



UNIVERSITY OF TM
KWAZULU-NATAL
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**KNOWLEDGE, ATTITUDES AND PRACTICES CONCERNING ORAL HEALTH
CARE AMONG UNDERGRADUATE STUDENTS IN THE LIFE SCIENCES
DEPARTMENT AT THE CENTRAL UNIVERSITY OF TECHNOLOGY, FREE STATE**

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Submitted in partial fulfilment of the academic requirements for

the Master's Degree in Medical Science

Dental Therapy

in the College of Health Sciences

School of Dentistry

at the University of KwaZulu-Natal

As the candidate's supervisors, who have approved this thesis for submission

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Declaration

I, **FEZIWE FLORA MBELE-KOKELA**, declare that:

- (i) The research reported in this dissertation, except where otherwise indicated, is my original work.
- (ii) This dissertation has not been submitted for any degree or examination at any other university.
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Date 4 December 2020

FEZIWE FLORA MBELE-KOKELA

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Dedication

I dedicate this work to my families- the Kokela family and the Mbele family who are all advocates for education. Their support towards my studies made the journey worthwhile.

Acknowledgements

- i. To God, be the glory for all the wonderful things he has done for me.

- ii. My supervisor, Dr Rajeshree Moodley, with whom I would not have achieved this without. Thank you for your guidance, patience and support and for sharing your knowledge and wisdom with me.

- iii. My utmost appreciation goes to my family- my husband Ben Kokela and my son Tlhompo for their unmerited support and understanding throughout my studying journey.

- iv. My colleagues in the Faculty of Health and Environmental Sciences and Life Sciences Department, my team in the Dental Assisting programme, thank you for walking this journey with me.

- v. To the participants that made the study possible thank you for your time and consideration.

- vi. My mom and my sisters, especially my twin Fezeka whom I troubled the most, for their unwavering support and love during the period of my studies.

- vii. Lastly, DHET for the grant/funding through the Central University of Technology so I could be able to complete my studies.

List of Abbreviations

CUT	Central University of Technology
DA	Dental Assisting
DMFT	Decayed, Missing, Filled Teeth
DoH	Department of Health
EH	Environmental Health
HSSREC	Humanities and Social Sciences Research Ethics Committee
FS	Free State
KPA	Knowledge, attitudes and practices
KZN	KwaZulu-Natal
PHC	Primary health care
STATS SA	Statistics South Africa
SA	South Africa
UKZN	University of KwaZulu-Natal
WHO	World Health Organization

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Abstract

Background

Problems with oral health can, in many ways, affect the quality of life. Bad oral health can prevent positive feelings from being expressed by students, influencing their social experiences and how they feel about themselves. Adults' periodontal wellbeing influences their smiling habits and their quality of life linked to smiles. Bad periodontal health can also prevent positive feelings from being expressed by adults, which may, in turn, influence their self-concept and social interactions.

Objectives

The aim and objectives of this study were to determine the students' knowledge, attitudes and practices regarding oral health care among undergraduate students in the Life Sciences Department at the Central University of Technology, Free State.

Methods

This descriptive study design used quantitative and qualitative methods conducted among undergraduate students in the Faculty of Health and Environmental Sciences, Department of Life Sciences at the Central University of Technology (CUT). Data were collected using an online survey questionnaire.

Data were summarised and aggregated using numerical formats, and the responses related to the KAP of students were numerically coded, which helped to interpret the results. The minimum proportional response rate that was required was (n=156), where purposive sampling was used calculated with 95% confidence level.

Results

A total of (n=220) participants completed the questionnaire. Overall, 28.4% (n=62) were males and 70.2% (n=153) were females with 1.4% (n=3) classifying themselves as other (p<0.001). The questionnaire assessed oral health care knowledge, dental attitudes and oral health care practices (i.e. frequency of tooth brushing, use of dental floss and dental visits).

Of the participants, it was noted that significantly more males smoked compared to the other two groupings. Out of (n=220) participants, 26.6% (n=58) smoked. Habits were also structured around the participant's sugar intake. In this study, over 80%; (n=187) of the participants agreed that they loved sugar. More than 63% (n=138) participants confirmed brushing their teeth twice a day, and 31% (n=68) brushed once a day. The findings in this research further suggested that participants

did not use oral hygiene strategies such as dental floss. Results suggested that more 56.4% (n=123) did not floss. The participants were asked 'what is plaque?' 41% (n=91) stated it was a layer of bacteria in the teeth while other participants 14%; (n=8) stated it was dirt on the teeth. A few of the participants, 37.9% (n=77), stated that they did not know what plaque was.

