

An investigation of pharmacy students' perceptions of their oral health knowledge and education: A preliminary study

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Abstract

Pharmacists are highly accessible healthcare providers who have the potential to improve oral health inequities through oral health education and promotion. International studies suggest there is limited oral health training in pharmacy curricula. However, this has not been investigated in New Zealand. This study evaluated final-year pharmacy students' oral health knowledge, readiness to manage oral health issues, perceptions of curriculum coverage, and attitudes toward integrating oral health into pharmacy practice. An online survey was distributed to final-year students at the University of XXX and the University of YYY. The questionnaire included demographic items, Likert-scale measures of perceived knowledge and preparedness, multiple-choice items assessing objective knowledge, and open-ended questions on curricular experiences. Quantitative data were analysed descriptively and with chi-square tests; qualitative data were thematically analysed. Seventy-one students responded (44.1%). Most reported limited time was dedicated to oral health topics (81.7%), with almost 40% rating their education as poor. While 87.3% recognised medication-related oral side effects, fewer felt prepared to counsel patients (60.5%) or discuss how systemic diseases and medications impact oral health (29.6%). Students strongly supported a role for pharmacists in oral health and expressed preferences for practical, case-based, and interprofessional teaching. New Zealand pharmacy students demonstrated knowledge gaps, particularly regarding oral-systemic connections, highlighting inadequate oral health training. Despite this, many students expressed positive attitudes towards further oral health training. Integrating oral health content within pharmacy programmes would strengthen graduates' preparedness and support pharmacists' role in oral health education and promotion.

Introduction

Pharmacists are highly accessible healthcare professionals, with over 1100 community pharmacies across New Zealand (NZ) (Leach, 2025). In addition to their traditional dispensing role, pharmacists also provide free healthcare advice, educate patients on the safe and effective use of medications, collaborate with other healthcare professionals to address medication issues, provide over-the-counter treatments for minor ailments, and make referrals when necessary. Over time, the pharmacist's scope of practice has expanded to include vaccinations, smoking cessation, and health promotion (McDonald et al., 2021). Furthermore, their affordability, broad geographic distribution, and extended operating hours make them more accessible than other healthcare professions. As a result, they are often the first point of contact and the most frequently visited health professional, especially by patients of low socioeconomic status or those affected by chronic diseases (Mann et al., 2015; Taing et al., 2016). Therefore, pharmacists have the potential to make a positive contribution to oral healthcare, particularly as they are frequently consulted about oral health issues (Cohen, 2013; Hu et al., 2022; Jones et al., 2024; Taing et al., 2016).

Oral diseases, such as dental caries, periodontal disease, and mucosal diseases, are among the most prevalent chronic health conditions worldwide (World Health Organization, 2022). There is increasing evidence to support the association between oral and systemic diseases, including cardiovascular disease, respiratory disease, and diabetes (Botelho et al., 2022; Hashim et al., 2025). Additionally, medications used to manage chronic diseases can have oral implications, including dry mouth, lichenoid reactions, gingival hyperplasia, bruxism, and an increased risk of fungal infections (Tavares et al., 2014). As medication experts who frequently encounter individuals with chronic diseases, pharmacists can educate patients on the oral health-related side effects of medications and the implications that systemic diseases may have on oral health (Cohen, 2013). As these individuals are often at increased risk of oral conditions, this provides an opportunity for pharmacists to provide early intervention and promote oral health (Taing et al., 2016).

Additionally, pharmacists can address risk factors for oral health conditions, such as smoking, which is also a shared risk factor for many chronic diseases (Wolf et al., 2021). This further highlights the need for pharmacists to have a good understanding of the oral-systemic connection to provide holistic patient care.

