

## Effectiveness of a training program for the nursing staff on the oral health of institutionalised aged. Randomised trial

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Efectividad de un programa de entrenamiento al personal de enfermería, sobre la salud bucal de adultos mayores institucionalizados. Ensayo Aleatorizado. \*

### ABSTRACT

**Background:** it has been suggested that nursing-staff should be educated in maintaining the oral health (OH) of institutionalised elder people. **Objective:** this work aimed for measuring the effectiveness of a 3-hour oral health training-programme (OHTP) provided to nursing-staff by assessing the residents' OH gains. **Materials and methods:** this was a one-year longitudinal-controlled-interventional study evaluated via a nursing-staff questionnaire and residents' oral examinations. Managers of 30 nursing homes in Granada, Spain, were contacted and offered three oral examinations for their residents and an OHTP for the nursing-staff; nine of them consequently agreed to participate for all consenting people. 269 residents were examined at baseline and 12 months. After the baseline examination, the nursing homes were randomised into an intervention or control group; the OHTP was then carried out on the intervention group. **Results:** the residents' denture hygiene ( $p=0.03$ ) and wearing of dentures at night ( $p=0.003$ ) improved significantly in the intervention group; caries prevalence increased in both groups. **Conclusions:** the OHTP was effective for improving caregivers' knowledge and OH care routines, but the improvements were not enough to improve residents' overall OH.

**Keywords:** Nursing homes; Nursing care; Training Support; Oral Health; Aged.

### RESUMEN

**Introducción:** se ha sugerido que el personal de enfermería debe ser educado en el mantenimiento de la salud bucal (SB) de los adultos mayores institucionalizados. **Objetivo:** el presente trabajo buscó medir la efectividad de programa de tres horas de entrenamiento en salud bucal (PESB) al personal de enfermería, mediante la medición de los cambios en la SB de adultos mayores residentes en instituciones geriátricas. **Materiales y métodos:** se realizó un estudio longitudinal a un año, controlado, evaluado mediante un cuestionario al personal de enfermería y exámenes bucales a los residentes. Se contactó a los directores de 30 instituciones geriátricas de la Provincia de Granada – España y se les ofreció un PESB para su personal de enfermería y tres exámenes bucales para sus residentes, nueve aceptaron participar, con todos aquellos residentes que consintieran. Se examinaron 269 residentes al inicio y a los 12 meses. Después del examen inicial, las instituciones fueron asignadas aleatoriamente en un grupo control y en un grupo de trabajo que recibió el PESB. **Resultados:** la higiene protésica ( $p=0.03$ ) y el uso nocturno de las prótesis ( $p=0.003$ ) mejoraron significativamente en el grupo de trabajo, mientras que la prevalencia de caries aumentó en ambos grupos. **Conclusiones:** el PESB fue efectivo para el mejoramiento del conocimiento y las rutinas de SB del personal de enfermería, pero estas mejoras no fueron suficientes para mejorar globalmente el estado de SB de los residentes.

**Palabras clave:** Instituciones geriátricas; Cuidado de enfermería; Entrenamiento de soporte; Salud Oral; Adulto mayor.

\* Artículo original de investigación.

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### CITACIÓN SUGERIDA

Marín Zuluaga DJ, Gil Montoya JA, Willumsen T. Effectiveness of a training program for the nursing staff on the oral health of institutionalised aged. Randomised trial. *Acta Odont Col* [en línea] 2018 [fecha de consulta: dd/mm/aaaa]; 9(1) 58-70. Disponible en: <https://revistas.unal.edu.co/index.php/actaodontocol/article/view/76124>

DOI <https://doi.org/10.15446/aoc.v9n1.76124>

Recibido	Aprobado	Publicado
06/10/2018	06/12/2018	01/01/2019



## Introduction

The population of elder people has been rapidly increasing; these people, especially the oldest-old segment, are more susceptible to disease and disability [1]; 2.3% of these disabled people live in residential homes in Spain [2]. Compared to the elder people living at home, those living in institutions have been shown to have worse oral health (OH) [3].

