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## Cross-sectional study of oral health care service, oral health beliefs and oral health care education of caregivers in nursing homes



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## ABSTRACT

**Objectives:** To assess oral care beliefs and oral hygiene procedures among nursing home personnel to identify strengths and weaknesses in managing oral care.

**Methods:** A cross-sectional study in two nursing homes using an oral health care questionnaire including the Nursing Dental Coping Belief Scale.

**Results:** A total of 109 health personnel participated. Oral care was seldomly achieved twice a day and dental supplies were not guaranteed. Registered nurses found the oral health of residents more acceptable than did allied health personnel with less oral care education, who mostly delivered daily care. Conversely, nursing staff with oral care education had lower dental coping beliefs, suggesting a lack of self-reliance in controlling oral health outcomes.

**Conclusion:** Dental supplies should be part of nursing care equipment. Educational programs could increase positive oral health beliefs and enhance the quality of care in these settings, particularly among those who are accountable for oral care.

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## Introduction

Nursing homes face the challenge of providing complete care to frail and multimorbid older residents to maintain their quality of life. Oral health conditions among older people vary and are related to economics, culture, oral care habits, diet, access to oral health care, and dental cost subsidies.<sup>1</sup> A systematic review on the oral health status of older adults in medium- to long-stay health and social care settings in Europe, Asia, and Australia concluded that developing oral health protocols and accordingly training responsible personnel are necessary to improve oral health outcomes in these settings.<sup>2</sup>

In nursing, oral care may be defined as basic nursing targeted to assess, maintain, and care for the oral cavity to keep it intact and free from oral and dental diseases.<sup>3</sup> The ultimate goal is to support frail residents to maintain good oral health, which is associated with well-being,<sup>4</sup> general health,<sup>5,6</sup> and quality of life<sup>7–10</sup> in older adults. Thus, nursing homes should include oral care as an integral part of planning residents' care,<sup>11</sup> combining need assessments, execution plans, quality control,<sup>11</sup> and monitoring delivery.<sup>12</sup>

During recent decades, a positive shift has occurred in oral health among older adults, resulting in an increased number of dentate residents,<sup>13</sup> with complex restorations and prostheses.<sup>14</sup> Oral hygiene regimens must meet these challenges in nursing homes.

Hilton et al. summarized evidence-based practice guidelines in the literature for standard oral care practices for older adults. Most agreed that oral hygiene should be ideally performed twice a day for dentate individuals,<sup>15,16</sup> typically using a toothbrush with high-fluoride toothpaste.<sup>16</sup> Dentures should be cleaned daily using a toothbrush or denture brush and mild soap or water, and they should be soaked in water or cleaning solution overnight.<sup>16</sup> Other guidelines recommend brushing dentures twice daily with abrasion-free cleaning products.<sup>15</sup> Hilton et al. found little information in the literature of the achievability of implementing these practices in geriatric oral care.<sup>16</sup> However, oral hygiene is reported to be poor<sup>8,17</sup> in nursing homes, and oral care activities vary greatly and seldom meet recommended oral care standards<sup>12</sup> in long-term care.<sup>15</sup>

Recent studies have shown that 72% to 78% of nursing home residents need dental treatments.<sup>8,10,18</sup> The most frequent oral health problems are associated with natural teeth<sup>8,17</sup> showing high caries prevalence,<sup>19</sup> requiring dental fillings and extractions.<sup>8,10</sup> Denture wearers are also susceptible to severe oral health irregularities<sup>17</sup> such as oral candida<sup>20</sup> and dry mouth, with an associated risk of malnutrition.<sup>20,21</sup>

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Oral health screening has found that 78% of residents in long-term care need help with oral hygiene, but less than 7% receive such help.<sup>22</sup> This is concerning since most residents do not ask for daily oral health support.<sup>23</sup> Several studies have also shown that oral care in nursing homes is neglected<sup>24</sup> or missed intentionally.<sup>25</sup> Further, the standard of toothbrushing for 2 minutes<sup>12</sup> is rarely met, with the average time varying from 16 seconds for teeth<sup>12</sup> to 52 seconds for both teeth and dentures.<sup>26</sup> This neglect could be explained by different care cultures, which can affect the prioritization and integration of oral care into general care practices<sup>27</sup> and daily routines,<sup>23</sup> as well as a lack of training and support to provide oral care and a poor understanding of the connection between oral care, oral diseases, and general health.<sup>5,9,11,28</sup>

