Received: 16 June 2021 | Revised: 16 June 2021 | Accepted: 15 January 2022

DOI: 10.1002/jdd.12895

ADEA THE VOICE OF DENTAL EDUCATION WILEY

ORIGINAL ARTICLE

Knowledge of nursing graduates on oral health care for older people in the long-term care

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Abstract

Objectives: Oral health self-care deteriorates in older adults due to a decreasing level of cognition increasing disability and/or a reduction in manual dexterity. Older adults in hospital care or residential care therefore increasingly need assistance for oral health care. There is an increase in dentate patients entering residential care due to advances in dentistry. It is suggested therefore that nurses in aged care increasingly need advanced knowledge to care for their older dentate patients to prevent and minimize progression of oral diseases, given the impact of poor oral health on general health. The current study was conducted to investigate the oral health care knowledge of nursing graduates across Aotearoa New Zealand.

Methods: A cross-sectional study was conducted among third year nursing graduates in 18 nursing institutes in New Zealand. Oral health care knowledge and oral–systemic connection knowledge, and predictors of oral health care knowledge were investigated.

Results: Total 148 students participated in the student's survey, making it 15% of 2020 graduates. The students' survey results suggested that nursing graduates have good basic oral health knowledge, however, their knowledge of the oral–systemic disease connection and the value of an examination of the oral cavity were poor.

Conclusion: The oral health care knowledge of nursing students and their ability to care for older adults relies on oral health care education in their nursing programs. A revision of curricula to improve oral health education in nursing programs is strongly recommended.

KEYWORDS

geriatric oral health, oral health care in nursing oral health in long-term care, oral health education, oral–systemic connection

1 | INTRODUCTION

Self-care can help prevent the majority of oral diseases, and it is most effective when individuals are oral health literate.[1] Oral health self-care deteriorates in older adults due to a decreasing level of cognition and an increase in disability and/or a reduction in manual dexterity.[2] Older adults in hospital care or residential care therefore need assistance for oral health care due to the impact of oral diseases on general health and quality of life.[3,4] Dentistry has been very successful in treating and preventing dental caries and periodontal disease resulting in an increased number of dentate older adults entering long-term care. A recent national survey[5] conducted among 987 elderly residents in 120 residential homes in New Zealand suggested that almost 45% (n = 443) of participants (65+) were dentate. The studies by Thomson et al.[6] (2018) and Hyland et al.[5] (2019) suggested that the dental caries and treatment needs were very high, even though there is a decline in edentulism. The same national data suggested that the treatment needs were higher for older adults with moderately and severely impaired cognitive function compared to unimpaired population. Similarly, oral debris level was higher among older adults with higher dependency level. Petersen[7] suggested that institutionalized older adults have poorer oral health compared to independent and active elderly. Hence, lack of biofilm removal among high-dependent older adults has been a major reason for increased treatment need. A study by Kelsen and Thomson has indicated lack of oral health protocol in 64% of 139 surveyed residential homes, and the authors suggested not performing a proper debris removal as a major reason for increasing treatment needs among institutionalized older adults. The survey among care facilities' staff suggested various barriers to care for older adults in New Zealand, such as transport of residents to a dentist, willingness of a dentist to treat residents at the nursing care facility, lack of funding, lack of interest in dental care by residents, the resident's family, nursing staff, and general practitioner. The survey among about 905 nurses/managers indicated that residents' oral health could be improved by providing training to nurses on oral health care.[8] However, the economic burden for training nurses after recruiting would put additional pressure on aged care.

In New Zealand, oral health care is funded for children and adolescents aged less than 18 years, and for low-income adults up to $300 per year is available.[9] There is some funding available for special needs and medically compromised patients, but the Ministry of Health website suggested the amount of funding available to medically compromised patients depend on where they live as funding is through district health boards in New Zealand which is variable.[9] The contract between the district health boards of New Zealand and aged care facilities states that residential homes are responsible for providing access to oral health services and residents are accountable for the costs involved in their oral health care. New Zealand currently lacks a formal oral health public policy for the aged population, irrespective of their dependency level. Older people who are highly dependent on carers were 1.6 times more likely to not visit a dental professional compared to those living independently.[10] For rural residential care, access to a dentist for regular care and emergency care is poor compared to facilities in cities.[8]

As New Zealand does not have public oral health policies/funding available for older adults, thus the most economical way to reduce the burden of oral diseases within the population would be effective prevention with support provided by health professionals, especially nurses in the context of older adults. To be effective, nurses need up-to-date knowledge and competencies with respect to oral health care to care for the older dentate population. The current study was conducted to investigate the oral health care knowledge of nursing graduates in New Zealand, and to identify predictors of oral health care knowledge among nursing graduates.