Providing oral care for the institutionalised elder people is a basic nursing task [4]; residents should be helped in maintaining their OH, preventing and treating oral pathologies and promoting healthy living and ageing [5]. Unfortunately, this is frequently omitted or neglected in nursing homes [3, 6]. The barriers for overcoming such neglect may be difficulties concerning dental treatment: the cost of treatment and mobility, as well as cognitive problems making it difficult to get to the dental office. In addition, factors exist within the nursing home such as low OH priority, lack of time, nurses' lacking knowledge and training in oral care, low perceived needs by residents and staff, and patients' resistive behaviour towards receiving oral care [7]. Health education, understood as being: "the process of assisting individuals, acting separately or collectively, to make informed decisions about matters affecting their personal health and treatment of others" [8], influences knowledge and behaviour [9]. OH education programmes including not only theoretical knowledge but also practical training for nursing staff have thus been proposed as measures aimed at improving the OH of functionally-dependent elder people [4, 10-12]. However, results from training programmes evaluated by reference to residents' OH levels have varied from not having any impact [12], little impact [13, 14] to achieving progressive improvement [4, 10], this seems to reflect the fact that knowledge about OH care is not always put into practice [15, 16], and the need for periodical reinforcement to maintain the benefits of education regarding oral health. This is clearly a complex issue, which must include nursing staff and also residents' families, directors of institutions and stakeholders [17]. It could be hypothesised that with all the barriers to good oral health, oral health in nursing homes deteriorates. This is a common clinical observation but few studies have followed the development of the patients' oral health in nursing homes.

The primary aim was to assess the effectiveness of a 3-hour oral health training-programme (OHTP) provided to nursing-staff by assessing the residents' OH gains.

## Materials and Methods

*Design:* This was a one-year (2009 - 2010) longitudinal-controlled-interventional study carry out in nursing homes in Granada, Spain.

*Sample:* A list of nursing homes in the province of Granada, Spain, was obtained from the Social Services (IMSERSO). From 54 nursing homes reported, thirty (56%) within one-hour drive from the city of Granada were invited to participate. Nine of these nursing homes, with accommodation for 726 residents, and with 212 people employed as a nursing staff, agreed to participate. Subsequently, all the directors, nursing staff and the residents who had at least three natural teeth (this number was set because of the tools used to measure OH in dentate individuals) and/or were wearing dentures and willing to sign informed consent either by themselves, or by a relative on their behalf, were invited to

participate in the study. The nine directors, 167 people from the nursing staff (79%) and 369 residents (51%) accepted.

*Procedures:* A baseline, 6 months and 12 months clinical examinations of the residents and a baseline nursing staff questionnaire were applied. After baseline procedures, the nursing homes were assigned to an intervention group (4 institutions) or control group (five Institutions) by cluster randomisation, as follows: the second author (JG) wrote the names of the nursing homes on pieces of paper and put into a bag to randomise them; they were then taken out one by one and alternately assigned to a group. When the groups had been arranged, a coin was tossed to name them as either control or intervention group. After randomisation, the OHTP was carried out on the intervention group (82 nursing staff attended, 83%). After the OHTP all nursing homes followed their regular procedures concerning oral care among the residents. At the end of the study the OHTP was also carried out on the control group.

#### Baseline questionnaires Nursing staff questionnaire

A structured questionnaire was sent to all nurses and nurse aids that agreed to participate in the study. The questionnaire was not validated, but it was tested in a pilot study. It was anonymous and included questions about demographics; provider experience; personal OH care and help in oral care routines to the residents and problems while doing so. Finally they were asked to describe which aspects they would like to learn more regarding OH care involving institutionalised people.

#### Oral health training-programme

Most of the OH care issues the nursing-staff answered they wanted to learn, as well as the problems they reported experiencing during oral hygiene assistance, were included in the OHTP. The programme was designed by two professors of gerodontology (DM, JG) and a Psychologist (RR), the head of the PhD programme in Social Gerontology of the University of Granada. Contents of other programmes<sup>18</sup> were also revised to arrange the current OHTP, as well as the test on OH knowledge.

