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ARTICLE

Implementation and evaluation of an oral health education programme for caregivers in nursing homes

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Abstract

Aim: The aim was the design, implementation, and evaluation of an oral health education program for nursing home caregivers.

Methods and results: Fifty-five formal caregivers working in the three units of a nursing home were allocated to either a control (n = 27) or an intervention group (n = 28). A knowledge and attitudes questionnaire about oral health was developed and completed by the caregivers. Then, an education program about oral heath in older people was applied to the intervention group, and the completion of the questionnaire was repeated by both the intervention and control groups. Two months after the intervention, the questionnaire was completed again by the intervention group. Within groups analyses revealed a statistically significant increase in knowledge and attitudes only in the intervention group after the implementation of the education program ($P < .001$). Between-group analyses showed that the total knowledge and attitudes score in the intervention group were statistically significantly higher than in the control group ($P < .001$ and $P = .02$, respectively). In the intervention group, knowledge and attitudes were maintained in the measurement recorded 2 months later ($P = .11$ and $P = .21$, respectively).

Conclusion: The education program was effective in improving the caregivers' knowledge and attitudes toward nursing home residents' oral health and maintaining them 2 months after implementation.

KEYWORDS
elders, nursing home residents, oral health

1 | INTRODUCTION

Frail older adults often face a rapid oral health deterioration due to numerous barriers and risk factors including intrapersonal factors, lack of professional support, and lack of effective oral health policies.[1–4] Nursing home residents are a particularly vulnerable part of the older population with high rates of oral disease.[5–12] A high prevalence of poor dental and denture hygiene, coronal and root caries, periodontal disease, missing teeth, mucosal lesions, and denture-related conditions is recorded, leading to increased rates of dental and prosthetic needs.[5,6,8,10,11] The clinical importance of poor oral health among frail elders is high as periodontal disease has been associated with

diabetes mellitus, cardiovascular diseases, and respiratory disease, while poor oral hygiene and denture wearing at night have been associated with aspiration pneumonia in frail older people with swallowing disorders.[13–17] Oral health is a significant component of general health and well-being in older adults,[18] which is particularly relevant among frail and care dependent nursing home residents.

Although the oral health of frail older people is poor, their access to dental care is limited, while their communication with non-dental healthcare providers increases.[1] Taking this into consideration, all healthcare providers that treat older persons in the community, and particularly in nursing homes, should be adequately trained to initially assess oral problems and perform oral health promotion measures.[1] Although the role of nursing homes' staff in the oral health promotion of residents is crucial and their oral education is of utmost importance,[19,20] many studies have identified a number of barriers including the caregivers' lack of knowledge and training in oral care provision, increased workload, administrative problems, inadequate number of staff, and residents' resisting behaviour.[1,21–26]

A number of systematic reviews highlighted the role of oral health education of formal caregivers to improve residents' oral health,[21,22,27,28] and dedicated questionnaires have been published for the evaluation of nurses' and formal caregivers' knowledge and attitudes toward oral health and care in nursing homes residents.[29–34]

Taking into consideration the above facts, the European College of Gerodontology and the European Geriatric Medicine Society have published an expert opinion document with joint recommendations on oral health promotion in older adults,[1] with specific protocols for oral health prevention and promotion in institutional settings, including the regular training of caregivers in providing oral care to residents, and specific learning objectives for training in oral health assessment and promotion. The two Societies have also published details on the methods of initial oral health assessment and oral disease prevention by non-dental healthcare providers in nursing homes.[35]

The purpose of the present study was the design, implementation, and evaluation of a pilot oral health education program for formal caregivers of nursing home residents based on the relevant recommendations of the European College of Gerodontology and the European Geriatric Medicine Society.

2 | MATERIALS AND METHODS

2.1 | Study design

According to the local regulations, a study protocol was established and approved by the Interdepartmental Committee of the Program "Health Promotion and Education" of the National and Kapodistrian University of Athens (24/3/2018). The study was quasi-experimental with non-equivalent pre-testing and post-testing control group design for the formal caregivers who worked in a nursing home. The flowchart of the study methodology is presented in Figure 1.