Nearly 32% (n=72) of the participants did not understand how the state of one's general health could affect their oral health. They indicated that they did not know the relationship between the two. In comparison, only 44.5% (n=98) had an idea.

Conclusion

It was found that oral health education was not covered in the disciplines researched in our study. We also found that variations in the source of dental information were correlated with oral health behaviour in university students. The study, therefore, concluded that oral health care knowledge, attitudes and practices are affected by education.

CHAPTER 1: INTRODUCTION

1. Introduction

The mouth is an indication of the state of a person's oral and general health. It allows us to speak, smile, chew, swallow and uses various facial expressions without pain and discomfort (Modikoe, Reid & Nel, 2019). Modikoe et al. (2019) further cited that this status will be realised when there is an absence of conditions involving various oral and dental structures, such as those that cause potential discomfort, mouth lesions, tooth decay and gum conditions. (Modikoe et al., 2019; Glick et al., 2016).

Worldwide, oral health disorders such as dental caries and periodontitis are reported. At some point in their lives, almost all adults are affected. These disorders rate among the top 100 conditions considered to impact the quality of life (QOL) (WHO, 2010). Some of the risk factors causing oral health problems are poor oral hygiene, diet and smoking. Poverty is also one of the determinants of oral health disorders in Africa, as it predisposes people to poor lifestyle choices and insufficient oral health-related information. Lifestyle choices can be improved by integrated oral health promotion strategies with the government's involvement (WHO, 2003a).

Good oral hygiene constitutes good healthy bodies as the mouth is regarded as the gateway to good health and is considered a mirror to how a body is perceived (WHO, 2009). Good oral hygiene also contributes a great deal towards a person's general behaviour, and it gives them a reason to socialise without fear of being victimised or embarrassed (Kaur et al., 2017). In most cases, dental caries is still a serious oral health problem in industrialised countries, affecting 60–90% of schoolchildren and most adults in many developing countries in Africa. The incidence of dental caries is expected to increase soon, especially due to increased sugar consumption and inadequate exposure to fluorides (Petersen, 2009). Although there has been a positive trend of decreasing tooth loss among adults in some developed countries in recent years, the proportion of edentulous persons among the elderly is high in other countries. In developing countries, oral health care services are largely inaccessible, so teeth are usually untreated or eventually extracted due to pain (Petersen, 2005).

According to Reddy and Singh (2017), the promotion of oral health in health-promoting schools is lacking, and as cited in the National Oral Health Strategy 2002 (South African National Department of Health, 2002), the promotion of oral health is a cost-effective technique that can be introduced for the prevention of oral diseases in schools. South Africa (SA) has established the relevance and importance of school-based programs for children. While integrated school-based approaches include oral health initiatives, there is a lack of documented data as to whether these initiatives have been put into practice and whether these programs have been tested. (Reddy & Singh, 2017).

1.2 Background

Dental caries in South Africa remains high due to socioeconomic standards in the society, and this is due to inequalities in the distribution of health care services, and lifestyle, i.e. poverty also plays a significant role in the plight to prevent dental caries (Ramphoma, 2016; Bhayat & Chikte, 2019). In the National Oral Health Survey conducted in South Africa between July 1999 and June 2002, the overall image of the poor state of children's oral health in the country was given, with the national prevalence of dental caries at 60% (Molete, 2018).

Oral disease is a health problem of considerable burden that often leads to pain and more significantly loss of the tooth, affecting appearance, quality of life, consumption of nutrients, and growth and development. The most widespread oral disorders in the human population such as dental caries and periodontal disease, affect 67.5% to over 80% of school children in some countries which amount to a significant health burden (Blaggana et al., 2016). The outcomes of a study done about oral health-related knowledge, attitudes and practices of adult patients in Mangaung Metropolitan Municipality could be used to enlighten the planning of integrated oral health promotion plans, in Mangaung and the Free State Province of South Africa (Modikoe et al., 2019).

According to Thema and Singh (2017), oral diseases that occur most frequently are largely preventable, but oral health care faces immense challenges in South Africa. The incidence and distribution of oral diseases across different provinces are inconsistent and poorly reported (Thema & Singh, 2017).

Furthermore, in SA, even though dental services are available and accessible in both the private and public sector, they are unevenly distributed (Thema & Singh, 2017; Singh, 2011b).

Thema and Singh (2013) cited that dental services form an important part of general health and that poor oral health care can compromise the functioning of the oral cavity needed for mastication. When one has good oral hygiene, it contributes towards a positive attitude and behaviour. Notably, good oral hygiene plays a huge role in nutrition, which equates to a healthy body, a healthy mind (Thema & Singh, 2013).