The OHTP was carried out by a professor in gerodontology (DM) and consisted of a single three-hour workshop session conducted at the residential homes, scheduled at two different times to preserve the institutions' normal functioning. The OHTP was arranged in chapters covering the following aspects: OH-related quality of life; social and biological functions of the mouth; frequent diseases and entities in the mouth; misconceptions about OH for elder people; different kinds of residents and their oral care needs and management; demonstrations of cleaning techniques for dentures and natural teeth; and practising these techniques by nursing staff using models and dentures; routines and aids for oral care; and the nursing staffs' crucial role in maintaining residents' OH. 6-12 nursing staff participated in each workshop; the meetings closed with a discussion and oral evaluation of the programme. A file including the contents of the programme, as well as the e-mail and telephone number of the dentist that delivered the programme

was delivered to all the nurse leaders in order to be consulted in case of any doubts by the care-staff.

As a part of the OHTP the nursing staff completed a test (non-validated but based on other programmes [18] and tested in ten people) including 18 true/false questions before and after the OHTP. At the end of the OHTP the test was collectively checked and the wrong answers discussed. Attendees, as well as the nursing homes, received a certificate from the University of Granada's Stomatology Department.

### Clinical examination

The clinical examination contained an anamnestic interview and a clinical examination.

*The anamnestic interviews* were conducted with the resident and his/her nurse, physician or relative. Data registered were: sex; age (years); educational level (no studies or primary studies, secondary studies, technical or university studies); number of years living in the institution; number of medicines they used; functional level (independent; some help needed; dependent, regarding dressing or washing and oral hygiene); frequency of oral check-ups (about yearly, only if needed); time since the last dental attendance (6-12 months, 1-2 year, >2 years); cause of the last dental attendance (pain, caries, dental abscesses, make or repair prosthesis, professional cleaning/control, other reason); tooth brushing (yes / no); and tooth brushing frequency (weekly, every two days, daily). It was also recorded whether denture wearers wore their dentures at night (yes / no).

*Clinical examinations* were conducted using a mouth mirror and a headlamp (SILVA headlamp, SILVA Sweden AB, Sollentuna, Sweden) and took place in an area of the institution ensuring the residents' privacy. An experienced dentist in gerodontology (DM) performed the examinations. 10 participants were re-examining to calibration and determining intra-examiner agreement.

Registered data were number of: remaining natural teeth, caries (visually detected), and retained roots. It was also recorded the presence and severity of denture-related stomatitis (according to Newton's criteria [19]). Dental and denture plaque were disclosed using red dental disclosing tablets to measure oral hygiene (G-U-M/MD. Sunstar Americas Inc. Chicago, IL 60630 USA. Residents having remaining natural teeth were asked to chew one tablet for 30 seconds; mouths were then rinsed with water. When dentures were present, they were put under running water for 15 seconds to eliminate any debris and then placed into a bowl for 30 seconds with 50cc of water with 10 dissolved disclosing tablets (the solution was changed for each resident). They were then rinsed with running water for 10 seconds. Oral hygiene was measured by a combination of three assessment tools: the Simplified Oral Hygiene Index (OHI-S) [20] (scores 0-3), the O'Leary Index [21] (percentage of tooth surfaces having visible dental plaque, scored 0-100%) and the Denture Hygiene Index [22] (excellent: none or only a few spots of plaque; fair: more extended plaque, less than half the denture base covered by plaque; and poor: more than half the denture base covered by plaque).

The oral hygiene evaluation for all participants was dependent on dental status, and was categorised into the following criteria: *Dentate*: 1= good (OHI-S score lower than 0.6 or overall plaque score below 50%), 2= acceptable (0.7 - 1.6 OHI-S score or 50% - 80% overall

plaque score) and 3= unacceptable (OHI-S score above 1.6, or >80% overall plaque score). *Denture users*: 1= good (DHI score = 1), 2= acceptable (DHI score = 2) and 3= unacceptable (DHI score = 3).

The University of Granada's Committee for Human Research Ethics approved the study.