The accessibility of pharmacists within the community, combined with their expertise in medication management, places them in an ideal position to contribute to oral health education and promotion. Despite the recognised potential of pharmacists, international studies have highlighted that pharmacists (Buxcey et al., 2012; Mann et al., 2015) and pharmacy students (Gavaza et al., 2016; Rajiah & Ving, 2014) are not adequately prepared for this role, with poor oral health knowledge and limited oral health education. However, the extent of oral health training in NZ pharmacy programmes has not been investigated. Therefore, this study aims to evaluate pharmacy students' knowledge of the oral-systemic connection, perceptions of their oral health education, and attitudes toward its integration into clinical practice. The insights from this study can help to improve the curricula and promote the integration of oral health into holistic patient care.

Methods

Study design and ethics

A cross-sectional study design, using a structured online questionnaire, was used to investigate the research questions. Ethics approval was obtained from the University of XXX Human Ethics Committee (25/0841), and Māori consultation was undertaken in line with local health research requirements (Reference number: 25168).

Participants and recruitment

Participants were recruited from the University of YYY and the University of XXX, the two institutions that offer pharmacy programmes in NZ. A purposive sampling procedure was used to recruit fourth-year Bachelor of Pharmacy students.

This cohort was selected as they are in their final year of study and therefore will provide a good representation of the extent of oral health education in the NZ pharmacy curricula. The survey was conducted using Qualtrics™.

Instrumentation

An online self-administered questionnaire was used. The questionnaire consisted of three sections. The first section collected demographic details, including ethnicity, gender, age, current university, and whether pharmacy is their first degree. The second and third sections included a Likert scale to quantify perceptions of oral-systemic knowledge, adequacy of oral health education in their curriculum, and attitudes to oral health in clinical practice. Multiple-choice questions were also used to gauge students' understanding of the oral-systemic connection, the oral health-related side effects of medications, and teaching practices. The survey questions were adapted from previous studies (Gavaza et al., 2016; Veerasamy et al., 2022). Additional questions were added based on information obtained from a literature review to address gaps relevant to the NZ pharmacy curricula.

Pilot study

To ensure face validity, a pilot study was conducted among 10 pharmacists who provided feedback on the clarity, length, and ease of completion on mobile and desktop devices. Based on the feedback received, revisions were made to the survey prior to its distribution to the eligible pharmacy students. The survey link, which included the information sheet, consent form, and questionnaire, was distributed via the online learning platforms Blackboard and Canvas, as well as directly to the students' university email addresses.

Data collection and analysis

Responses were collected anonymously via Qualtrics™, and the data were exported as CSV format for analysis. Quantitative data were cleaned, coded, and analysed using IBM SPSS Statistics (Version 29.01).

Open-ended survey responses were analysed thematically. Responses to “What oral health topics were included in your pharmacy curriculum, and to what extent were they covered (e.g., briefly mentioned, covered in detail, integrated into assessments)?” were reviewed and systematically coded. The following recurring themes were identified:

- Oral health topics covered in their pharmacy curriculum
- Current teaching practices

Quantitative results

A total of 80 students participated in the survey from the eligible cohorts of final-year Bachelor of Pharmacy students at the University of YYY and the University of XXX. Responses that were less than 30% completed were excluded from analysis. This resulted in a final sample of 71 completed responses, producing a response rate of 44.1% based on an estimated eligible population of 161 students.

Participant demographics

Most of the participants were female (78.9%), from the University of XXX (66.2%), and reported pharmacy as their first university-level degree (88.7%). Of the participants, the predominant ethnicity was Asian (48.6%), followed by European/Pākehā (32.9%), other (12.9%), and Māori (5.7%). The participant demographics are shown in Table 1.

Pharmacy students’ perspectives on oral health education

Table 2 summarises the students’ perceptions of oral health education. Students agreed that the dental discipline is relatively segregated from other healthcare disciplines (67.6%), that there is limited collaboration between primary care providers in the management of oral and overall health concerns of patients (64.8%), and that the time devoted to oral health topics in their current pharmacy programme is limited (81.7%). Only 23.9% of participants felt they received good oral health education, and 76.1% expressed a need for more education and training.