2.2 | Study participants

Three nursing homes participated in the study; they were all members of the same private organization and located in different regions of the Athens metropolitan area. At the beginning of the study, a semi-structured interview was conducted with the administration of the nursing home and the senior nurse managers to explain the objectives of the study and agree on the procedures to follow. Organizational constraints related to the working hours and other professional obligations precluded the randomization of the sample. A total of 81 caregivers worked in the three nursing homes. After detailed information of the project's aims and content, 74 caregivers agreed to participate and signed a relevant consent form (response rate: 91.3%). The participants were conveniently allocated to either intervention (n = 38) or a control group (n = 36). A total of 19 caregivers dropped out of the study after the pre-testing, and 55 (28 in the intervention group and 27 in the control group) participated in the post-testing.

2.3 | Development of questionnaires

The research team developed an anonymous questionnaire investigating knowledge and attitudes of the caregivers about geriatric oral health and care. The questionnaire consisted of six parts: (a) demographic characteristics of the caregivers, (b) professional experience in daily oral care provision for older adults, (c) sources of information about oral hygiene practices, (d) the caregivers' own dental visitation habits, (e) knowledge of oral health and care in older adults, and (f) attitudes toward oral care provision in older adults. The questionnaire was developed based on: (a) the recommendations by the European College of Gerodontology and the European Geriatric Medicine Society[1,35] on the elders' oral health promotion practices by non-dental healthcare providers, (b) an extensive literature review of related studies and questionnaires about oral health knowledge[29–32,36] and attitudes,[29–31,33,34,37] (c) interviews with nursing home staff, and (d) expert opinion.

The knowledge questions were close-ended (multiple choice and true-false). Every correct answer was rated