2 | METHODOLOGY

Ethics approval for this study was obtained from the Human ethics committee, University of Otago (D19/264). A cross-sectional study methodology was selected to answer the research questions posed to the participants. In New Zealand, there are 18 nursing schools offering undergraduate nursing programs, and seven schools are offering diplomas in nursing. A stratified sampling method was used to select the nursing students in their final year. As the study aim was to analyze the level of oral health care knowledge students achieved during their nursing program, it was appropriate to collect data from third year nursing students in their final semester prior to graduation. The survey was conducted using Qualtrics, a web-based survey software.

2.1 | Instrumentation

A multiple-choice self-administered questionnaire was used in the survey. Students' demographic variables, such as ethnicity, location, previous qualification, country of citizenship, age, and gender were collected. In addition, the following areas were also explored:

- basic oral health knowledge questions,
- personal dental visit behavior,

- older people oral health care knowledge,
- experience in working in residential homes,
- performing an oral examination.

The questions for the current study were adopted from various studies reported in the literature by Khan and Odisho,[11] Dolce and colleagues,[12,13] Messenger,[14] and from an intervention study by Reigle and Holm.[15] The questions were adapted, and additional questions added based on additional information from the literature review.

2.2 | Questionnaire development and pilot study

The content validity of the developed questionnaire was tested by sending the questionnaire to specialists in special care dentistry and prosthodontics, oral hygiene experts, interprofessional educators, and postgraduate students. The questionnaire was further improved based on the feedback received and later pilot tested with 10 third year nursing graduates.

The students were provided with information regarding the study and asked to complete the online questionnaire. Later, a focus group interview was conducted via Zoom with all 10 students to understand their experience and thoughts regarding the items in the questions, online survey format, time taken to complete the questionnaire, and other comments regarding the survey. The students were asked to judge the difficulty of understanding the questions and asked for suggestions to add further options for multiple choice questions. The average time taken to complete the survey was noted and added to the information sheet of the final survey. The students in the focus group wanted to change the answer to a previous question by going back to a previous screen and also thought a few questions had too many options, which they found confusing. The questionnaire was modified, and the same students were asked to repeat the survey before the final survey was sent to all final year nursing students. The survey was sent with an information sheet and consent form again via an online platform (Moodle learning platform or the appropriate course management system). The participants received the link for the survey through their online student portal.

The reliability of the questionnaire was tested using Cronbach's alpha test, and reliability was found to be strong with an alpha coefficient of 0.673, which suggests good reliability for the questionnaire. The responses for the oral health knowledge questions, as well as the oral health care knowledge question, and knowledge on oral–systemic connections were scored as either correct (1) or incorrect (0), and a total score out of 32 was calculated by computing all responses. The bivariate and multivariate analyses were conducted by comparing final scores for all independent variables.

3 | RESULTS

The final survey was only sent to 11 nursing schools (61%), as the rest of the schools declined to be involved. One hundred seventy-five nursing graduates participated in the survey; however, 32 respondents completed less than 30% of survey questionnaire and were therefore removed from the final analyses. This left a total of 148 responses, which is approximately 15% of the total nursing graduates in 2020 in New Zealand, which was more than the anticipated response to the survey of 10%.

3.1 | General oral health knowledge

The majority of the participants answered the basic oral health knowledge questions correctly. It was found that 56% ($n = 83$) of participants did not believe smoking caused gingivitis; 43.9% of participants indicated that smoking causes gingival bleeding and only 75.7% of participants indicated bacteria caused gingival bleeding. Table 1 shows the response of participants for each question.