Thema and Singh (2013) further indicated that in a report on the National Oral Health Survey done between 1999 and 2002 (SANDoH, 2002) indicated the imbalance of health distribution and in which areas it is most needed. Human resources, equipment and integrated health care, play a huge role in fighting oral diseases. Contributions to the training educational plan or curriculum and proceeding with instruction for registered nurses on issues, for example, oral assessment and oral health education, can add to transforming health integration into a reality (Thema & Singh, 2013).

A study done at Kuwait University to determine the extent of oral health knowledge among students indicated that they were satisfied with their oral health. However, they did not have the correct knowledge about the causes and prevention of dental diseases (Al-Hussaini et al., 2003).

A similar study done in KwaZulu-Natal among undergraduates about knowledge and attitudes in oral self-care practices showed that oral diseases cannot be avoided but can be prevented by tooth brushing twice a day fluoride toothpaste (Singh & Pottapinjara, 2017). Common risk factors in dentistry also include tobacco use, sugary products and low intake of vegetables and fruits and less sugary products. This was the most common practice in every educational institution (Formicola, 2017; Formicola & Bailit, 2012). Integrated dental services should be part of every educational institution where oral health education and oral health screening are provided. Students can access it through funding, i.e. simple dental payment systems including scaling and polishing, restorations, fissure sealants, and sepsis relief, making things easy and accessible for all students (Formicola 2017; Formicola & Bailit, 2012).

According to Singh (2011a), preventative measures such as fluoride application at home and visiting the dentist twice a year are also some of the most critical factors that contribute to a healthy mouth, leading to a healthy lifestyle (Singh, 2011a). Ghaffari, Rakhshanderou, Ramezankhani, Noroozi and Armoon (2018) suggested that research supported the fact that better oral care practices are presented through proper oral health awareness. Singh (2011b) analysed district oral health services. Their findings indicated that very little was known about oral health in communities and that there was an urgent need for oral health care services. Service delivery needed to be reoriented in KZN with an emphasis on preventative measures and oral health promotion to all the communities at large (Singh, 2011b).

In KwaZulu-Natal (KZN), a study on oral health promotion in schools was identified as a cost-effective way of improving oral health even though toothbrushing programmes were not implemented regularly. The programmes' sustainability was identified even though it benefitted the school and community (Reddy & Singh, 2017).

This is the first study evaluating oral health that was conducted at the Central University of Technology (CUT), Free State, and will provide baseline data that can be used for future interventions and surveys. This study's results are novel and will also enable the dental clinic at the University to assess student's knowledge of oral health. Data collected will provide the basis to modify the current teaching module to improve the outcomes.

As much as oral health promotion is available in school-health programmes, evidence demonstrating the sustainability and success is an issue because the progression of oral health-related problems continues into adult life and thus the aim of this study. Students in the universities are mostly regarded as role models to the youth. That is why it is important to take preventative measures for oral hygiene as early as possible and throughout life in general.

1.3 Problem statement

There is a high rate of dental caries in South Africa despite public and private services being available. While access is a problem, the knowledge of preventative measures is also very low (Singh, 2011a).

Good oral hygiene constitutes healthy bodies as the mouth is regarded as the gateway to good health and is considered a mirror of how a body is perceived (WHO, 2010). According to Reddy and Singh (2017), oral health promotion in health-promoting schools is lacking, as cited in the National Oral Health Strategy 2002 (Reddy & Singh, 2017; SANDoH, 2002). Promoting oral hygiene to prevent oral diseases is a cost-effective technique that can be carried out in classrooms. South Africa (SA) has established the relevance and importance of school-based programs for children. While integrated school-based approaches include oral health initiatives, there is a lack of documented data on whether these initiatives have been put into practice and whether these programs have been tested. (Reddy & Singh, 2017).

Reddy and Singh (2015) believed that communities in KwaZulu-Natal had very little knowledge about oral health. A study conducted in a community in KwaZulu-Natal indicated several six-year-olds with extensive dental caries. This was of concern because it indicated that little or no interventions were done in the communities (Reddy and Singh, 2015). Therefore, knowledge about oral health among students needs to be investigated further.

Blaggana et al. (2016) cited that students are the ideal target group for early intervention because healthy behaviours and lifestyles develop at younger ages and are more sustainable. Teaching or impacting students with acceptable oral hygiene practices benefits them and their families and peers and the communities in which they live. Oral health knowledge is crucial for developing healthy behaviours, and it has been shown that there is an association between increased knowledge and better oral health. Optimum health-related practices are more likely to be taken up if individuals feel a sense of control over their health with a better understanding of diseases and their aetiology (Blaggana et al., 2016).