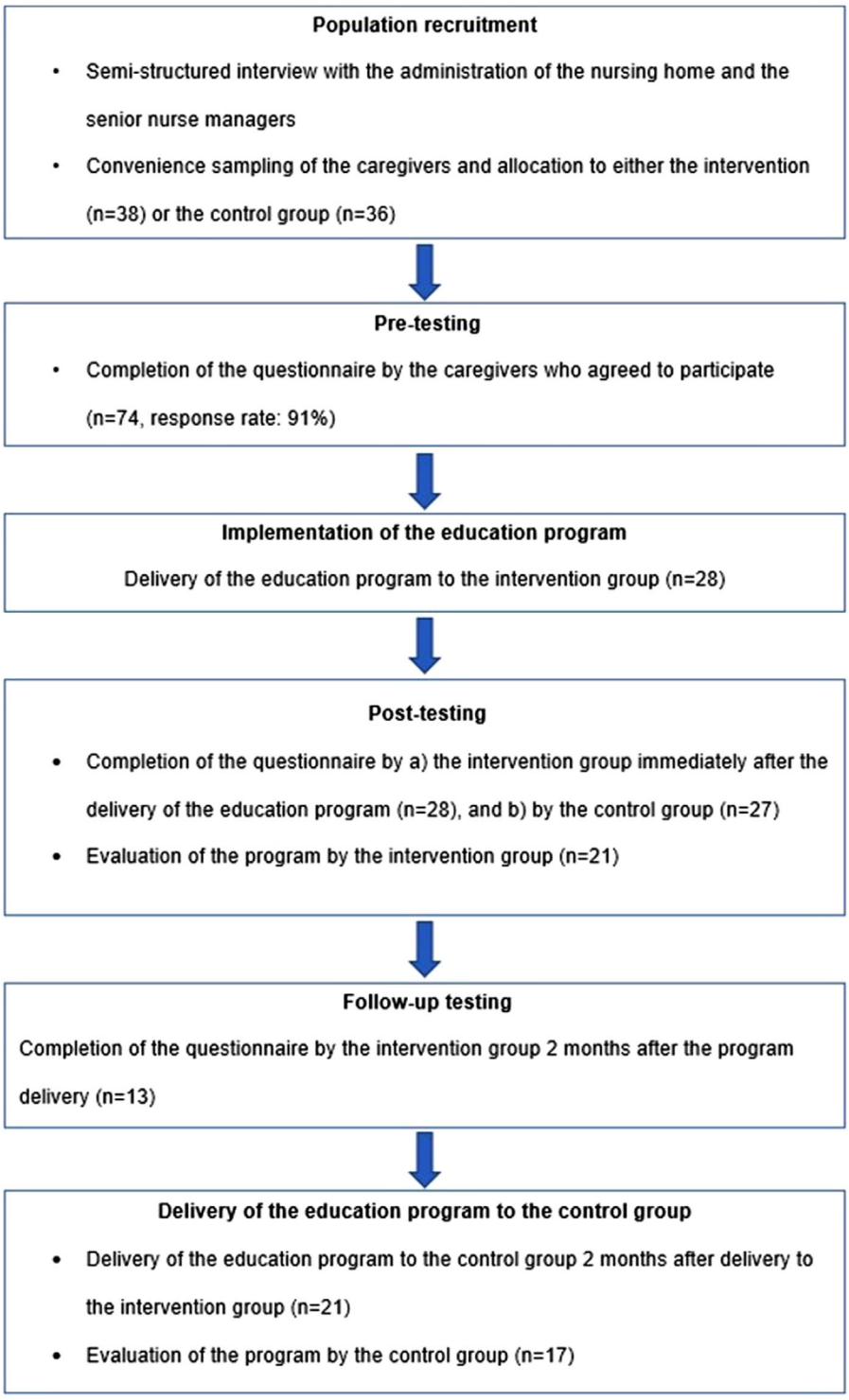

FIGURE 1 Flowchart of the study on the implementation and evaluation of an oral health education program for caregivers in nursing homes

with one point, whereas every wrong answer was rated with zero. The total score of knowledge ranged between zero and 12 points. Attitudes' statements were evaluated using a five-point Likert scale; six of them were positively worded, and the other eight were negatively worded. The positively worded statements were rated as follows: 1: I strongly disagree, 2: I disagree, 3: neither agree - nor disagree, 4: I agree, 5: I strongly agree, and the negatively worded statements were reversely rated. Consequently, the total score of attitudes ranged between 14 and 70 points with higher scores indicating more positive attitudes.

2.4 | Pre-testing

The questionnaire was completed by the caregivers of the control and the intervention groups at the pre-testing. The participants were asked to complete their four last digits of their mobile phone number on the questionnaire sheets to match the scores at the pre-testing, post-testing, and follow-up testing.

2.5 | Implementation of the geriatric oral health education program

Three weeks later, a geriatric oral health education program was delivered to the intervention group. The geriatric oral health education program consisted of both a theoretical and a practical part and had a duration of 90 minutes. It was carried out in appropriate nursing home rooms that were organized to host small group seminars. The content of the program was based on the recommendations by the European College of Gerodontology and the European Geriatric Medicine Society on the expected knowledge and skills of non-dental healthcare professionals about oral health promotion in frail older adults.[1,35]

The theoretical part included a PowerPoint presentation on the importance of oral health for general health and well-being, the common oral diseases in older people, the distinction between physiological and pathological oral findings, a description of appropriate oral health assessment tools, the reasons for dental referrals, oral hygiene provision and oral health promotion practices, as well as specific recommendations for oral health promotion in older adults with dementia. Questions and answers, multiple choice questions and discussion promoted the active participation of the caregivers.

In the intervention group, the education program was delivered in two groups of 14 members each. For the delivery of the practical training, the participants in each group were further divided into smaller groups of four or five members each. The practical part included a demonstration of oral and denture hygiene practices and of the relevant equipment. Printed and online educational material were provided to the participants.

2.6 | Post-testing

Immediately after the completion of the education program the members of the intervention and control groups filled-in the same questionnaires as in the pre-testing.

2.7 | Course evaluation by the intervention group

The course was evaluated by the intervention group using an eight-item questionnaire based on the continuing professional development (CPD) activity evaluation toolkit developed at the DentCPD project.[38] The questions could receive a score from 1 (strongly disagree) to 10 (strongly agree). The total score could range between 10 and 80.

2.8 | Follow-up testing

Two months after the intervention, the same questionnaire was repeated by the intervention group.

2.9 | Delivery of the education program to the control group

Two months after the delivery of the education program to the intervention group, the education program was also delivered to the members of the control group who were also asked to complete the course evaluation forms.