3.2 | Knowledge on oral health care for older people

The responses to the questions relating to knowledge of oral health care for older people were again generally thought to be acceptable. The results are summarized in Table 2. Forty-three percent of participants indicated that they worked in residential homes; however, the majority of them did not know the correct answers for denture cleaning procedures and their knowledge on oral health examination was equally poor. Participants (15.5%) also reported that they do not know what calculus would look like. Those who reported experience working in a residential home and had performed oral health care for older people were asked to respond to questions about denture care routine and their experience of examination of the oral cavity. Only 38.7% of participants correctly answered the question regarding denture care and the majority of them who provided oral care reported that they had never performed an examination of the oral cavity (83.9%).

Table 3 summarizes the participants' knowledge of the connection between oral and systemic health. The majority of participants did not answer these questions correctly. In addition, questions on medications causing dry

TABLE 1 General oral health knowledge

	n	%
Strategies for good oral health[a]		
Regular dental appointments	104	70.27
Daily oral care	145	97.97.0
Healthy diet and nutrition	111	75.0
Drinking water frequently	89	60.13
Other (oral health education, limiting fizzy drinks and sugary foods, using chewing gums, and cleaning tongue)	4	2.7
Ideal time for brushing[a]		
After breakfast and after last meal of the day	144	97.3
After breakfast only	1	0.7
Only after the last meal of the day	2	1.4
Other (after every meal [$n = 5$] and before breakfast and before bed [$n = 6$])	11	7.4
Color of healthy gum		
Red	1	0.7
Pink	147	99.3
Cause of gingival bleeding[a]		
Brushing teeth too hard	105	70.9
Insufficient brushing	79	53.4
Bacteria on the teeth and gums	112	75.7
Smoking	65	43.9
Other (alcohol and other drugs, gingivitis, not flossing, periodontitis, varying forms of gum disease)	6	4.05
Advantage of fluoride in toothpaste		
Strengthen the teeth	137	92.56
Weakens the teeth	4	2.7
Does not have any effect	2	1.4
Factors contribute to tooth decay[a]		
Smoking	131	88.5
Not brushing teeth	139	93.9
Constantly eating sugar-based food such as candy	148	100
Using toothpaste without fluoride	68	45.9
Other (not flossing)	3	2.02
Don't know	0	–

[a]Multiple response allowed.

TABLE 2 Knowledge on oral health care for older people

	n	%
How to tell someone suffering from bone loss (advanced gum disease/periodontitis)		
The teeth appear very long	67	45.3
The teeth are worn down	76	51.4
Spacing between teeth	83	56.1
Teeth are loose or mobile	109	73.6
Don't know	6	4.0
Calculus looks like		
Hard with light color	109	73.0
Soft, with a dark color	15	10.1
Soft, with a light color	37	25.0
Don't know	23	15.5
Best time to perform oral hygiene procedure for older people		
Before bed	5	3.4
Morning and evening	108	73.0
Before each meal	1	.7
After every meal	31	20.9
Don't know	3	2.0
Questions asked to those who worked/working in a residential center and performed oral care ($n = 31$)		
How you usually clean dentures?		
Soak in water overnight	4	12.9
Clean using water and a toothbrush	10	32.2
Clean using a toothbrush and denture cleaner	12	38.7
Don't know	5	16.13
Frequency of cleaning denture		
Once daily	25	80.6
2–3 times per week	2	6.4
Other	3	9.6
Don't know	1	3.2
How long would it take to do an oral health examination?		
Less than 30 seconds	5	16.1
Less than 1 minute	–	–
Less than 3 minutes	–	–
More than 3 minutes	–	–
Never done an oral health examination	26	83.9

mouth (73%) and the pathway linking chronic periodontitis and systemic diseases, such as diabetes and cardiovascular diseases (73%), were not answered particularly well. About 22% ($n = 33$) of participants did not know the recommended oral health management for a patient with dementia.