#### *Statistical analysis*

All the data was analysed using Statistical Package for Social Sciences (Version 15.0) (SPSS Inc., Chicago, IL, USA). Continuous variables were presented as mean and standard deviation, while binary variables as number and percentage. An independent sample t-test was used when comparing means in two groups; the chi square test was used when comparing binary variables in two groups. A linear regression was performed when evaluating change in a continuous variable from baseline to 12 months afterwards between two groups (value 12 months after as dependent variable and value at baseline and group (intervention / control) as independent variable) [23]. The McNemar test was used when evaluating change in a binary variable from baseline to 12 months afterwards.

## Results

### Nursing staff

One hundred and fifty one nurses and nurse aids from both the OHTP and the control groups returned the questionnaire. The mean age was 37 years old and 83% of the respondents were nurse assistants. 60% reported having received previous education regarding OH care. 64% of the nurses and 6% of the nurse aids said that they did not help residents with their oral hygiene. At baseline, knowledge about OH was acceptable in both groups (73% of correct answers in the OHTP group and 72% in the control group) and it improved significantly after the OHTP (on average nursing staff answered 17 (90%) items correctly in the post-test ( $p < 0.001$ )).

### Residents

Intra evaluator's agreement regarding oral hygiene criteria was calculated; the kappa-value was 0.76, which is considered substantial repeatability [24].

At the end of the study 269 residents were still enrolled. In the control group, 27 people died, 15 people moved, two people refused a new examination, and four people stopped using their dentures; in the intervention group, this numbers were 39, 5, 0, 7, respectively. The dead participants were statistically significantly more dependent on dressing or washing ( $p = 0.02$ ), were using more than three medicines ( $p = 0.05$ ), suffered from more than three pathologies ( $p = 0.05$ ), had severe cognitive impairment ( $p = 0.01$ ) and had less than seven remaining natural teeth ( $p = 0.04$ ).

The personal and background variables of the 269 residents who completed the study are presented in table 1. 137 of those people were cognitively normal and 36 had mild cognitive impairment and provided the information by themselves. The remaining 96

residents were moderately cognitive impaired (38 people) or severely cognitive impaired (58 people), for that reason, nurses, physicians and/or relatives provided the anamnestic information.

**Table 1.** Residents' background variables at baseline

Variable	OHTP group	Control group	Between groups
	(n=136)	(n=133)	
	n (%)*	n (%)	p value**
Gender – Women	105 (77.2)	99 (74.4)	ns
Mean age ± SD	82.8 ± 7.6	82.7 ± 7.4	ns
Mean number of medicines ± SD	6.9 ± 3.5	7.4 ± 4.1	ns
Mean number of pathologies ± SD	3.4 ± 1.3	3.3 ± 1.6	ns
Educational level			
Low	87 (71.9)	101(75.9)	ns
Medium	20 (16.5)	18 (13.5)	ns
High	14(11.6)	14 (10.5)	ns
Independence re dressing and washing			
Independent	56 (41.2)	67 (50.4)	ns
Some help needed	42 (30.9)	41 (30.8)	ns
Dependent	38 (27.9)	25 (18.8)	ns
Independence on oral health			
Independent	89 (64.4)	103 (77.45)	0.03
Some help needed	11 (8.1)	7 (5.3)	ns
Dependent	36 (26.5)	23 (17.3)	ns
Frequency of dental appointments			
About yearly	10 (8.8)	12 (9.3)	ns
Only if needed	103 (91.2)	117 (90.7)	ns
Time since the last dental meeting			
Less than 1-year	31 (27)	35 (27)	ns
1 – 2 years	14 (12)	11 (9)	ns
>2 years	71 (61)	83 (64)	ns
Cause of the last dental meeting			
Pain	32 (30)	36 (28)	ns
Caries	7 (7)	10 (8)	ns
Make /repair prosthesis	41 (39)	48 (38)	ns
Professional control	23 (22)	29 (23)	ns
Other causes	3 (2)	4 (3)	ns
Tooth brushing	107 (79)	113 (85)	ns
Tooth brushing frequency			
Daily	90 (84)	87 (77)	ns
Less than daily	17 (16)	26 (23)	ns
Aids used during the personal Oral hygiene			
Toothbrush	115 (85)	111 (83)	ns
Toothpaste	104 (76)	91 (68)	ns
Dental floss	2/55 (4)	5/57 (9)	ns
Mouth rinses	26 (19)	36 (27)	ns