2.10 | Statistical analysis

A descriptive analysis of the quantitative and qualitative variables was performed. The normality of quantitative variables was assessed with Kolmogorov-Smirnov test and Shapiro-Wilk test. Student's *t*-test and Mann-Whitney U test were used to assess differences between quantitative variables, while differences between qualitative variables were tested with chi-square test and Fisher's Exact test. Differences in the total score for knowledge and attitudes within the same groups between pre-test and post-test, and post-test and follow-up were analyzed with paired samples test and Wilcoxon Ranked test. The effect of independent variables on knowledge and attitudes improvement was investigated with bivariate analyses (Student's *t*-test, Mann-Whitney U test, Spearman's Rank Correlation Coefficient, Pearson's Linear Correlation Coefficient, Kruskal-Wallis test, one-way ANOVA). As improvement in knowledge did not follow the normal distribution, a categorical variable was created having as threshold the 75th percentile; variables significantly associated with an improvement in knowledge were further analyzed with binary logistic regression. Variables which

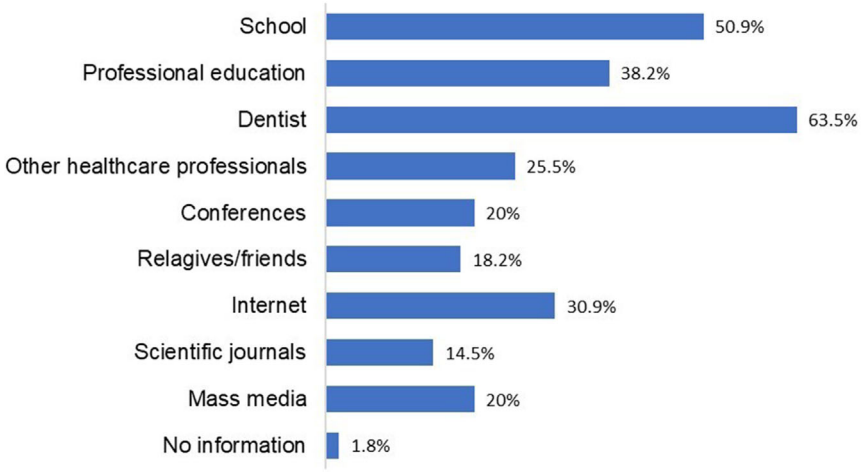

FIGURE 2 The sources of information about oral health care practices of nursing homes caregivers

were found to have a statistically significant association with an improvement in attitudes were analyzed with linear regression. The level of statistical significance was set at $P \leq .05$. The statistical analysis was performed with the IBM SPSS 21.0 software (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0., IBM Corp., Armonk, NY).

3 | RESULTS

3.1 | Sociodemographic characteristics of the sample

The final sample (n = 55) consisted of 28 caregivers in the intervention group and 27 in the control group. The mean age of the participants was 33.1 ± 9.1 years, ranging between 19 and 59 years. The majority (76.4%) were women. A total of 50.9% were nurses, and 32.7% were nursing assistants. The rest of the participants were psychologists, social workers, and care aides. The mean duration of their professional occupation with older adults' care provision was 5.5 ± 6.3 years (range: 0-30 years). A total of 65.5% of the caregivers reported that they provided oral care to the residents on a daily basis, 23.6% sometimes, whereas 10.9% never. Regarding their personal dental visitation habits, 85.5% had visited the dentist within the last 12 months, 10.9% in the past 12-24 months, and 3.6% had never visited a dentist.

The sources of information about oral health care practices are presented in Figure 2. The major source of oral health information was their dentist (63.6%), followed by primary and secondary school courses (50.9%), and education received during their professional training (38.2%). The internet had also been an important source of oral health information (30.9%).

3.2 | Knowledge and attitudes measurements

3.2.1 | Knowledge measurements

No statistically significant differences were found in the total score for knowledge between the intervention (9.0 ± 1.4) and the control group (8.9 ± 1.6) at the pre-testing (Mann-Whitney U test, $P = .8$).