Pharmacy students’ perceived knowledge of oral-systemic connection

Most students reported understanding the impact of medication-related oral effects on overall oral health (87.3%); however, fewer students reported being prepared to counsel patients and knowing when to refer (60.5%).

Approximately two-thirds (67.1%) of the participants felt they did not have adequate knowledge of periodontal disease and its associations with systemic diseases. Only 29.6% felt prepared to discuss how systemic diseases could affect a patient's oral health. In comparison, 52.1% were not confident discussing the implications of systemic diseases and relevant medications on oral diseases with other healthcare professionals. The students' perceived knowledge of the oral-systemic connection is shown in Table 2.

The students' understanding of medication-related oral side effects and the oral-systemic connection is shown in Table 3. The results showed that oral health-related knowledge varied across topics. While 59.4% correctly identified inflammation as the main mechanism linking periodontitis with systemic disease, almost a quarter (23.2%) selected "don't know," while 30.4% selected "microbial," and 24.6% selected "poor nutrition." A majority of the students correctly recognised smoking (89.9%), poor oral hygiene (94.2%), and diabetes (73.9%) as risk factors for periodontal disease, but only 26.1% identified pregnancy as a risk factor. Students were aware that corticosteroids (97.1%) and antibiotics (72.5%) could cause oral candidiasis, but fewer recognised medications associated with gum overgrowth (gingival hyperplasia) and dry mouth (xerostomia). Only 59.4% of students recognised anticonvulsants as a cause of gingival hyperplasia, while only 15.9% correctly identified calcium channel blockers. Most students recognised that antidepressants (72.5%) and antihistamines (69.6%) could cause dry mouth, but fewer identified angiotensin-converting enzyme inhibitors (46.4%) and calcium channel blockers (27.5%) as causes. Students understood that dry mouth results from reduced saliva production (81.2%), can cause oral burning sensation, change in taste, and difficulty with swallowing (69.6%), and increases the risk of developing caries (72.5%)

Attitudes towards oral health in clinical practice

The students widely acknowledged the importance of oral health in pharmacy practice, as shown in Table 2. There was a strong agreement that pharmacists should identify and address medication-related oral health issues (94.3%) and collaborate with dentists and other healthcare professionals on oral health matters (97.2%). Although nearly all participants believed oral health is an important aspect of overall holistic patient care (97.2%), only 73.3% felt that discussing oral health with patients should be a routine part of pharmacy practice.

Attitudes towards teaching practices

When asked to rate their oral health education, 48.5% described it as adequate, 38.2% as poor, and none rated it as excellent. The most preferred methods to improve understanding were guest lectures from dental professionals (33.8%), practical workshops (22.1%), and case-based learning (19.1%). Oral health topics were most often integrated into broader health topics "sometimes" (61.8%), and only 7.4% reported receiving clinical guidelines or protocols for oral health care in pharmacy practice.

When asked about preferred skills-based training, students expressed strong interest across multiple areas. In particular, 75.4% of participants wanted training in oral health screening techniques, 73.9% in patient counselling on oral hygiene, 76.8% in identifying medication-related oral side effects, and 71.0% were interested in interprofessional collaboration with dentists. These results are shown in Table 3.

The Shapiro–Wilk test indicated that the data were not normally distributed; therefore, non-parametric tests were applied to examine differences between groups. Significant results are summarised in Table 4. Bivariate analyses revealed significant differences in oral health knowledge and preparedness according to student background characteristics. Students with a previous degree were less likely to correctly identify medication-related oral health

effects compared with those studying pharmacy as their first degree. For example, they were less likely to recognise antidepressants (37.5% vs 77.0%; $\chi^2(1) = 5.54$, $p = 0.032$), antihistamines (25.0% vs 75.4%; $\chi^2(1) = 8.49$, $p = 0.008$), and antibiotics (25.0% vs 78.7%; $\chi^2(1) = 10.22$, $p = 0.004$) as contributing to oral conditions. This finding suggests that prior tertiary education does not necessarily provide an advantage in oral health knowledge and may reflect differences in exposure to relevant health content.