Table 4 provides details of the mean oral health care knowledge scores among different demographic variables. Sixty-nine percent of participants indicated that they did not have enough oral health knowledge to take care of their patients. The oral health care knowledge scores were higher for those who indicated they had enough knowledge compared to those who said they did not. Further, individuals who indicated they were performing oral health care for patients scored more than those who did not perform oral health care for older people. Table 4 shows that the ethnicity distribution of sample was representative of the population of Aotearoa New Zealand (as of the 2018 census, European descent: 70%; indigenous Māori: 16.5%;

TABLE 3 Knowledge on oral health and systemic heath connection

	n	%
Medication not associated with decreased salivary flow		
Antihistamines	10	6.8
Diuretics	14	9.5
Anticholinergics	16	10.8
Antibiotics	43	29.1
Don't know	65	43.9
Common pathway linking chronic periodontitis and conditions such as diabetes and cardiovascular disease		
Microbial	14	9.5
Poor nutrition	70	47.3
Circulating antibodies	6	4.1
Inflammation	25	16.9
Don't know	33	22.3
Not a risk factor for dental caries in older adults		
Low socioeconomic status	5	3.4
A vegetarian diet	123	83.1
Physical disabilities	6	4.1
Don't know	19	12.8
Dry mouth		
Dry mouth is caused by a decrease in the production of saliva	10	6.8
Dry mouth can cause an oral burning sensation, a change in taste, and difficulty with swallowing	19	12.8
Dry mouth is rarely a problem for patients wearing dentures	80	54.1
Dry mouth can increase the risk of developing caries	20	13.5
Don't know	19	12.8
Dementia		
Aging alone is the major contributor to poor oral health of older individuals with dementia	7	4.7
Medications used to treat hypertension, depression, and behavioral disturbances seen in this population have little effect on their oral health	4	2.7
As this population struggles with the activities of daily living, they are at high risk of poor oral health unless caregivers provide assistance with oral care	115	77.7
Reminding those with dementia to brush their teeth each day is adequate to achieve and maintain good oral health	17	11.5

Asians: 15.3%; and non-Māori Pacific Islanders: 9.0%). The Asians scored lowest, followed by Maori, and the New Zealand Europeans scored the highest of all groups.

A bivariate analysis was conducted to understand the association between socio-demographic variables and the students' oral health care knowledge score. A test of normality was conducted using the Shapiro Wilk test and the dependent variable was found to have a normal distribution. As the dependent variable is a continuous ratio variable and independent variables are categorical variables, independent sample *t*-test and analysis of variance (ANOVA) were used based on number of categories in the item. Gender, age, qualification, number of hours oral health education taught in undergraduate nursing program, dental visit behavior, experience on performing oral health care, experience on working at a residential care, and students' self-reported knowledge to perform oral health care were tested and results are presented in Table 5. The association between oral health care knowledge score and sociodemographic variables, such as a students' previous experience on performing oral health care, gender, tertiary qualification, nationality, last dental visit, age, total hours of oral health care teaching, and ethnicity were tested using independent *t*-test (two categories) and ANOVA (three or more categories).

The results revealed very weak evidence for any association between students' oral health care knowledge score and predictor variables, such as gender, nationality, last dental visit, age, and ethnicity. However, having a tertiary qualification, previous experience in performing oral health care for older people, and total hours of oral health care teaching provided weak evidence for influencing the oral health care knowledge score for students with a significant *p*-value ($p < 0.05$).

A multivariable linear regression analysis was conducted to identify any stronger associations. A preliminary analysis was carried out using linear regression with each variable. A second model with predictor variables produced a significant beta coefficient in the first model was entered at the same time rather than stepwise regression method. The predictor variables entered in the second model were hours of teaching and nationality. The R^2 value for the resultant model was 0.055, which was higher than expected due to the reduced variability of oral health care knowledge score. Even though the oral health care knowledge score in this study can be between 0 and 32, the score ranged between 12 and 27. Field and Miles (2010) suggested if variability of data is low, the significance of *F* statistics indicates the fitness of the model. The *F* statistics (2.036; $p < 0.001$) of the model indicates the real association between predictors and dependent variables. Table 6 shows that students who reported that no oral health care content was taught in their program scored less, which is

TABLE 4 Demographic variables and descriptive results of oral health care knowledge scores