In particular, licensed practical nurses and care assistants<sup>29</sup> have reported lacking the necessary oral health knowledge in their area of responsibility<sup>30</sup> and rated their knowledge of oral care conditions significantly lower than registered nurses.<sup>31</sup> Insufficiencies in both oral health education<sup>32</sup> and practical oral care training<sup>28,32</sup> have been reported as barriers to oral care and hygiene.<sup>32–34</sup>

Oral health knowledge is considered an important prerequisite for health-related behaviors and attitudes,<sup>13</sup> and studies have shown an association between improved knowledge and attitudes and better oral care.<sup>35</sup> Further, oral health knowledge and attitudes and perceived behavior control are predictors of intention to improve oral health behaviors.<sup>36</sup> Individuals with poor knowledge, attitudes, and perceived behavior control may have low oral care priorities and little belief in their power to change oral health outcomes, hindering the promotion of good oral health.<sup>30,37</sup> Those with positive attitudes toward oral care are more likely to have good oral health knowledge<sup>38</sup> and value their oral health.<sup>36</sup> Correspondingly, health personnel with a positive attitude toward oral health are more likely to prioritize oral care during their routine work in the nursing home.<sup>34,37,38</sup>

Oral care in long-term care is well-documented worldwide but has gained little attention from Icelandic authorities and policymakers. Currently, local authorities only demand that nursing homes set their own oral hygiene aims and facilitate access to dentists when needed.<sup>39</sup> Local public information on oral health education and oral care provider training is not clear, and in general, dental and oral health material is seldom included in the curricula of health care disciplines other than dental professions.<sup>40</sup> Consequently, the delivery of oral care in nursing homes is often left in the hand of care givers who may have different priorities in geriatric oral care.

This situation may show that local authorities and policymakers are confident in the power of the hidden curriculum in interpersonal education and training,<sup>41</sup> that is, the influence of experienced health professional and clinical associate role models on novices, students, and peers. Moreover, they rely on expertise, experience, and attitudes toward nursing practice and successful performance being transferred to inexperienced personnel. This may impact self-efficacy when the novice worker accomplishes an activity themselves, reinforcing their outcome expectations.<sup>42</sup> Notably, negative characteristics of role models can result in poor clinical competency.<sup>41</sup>

The current literature on institutional oral hygiene practices is very limited in Iceland.<sup>43,44</sup> To our knowledge, oral care experiences among nursing home personnel have not been studied. It is also unclear, how background education of care givers or years of experience are related to oral health care beliefs and attitudes.

To gain more knowledge on oral care in nursing homes in Iceland, we focused on nursing home employees and conducted a cross-sectional study to investigate oral care activities, beliefs, and education in three groups of caregivers: care assistants, licensed practical

nurses, and registered nurses. We hypothesized that higher education, oral health education, and longer work experience are associated with positive oral health beliefs.

## Material and methods

### Study participants

This cross-sectional study used a convenience sample of employees at two nursing homes in Reykjavik, Iceland, both operated by the same organization with identical structures and services. The criteria for selecting nursing homes were based on official information. The four nursing homes with the highest ratio of non-bedbound residents were invited to participate; they occupied a third ( $n = 471$ ) of the nursing capability in the area and nearby municipalities. Two of the nursing homes declined to participate in the study.

The number of eligible participants was  $N = 200$  employees with or without formal health education. Employees from dementia units within the nursing homes were excluded<sup>10</sup> from the study.

### Procedures

The head nurse in each nursing home introduced our study at staff meetings, identified potential participants, distributed the printed questionnaires, and arranged the return protocol in cooperation with the researchers. The health care providers completed the written questionnaire during one shift at a quiet place in the nursing home and returned their responses in a sealed box on site.

Involvement in the study was voluntary and anonymous. By returning the self-administrated questionnaire, participants gave their written informed consent to participate in the study.

### Data collection

#### *Nursing dental coping beliefs and oral care opinions*

The Nursing Dental Coping Belief Scale used in this study was translated to Icelandic with written permission from corresponding author Wårdh<sup>45</sup> and adapted and tested. Cronbach's analysis was used to test the reliability of the Icelandic version. The alpha value was 0.776, and 0.786 based on standardized items, indicating an adequate level of inter-item reliability. The scale has 28 questions divided equally into four constructs<sup>45</sup> describing attitudes on a five-point Likert scale ranging from 1 ("strongly disagree") to 5 ("strongly agree"). (1) The oral health coping belief items rationalize personal conviction of being able to influence health behaviors. (2) Self-efficacy determines whether coping behavior will aid in a favorable oral health outcome. (3) Internal locus of control describes opinions of being able to control events. (4) External locus of control clarifies whether a person believes that events or success are based on fate, luck, or elements out of their control.