Another research carried out among KZN undergraduate students found that there were discrepancies with dental procedures and a shortage of oral health awareness. (Singh & Pottapinjara, 2017). The

knowledge about oral health needs to be investigated further among students (Singh & Pottapinjara, 2017).

The outcomes of a study done about oral health-related knowledge, attitudes and practices of adult patients in Mangaung Metropolitan Municipality could be used to enlighten the planning of integrated oral health promotion plans, in Mangaung and the Free State Province of South Africa. This could further reinforce positive oral-health related behaviours (Modikoe et al., 2019).

Another study at the University of KwaZulu-Natal that was conducted among other health care students examined oral self-care attitudes among nursing students involved in oral health promotion. The results indicated that more than half of the respondents had not visited a dentist in the previous year and those who had had done so only when needed. Even though there was an understanding of the value of oral health and its relationship to general health, as do inconsistencies in oral self-care methods, guidelines were given for the curriculum analysis required to ensure the prevention and promotion of oral diseases. (Kerr and Singh, 2018).

1.4 Aim

The study aimed to assess the Life Sciences Department's undergraduate students' knowledge, attitudes, and practices and establish their understanding regarding their oral health.

1.5 Study objectives

The objectives were:

1. To determine the students' knowledge regarding oral health care through an online survey of the questionnaire;
2. To explore the students' attitudes towards dental care by using an online survey of the questionnaire;
3. To establish the students' practices with regards to oral health and hygiene using an online survey of the questionnaire;
4. To compare results between students in dental assisting, environmental health and in students that are offered generic base subjects within environmental health; and
5. To establish whether a course focuses on students' oral and general health through a curriculum review.

1.6 Research questions

1. What is the level of knowledge of students at the University regarding their oral health?
2. How do students perceive oral health?
3. How do students practise their oral health care?

1.7 Chapter Outline

The current study is presented in six chapters, as outlined below.

Chapter 1: Introduction

The researcher introduced the study and discussed the problem statement, aim and objectives, and the study's research question.

Chapter 2: Literature review

A detailed literature review mostly focusing on topics such as the concept of oral health, oral health conditions & common oral diseases, dental caries, prevention strategies, oral health education, oral hygiene knowledge and practices in students from various studies, in various countries including South Africa was discussed in this chapter.

Chapter 3: Manuscript submitted to the International Journal of Dental Hygiene

The manuscript entitled 'Knowledge, attitudes and practices concerning oral health care among undergraduate students in the Life Sciences Department at the Central University of Technology, Free State' was submitted to the International Journal of Dental Hygiene on 03 December 2020 (Reference Number: IDH-20-OA-3103) and is currently under review.

Chapter 4: Methodology

This chapter provides a discussion of the methodology used. The researcher discusses the research design, settings, population and sample size, data collection methods, analysis and data management. Limitations of the research, pilot study, validity and reliability and ethical considerations are also discussed.

Chapter 5: Results

This chapter presents the results and discusses the findings obtained from the questionnaire in this study.

Chapter 6: Conclusion

The study is discussed in this chapter and recommendations, and the conclusions are made.

1.8 Positionality of the researcher

The researcher is a black South African female, originally from KwaZulu-Natal but now based in Bloemfontein. She studied and qualified as a Dental Therapist back in 2004; however, she had no idea what career opportunities were available for her as a young professional. She started in the private sector, and later in her career, decided that she needed to improve and enhance her skills. She joined the public sector and studied towards a Diploma in Public Management.

During that time in her career (2017), she discovered that CUT was looking for a Dental Therapist/Oral Hygienists to lecture in the Dental Assisting programme. She applied and received an offer to start as a Junior Lecturer in January 2018. As a young, fresh academic, research was a new concept, but teaching students developed the interest.

The researcher noticed that many students did not know about their oral hygiene, and the idea for the research topic was born. When the Dental Assisting programme decided to do dental screenings in September 2018 as part of “oral health care month”, the researcher decided that she would like to investigate the topic further.

She believes that this is just the beginning of her career as a researcher and an academic and is anticipating growth and enhanced skills and knowledge in her career path.

1.9 Study method and design

In 2020, the Life Sciences Department had a total of 260 students. There were 75 students in Dental Assisting, 160 in Environmental Health and 25 from the Generic Base Subjects within Environmental Health. All 260 students in the Life Sciences Department were invited via a link to participate in the survey. The study did not limit any student from participating should they wish to. The completed online questionnaires were used to collect data on knowledge, attitudes, and practices about students' dental practices in the following programmes in Life Sciences Department: Dental Assisting, Environmental Health, and students offered Generic Base Subjects within Environmental health. The minimum response rate was calculated at 156 as the minimum used for the sample size, calculated with a 95% confidence level.