	Frequency	Percentage	Mean	SD	Median
Gender					
Female	142	95.9	21.92	2.99	22
Male	6	3.4	22.33	2.25	23
Age (years)					
18–20	30	20.3	20.93	3.46	22
21–25	63	42.6	21.22	3.25	22
26–30	21	14.2	21.52	19.7	22
≥31	34	23.0	20.88	19.64	22
Ethnicity					
Maori	21	14.2	20.25	3.36	21
New Zealand European	101	68.2	21.29	3.47	22
Samoan	5	3.4	21.18	3.47	21
Asian	11	7.4	20.01	3.23	20
Other	10	6.8	21.13	3.14	21
First undergraduate qualification					
Yes	118	79.7	20.95	2.90	22
No	30	20.3	21.8	3.19	22
Worked in aged care facility					
Yes	84	56.8	21.92	3.21	22
No	64	43.2	21.97	2.60	22
Performed oral health care for elderly					
Yes	31	20.94	21.53	3.86	22
No	117	79.05	21.05	3.27	22
Do you think you have enough knowledge to help with future patients' oral health needs?					
Yes	46	31.1	20.74	3.3	21
No	102	68.9	21.98	3.6	20
Your last dental visit					
Within a year	82	55.4	21.16	3.47	22
More than 1.5 years	66	44.6	21.17	3.46	22
Total hours of teaching oral health content					
0 hour	42	28.4	20.21	4.05	19.5
1–10 hours	81	54.7	21.55	3.39	21.0
11–20 hours	25	16.9	22.40	3.06	22.0
Total	148	100	32.00	–	–

shown by a negative beta value ($p < 0.005$). In addition, a student's nationality predicted the oral health care knowledge score; however, the evidence for the association was weak ($p < 0.050$).

4 | DISCUSSION

The questions asked in this survey focused on basic oral health knowledge, the ability to identify oral health issues in an older population, managing/preventing oral health diseases, and knowledge of the oral–systemic connection. The results indicated that the general oral health knowledge of participants was generally acceptable. However, knowledge of the oral–systemic connection and oral health care knowledge was lower than expected when asked about caring for older adults. This result was similar to the Khan and Odisho[11] study conducted among nursing students ($n = 105$) in the Netherlands and Canadian universities. In the current study, 71% of participants selected vigorous brushing as the reason for gingival bleeding and only 75% of participants selected

TABLE 5 Bivariate analysis: *t*-test and ANOVA

a) Independent sample *t*-test	*N*	Knowledge score Mean	SD	Levene's test for equality of variance *F*	*p*	*t*-Test for equality of means: Equal variance assumed *t*	*p*	Equal variance not assumed *t*	*p*
Performed oral care for older people									
Yes	31	21.53	3.86	3.022	**0.050**	−3.585	0.054	−1.938	**0.003**
No	117	21.05	3.27						
Self-reported oral health knowledge to care for older people									
I have	46	22.21	3.75	0.878	0.350	2.064	0.041	2.002	0.05
I do not have	102	20.91	3.47						
Gender									
Female	142	21.25	3.60	0.445	0.50	−1.053	0.30	−1.140	0.30
Male	6	22.83	3.31						
Tertiary qualification									
Yes	118	21.11	3.37	4.180	**0.043**	−1.394	**0.05***	−1.203	0.04
No	30	22.13	4.33						
Nationality									
Non-New Zealander	20	20.66	2.51	0.743	**0.040**	−0.315	0.80	−0.448	**0.05**
New Zealander	128	21.33	3.62						
Last dental visit									
Within a year	82	21.39	3.62	0.001	0.972	0.231	0.818	0.231	0.818
More than 1 year	66	21.25	3.59						

b) ANOVA	Sum of squares	d.f.	Mean square	*F*	*p*
Age					
Between groups	7.993	3	2.664	0.202	0.895
Within groups	1898.081	144	13.181		
Total hours of oral health care teaching					
Between groups	85.003	2	42.50	**3.384**	**0.037***
Within groups	1821.071	145	12.56		
Ethnicity					
Between groups	21.655	2	10.827	0.833	0.437
Within groups	1884.074	145	12.996		

Abbreviations: ANOVA, analysis of variance; d.f., degree of freedom.

TABLE 6 Multiple variable linear regression analysis for oral health care knowledge

Variable	Unstandardized coefficients *B*	SE	Standardized coefficients Beta	*T*
Constant	21.350	0.402		53.156**
Hours of teaching				
None	−1.492	0.670	−0.187	−2.277**
3–10 hours	Reference category			
11–20 hours	0.784	0.802	0.168	2.079
Nationality				
New Zealander	Reference category			
Non-New Zealander	1.663	0.800	0.168	2.079**
$R = 0.238$; $R^2 = 0.055$; $F = 2.790$; $p < 0.001$				

*$p < 0.05$, **$p < 0.001$.

bacteria as the reason for gingival bleeding, which is lower than what was reported in the Netherlands (83%) and Canada (88.5%).