Total scores range from 28–140. Lower scores represent an individual's positive dental coping belief<sup>45</sup> and strong conviction in their ability and competence to influence oral health behaviors.

Participants were also asked to respond to statements such as "Oral care might be left out if staff are short-handed" and "I dislike cleaning teeth or prostheses of residents," answering either "disagree," "unsure," or "agree."

#### *Socio-demographics and work experience*

Further questions collected information on socio-demographics, including age ( $\leq 25$ , 26–35, 36–45, 46–55, and  $\geq 56$  years), gender (male and female), level of education (care assistants, with at least 10 years of compulsory education; licensed practical nurses, with college secondary education from a 3-year vocational program; and

**Table 1**  
Characteristic of the study population (N = 109) in nursing homes A (n = 52) and B (n = 57).

Variable		Nursing home A n (%)	Nursing home B n (%)	Total n (%)	P-value*
Gender (n = 107)	Male	1 (1.9)	5 (9.1)	6 (5.6)	0.107
	Female	51 (98.9)	50 (90.9)	101 (94.4)	
Age group (n = 105)	≤25 years	21 (41.2)	13 (24.1)	34 (32.4)	0.122
	26–35 years	6 (11.8)	12 (22.2)	18 (17.1)	
	36–45 years	5 (9.8)	10 (18.5)	15 (14.3)	
	46–55 years	9 (17.6)	5 (9.3)	14 (13.3)	
	≥56 years	10 (19.6)	14 (25.9)	24 (22.9)	
Education (n = 106)	Care assistant	13 (25.5)	11 (20.0)	24 (22.6)	0.003*
	LP nurse <sup>a</sup>	36 (70.6)	28 (50.9)	64 (60.4)	
	R nurse <sup>b</sup>	2 (3.9)	16 (29.1)	18 (17.0)	
Work experience (n = 107)	<1 year	7 (13.5)	9 (16.4)	16 (15.0)	0.447
	1–6 years	25 (48.1)	22 (40.0)	47 (43.9)	
	7–12 years	3 (5.8)	8 (14.5)	11 (10.3)	
	>12 years	17 (32.7)	16 (29.1)	33 (30.8)	
Oral care service (n = 109)	Yes	49 (45.0)	50 (45.9)	99 (90.8)	0.239
	No	3 (2.8)	7 (6.4)	10 (9.2)	
Oral care training (n = 105)	Practical Yes	26 (49.1)	27 (50.9)	53 (50.5)	0.766
	No	24 (46.2)	28 (53.8)	52 (49.5)	
(n = 107)	Theoretical Yes	17 (43.6)	22 (56.4)	39 (36.4)	0.523
	No	34 (50.0)	34 (50.0)	68 (52.3)	

\* Based on chi-squared statistics, <sup>a</sup> Licensed practical nurse, <sup>b</sup> Registered nurse.

registered nurses, with university tertiary education with 4-year baccalaureate degree). Participants were asked to report how long they had worked in a nursing home (<1, 1–6, 7–12, and >12 years) and the type of oral care education they had received: formal theoretical oral health education, defined as participation in oral health lectures in school, in seminars, or at a nursing home (yes or no); and practical training in oral hygiene practices, defined as hands-on training in school, in seminars, or at a nursing home (yes or no).

#### Oral care activities, equipment, and dental supplies

The oral care activities of participants for residents in their care were self-reported as the frequency of care (seldom [not every day], at least once a day, or more than once a day); type of equipment used for dentate, partially dentate, and edentulous residents (soft, hard, or electronic toothbrush; denture brush; interdental brush; dental floss; gauge; and sponge); and dental supplies used (toothpaste, fluoride toothpaste, mouthwash, mouthwash with alcohol, chlorhexidine, mild soap, gel or denture paste, and water). Open-end questions allowed participants to write their own comments or clarifications if needed.

#### Statistical analysis

The data were analyzed using SPSS statistical software version 26.0 (SPSS, Chicago, IL, USA). Data are presented as frequencies (counts and percentages) and mean ± standard deviation. Data were checked for normality using the Kolmogorov–Smirnov test. Differences between groups were calculated using the chi-squared test (categorical variables) and independent samples t-test (continuous variables). Multiple linear regression models (SPSS general linear model; univariate) were constructed to investigate the relationships

of education, work experience, and oral hygiene training with Nursing Dental Coping Belief Scale scores (dependent variables). The level of significance was set at  $P < 0.05$ .