\* n corresponds to the number of answers for the variable

\*\* Chi square test categorical data, independent T test numerical data

Overall the changes in oral health variables were clinically insignificant, but some tendencies could be found. At baseline, almost half of the denture wearers (42%) had denture-related stomatitis (37% type I, 38% type II and 25% type III). It decreased approaching significance ( $p=0.090$ ) in the OHTP group and increased in the control group ( $p=0.637$ ). Night use of dentures decreased significantly in the OHTP group ( $p=0.003$ ). Pearson correlation was significant between “sleeping with dentures” and “sub-denture stomatitis” both at baseline ( $p=0.001$ ) and after 12 months ( $p=0.001$ ), (table 2).

**Table 2.** Oral health variables at baseline and 12-month follow-up period

Variable	Intervention group n = 136			Control group n = 133		
	Baseline n (%)	Change after one year n (%)	p	Baseline n (%)	Change after one year n (%)	p
Night use of dentures	32/72 <sup>a</sup> (44.4%)	-11(-34%)	0.003	26/77 (33.8)	-7 (-27%)	0.132
Sub-denture stomatitis	33/73 <sup>a</sup> (45.2%)	-7 (-21%)	0.09	30/77 (39.0)	+1 (+3.3%)	0.63
	mean (SD)	mean (SD)		mean (SD)	mean (SD)	
No. of teeth	8.4 ± 8.9	-0.91 (2.1)		8.7 ± 8.9	-0.5 (0.91)	0.01 <sup>b</sup>
No. of decayed teeth	1.0 ± 1.4	+0.28 (1.5)		1.0 ± 1.7	+0.6 (1.53)	0.08 <sup>b</sup>
No. of retained roots	1.2 ± 2.6	+0.41 (1.1)		1.2 ± 2.3	+0.3 (1.0)	0.3 <sup>b</sup>

a Total amount of cases for this variable. b ANCOVA analysis, between group differences at baseline.

Edentulousness prevalence at baseline was 28%. The OHTP group had lost more teeth ( $0.91 \pm 2.1$ ) than control ( $0.47 \pm 0.9$ ) and had more retained roots (OHTP  $0.4 \pm 1.1$ , control  $0.35 \pm 1.0$ ). Paired t-tests showed significant changes from baseline to 12 months in both groups, with a decrease in remaining teeth ( $p < 0.001$ ), increase in decayed teeth ( $p < 0.001$ ), and increase in number of retained roots ( $p = 0.011$ ). ANCOVA analysis with number of teeth after 12 months as dependent variable and number of teeth at baseline and intervention / control as predictors was used to control for baseline ( $p = 0.018$ ) between group differences. Equal analysis for controlling for baseline showed no effect in the number of caries when controlling for baseline between groups ( $p = 0.089$ ) and also that retained roots diminished ( $p = 0.366$ ). Dentate residents did not have any significant improvement in the oral hygiene: intervention group: (OHI-S:  $p = 0.9300$ , O’Leary Index  $p = 0.5610$ ), control group: (OHI-S:  $p = 0.3836$ , O’Leary Index  $p = 0.7691$ ). More residents in the OHTP group improved their denture hygiene ( $p = 0.003$ ), (table 3).

**Table 3.** Overall oral hygiene at baseline and follow-up period, intervention group (n=136) and control group (n=133)

Time/group	Good %	Acceptable %	Unacceptable %	Chi square
T0 Intervention	13.2	30.9	55.9	p=0.46
Control	11.3	28.6	60.2	
T1 Intervention	22.1	25.0	52.2	p=0.048
Control	12.0	21.8	66.2	
T2 Intervention	26.5	30.9	42.6	p=0.035
Control	18.0	27.1	54.9	
Change in oral hygiene T0-T2	Improved	The same	Worse	
Intervention	34.6	53.7	11.8	p=0.03
Control	20.3	66.2	13.5	

\*T0: Baseline; T1: Six months; T2: 12 months.