Ethnicity was also associated with preparedness and training preferences. Māori students were more likely to report being “very well prepared” to advise patients on medication-related oral health issues ($p = 0.002$), while Asian and “Other” students more often reported lower preparedness. Preferences for skills-based training varied by ethnicity; Māori students were less likely to request training in identifying medication-related oral side effects than European/Pākehā and Asian students ($p = 0.049$). These results highlight the importance of considering cultural and educational background when designing oral health components within pharmacy curricula.

Qualitative results

Oral health topics covered in their pharmacy curriculum

Students from both universities described oral health coverage as limited and often brief, as they lacked a dedicated oral health module.

“We had a lecture on “mouth conditions” which was extremely brief and overall, too fast-paced and rushed.”

“We unfortunately did not have an oral health module in pharmacy school ... oral health was briefly mentioned throughout.”

Across both universities, oral thrush was most frequently covered in detail. YYY students also recalled content on toothache, ulcers, mucositis, infective endocarditis, and medication-related effects, including medication-related osteonecrosis of the jaw:

“Some oral diseases related to medicine use are covered in some detail, e.g., drug-induced oral thrush, oral mucositis. Medicines impacting oral health are also covered in detail e.g. tetracyclines, chemotherapy agents.”

“Discussion of bisphosphonates on oral health and the need for good dental hygiene and an oral health check before initiation due to the risk of jaw necrosis. Briefly discussed toothache in primary health care... anticholinergic medicines and dry mouth ... [and the] role of oral health in chemotherapy (mucositis)”

In comparison, XXX students described a broader range of topics, including angular cheilitis, oral cancer, gingival hyperplasia, tooth discolouration, and bruxism.

“I have seen topics such as oral thrush, Sjogren's syndrome/dry mouth, ulcers/mucositis, oral cancer, as well as conditions surrounding the mouth (angular cheilitis, cold sores, impetigo, etc) and affecting oral pain (sinusitis) covered in our curriculum.”

“Side effects of medications like methotrexate ulcers and yellowing/discolouration of teeth, with doxycycline or iron supplements, fungal infections like thrush, general ulcer care.”

However, other oral conditions, such as periodontal disease, were only “briefly mentioned” at both universities. Overall, students reported that oral health content in their pharmacy curriculum was “not covered well.” Some students expressed the need for more training in this area.

Current teaching practices

Some students reported gaining knowledge from workplace experience or peer learning, rather than formal teaching.

“Most of the oral health pharmacy education I have is ... asking questions to the pharmacist I am working with.”

“A majority of students have learnt small amounts through working or placement, and we share and learn from each other.”

Discussion

This study is the first to investigate NZ pharmacy students’ perception of their oral health knowledge and education. The findings indicate that while final-year pharmacy students recognise the importance of oral health in holistic patient care, they perceive significant gaps in their preparedness, knowledge, and training. Many students felt that limited time was dedicated to oral health in their curricula, with almost 40% rating the quality of oral health education in the pharmacy programme as poor.

The lack of a structured oral health module is a contributing factor to students being insufficiently prepared. Pharmacy education prioritises pharmacology, therapeutics, and systemic disease management, with oral health only briefly mentioned and limited to isolated lectures or workshops. As a result, students develop a strong knowledge of medication side effects but have limited exposure to oral-systemic connections, preventative strategies, and practical counselling skills. This is consistent with a study conducted among final-year pharmacy students in California, where 89.5% agreed that limited time is devoted to oral health topics and 73.2% felt they needed more education and training in oral health (Gavaza et al., 2016). Additionally Hein et al. (2011) found that over half of the pharmacy programmes across multiple countries reported little or no requirement to include oral-systemic connection in their curricula. Compared to medical and nursing students, pharmacy students were found to have received the least oral health training (Hein et al., 2011), reflecting a persistent separation between oral and general health in healthcare education.