1.10 Data collection

An online survey of the questionnaire was used to collect data on knowledge, attitudes and practices about dental practices in the students (**Appendix 5**). Data were collected and handled by the researcher and was then captured on a computer. The computer is password-protected, and the data will be kept for five years. Access is only granted to the researcher and the supervisor.

1.11 Data analysis

Descriptive statistics were used to analyse the data. In this study, the questionnaire was the primary tool that was used to collect data and was distributed to (n=260). The data collected from the responses were analysed with SPSS version 26.0. The results will present the descriptive statistics in the form of graphs, cross-tabulations and other figures for the collected quantitative data. Inferential techniques include the use of correlations and chi-square test values, which are interpreted using the p-values. The traditional approach to reporting a result requires a statement of statistical significance. A p-value is generated from a test statistic. A significant result is indicated with “ $p < 0.05$ ”.

1.12 Ethical consideration

Ethical approval was obtained from the Humanities and Social Sciences Research Ethics Committee in the University of KwaZulu-Natal (HSSREC/00001570/2020) and permission was granted by the Department of Life Sciences for the researcher to collect data (**Appendices 1 and 2**). The researcher adhered to all principles and policies to ensure confidentiality. Informed consent was obtained from all participants in the study, and they were given a copy detailing all objectives of the study. Participants were advised that they could withdraw from the study at any stage.

1.13 Conclusion

The role of oral hygiene practices in maintaining oral health quality is of pivotal importance across all age groups. Several factors influence adopting good oral hygiene habits, including poverty, low literacy rate, and lack of oral health experts' access. Even though evidence has shown school-health programmes in place, these programmes' sustainability and success are not sufficiently published. Thus, the study focused on students because evidence has shown that they have a greater responsibility to their family, friends, and community. Therefore, they must be taught to spend plenty of time on good oral hygiene practices during their undergraduate training.

The oral hygiene habits, particularly proper use of tooth brushing and dental floss can avoid most common oral diseases. Better oral health practices and attitude are correlated with healthy teeth and gums; after all, there is no health without oral health.

A detailed literature review mostly focusing on other topics such as the concept of health and oral health conditions, common oral diseases, dental caries, prevention strategies, oral health education and knowledge and practices in students from various studies, in various countries including South Africa follows in Chapter 2.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter outlines topics such as the concept of health and oral health, the common oral diseases and their aetiology, oral health education and knowledge, oral hygiene practices in students from various studies among students, and oral health quality of life and the use of oral health care services among students in various countries including South Africa.

The World Health Organization's Global Oral Health Program (WHO OHP) has worked tirelessly over the years to bring oral health to the forefront of politicians and decision-makers around the world's health agenda (Petersen, 2010). In part, the resolutions were to raise awareness of global problems to improve oral health and the unique needs of low-income countries and vulnerable and marginalised populations. It is evident that good oral hygiene contributes to healthy bodies with the mouth as the gateway to good health and a mirror as to how a body is perceived (WHO, 2010).

Of concern among students was the consumption of alcohol, smoking and sugary intake, which appeared to peak between 18 and 25 years of age. University students in this age group are more at risk for increased alcohol consumption than non-enrolled age-matched controls. It was observed that the overall trend of alcohol use increased (Afshin et al., 2019). Ramphoma (2016) cited that despite the impact that oral health has on general health and the quality of life, it is still one of the most neglected aspects of health in most developing countries, including South Africa (Ramphoma, 2016).

With increased awareness of health in institutions, establishing general knowledge about students' oral health was necessary (Reddy & Singh, 2017).

2.2 Oral health

Oral health is a primary predictor of fitness, nutrition and quality of life overall. WHO defines oral health as 'the condition of being free from chronic mouth and facial pain, oral and throat cancer, oral infection and sores, periodontal (gum) disease, tooth decay, tooth loss, and other diseases and disorders that impair the ability of a person to bite, chew, smile, speak, and psychosocial wellbeing' (Bissett & Preshaw, 2011).

