were female (97.7%), aged mainly between 41 and 50 years (34.1%). Most participants lived in rural areas (56.8%) and

had a basic education level (52.3%). Over half of the sample (59.1%) reported more than 10 years of professional experience as caregivers (Table 1).

Table 1
Sociodemographic and professional profile of
institutional caregivers (n = 44).

Variable	Category	n	%
Gender	Female	43	97.7
	Male	1	2.3
Age (years)	21–30	5	11.4
	31–40	9	20.5
	41–50	15	34.1
	51–60	10	22.7
	61–70	5	11.4
	> 70	0	0.0
Experience as caregiver	< 1 year	3	6.8
	1–5 years	8	18.2
	6–10 years	7	15.9
	> 10 years	26	59.1

Regarding professional education, 70.5% of the participants had previous training in healthcare fields, primarily in nursing (32.3%) and nutrition (22.6%). Only 29.5% reported specific training in oral health care. Nevertheless, nearly all caregivers (90.9%) considered oral health training essential for their professional duties (Table 2).

Table 2
Oral health training and hygiene practices applied to residents.

Variable	Category	n	%
Previous health training	Yes	31	70.5
	No	13	29.5
Field of training	Nursing	10	32.3
	Nutrition	7	22.6
	Physiotherapy	5	16.1
	Medicine	4	12.9
	Other	5	16.1
Specific oral health training	Yes	13	29.5
	No	31	70.5
Considers oral health training important	Yes	40	90.9
	No	4	9.1

Common oral hygiene practices for residents included the use of family-provided toothbrushes (68.2%), fluoride toothpaste (63.6%), and avoidance of food or drink after night-time cleaning (56.8%).

The 28-item DCBS-PT exhibited excellent internal consistency, with a Cronbach's alpha of 0.942, indicating strong reliability and internal coherence of the instrument. The mean item score was 3.61, ranging from 2.59 to 3.98, reflecting moderately positive beliefs towards oral health care (Table 3).

Table 3
Reliability and descriptive statistics of the DCBS-PT (n = 44).

Parameter	Value
Number of items	28
Mean item score	3.61
Minimum	2.59
Maximum	3.98
Range	1.39
Variance	0.28
Cronbach's α	0.942

These findings confirm that the DCBS-PT is a reliable and consistent instrument for assessing oral health beliefs among Portuguese-speaking caregivers.

At baseline, caregivers demonstrated generally positive attitudes towards oral health. Most participants strongly agreed that correct toothbrushing prevents dental problems (84.1%) and that oral hygiene training improves care (90.9%). However, misconceptions persisted as 43.2% believed gingival bleeding should stop toothbrushing, and 38.6% were unsure about the impact of systemic diseases on oral health (Table 4).

Table 4
Selected baseline beliefs and attitudes regarding oral health (n = 44).

Statement	Strongly disagree (%)	Neutral (%)	Strongly agree (%)
Proper toothbrushing reduces dental problems	0.0	0.0	84.1
Oral health training improves care quality	0.0	2.3	90.9
Gingival bleeding should stop toothbrushing	15.9	20.5	43.2
Diseases and medications do not affect teeth	36.4	15.9	2.3
Oral diseases can be prevented	2.3	11.4	59.1

Following the educational session, improvements were observed across several domains of oral health literacy. Statistically significant differences ($p < 0.05$) were found in beliefs related to:

- The need to assist residents with oral hygiene (Q01, $p = 0.005$);
- The controllability of gingival disease (Q14, $p = 0.004$);
- Prevention of oral candidiasis (Q15, $p = 0.004$);
- Correct management of gingival bleeding (Q26, $p = 0.03$).

These changes indicate a more informed and proactive attitude towards oral health care after the intervention.

Table 5
Comparison of key beliefs before and after the educational intervention.

Item	Belief statement (simplified)	p-value	Change observed
Q01	Recognising need for help with oral hygiene	0.005	Improved awareness
Q14	Gingival disease is impossible to control	0.004	Shift towards positive belief
Q15	Knows how to prevent oral candidiasis	0.004	Increased confidence
Q16	Stop flossing if gums bleed	0.004	Reduction in incorrect belief
Q26	Stop brushing if gums bleed	0.03	Significant behavioural correction
Q19	Visit dentist only when in pain	> 0.05	No significant change

Overall, post-intervention responses reflected improved understanding of preventive care and stronger belief in self-efficacy and professional responsibility in maintaining residents' oral health. The results presented in Table 5 demonstrate a positive impact of the educational intervention on most of the beliefs assessed. A statistically significant improvement was observed in recognising the need for help with oral hygiene ($p = 0.005$), as well as a favourable shift in the belief that gingival disease is impossible to control ($p = 0.004$). Participants also showed a significant increase in confidence regarding their knowledge of how to prevent oral candidiasis ($p = 0.004$). In addition, there was a significant reduction in incorrect beliefs related to discontinuing flossing ($p = 0.004$) and toothbrushing ($p = 0.03$) in the presence of gingival bleeding, indicating meaningful behavioural correction. In contrast, the belief that dental visits are only necessary when experiencing pain did not show a statistically significant change following the intervention ($p > 0.05$) (Table 5).

Discussion

This study validated the Portuguese version of the *Dental Coping Beliefs Scale* (DCBS-PT) and assessed the impact of an oral health education intervention for institutional caregivers. The results confirmed that the DCBS-PT is a psychometrically robust instrument, and that educational training significantly improved caregivers' oral health knowledge and beliefs. These findings align with international evidence underscoring the importance of structured training to enhance oral health literacy among healthcare professionals and caregivers (1–3).