This separation is also reflected in current pharmacy practice. Ho et al. (2024) conducted a study among pharmacists in Cairns reported that pharmacists were confident in identifying the side effects of steroid inhaler use; however, the implications of these side effects on oral health (caries and gingivitis) were not routinely discussed when counselling patients on the use of steroid inhalers. Instead, pharmacists focused more on asthma management and inhaler technique. Pharmacists reported counselling patients on the oral effects of inhalers only when asthmatic patients sought advice for an oral health issue (Ho et al., 2024). This reflects a reactive rather than a preventative approach.

With an aging population and an increasing prevalence of chronic diseases and polypharmacy, prevention is essential to reducing the burden of diseases and inequities. This is particularly important in NZ as Māori and Pacific communities are disproportionately burdened by systemic and oral diseases and consistently suffer poorer health outcomes. Furthermore, due to cost, individuals of lower socioeconomic status tend to utilise pharmacy services rather than seeing dentists (Cohen, 2013; Mann et al., 2015). Māori and Pacific people in NZ are disproportionately represented in the lowest socioeconomic groups, further highlighting the need to integrate oral health education into the NZ pharmacy curricula (Ministry of Health, 2010).

Importantly, many oral diseases, including periodontal disease, are largely preventable through effective patient education and preventive strategies. Pharmacists frequently interact with patients managing chronic diseases, placing them in an ideal position to provide oral health education and promotion, as well as manage risk factors associated with these conditions. The low level of perceived knowledge among students indicates a missed opportunity for patient education and health promotion, particularly in preventive oral healthcare. Since oral disease and systemic chronic diseases have shared social and environmental determinants and risk factors, such as tobacco smoking, alcohol consumption, and unhealthy dietary habits (high intake of salt, sugar, and saturated and trans fats) (Wagner & Brath, 2012), managing these risk factors can help reduce the burden of both oral and systemic diseases and improve overall health outcomes.

Another contributor to students being insufficiently prepared is the lack of integration with dentistry. Only 21.1% of students in the present study felt confident discussing the implications of systemic diseases and medications on oral health with other health professionals, such as dentists. Additionally, about 65% of students felt that there is limited collaboration between primary care providers in managing patients' oral and overall health concerns. Similarly, Al-Saleh et al. (2017) reported that this was the most common barrier for pharmacists to provide oral health services. This is concerning as collaboration between healthcare providers is essential to integrated, holistic patient care. Pharmacists should be confident in communicating with dentists to provide appropriate referrals, contribute to collaborative treatment planning, ensure medication safety, and reinforce preventative advice. The World Health Organization (2010) defines interprofessional education (IPE) as "education [that] occurs when two or more professionals learn about, from, and with each other to enable effective collaboration and improve health outcomes." Evidence from international studies demonstrates that IPE can improve both knowledge and confidence in collaborative oral healthcare. Following an IPE workshop involving pharmacy and dental professionals, pharmacists reported increased confidence in providing dental advice to patients, while dental professionals gained a better understanding of how pharmacists can support patient care (Barraclough et al., 2022). In a study conducted in the United States, pharmacy and dental students worked together to assess a patient during a dental clinic visit. Following this intervention, the students reported a better understanding of their roles in providing oral healthcare (Dresser et al., 2021). Similarly, Pogge et al. (2018) conducted a pilot study involving second-year pharmacy and third-year dental students who participated in two lectures, one online lecture, one workshop, and five clinic sessions. The intervention improved the pharmacy students' knowledge of oral health-related pharmacotherapy. Furthermore, both pharmacy and dental students reported positive changes to their attitudes towards IPE. These findings suggest that integrating IPE opportunities into the NZ pharmacy curricula could prepare students for interprofessional collaboration and help pharmacists address oral health inequities, particularly for populations with limited access to dental care.