#### Ethical approval and informed consent

The study protocol was approved by the Icelandic Data Protection Authority (S-6034) and The Icelandic National Bioethics Committee (VSN 12-207 and 12-207-1). No risk was involved for participants in the study.

#### Results

The study response rate was 54.5% (109/200). The study included individuals aged from 18 to 70 years, with 94.4% female. The mean age was  $38.5 \pm 15.8$  years, and male participants were on average 10 years younger than the female participants ( $29.7 \pm 8.1$  years vs.  $39.1 \pm 15.9$  years;  $P < 0.05$ ).

The characteristics of the participants from each nursing home are shown in Table 1. Gender and age distribution, work experience, oral care delivery, and oral care training were similar between nursing homes A and B. However, a significantly higher proportion of registered nurses worked in nursing home A. Although most participants (>90%) provided oral care, only around half had received practical oral care training, and only 36% had received theoretical oral care training.

The results in Table 2 show the oral care delivery, oral health education, and attitudes among care assistants, licensed practical nurses, and registered nurses. Registered nurses were less likely to deliver oral care compared to licensed practical nurses and care assistants, but the latter two groups were less likely to have received some form

**Table 2**

Oral health education, practices, and beliefs among care assistants, practical nurses, and registered nurses.

		Care assistants		Practical nurses		Registered nurses		P-value*
		n	(%)	n	(%)	n	(%)	
Oral care provider	Yes	24	(100.0)	60	(93.8)	13 <sub>b</sub>	(72.2)	0.004*
	No	0	(0.0)	4	(6.2)	5	(27.8)	
Theoretical and/or practical oral health education	Yes	8	(33.3)	34	(54.0)	15	(83.3)	0.006*
	No	16	(66.7)	29	(46.0)	3	(16.7)	
All residents in my care want assistant with oral hygiene	Agree	14	(58.3)	30	(46.9)	10	(55.6)	0.087
	Unsure	4	(16.7)	18	(28.1)	0	(0.0)	
	Disagree	6	(25.0)	16	(25.0)	8	(44.4)	
Oral care might be left out if staff are short-handed	Agree	12	(50.0)	38	(59.4)	13	(72.2)	0.294
	Unsure	2	(8.3)	11	(17.2)	2	(11.1)	
	Disagree	10	(41.7)	15	(23.4)	3	(16.7)	
I dislike cleaning the teeth or prostheses of residents	Agree	0	(0.0)	7	(10.9)	3	(17.6)	0.110
	Unsure	1	(4.2)	8	(12.5)	0	(0.0)	
	Disagree	23	(95.8)	49	(76.6)	14	(82.4)	
Oral health service is lacking in the nursing home	Agree	8	(34.8)	31	(48.4)	13	(76.5)	0.071
	Unsure	10	(43.5)	18	(28.2)	1	(5.9)	
	Disagree	5	(21.7)	15	(23.4)	3	(17.6)	
Overall, the oral health of residents is acceptable	Agree	2	(8.7)	13	(20.6)	9	(52.9)	0.007*
	Unsure	11	(47.8)	23	(36.5)	1	(5.9)	
	Disagree	10	(43.5)	27	(42.9)	7	(41.2)	
Nursing dental coping belief (total score)		69 ± 7		64 ± 10		58 ± 13		0.001*

\*Based on chi-squared statistics,  $P < 0.05$ .

of oral care training. Registered nurses more often agreed with the statement “Overall, the oral health of residents is acceptable” than did care assistants or licensed practical nurses. Though not statistically significant, more registered nurses than care assistants or licensed practical nurses agreed that residents were not always willing to accept assistance with oral hygiene (44.4%), oral care might be left out if staff were short-handed (72.2%), and oral health service was lacking in the nursing homes (76.5%).

Nursing staff with oral care education scored significantly lower on the Nursing Dental Coping Belief Scale ( $62.1 \pm 11.5$ ) compared to those with no formal oral care education ( $66.1 \pm 9.5$ ), as well as on the self-efficacy subscale ( $15.3 \pm 3.1$  vs.  $17.0 \pm 2.8$ ). The scores in other subscales were not significantly different.

General linear models were used to investigate the relationships between education, work experience, practical training in oral care, and scores on the Nursing Dental Coping Belief Scale and its subscales (oral health coping belief, self-efficacy, internal locus of control, and external locus of control; Table 3). Compared to registered nurses, care assistants and licensed practical nurses had higher total scores and higher scores on several subscales. Practical oral care training was associated with lower total and self-efficacy scores (not significant for other subscales). Work experience >12 years was associated with higher total, internal locus of control, and external locus of control scores compared to the other work experience categories.