Poor oral health, particularly in developed and underdeveloped countries, is still a major burden for populations worldwide. The WHO (2010) describes oral health as a primary predictor of the quality of life, wellbeing and overall health. This covers several diseases and disorders, including dental caries, periodontal disease, and teeth loss (Glick et al., 2012). Afshin et al. (2019) estimated in the 2017 Global

Burden of Disease Study that 3.5 billion people worldwide suffer from oral diseases, with the most prevalent non-communicable diseases of untreated dental caries, and with an established oral and general health relationship. For example, diabetes mellitus is associated with the development and progression of periodontitis. In addition to the previous statement, there is a causal correlation between high intakes of sugar and non-communicable disorders such as cardiovascular disease and diabetes. (Afshin et al., 2019; Murray et al., 2020; Heilmann, Machuca-Vargas & Watt, 2020).

2.3 Oral health conditions

Dental caries, periodontal diseases, oral cancers, oral manifestations of HIV, oro-dental trauma, cleft lip and palate, and noma (described as a severe gangrenous disease that starts in the mouth) are the most common oral health disorders which also often affect children. Most oral health problems are generally preventable in their early stages and can be treated (Reznik, 2005). Globally, an estimated 2.3 billion people are suffering from permanent teeth caries, and over 530 million children are suffering from primary teeth caries (Afshin et al., 2019; Murray et al., 2020). In South Africa, there is a high rate of dental caries despite public and private services being available. Whilst access is a problem, the knowledge of preventative measures is also very low (Singh, 2011a; Modikoe et al., 2019). The findings of the last National Survey of Oral Health (1999-2002) revealed that approximately 45-60% of young children living in South Africa require dental decay treatment (Ramphoma, 2016; NDoH, 2002).

In most low- and middle-income countries, the prevalence of oral diseases increases with increasing urbanisation and living conditions changes. This is partly attributed to insufficient fluoride intake (in the water supply and oral hygiene products such as toothpaste) and inadequate community access to oral health care services. The promotion of foods and drinks high in sugar and tobacco and alcohol, has contributed to a rise in the intake of products that lead to oral health conditions and other non-communicable diseases. (Afshin et al., 2019; Heilmann et al., 2020).

2.3.1 Periodontal disease

The tissues that both cover and protect the tooth are affected by periodontal disease. Bleeding or swollen gums (gingivitis), pain and often poor breath are characteristics of the illness. The gum will come away from the tooth and help the bone in its more extreme form, causing teeth to become loose and occasionally fall out. It is estimated that severe periodontal diseases affect more than ten percent of the global population. Poor oral hygiene and tobacco use are the primary causes of periodontal disease (Benzian, Bergman, Cohen, Hobdell & Mackay, 2014).

2.3.2 Dental caries

Dental caries was identified as the degradation of hard tissues, i.e. enamel by food intake acid of carbohydrates all day long (Selwitz, Ismail & Pitts, 2007). It is an infectious microbial disease of the calcified teeth tissues, characterised by demineralisation of the inorganic component and degradation of the tooth's organic material, leading to cavitation. Dental caries is classified among the most severe human oral disorders, also known as tooth decay. The effect of dental caries is that plaque formed on the tooth surface transforms the free sugars in foods and beverages into acids that dissolve tooth enamel (Selwitz et al., 2007).

Maintaining a constant low level of fluoride in the oral cavity will prevent dental caries to a large extent, which means that the greater the fluoride levels, the reduction of dental caries is equivalent. It is possible to obtain enough fluoride from various sources, such as fluoridated drinking water, salt, milk, and toothpaste. Twice-daily tooth brushing with fluoride-containing toothpaste should be recommended, i.e. 1000 to 1500 ppm (Selwitz et al., 2007). Aurlene, Manipal, Prabu and Sindhu (2019) further described dental caries as an inevitable microbial disease characterised by the demineralisation of the inorganic component of the calcified teeth and the degradation of the organic material of the tooth, often leading to cavitation (Aurlene et al., 2019).

2.4 Oral health inequalities

The poor and socially vulnerable members of society are disproportionately affected by oral diseases. The correlation between socioeconomic status (income, occupation and educational level) and the prevalence and severity of oral diseases is apparent and consistent. This correlation is present in the high-, middle- and low-income countries from early childhood to older age and population groups. (Bissett & Preshaw, 2011).

2.4.1 Access to oral health services

In most countries, the uneven distribution of oral health practitioners and the lack of enough health facilities means that access to primary oral health services is often low. According to a survey among adults that were voicing a need for oral health services, the overall access varied from 35% in low-income countries to 60% in low- to middle-income countries with 75% in upper-middle-income countries and 82% in high-income countries (Hosseinpour, Itani & Petersen, 2012). In addition, there is a general lack of oral health facilities and employees in South Africa, exacerbated by the country's unequal distribution of dental services (Ramphoma, 2016). Furthermore; dental care is expensive even in high-income environments, averaging five percent of overall health spending and 20% of out-of-pocket health expenditure. Universal Health Coverage support activities will help frame policy dialogue

to resolve weak primary oral health programs and resolve high out-of-pocket oral health care costs in many countries. (Sarpkaya, Çavus & Yilmaz, 2018).