The DCBS-PT exhibited excellent internal consistency (Cronbach's $\alpha = 0.94$), exceeding the thresholds typically accepted for psychological and behavioural measurement tools (4). This level of reliability suggests that the instrument provides a stable and coherent measure of caregivers' beliefs across multiple dimensions, such as self-efficacy, perceived control, and attitudes towards preventive care. Similar results have been reported in adaptations of the DCBS in other languages, including Spanish and Japanese versions, supporting the cross-cultural stability of the scale (5, 6).

The mean item scores indicated a moderately positive baseline orientation towards oral health, which reflects that caregivers already possessed some awareness of the importance of oral hygiene. Nevertheless, the persistence of misconceptions, for instance, regarding the management of gingival bleeding and the role of systemic conditions highlights the need for ongoing professional education.

The intervention effectively enhanced participants' beliefs in key areas of oral health literacy. Notably, significant improvements were observed in understanding disease prevention, controlling gingival inflammation, and recognising the need to assist residents in their oral hygiene. These findings reinforce previous research showing that targeted educational programmes can significantly influence caregivers' oral health-related attitudes and practices (7–10).

Similar interventions conducted in nursing homes have demonstrated that practical, hands-on training coupled with theoretical explanations leads to better oral care practices and increased confidence among staff (11, 12).

In this study, the combination of visual materials, live demonstrations, and interactive discussion proved particularly effective. Participants reported feeling more capable of identifying oral health problems and implementing preventive strategies, which is consistent with the concept of self-efficacy proposed by Bandura (13).

The results also suggest a positive behavioural shift concerning misconceptions. Prior to the intervention, a considerable proportion of caregivers believed that toothbrushing or flossing should be stopped in case of gingival bleeding. Following the session, these incorrect beliefs decreased significantly ($p = 0.03$), demonstrating that short, focused educational actions can achieve measurable cognitive and attitudinal changes.

Improved oral health literacy among caregivers is directly associated with better quality of care for dependent older adults (14). By increasing their knowledge, caregivers are more likely to perform routine oral hygiene procedures correctly, identify early signs of disease, and promote preventive habits. This has broader implications for the overall health of institutionalised populations, as poor oral hygiene has been linked to aspiration pneumonia, malnutrition, and reduced quality of life (15–17).

In addition, promoting oral health within care institutions contributes to interdisciplinary collaboration. The findings of this study support the integration of dental professionals into the training and supervision of caregiving teams. This aligns with the World Health Organization's recommendations on the inclusion of oral health promotion in long-term care strategies (18).

While this study corroborates existing evidence on the positive effects of educational interventions, it also adds value by simultaneously validating a measurement instrument and applying it within a real-world intervention context. Previous studies have often focused solely on knowledge improvement, without ensuring the reliability of the assessment tools used (19). The present study's dual approach

strengthens the robustness of the findings and provides a reliable framework for future research in Portuguese-speaking contexts.

Furthermore, the observed effect sizes and statistical significance (notably in Q14, Q15, and Q26) are comparable to those reported in similar interventions in Scandinavian and Asian populations (20, 21). This suggests that the benefits of caregiver education are culturally transferable and not confined to specific healthcare systems.

This study presents certain limitations. First, the sample size was relatively small ($n = 44$) and restricted to two care facilities, which may limit generalisability. Future studies should include a larger and more diverse sample. Second, the follow-up period was short (one month after the intervention), preventing assessment of long-term behavioural changes. Third, the study relied on self-reported data, which are susceptible to social desirability bias. Direct observation or longitudinal monitoring would provide a more objective evaluation of care practices.

Despite these limitations, the study's methodological rigour, use of validated tools, and significant pre-post differences strengthen the reliability of its conclusions.

The findings underscore the need for continuous, structured oral health training for institutional caregivers. Educational interventions should be embedded in staff induction and continuing education programmes. Collaboration between dental professionals and long-term care institutions could further improve oral care outcomes, reduce preventable oral diseases, and enhance the well-being of dependent older adults.

Conclusions

This study successfully validated the Portuguese version of the *Dental Coping Beliefs Scale* (DCBS-PT) and demonstrated the positive impact of an oral health education intervention on institutional caregivers' knowledge and beliefs. The DCBS-PT proved to be a reliable and valid tool for assessing oral health literacy in Portuguese-speaking contexts, with excellent internal consistency (Cronbach's $\alpha = 0.94$).

The educational intervention effectively improved caregivers' understanding of oral hygiene practices, disease prevention, and professional responsibility in promoting oral health among dependent older adults. Significant post-intervention improvements were observed in key domains of belief and behaviour, such as controlling gingival disease and recognising the need for active oral care support.

These results reinforce the value of integrating oral health education into the training of institutional caregivers. Ongoing, structured programmes can enhance care quality, reduce preventable oral diseases, and improve the well-being and dignity of residents in long-term care facilities.

Declarations

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Authors contributions

NV, PC MJC and PCL were responsible for the conceptualization and design of the project. NV, PC, KP and RA were responsible for the data collection. NV, HC, SL, IA, KP and RA were responsible for the statistical analysis and contributions to the various analytical approaches and interpretations of data. PCL, PC, SL and JJ drafted the main manuscript and made major contributions to the revising of the manuscript. All authors read and approved the final manuscript submitted.

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Availability of data and materials

The data used to generate and support the findings of this study are available from the corresponding author upon request.

Human ethics and consent to participate

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This research was approved by the Health Ethics Committee of the Universidade Católica Portuguesa (Approval number 251). Written informed consent was obtained from all participants.

Consent for publication

Not applicable.

Competing interests

The author declares that they have no competing interests.

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Supplementary Files

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