The frequencies of oral care for dentate and edentate residents by care assistants, practical nurses, and registered nurses are shown in Appendix A. On average, only 7% and 9% of caregivers reported brushing teeth and dentures more than once a day, respectively. Although oral care activities were similar between care assistants and licensed practical nurses, with the majority brushing teeth (87.5%) and dentures (95.8%) at least once a day, a significantly higher proportion of registered nurses reported brushing teeth (38.5%) and dentures (30.8%) more than once a day.

Most used a soft toothbrush (93.6%) on natural teeth and fixed prostheses and regular toothpaste (76.3%) or water (50.5%), but very few used an interdental brush or floss (9.6%). Dentures were most often cleaned using a soft toothbrush (62.7%) or denture brush (36.8%). Most used water (68.8%) and/or mild soap (68%) as denture cleaning agents, and some used toothpaste (42.7%; for details, see Appendices B and C).

A positive oral care belief was associated with more frequent use of an electric toothbrush (23% vs. 6%,  $P = 0.02$ ) compared to a negative oral care belief. Further, practical oral care education was associated with more frequent cleaning of dentures (at least twice a day; 13% vs. 4%;  $P = 0.082$ ), and theoretical oral care education was associated with greater use of dental floss (18% vs. 5%,  $P = 0.045$ ).

## Discussion

We investigated the oral care delivery, oral health care beliefs, and oral health care education of caregivers in Icelandic nursing homes. We found that care assistants, the caregivers most likely to deliver oral care, were the least likely to have some form of oral health care education compared to licensed practical nurses or registered nurses.

Further, many caregivers felt that oral health service was lacking<sup>31</sup> in the nursing home, and most employees thought that oral care might be left out if staff were short-handed, which has been also reported in previous studies.<sup>25,34,46</sup> Registered nurses had more positive oral health beliefs compared to care assistants<sup>29</sup> and licensed practical nurses. Unexpectedly, registered nurses found the oral health of residents more acceptable than did care assistants or licensed practical nurses. Care assistants and licensed practical nurses were often unsure in these matters, possibly due to their lesser degree of education or oral care training. These differences in opinion may reflect the different roles and responsibilities of staff within nursing. Registered nurses are likely not involved in daily oral care unless<sup>30</sup> their expertise is required, such as in complex oral care

**Table 3**  
Multiple linear regression models of the relationships of education, work experience, and oral hygiene training with Nursing Dental Coping Belief Scale scores.

Dependent variable	Parameter	B	95% CI		P-value
Oral health coping belief	Intercept	14.032	11.475	16.590	<0.001
	Care assistant <sup>a</sup>	3.095	0.646	5.544	0.014
	Practical nurse <sup>a</sup>	3.242	1.219	5.265	0.002
	<1 year of work <sup>b</sup>	0.259	-2.202	2.721	0.835
	1–6 years of work <sup>b</sup>	-0.514	-2.350	1.321	0.579
	7–12 years of work <sup>b</sup>	-0.126	-2.894	2.643	0.928
	Training in oral care: yes <sup>c</sup>	-0.428	-2.092	1.236	0.611
Self-efficacy	Intercept	16.184	14.255	18.112	<0.001
	Care assistant <sup>a</sup>	2.195	0.349	4.042	0.020
	Practical nurse <sup>a</sup>	0.720	-0.806	2.245	0.351
	<1 year of work <sup>b</sup>	0.634	-1.222	2.490	0.499
	1–6 years of work <sup>b</sup>	-0.623	-2.007	0.761	0.374
	7–12 years of work <sup>b</sup>	-1.677	-3.764	0.411	0.114
	Training in oral care: yes <sup>c</sup>	-1.445	-2.699	-0.190	0.024
Internal locus of control	Intercept	14.749	12.242	17.255	<0.001
	Care assistant <sup>a</sup>	1.502	-0.898	3.903	0.217
	Practical nurse <sup>a</sup>	0.665	-1.317	2.648	0.507
	<1 year of work <sup>b</sup>	-2.478	-4.890	-0.066	0.044
	1–6 years of work <sup>b</sup>	-2.061	-3.860	-0.262	0.025
	7–12 years of work <sup>b</sup>	-3.382	-6.095	-0.669	0.015
	Training in oral care: yes <sup>c</sup>	-0.915	-2.545	0.716	0.268
External locus of control	Intercept	18.687	16.171	21.204	<0.001
	Care assistant <sup>a</sup>	3.270	0.860	5.680	0.008
	Practical nurse <sup>a</sup>	1.385	-0.605	3.376	0.170
	<1 year of work <sup>b</sup>	-3.204	-5.626	-0.782	0.010
	1–6 years of work <sup>b</sup>	-2.709	-4.515	-0.903	0.004
	7–12 years of work <sup>b</sup>	-3.268	-5.992	-0.543	0.019
	Training in oral care: yes <sup>c</sup>	-1.262	-2.899	0.375	0.129
Total score	Intercept	64.239	57.421	71.057	<0.001
	Care assistant <sup>a</sup>	9.453	2.923	15.983	0.005
	Practical nurse <sup>a</sup>	5.702	0.309	11.095	0.038
	<1 year of work <sup>b</sup>	-4.170	-10.732	2.393	0.210
	1–6 years of work <sup>b</sup>	-5.800	-10.694	-0.906	0.021
	7–12 years of work <sup>b</sup>	-7.886	-15.267	-0.506	0.037
	Training in oral care: yes <sup>c</sup>	-3.911	-8.348	0.525	0.083