2.5 Prevention strategies

2.5.1 Fluoride

Fluoride has been widely used as a preventive intervention to reduce dental decay in communities worldwide. From the implementation of water fluoridation schemes over five decades ago, fluoride treatment has been the cornerstone of caries-preventive strategies (O'Mullane et al., 2016). Fluoride is defined as a chemical that is added to drinking water and toothpaste to help maintain healthy teeth. It is often known as sodium fluoride or other fluorine-containing salts added to water sources or toothpaste to prevent decay in the tooth (Delbem & Pessan, 2019). Recent studies have provided ample evidence that fluorides delivered as topical delivery systems are much more effective in preventing dental caries than using toothbrushing techniques only (Aurlene et al., 2019).

2.5.2 Oral health education

Dental education encourages oral health promotion as awareness should be community-based and included in the curriculum for all students with more emphasis on preventative than curative measures (Reddy & Singh, 2017).

Basic dental education involves the teaching and learning of the future generations of students to prevent oral diseases. Oral health diseases are preventable through dental education. If this is not done as early as possible, it may lead to gum diseases, tooth decay and eventually tooth loss. These issues are not usually regarded as emergencies in general health because oral health diseases are not fatal, but in recent studies, dental diseases have been associated with cancer, diabetes and cardiovascular diseases (Formicola, 2017; Sabbah, Folayan & El Tantawi, 2019). School-based oral health programs can increase access to health care, as schools are often the most effective means of providing children especially students from poor communities and families, with both preventive and treatment services (Reddy & Singh, 2017).

2.5.3 Media

Africa's promotion of oral health is planned to be readily adaptable to various national contexts. It seeks to educate and inspire policymakers and managers, primary health care workers, schools and local communities to reduce the burden of oral diseases. (Petersen, 2010; Petersen, 2009).

Every year, there is the World Oral Health Day that is held in March. World Oral Health Day is an initiative of the FDI World Dental Federation, an organisation that brings together the dental world to ensure optimum oral health for everyone. The aim is to target all individuals through campaigns and events to offer oral health learning. This is also done to educate the communities through governments and policymakers to champion improved oral health for everyone, and this year (2020) the media reach for World Oral Health Day was (n=1 959 573 490) in 177 countries including South Africa (<https://www.worldoralhealthday.org/>).

2.5.4 Toothbrushing

The development and preservation of good general and oral health is a priority and a key factor in enabling adults to achieve overall wellbeing and enhanced quality of life. Therefore; it is essential to determine how people rate their oral health status, their perceived dental needs, and the actual use of available dental services (Azodo et al., 2010). Toothbrushing should be a tool included in oral health education, and it should be focused on the concept of educating individuals with the necessary knowledge to gain motivation and awareness to improve their behavioural patterns in oral health care (Kolisa, 2016). Maintenance of proper oral health relies on the implementation of dental check-ups, frequency of toothbrushing, less intake of food and sugar, use of dental floss, and other interproximal cleaning techniques (Graça et al., 2019).

2.6 Dental Services and KAP Studies

Sheiham (2005) believes that dental services have been ranked fourth among other diseases globally when it comes to treatment costs (Sheiham, 2005). This also means the costs will have an impact on the country's economy. The Global Burden of Disease Study 2016 by Naghavi et al., (2016) estimated that oral diseases affected half of the world's population (3.58 billion people) with dental caries in permanent teeth being the most prevalent condition assessed (Naghavi et al., 2016). According to The Global Burden of Disease Study in 2017 by Afshin et al. (2019), the figure estimated that 3.5 billion people worldwide suffer from oral diseases. However, the decrease compared to the estimate in 2016 is worth noting as it impacts the world's economy and treatment costs (Sheiham, 2005; Afshin et al. 2019).

Al-Ansari et al., (2020) conducted a study on self-perceived oral health practices in young Saudi adults and found that participants with a poor understanding of oral health and internet addiction had a lower sugar intake rate than those with average/frequent use of the Internet. Mental and psychological signs and poor health habits such as smoking, consuming alcohol, drug use, missing meals, binge eating, not exercising and not seeking medical attention are correlated with internet addiction (Al-Ansari et al., 2020). Cash, Rae, Steel and Winkler (2012) and Cardak (2013) further noted that university students

decreased impulse control, loneliness/depression, social comfort, and diversion have negatively predicted psychological wellbeing. Psychological wellbeing is more likely to be low in students with higher Internet addiction levels (Al-Ansari et al., 2020).