There was a statistically significant increase in the total score for knowledge in the intervention group in the post-testing (10.8 ± 1.3) compared to the pre-testing, as opposed to the control group (8.7 ± 1.5) (Wilcoxon Ranked Test, $P < .001$ and paired samples Test, $P = .568$, respectively). Moreover, the total score for knowledge in the intervention group was statistically significantly higher than in the control group in the post-testing (Student's *t*-test, $P < .001$) (Table 1). The intervention group had statistically significant higher rates of correct answers in four questions (Table 1).

Bivariate analyses have shown that only gender and "group type" (intervention or control) had a statistically significant effect on the difference in the knowledge score between pre-testing and post-testing ($P \leq .05$). However, binary logistic regression analysis has shown that "group type" was the only factor that had significantly affected this difference (Table 2). The caregivers in the intervention group had a 91.8% greater chance of having a difference in the total knowledge score between pre-testing and post-testing of two or more points compared to the control group ($P = .001$).

Thirteen caregivers of the intervention group participated in the follow-up testing recorded 2 months later, and there was no statistically significant difference in knowledge (9.9 ± 1.0) compared to the post-testing (10.4 ± 1.3) (paired samples test, $P = .11$)

TABLE 1 Differences in the total and the individual items' knowledge scores between the intervention and the control group after the delivery of the oral health education program

Question	Intervention group (n = 28) Correct answers n (%) or mean ± SD	Control group (n = 27) n (%) or mean ± SD	*P*-value
1. Loss of natural teeth is a normal effect of ageing.	23 (82.1%)	9 (33.3%)	**<.001**[†]
2. In gingivitis, gums are red, swollen, and bleed easily.	27 (96.4%)	27 (100.0%)	1.000[†]
3. It is better to use a hard toothbrush.	27 (96.4%)	22 (81.5%)	.101[†]
4. Dentures should be removed at night and kept in a glass of water.	26 (92.9%)	26 (96.3%)	1.000[†]
5. Tongue cleaning is an important part of the daily oral care.	26 (92.9%)	27 (100.0%)	.491[†]
6. When should tooth brushing be performed? (three possible answers: only in the morning, only at night, twice a day)	25 (89.3%)	27 (100.0%)	.236[†]
7. Dental caries, gingivitis, and periodontitis can be prevented.	25 (89.3%)	25 (92.6%)	.611[†]
8. Which of the following factors increase the risk of oral diseases in older adults? (five possible answers: dementia, reduced manual dexterity, xerostomia, sugary diet, and all the above)	26 (92.9%)	14 (51.9%)	**.001**[†]
9. Dentures should be brushed with a toothpaste.	16 (57.1%)	5 (18.5%)	**.005**[†]
10. Oral bacteria may cause pneumonia.	26 (92.9%)	21 (77.8%)	.170[†]
11. Decayed teeth may cause agitation in older adults with dementia.	27 (96.4%)	21 (77.8%)	.05[†]
12. Xerostomia is a normal effect of ageing.	20 (71.4%)	8 (29.6%)	**.003**[†]
Total knowledge score	10.8 ± 1.3	8.7 ± 1.5	**<.001**[‡]

[†]Chi-square test.
[‡]Student's *t*-Test.

TABLE 2 Binary logistic regression analysis for the knowledge score before and after the intervention

Variables	*P*-value	Odds ratio
Gender	.135[†]	3.942
Intervention	**.001**[†]	0.082

[†]Binary logistic regression.

3.2.2 | Attitudes' measurements

No statistically significant differences were found in the total score for attitudes between the intervention (51.0 ± 5.2) and the control group (52.3 ± 4.8) at the pre-testing (Student's *t*-test, $P = .341$).

A statistically significant improvement in the total score of the attitudes toward oral care provision to older residents was also found in the intervention group in the post-testing (54.9 ± 4.6) compared to the pre-testing, as opposed to the control group (51.4 ± 5.8) (paired Samples test, $P < .001$ and $P = .206$, respectively). Between the two groups, the attitudes score in the post-testing was higher in the intervention group to a statistically significant degree (Student's *t*-test, $P = .017$) (Table 3). Moreover, a statistically significant difference was found in six statements (Table 3).

Bivariate analyses have shown that only "group type" (intervention or control) had a significant effect on the final score. A linear regression analysis revealed that the caregivers in the intervention group had 4.8 more points on average in the improvement of the total score of attitudes compared to the control group ($P < .001$).