<sup>a</sup> as compared to registered nurses, <sup>b</sup> as compared to more than 12 years, <sup>c</sup> as compared to no training in oral care.

situations or if resistant oral care behavior<sup>31</sup> arises. Since oral care standards for nursing homes are not set by Icelandic authorities, screening, planning oral care, execution, and follow-up can vary both between nursing homes and within wards.

Regular oral care<sup>47</sup> is important to oral health,<sup>13</sup> which affects both quality of life<sup>5,10</sup> and general health.<sup>5</sup> In our study, caregivers did not dislike cleaning the teeth or prostheses of residents, although only a minority doing so more than once a day. Oral care in nursing homes seldom meets minimum standards,<sup>12</sup> risking the accumulation of dental plaque and progression of oral diseases.<sup>13</sup> Other studies have also shown that oral care is poorly integrated into everyday care<sup>27</sup> and often missed in nursing homes.<sup>48,49</sup>

For practice, using existing data on oral health, such as from the Resident Assessment Instrument, may be helpful to establish clinical guidelines for oral care. These could be useful to support staff in decision-making when performing oral care based on individualized needs.

Although care assistants and licensed practical nurses provided most of the oral care, they were less likely to have oral health education compared to registered nurses. In Iceland, oral health education is part of the curriculum for dental professions, but as in other countries, it is limited for registered nurses<sup>50</sup> and associated professions.<sup>40</sup> The lack of oral care education has been discussed in previous papers<sup>28,32</sup> because it relates to low prioritization and oral care neglect. In our study, oral health education tended to be associated with more frequent brushing of dentures and use of dental floss.

Oral care beliefs are an important factor and can predict how people perceive their ability to control oral health outcomes. A positive attitude is more likely to value oral health,<sup>34</sup> increase the priority of oral care in the daily care of older people,<sup>37,45</sup> and result in better oral hygiene outcomes.<sup>35</sup> Oral health coaching programs can influence oral health beliefs and support health personnel to maintain good oral health of those in their care.<sup>38</sup>

According to our multivariate analyses, care assistants and licensed practical nurses had higher scores on the Nursing Dental Coping Belief Scale (i.e., lower beliefs) compared to registered nurses, and this was consistent for the subscales. Similar results have been seen in other studies using the scale,<sup>45,51</sup> showing that less educated caregivers responsible for oral care have low beliefs in their oral care competence and limited knowledge and skills to perform the care. Unexpectedly, work experience >12 years was also associated with poorer beliefs. The potential positive effects of education on beliefs may fade over time<sup>50</sup> when training is not renewed regularly, such as through continuing education. On the other hand, oral care education was associated with higher beliefs (independently from being a registered nurse, care assistant, or licensed practical nurse), which indicates that oral care education was associated with enhanced confidence in oral care practices.

To strengthen and support oral care competence, Icelandic authorities could mandate nursing homes in the service agreement to guarantee residents have access to trained oral care workers, similar to the Swedish legislation.<sup>34</sup> Accordingly, oral

care workers would need access to formal education on oral health, including oral diseases and their detection and prevention, as well as training in geriatric oral care techniques. A multidisciplinary approach is needed<sup>52</sup> to form an oral health education program for oral care workers, involving health care personnel and dental professionals.