However, when asked about the number of teaching hours of oral health content, compared to students from Canadian institutes (22.6%), more students from New Zealand (28.37%) and Dutch institutes (27.7%) indicated no oral health education teaching in their program. This could explain the comparatively better oral health knowledge demonstrated by Canadian students. These results also indicate that incorporating oral health care into nursing curricula increases the nurse's knowledge on oral health care and its relevance to overall health outcomes.

When asked a question whether students have enough oral health care knowledge to care for future patients, only 21% of participants in the current study indicated that they have enough oral health knowledge. However, a significantly higher percentage of students from Canadian (38.5%) and Dutch (37.7%) universities indicated that they have enough knowledge to care for their patients.

Performing an examination of the oral cavity is an important factor to manage and prevent oral health issues in older adults. A question was asked to know how many students performed an oral health examination in their 3-year program. Clemmens et al.[16] conducted a similar investigation in US universities and found that 49% of participants indicated that they had previously performed an examination of the oral cavity. In the current study, only 16.1% of participants indicated that they performed an oral examination, suggesting that the oral health examination is currently not prioritized in nursing programs in New Zealand. Even though 62% of the students reported receiving some oral health care education in their nursing program, only 16% had performed oral health examination for their patients.

All correct answers were scored, and the total score was used to understand any association between independent variables and oral health care knowledge scores. On bivariate and multivariable analyses, an association between the oral health knowledge score and nationality was identified. The mean score for participants who indicated nationality as New Zealand scored higher than non-New Zealanders and this result was confirmed in a multiple variable linear regression analysis. In New Zealand, a publicly funded oral health service is available for children and adolescents, which could have some influence on the oral health knowledge of nurses who lived in New Zealand and had used the publicly available free dental services routinely. The participants' experience on performing oral health care for older adults showed an association with the knowledge score; however, this association was not confirmed in further analyses. The participants who performed oral health care for older adults were asked questions on denture care and the oral examination, and the majority of participants chose incorrect answers. This result suggests that participants having experience working in residential homes did not change their oral health care knowledge. The mean score for those who had a previous tertiary qualification was higher, and bivariate analysis showed evidence for this association; however, this was not significant when other factors were considered and controlled for in the multiple variable analysis. However, the number of hours that oral health education was taught in nursing program was associated with the oral health knowledge score of the participants and this association was confirmed in the multiple variable analysis when all independent predictor variables were included in the model.

The results imply that students' previous experience, previous qualification, gender, ethnicity, dental visit behavior, and self-reported ability to perform oral health care did not predict nurses' knowledge of older people's oral health care requirements. The nationality of a nurse and the number of hours of oral health education taught during their nursing undergraduate program was found to predict their knowledge of oral health care. This suggests that a strong oral health intervention should be provided to those who are not New Zealand citizens or residents or who did not spend their childhood in New Zealand or use the New Zealand public oral health services. In addition, oral health curricula should be strengthened and inconsistencies between institutes on teaching oral health content addressed to improve oral health care knowledge of nurses and in turn to improve the oral health outcome of older population in New Zealand.

5 | CONCLUSION

The current study was conducted to understand the oral health care knowledge of nursing graduates in New Zealand nursing schools. The results suggested that nursing graduates have good basic oral health knowledge; however, their knowledge of the oral–systemic disease connection and an examination of the oral cavity or screening was found to be poor, which it is suggested is due to lack of oral health care content in nursing curricula. The oral health care knowledge of nursing students and their ability to care for older adults depend strongly on oral health care education in their nursing program. A revision of curricula to improve oral health education in nursing programs is strongly recommended, with more education on oral screening and improved curriculum content with respect to the oral–systemic connection.

ACKNOWLEDGMENTS

We thank all nursing institutes and students who participated in the study.

Open access publishing facilitated by University of Otago, as part of the Wiley – University of Otago agreement via the Council of Australian University Librarians.

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How to cite this article: Veerasamy A, Lyons K, Crabtree I, Brunton P. Knowledge of nursing graduates on oral health care for older people in the long-term care. *J Dent Educ*. 2022;86:830–838. https://doi.org/10.1002/jdd.12895