No statistically significant difference in attitudes of the thirteen caregivers of the intervention group was found between the follow-up testing (53.5 ± 4.9) and the post-testing (54.6 ± 4.4) (paired samples test, $P = .21$).

3.3 | Participants' evaluation of the education program

A total of 38 caregivers (21 of the intervention group and 17 of the control group) participated in the evaluation of the education program, while a total of 17 caregivers dropped out of the evaluation. The intervention group evaluated the program immediately after the delivery of the course (post-testing), while the control group 2 months after the delivery of the program to them too. The mean score was high 74.8/80 ± 6.6 indicating the satisfaction of the participants from the program. The score for each question is presented in Table 4. Interestingly, the participants highly scored the statements regarding the planning of making changes to their professional practice (9.3 ± 1.7) and their personal habits (9.7 ± 0.6).

TABLE 3 Differences in the total and the individual items' attitudes scores between the intervention and the control group after the delivery of the oral health education programme

Question	Intervention group (n = 28) Mean ± SD	Control group (n = 27) Mean ± SD	*P*-value
1. I consider daily oral and denture hygiene very important for the older adults.	4.9 ± 0.3	4.7 ± 0.7	.120[‡]
2. I believe that I know well how to clean the residents' teeth.	4.6 ± 0.6	3.9 ± 0.7	**.001**[‡]
3. I believe that I know well how to clean the residents' dentures.	4.7 ± 0.5	3.7 ± 1.2	**<.001**[‡]
4. Older adults should visit the dentist only when they feel oral pain.[†]	4.7 ± 0.5	4.2 ± 0.9	**.015**[‡]
5. Daily provision of oral hygiene in older adults is difficult because they do not cooperate.[†]	2.3 ± 1.1	2.3 ± 0.7	.850[‡]
6. Older adults don't care about their oral hygiene.[†]	2.5 ± 0.9	2.3 ± 1.0	.602[‡]
7. Cleaning the mouth of the residents is more unpleasant than providing personal hygiene (e.g. changing diapers, body wash).[†]	3.4 ± 1.1	3.9 ± 0.9	
	0.096[‡]		
8. Caregivers should prompt the care independent older adults to clean their teeth and/or dentures every day.	4.6 ± 0.5	4.4 ± 0.6	.206[‡]
9. I believe that cleaning the mouth is more difficult than providing personal hygiene and care.[†]	2.8 ± 1.2	3.2 ± 1.3	.199[‡]
10. It is difficult to clean the mouth and dentures of the residents because I don't have the necessary training.[†]	4.5 ± 0.5	3.5 ± 1.1	**<.001**[‡]
11. It is difficult to screen the mouth of the residents because I don't have the necessary training.[†]	4.1 ± 0.7	3.1 ± 1.1	**.001**[‡]
12. Daily oral hygiene provision should be compulsory in nursing homes.	4.6 ± 0.6	4.4 ± 0.7	.193[‡]
13. Regular oral screenings should be compulsory in nursing homes.	4.5 ± 0.6	4.4 ± 0.6	.536[‡]
14. It is difficult to provide daily oral hygiene to residents due to lack of time.[†]	2.9 ± 1.3	3.6 ± 1.0	**.032**[‡]
Total attitudes' score	54.9 ± 4.6	51.4 ± 5.8	**.017**[§]

[†]Negative statements scored in reverse.
[‡]Mann-Whitney U test.
[§]Student's *t*-Test.

4 | DISCUSSION

The findings of this pilot non-randomized clinical trial revealed that the implementation of an oral health education program improved the geriatric oral health knowledge of formal caregivers as well as their attitudes toward oral care provision to the older residents. Moreover, both knowledge and attitudes in the intervention group were maintained 2 months after the program. To measure the outcomes of the education program, we developed a questionnaire that matched the educational objectives and the content of the program.

The initial level of oral health knowledge of the caregivers was moderate to good (75%), but was significantly improved to 92% after the intervention, particularly in specific items, that is related to the dentures' care and xerostomia that are commonly answered incorrectly in many studies.[39–41] The initial attitudes toward oral care in older residents were also moderate to good (73%), but were significantly improved after the educational intervention to 79%; this score should be further improved. An explanation for this initial relatively high level of knowledge and attitudes in the pre-testing may be related to the fact that the major sources of the caregivers' oral health information were valid and reliable including their dentist and formal education.