Our study also shows that the use of some types of equipment for cleaning teeth and dentures among residents is infrequent. For example, the use of electric brushes, floss, and interdental brushes range from only 8–29%, similar to the findings of previous studies.<sup>46,53,54</sup> Although more frequent use of this equipment is desirable, this is not necessarily related to the caregivers' beliefs or education: the availability of dental equipment and supplies is dependent on the resident (or their family) and is not provided by the nursing home in Iceland. Since nursing home residents have limited financial resources, they might not see toothbrushes, toothpaste, dental floss, or special oral care equipment as necessary. This could explain the infrequent use of mouthwash and other dental supplies in our study compared to findings in a similar setting,<sup>54</sup> as well as the frequent use of water as a cleaning material (teeth: 50.5%; dentures: 68.8%). To prevent the lack of necessary dental supplies, oral care guidelines should recommend regular staff follow-ups on private supplies and the use of a notification system (first verbal, then by email or SMS) to a contact person (spouse or family) if the resident does not renew the necessary dental supplies themselves.

Though the Icelandic health care system is similar to other Scandinavian health care systems in many aspects, all dental work is in the private sector. Dental expenses for nursing home residents are not fully covered by the public health care system and are excluded from service agreements with Icelandic nursing homes.<sup>39</sup> Consequently, the financial burden of dental expenses stays with residents, adding risk to their oral health. This might affect the quality of oral health care in nursing homes and increases oral health inequalities among residents.

In Iceland, care assistants represent the largest proportion (63%) of nursing home employees.<sup>55</sup> Registered nurses (12% of nursing home staff) mostly oversee medication administration and daily care planning, but licensed practical nurses (18%)<sup>49</sup> and care assistants perform the actual health care.<sup>29</sup> Consequently, registered nurses are less likely to be directly involved in oral care<sup>30</sup> than care assistants or licensed practical nurses, and it is unsurprising that the three groups do not always share opinions on the oral health care or status of residents. In the future, documenting available oral health education and training in geriatric oral care techniques in nursing homes and schools and identifying oral care delivery and personal oral health beliefs among staff are equally important<sup>35,45</sup> since these factors might affect the prioritizing and quality of oral care delivery.

### Strengths and limitations

This is a cross-sectional study, which cannot distinguish between cause and consequence in an observed association. Although it sounds reasonable that oral care training leads to a better oral care belief, we cannot exclude the possibility that staff with better beliefs would rather attend oral care training.

The study used a convenience sample from two out of the four largest nursing homes in the area, both run under the same management umbrella. The results might have been different if the other organizations had been involved in the study.

Only a few care assistants took part in this survey, although they represented most caregivers in Icelandic nursing homes. Because many care assistants have a migrant background, they might have been missed because the questionnaire was in Icelandic. Further, the small sample size limits the ability to detect smaller differences between groups as statistically significant.

A further limitation of this study is that we used self-reported questionnaires. Respondents may be susceptible to bias when asked about their own experiences and influenced by social desirability, causing them to exaggerate in their responses. Nevertheless, a strength of the current study is that we used the well-accepted Nursing Dental Coping Belief Scale<sup>38,45,51</sup> and connected it to education, oral care training, and working years, thus yielding useful and interesting results.

### Conclusion

This study found that in Icelandic nursing homes, care assistants, the caregivers most likely to deliver oral care, were the least likely to have some form of oral health care education compared to licensed practical nurses and registered nurses. Further, many caregivers felt that oral health service was lacking, and although they did not dislike cleaning the teeth or prostheses of residents, only a minority reported doing so more than once a day. Care assistants and licensed practical nurses had lower dental coping beliefs and thus a lesser conviction in their ability and competence to influence oral health behaviors compared to registered nurses. Unexpectedly, longer work experience was also associated with poorer dental coping beliefs.

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### Declaration of Competing Interest

The authors declare no conflict of interest.

### Appendix A. Frequency of oral care of dentate and edentate residents performed by care assistants, practical nurses, and registered nurses.

	Care assistants		Practical nurses		Registered nurses		P-value*
	n	(%)	n	(%)	n	(%)	
<b>Teeth</b>							
More than once	2	(8.3)	3	(5.0)	5	(38.5)	0.008*
At least once a day	21	(87.5)	56	(93.3)	8	(61.5)	
Seldom	1	(4.2)	1	(1.7)	0	(0.0)	
<b>Dentures</b>							
More than once	1	(4.2)	2	(3.3)	4	(30.8)	0.009*
At least once a day	23	(95.8)	56	(93.3)	9	(69.2)	
Seldom	0	(0.0)	2	(3.3)	0	(0.0)	

\*Based on chi-squared statistics,  $P < 0.05$ .