## Discussion

Nursing staff participation in the OHTP was 83% and their knowledge about OH care improved significantly immediately after the programme. Dental hygiene did not improve significantly; on the contrary denture hygiene did it. Night use of dentures decreased significantly and sub-denture stomatitis decreased almost significantly in the OHTP group. The OHTP group also showed a lower increase in the number of decayed teeth after one year than the control group did. Nevertheless oral hygiene was still unacceptable and the hypothesis that oral health deteriorates in nursing homes seems true as both groups increased the prevalence of caries, which is a main problem among institutionalised elder people. One-year mortality rate was 18%; this is within the range of mortality rates reported in comparable studies [25].

By the time the study was performed 57% of the geriatric institutions in the Province of Granada were private, 36% state assisted, and 7% public [26], this figure is similar to the distribution of the institutions that were part of the study. The low priority given to OH in geriatric institutions has been frequently reported [2, 6]. The invited institutions participation rate (nine out of 30, 30%) could support this, as well as the information provided by directors, which showed a lack of evident OH policies in residents' oral care protocols and guidelines; the fact that not all nursing staff verified, helped or performed residents' OH and the type of residents helped by them. Directors' participation in OH education programmes is thus very important; however, only 44% of them participated in our OHTP.

Substantial groups of both, nurses and residents (66% and 79%, respectively) sought dental services only when they had urgent treatment needs; half of nursing staff did not use dental floss and 1/3 had not visited the dentist during the previous year. These facts showed that their OH routines were not optimal. It may be reasonably considered that if care-staff do not care adequately about their own OH they would not do so for their patients either. This correlates with Nordenram *et al.*, who stated that, in cases of dependence, provision of care and treatment depends on what perspective and treatment priorities the advocate has [27] and with Frenkel *et al.*, who stated that the main predictors

for knowledge and attitude towards OH care were nursing staff age and dental attendance pattern [11].

There was significant improvement in the knowledge exhibited by the attendees after the OHTP; this agreed with other studies [12, 13, 28, 29]. The first two chapters of the current OHTP (OH-related quality of life and social and biological functions of the mouth) were a motivational part of the programme, focused on the nursing staff's own OH. It aimed at improving their awareness about the importance of OH in their daily life, and by that way improving their personal OH care routines and consequently the OH care of their patients. Once having achieved this, the programme targeted the issue of putting knowledge into practice [15, 16]. Our rationale is in line with Samson et al., who stated: "The education should not only focus on developing practical skills, but also ensure that caregivers have a clear understanding of the relationship between oral health, general health and quality of life" [30].

A recent review about OH in a dependent population summarises the most important reported obstacles to good OH care in nursing homes: 1. Nursing staff: lack of knowledge, training, time and appropriate supplies for oral care; misinformation, inadequate translation of knowledge into best practice, ethical dilemmas, fear of being bitten, own traumatic experiences regarding dentistry, troubles assisting demented residents, tendency to seek help from dentists and dental hygienists rather than involve themselves in the daily preventive care of their residents. 2. Residential homes: dismissing of oral care training, staff shortages, and organisational barriers. 3. Nursing schools: Nursing textbooks in general are neglectful of basic OH care, inadequate formation regarding oral care of student nurses and nurse aids [17].