Despite the gaps in students' knowledge and preparedness, students expressed positive attitudes towards integrating more oral health training in their curricula. Over 95% of students recognised oral health as an important aspect of holistic patient care. This aligns with international studies among pharmacists, who have expressed interest in strengthening their oral health education to become more involved in oral health promotion and education (Mann et al., 2015; Taing et al., 2016). These positive attitudes are important as they suggest that curriculum changes are likely to be well-received and may foster greater engagement with oral health education.

This study has several limitations that should be considered when interpreting the findings. First, the voluntary nature of the survey may have led to selection bias, and the reliance on self-reported data introduces the potential for recall and social desirability bias. Second, although both NZ pharmacy schools were included, the results may not be generalisable to international settings where curricula, health systems, and professional roles may differ. Despite these limitations, this study highlights gaps in pharmacy education and a need to incorporate oral health education

within the NZ pharmacy curricula. Oral-systemic links should be integrated into pharmacotherapy and chronic disease modules. Additionally, oral health education can be strengthened with structured, skills-based training in patient counselling and prevention. Incorporating interprofessional learning opportunities with dental students would support graduates' confidence in collaborating with other health professionals to provide integrated healthcare. Given pharmacists' accessibility and frequent contact with patients, enhancing their training in oral health will enable them to play an important role in prevention, early intervention, and reducing oral health inequities in NZ. Future research could explore the effectiveness of integrating oral health modules into pharmacy curricula and measure changes in students' preparedness longitudinally. This would provide stronger evidence to guide curriculum development and evaluate the long-term impact on clinical practice.

Conclusion

The current NZ pharmacy curricula have limited oral health training, particularly in understanding the oral-systemic connection. Given that pharmacists are easily accessible in the community, with the right skills and knowledge, they have great potential to improve oral health outcomes and inequities through prevention and early intervention. This is particularly important with the disproportionate burden of oral disease among disadvantaged populations in NZ. Many students recognised the importance of oral health in holistic patient care and expressed positive attitudes towards more oral health training. By integrating structured oral health training and interprofessional learning opportunities into future curriculum development, pharmacy graduates would be better prepared for their expanding role in oral health education and promotion.

Statements and Declarations

Financial interest: The authors have no relevant financial or non-financial interests to disclose

Ethics approval: The questionnaire and methodology for this study were approved by the Human Research Ethics Committee of the University of Otago (Reference number: 25/0841) on 21/03/25 prior to commencing research. The study was conducted in accordance with the Declaration of Helsinki

Informed consent: Informed consent was obtained electronically from all participants prior to participation. A consent form and information sheet outlining the study aims, procedures, risks, and confidentiality was provided at the start of the online questionnaire. Participants indicated their consent by selecting an 'I agree' option before accessing the questionnaire. Consent was obtained by the research team from all eligible participants at the time of survey completion between April 2025 and September 2025

Data availability: All relevant study materials, including the survey instrument, anonymised dataset, and variable coding information, have been provided as supplementary files to support editorial and peer review.

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Tables

Table 1. Participant demographics

	n(%)
Gender	
Female	56 (78.9)
Male	15 (21.1)
University	
University of YYY	24 (33.8)
University of XXX	47 (66.2)
First degree?	
Yes	63 (88.7)
No	8 (11.3)
Ethnicity	
European/Pākehā	23 (32.9)
Māori	4 (5.7)
Asian	34 (48.6)
Other	9 (12.9)

Table 2. Pharmacy students' perspectives on oral health: knowledge, education, and attitudes