A number of studies have investigated the implementation of oral health education programs for formal caregivers and staff in nursing homes. The results of these studies were similar to ours regarding the improvement in knowledge[39–45] and/or attitudes after the intervention.[34,46–48]

The findings stressed the importance of training that increased the participants' self-confidence regarding the implementation of oral hygiene and regular oral screenings as also previously recorded.[47] On the other hand, the education program increased the caregivers' concern about the time adequacy for oral care provision, as they

TABLE 4 Evaluation of the education program by the participants of both the intervention and the control group (n = 38)

Statement	Mean ± SD
1. The education program has greatly improved my knowledge of oral health.	8.8 ± 2.0
2. I plan to make changes to my professional practice.	9.3 ± 1.7
3. I plan to make changes to my personal habits.	9.7 ± 0.6
4. The content of the education program was satisfactory.	9.5 ± 0.9
5. The educational venue was appropriate.	8.9 ± 1.4
6. The presentation techniques of the instructor were satisfactory.	9.5 ± 1.1
7. The organization of the education program was satisfactory.	9.5 ± 1.0
8. I would recommend this education program to my colleagues.	9.6 ± 0.9
Total score	74.8 ± 6.6

realized the time and effort necessary to provide efficient oral hygiene to the residents. The importance of practice to improve the necessary skills was highlighted.

Less than half of the caregivers of the intervention group answered the questionnaire in the follow-up testing 2 months after the delivery of the educational program; the results showed that they maintained their knowledge and attitudes toward elder's oral care. However, this finding should be interpreted with caution due to the lack of further testing for a longer period of time. The oral health education programs to caregivers should be repeated on an annual basis to maintain and update their knowledge, attitudes, and skills. In a randomized control trial with longer follow-up period, both knowledge and attitudes on oral health were improved and maintained 1 and 2 months after the intervention.[45] However, in another cluster-randomized control trial, only the knowledge of the caregivers in the intervention group was improved, but not the attitudes.[45]

The demographic and professional characteristics of our study participants did not affect the improvement in the knowledge and attitudes' scores after the intervention. However, in a study in Belgium,[45] the knowledge improvement was greater among nurses compared to nursing aides. Moreover, besides the education program, significant factors for the attitudes improvement were age and profession, with caregivers over 38 years having more positive attitudes compared to younger caregivers.[45] These differences may be attributed to local factors.

The content of the education intervention was based on the related recommendations by the European College of Gerodontology and the European Geriatric Medicine Society.[1,35] It included both a theoretical and a practical part. Interestingly, when they were asked to screen the mouth and brush each other's teeth, most of them felt uncomfortable and refused to try, as also previously reported.[49,50]

The scope of these educational interventions is the improvement of the residents' oral health outcomes. Previous studies have shown a decrease in residents' plaque index in both dentures and natural teeth, a decrease in the prevalence of denture stomatitis, and an improvement in the gingival index after the implementation of an education program to the formal carers.[50–56] Nevertheless, the implementation and testing of effective oral hygiene protocols raise significant difficulties and demand adapted procedures.[57] Recently, a group of multidisciplinary healthcare professional experts, using the e-Delphi method, reached a consensus for the minimum standard of oral health in care-dependent older people;[58] however, more research is necessary on developing evidence-based protocols. Moreover, more studies are necessary to identify the most effective educational design which will improve the residents' oral hygiene outcomes.[59,60]

Further studies regarding the implementation of the present education program in larger samples of caregivers, with longer follow-up periods are being planned.

An important study limitation was the convenience sampling for the recruitment of the participants that precludes the elimination of confounding factors and the generalization of the results. Moreover, organizational constraints and increased workload limited the duration of the program and the increased participation of the caregivers.

5 | CONCLUSION

This pilot education program was effective in improving oral health knowledge and attitudes of the formal caregivers toward oral care promotion to residents, and maintaining them 2 months after its implementation. The study should be expanded in a larger sample, with longer follow-up periods, also measuring the effects of the program on the oral health outcomes of the residents.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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