Instead of the good participation rate of the nursing staff, the significant improvement achieved on the OH's knowledge, the motivational part of the program, the focus on the problems reported by the staff and the practical component of the OHTP, as in other studies [10, 12, 14] the results regarding residents' OH improvement were poor in terms of dental health and the achievements were mainly on those issues related with denture wearing. These findings represent a challenge for the dental profession and carers as the number of remaining natural teeth in the elderly continues to grow. There is a range of dental conditions among elder people inhabiting residential homes (edentulous wearing dentures, partial tooth loss with and without dentures and with few or many teeth and dentate), this is a complex issue that the dental profession must focus on in the foreseeable future and needs an integral approach. Nursing staff education regarding OH and preparing them to face adverse situations at work [28] is a partial solution to this problem. In order to overcome this situation, we need to develop an integral approach that includes nursing staff, residential homes and nursing schools [17]. Future works should focus on supervised oral hygiene training on the residents, especially on those uncooperative during the oral care assistance. A previous work showed that institutionalised elderly who were cleaned by the nursing staff had worse oral health compared with those independent on oral care, and that the worst oral health state was among uncooperative residents [31]. Another central issues that most be pointed in the OHTP are: strategies to translate knowledge into best practice, working with the nursing home's directors in order to get time for oral care into the daily care routines, trying to solve the overload of the nursing staff (93% of nursing staff complained of being overworked as the most frequent barrier to providing adequate OH); oral care is commonly viewed as a

disgusting work, and it is not a priority, so if they do not have time to perform this work they will not do it even if they have the knowledge. It is necessary too, to carry programs out with independent residents, those people refuse being assisted or supervised during their oral care routines and their OH deteriorates if they do not have good techniques for tooth or denture cleaning.

The picture described above is incomplete without three more players: stakeholders, policy-makers and health education schools (dental and nursing schools). Only 7% of the places in residential homes in Andalucía, Spain, are public, 57% are private and 36% are state-assisted [26]. With most nursing homes in private ownership, their need-for-profit role may potentially conflict with high-quality care delivery. Policy-makers are thus responsible for legislating to guarantee adequate care in nursing homes, OH care included. Dental schools should contact and work together with nursing schools to include OH care in their curricula and should assist policy-makers in including oral care as a compulsory daily task in nursing homes.

After each resident's oral screening, the main OH problems found and the measures needed to manage such problems, were reported to the head nurses and director in both the OHTP group and the control group. This common intervention may explain the improvement in denture hygiene and the decrease in night-time use of dentures in the control group. Denture-related stomatitis decreased approaching significance in the intervention group; this condition is associated with night-time use of dentures and unacceptable denture hygiene [16], so this change could also have been attributed to the OHTP results and this is highly significant from a clinical point of view. Other studies have reported similar findings in denture-wearing habits and denture-related stomatitis prevalence after nursing staff have participated in educational programmes [10]. The number of teeth decreased more in the OHTP group indicating more treatment in a dental office for extraction of deteriorated teeth than in the control group.

The strength of this study was that the OHTP was developed from the baseline knowledge and viewpoints of the nursing home staff, as well as several of the complex aspects regarding improvement in oral hygiene being assessed. However, some of the present study's limitations need to be discussed. The response rate was low among the nursing homes in the study. They were considered to be representative of Granada's nursing homes but the sampling framework was not random. Although calibration was conducted, the examiner was not blind about which institutions participated in the OHTP, potential bias, due to this, cannot be ignored. Given the relatively low sample-size and different conditions that probably exist in other nursing homes, one should be cautious when generalising about the results. Furthermore, the use of clustering instead of individual randomisation created more uncertainty and the high number of analysis performed indicates that the p values should be interpreted with caution.

## Conclusion

Even if the OHTP had an effect on improving nursing staff knowledge and OH care routines, as shown by the improvement in residents' problems related with denture wearing and in denture hygiene, too many residents still had unacceptable oral hygiene and their OH deteriorated over one year in the nursing homes. We need to develop an integral

approach that includes nursing staff, residential homes and nursing schools, in order to improve the OH of institutionalised people.

## Clinical relevance

This study point out that staff of nursing homes is relevant to improve oral health related with the use of dentures and that even though nurses and nurse aids assist residents with dental hygiene, this is not enough to improve the overall dental health, so dentists should work in a team with those health workers and periodically provide professional health care (depending on the physical and cognitive state of the residents), in order to improve the overall oral health status of institutionalized aged.

## Disclosure and Acknowledgements

The authors declare that they have no conflicts of interest.

The Universidad de Granada, supported the work by providing the materials required.

We would like to thank Dr. Leiv Sandvik at Oslo University for his support in the statistical analysis, as well as the institutions, residents and staff who formed part of this work.

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