Item (n=69)	Strongly Disagree (%)	Disagree (%)	Neither agree nor disagree (%)	Agree (%)	Strongly Agree (%)
Perceptions of oral health education in pharmacy					
The dental discipline remains relatively segregated from other healthcare disciplines.	-	12 (16.9)	11 (15.5)	37 (52.1)	11 (15.5)
There is limited collaboration between primary care providers in managing oral and overall health concerns of patients.	-	14 (19.7)	11 (15.5)	38 (53.5)	8 (11.3)
Limited time is devoted to oral health topics in pharmacy education.	-	3 (4.2)	10 (14.1)	39 (54.9)	19 (26.8)
I need more education and training on oral health (e.g. oral side effects of medications, oral impacts of systemic disease).	-	7 (9.9)	10 (14.1)	43 (60.6)	11 (15.5)
Overall, I have had good oral health education in my pharmacy curriculum.	4 (5.6)	21 (29.6)	29 (40.8)	17 (23.9)	-
Perceived knowledge on oral-systemic connection					
I understand the effect of medication-related oral adverse effects (e.g., dry mouth, mouth ulcers) on overall oral health.	-	6 (8.5)	3 (4.2)	52 (73.2)	10 (14.1)
I feel prepared to counsel patients about how medication-related oral adverse effects impact overall oral health and when to refer	-	12 (16.9)	16 (22.5)	41 (57.7)	2 (2.8)
I have adequate knowledge of gum (periodontal) diseases and their associations with systemic diseases.	11 (15.7)	36 (51.4)	16 (22.9)	5 (7.1)	2 (2.9)
I feel prepared to discuss how systemic diseases and relevant medications can affect a patient's oral health	3 (4.2)	20 (28.2)	27 (38.0)	18 (25.4)	3 (4.2)
I can confidently discuss the implications of systemic diseases and relevant medications on oral diseases with other health care professionals (e.g., dentists).	5 (7.0)	32 (45.1)	19 (26.8)	14 (19.7)	1 (1.4)
Attitudes towards oral health in clinical practice					
Pharmacists should have a role in identifying and addressing medication related oral health issues	-	-	4 (5.6)	41 (57.7)	26 (36.6)
Pharmacists should collaborate with dentists and other healthcare professionals on oral health matters.	-	-	2 (2.8)	30 (42.3)	39 (54.9)
Discussing oral health with patients should be a routine part of pharmacy practice.	-	7 (9.9)	12 (16.9)	30 (42.3)	22 (31.0)
I believe oral health is an important aspect of overall holistic patient care.	-	-	2 (2.8)	24 (33.8)	45 (63.4)

Table 3. Pharmacy students’ knowledge about oral health & opinions on teaching practices

Item (n=69)	Response option	n (%)
Knowledge of oral health		
Which of the following is the most common mechanism linking chronic gum disease (periodontitis) and systemic diseases such as cardiovascular disease?	Microbial	21 (30.4)
	Poor nutrition	17 (24.6)
	Circulating antibodies	7 (10.1)
	Inflammation	41 (59.4)
	Don't know	16 (23.2)
Which of the following are risk factor(s) for gum disease (periodontitis)?	Smoking	62 (89.9)
	Pregnancy	18 (26.1)
	Diabetes	51 (73.9)
	Poor oral hygiene	65 (94.2)
	Don't know	3 (4.3)
Which of the following medication(s) can cause dry mouth (xerostomia)?	Antidepressants	50 (72.5)
	Antihistamines	48 (69.6)
	ACE inhibitors	32 (46.4)
	Calcium channel blockers	19 (27.5)
	Don't know	3 (4.3)
Which of the following medication(s) can cause oral candidiasis?	Corticosteroids	67 (97.1)
	Antibiotics	50 (72.5)
	Antihistamines	1 (1.4)
	Statins	-
	Don't know	-
Which of the following side effect(s) may occur in patients taking bisphosphonates?	Dry mouth	7 (10.1)
	Gingival bleeding	12 (17.4)