### Appendix B. Type of equipment used for cleaning teeth and dentures among residents by care assistants, practical nurses, and registered nurses.

Type of resource	Job title			
	Care assistants	Practical nurses	Registered nurses	Total
	% (n/N)	% (n/N)	% (n/N)	% (n/N)

(continued)

(Continued)

Type of resource	Job title							
	Care assistants		Practical nurses		Registered nurses		Total (n/N)	
	%	(n/N)	%	(n/N)	%	(n/N)		%
<b>Teeth</b>								
Soft toothbrush (N = 88)	90.9	(20/22)	93.2	(55/59)	100	(13/13)	93.6	(88/94)
Hard toothbrush (N = 32)	31.8	(7/22)	37.3	(22/59)	23.1	(3/13)	34.0	(32/94)
Electronic toothbrush (N = 24)	22.7	(5/22)	22.0	(13/59)	46.2	(6/13)	25.5	(24/94)
Interdental brush (N = 9)	13.6	(3/22)	8.5	(5/59)	7.7	(1/13)	9.6	(9/94)
Dental floss (N = 9)	0.0	(0/0)	10.2	(6/59)	23.1	(3/13)	9.6	(9/94)
Gauge or sponge (N = 24)*	9.1	(2/21)	35.6	(21/59)	7.7	(1/13)	25.5	(24/94)
<b>Dentures</b>								
Soft toothbrush (N = 59)	58.3	(14/24)	60.3	(35/58)	76.9	(10/13)	62.7	(59/95)
Hard toothbrush (N = 28)	25.0	(6/24)	36.2	(21/58)	7.7	(1/13)	29.5	(28/95)
Electronic toothbrush (N = 8)	8.3	(2/24)	8.6	(5/58)	7.7	(1/13)	8.4	(8/95)
Denture toothbrush (N = 35)	29.2	(7/24)	41.4	(24/58)	30.8	(4/13)	36.8	(35/95)
Gauge or sponge (N = 32)	33.3	(8/24)	32.8	(19/58)	38.5	(5/13)	33.7	(32/95)

\*Based on chi-squared statistics, P < 0.05.

**Appendix C. Types of material used to clean teeth and dentures among residents by care assistants, practical nurses, and registered nurses.**

Material	Job title							
	Care assistants		Practical nurses		Registered nurses		Total (n/N)	
	%	(n/N)	%	(n/N)	%	(n/N)		%
<b>Teeth</b>								
Toothpaste (N = 74)	66.7	(16/24)	76.7	(46/60)	92.3	(12/13)	76.3	(74/97)
Toothpaste with fluoride (N = 43)	45.8	(11/24)	43.3	(26/60)	46.2	(6/13)	44.3	(43/97)
Mouthwash (N = 28)	8.3	(2/24)	35.0	(21/60)	38.5	(5/13)	28.9	(28/97)
Mouthwash with alcohol (N = 2)	0.0	(0/0)	3.3	(2/60)	0.0	(0/0)	2.1	(2/97)
Chlorhexidine solution (N = 2)	0.0	(0/0)	3.3	(2/60)	0.0	(0/0)	2.1	(2/97)
Water (N = 49)	45.8	(11/24)	53.3	(32/60)	46.2	(6/13)	50.5	(49/97)
<b>Dentures</b>								
Toothpaste (N = 41)	41.7	(10/24)	44.1	(26/59)	38.5	(5/13)	42.7	(41/96)
Toothpaste with fluoride (N = 10)	8.3	(2/24)	11.9	(7/59)	7.7	(1/13)	10.4	(10/96)
Mouthwash (N = 36)	20.8	(5/24)	40.7	(24/59)	53.8	(7/13)	37.5	(36/96)
Mouthwash with alcohol (N = 2)	0.0	(0/0)	3.4	(2/59)	0.0	(0/0)	2.1	(2/96)
Chlorhexidine solution (N = 6)	8.3	(2/24)	3.4	(2/59)	15.4	(2/13)	6.2	(6/96)
Mild soap (N = 66)	66.7	(16/24)	68.3	(41/60)	69.2	(9/13)	68.0	(66/97)
Gel, paste for dentures (N = 20)	12.5	(3/24)	23.3	(14/60)	23.1	(3/13)	20.6	(20/97)
Water (N = 66)	54.2	(12/24)	78.0	(46/59)	53.8	(7/13)	68.8	(66/96)

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