	Mouth ulcers	10 (14.5)
	Osteonecrosis of the jaw	57 (82.6)
	Don't know	9 (13.0)
Which of the following medication(s) can cause gum overgrowth (gingival hyperplasia)?	Beta-blockers	5 (7.2)
	Calcium channel blockers	11 (15.9)
	Anticonvulsants	41 (59.4)
	Diuretics	-
	Don't know	27 (39.1)
Which of the following statement(s) regarding dry mouth is true?	Dry mouth is caused by a decrease in the production of saliva	56 (81.2)
	Dry mouth can cause oral burning sensation, change in taste, and difficulty with swallowing	48 (69.6)
	Dry mouth is rarely a problem for patients wearing dentures	2 (2.9)
	Dry mouth can increase the risk of developing decay	50 (72.5)
	Don't know	5 (7.2)
Teaching practices		
How would you rate the overall quality of oral health education in your pharmacy programme?	Excellent	-
	Good	7 (10.3)
	Adequate	33 (48.5)
	Poor	26 (38.2)
	No formal education received	2 (2.9)
Which teaching method do you think would improve your understanding of oral health the most?	Lectures from pharmacy educators	9 (13.2)
	Guest lectures from dental professionals	23 (33.8)
	Case-based learning	13 (19.1)
	Practical workshops	15 (22.1)
	Interdisciplinary learning with dental or	8

	medical students	(11.8)
How often have oral health topics been integrated into broader health topics (e.g., diabetes, cardiovascular disease) in your curriculum?	Often	2 (2.9)
	Sometimes	42 (61.8)
	Rarely	23 (33.8)
	Never	-
	I don't know	1 (1.5)
Have you been provided with any clinical guidelines or protocols related to oral health care in pharmacy practice?	Yes	5 (7.4)
	No	39 (57.4)
	Not sure	24 (35.3)
How prepared do you feel to identify and advise patients on medication-related oral health issues (e.g., dry mouth, oral candidiasis)?	Very well prepared	5 (7.2)
	Somewhat prepared	46 (66.7)
	Not well prepared	17 (24.6)
	Not prepared at all	1 (1.4)
What types of oral health skills-based training would you like to receive in your pharmacy curriculum?	Oral health screening techniques	52 (75.4)
	Patient counselling on oral hygiene	51 (73.9)
	Identifying medication-related oral side effects	53 (76.8)
	Interprofessional collaboration with dentists	49 (71.0)
	None of the above	-
	Other	-

Table 4. Bivariate data analysis

Previous degree							
Survey item	No previous degree		Previous degree		χ ² value	df	p
	n (%)		n (%)				
Don't know the mechanism linking gum disease and systemic disease	12 (19.7)		4 (50.0)		3.65	1	0.077
Identified antidepressants as a causative factor for dry mouth (xerostomia)	47 (77.0)		3 (37.5)		5.54	1	0.032
Identified antihistamines as a causative factor for dry mouth (xerostomia)	46 (75.4)		2 (25.0)		8.49	1	0.008
Identified antibiotics as a causative factor for oral candidiasis	48 (78.7)		2 (25.0)		10.22	1	0.004
How prepared do you feel to identify and advise patients on medication-related oral health issues?							
Ethnicity	Very well prepared	Somewhat prepared	Not well prepared	Not prepared at all	χ ² value	df	P value
	n (%)	n (%)	n (%)	n (%)			
European/Pākehā	-	19 (86.4)	3 (3.6)	-	39.8	9	0.002
Māori	3 (75.0)	1 (25.0)	-	-			
Asian	2 (6.1)	20 (60.6)	11 (33.3)	-			
Other	-	5 (55.6)	3 (33.3)	1 (11.1)			
What types of oral health skills-based training would you like to receive in your pharmacy curriculum?							
Ethnicity	Identifying medication-related oral side effects				χ ² value	df	Exact Sig. (2-sided)
	n (%)						
European/Pākehā	19 (86.4)				8.38	3	0.049
Māori	1 (25.0)						
Asian	27 (81.8)						
Other	6 (66.7)						