According to studies conducted on associations between dental knowledge and oral behaviour in Japan by Taniguchi-Tabata et al. (2017), oral health education in primary or secondary school could improve oral health behaviour (Taniguchi-Tabata et al., 2017). Additional research by Gargano, Mason and Northridge (2019) further confirmed that school-based oral health programs could increase healthcare access. Additionally, schools are often the most effective means of providing students from poor communities and families, with preventive treatment (Gargano et al., 2019).

A cross-sectional study conducted by Yamane-Takeuchi et al. (2016) with Japanese university students suggested that improving self-related oral health qualities in young and elderly people is critical. The study further supported research that suggests that in universities, regular oral health examinations should involve an analysis of Oral Health-Related Quality of Life predictors (Yamane-Takeuchi et al., 2016).

On the other hand, other reports have shown little change in school-based education systems. A study conducted by Qadri, Alkilzy, Franze, Hoffmann and Splieth (2018) on school-based oral health education found that schoolteachers' or dentists' oral health education was equally successful in improving oral health literacy and adolescent oral hygiene status (Qadri et al., 2018). This is further supported by research done by Gargano et al. (2019). The authors argue that school-based oral health initiatives must address the determinants of access to health care. Furthermore, health education through multiple levels of impact can be more effective in achieving oral health equity than programs aimed at a single outcome (Gargano et al., 2019).

However, Qadri et al. (2018) further cited that the results of oral health education programs depend on the teachers' guidance or motivation. Also, it appears that non-repetitive oral health programs could improve oral health behaviour transiently but could not maintain improved oral health behaviour over the long term. Therefore, oral health education in any form should be repeated to sustain positive results (Qadri et al., 2018). School-based oral health initiatives can strengthen skills-based health education, for example, by increasing awareness of health factors among students, teachers and parents, helping them to make healthier decisions and adopt healthy behaviours across their lives (Gargano et al., 2019).

Gathecha, Makokha, Wanzala, Omolo and Smith (2012) were cited in a Kenyan study about dental caries and oral health practices among 12-year-old children in Nairobi West Mathira West Districts (Gathecha et al., 2012). In Nairobi West District, an urban area, the incidence of dental caries and the

Decayed, Missing and Filled Teeth (DMFT) was substantially higher than in Mathira West District, which is a rural area. Life in urban areas has implications on lifestyle, including eating habits, and an increased prevalence of dental caries has been shown to be associated. The prevalence of dental caries was marginally lower than in other East African countries, with 41% prevalence in urban areas and 29% in rural areas in Uganda and 41.5% among urban children in Tanzania (Gathecha et al., 2012).

According to Gathecha et al. (2012), to reduce the higher prevalence of dental caries, country-wide intensive oral health promotion should be carried out, particularly in urban areas. Gathecha et al. (2012) further cited that the school health policy would be used to encourage oral health by offering oral health advice and highlighting unsanitary dietary activities. Preventive activities like routine dental check-ups in schools should be supported and encouraged (Gathecha et al., 2012). A study in Bangladesh about the influence of school-based oral health education on preventing untreated dental caries and the adolescent awareness, attitudes and practices was found to be successful in improving self-reported awareness of school-age adolescents; attitude; and oral health scores practices (Haque et al., 2016).

A cross-sectional survey was undertaken amongst 1027 secondary level school students, in Chandigarh, India. The study was conducted to determine the oral health knowledge, attitudes and practice behaviour. The results suggested that oral health education's efficacy can be improved if health initiatives are designed to invade the population's attitudes (Blaggana et al., 2016). Teachers have been shown to play an important role in encouraging good behaviour in oral health and oral health education in schools directly impacting children (Al-Hussaini et al., 2003).

Research on oral health has been carried out, among university students, in low- and middle-income countries. A study in 2014 was conducted to investigate oral health behaviour (tooth brushing and dental attendance) in low, middle- and high-income countries. This study was among a group of university students. Peltzer and Pengpid (2014) believed that students who are in a transitional time, take personal responsibility for oral health behaviours and will be future leaders and role models in their communities (Peltzer & Pengpid, 2014).

Furthermore, Peltzer and Pengpid's (2014) research of poor oral health habits was again conducted in India, Nigeria, South Africa, and Turkey. Overall, the study suggested that 32.8% of the community that participated had insufficient or ineffective teeth brushing, and 58.2% had occasionally or never gone for a dental check-up. These developing countries' findings would attest to the low toothbrushing and dental attendance rates from the participants (Peltzer & Pengpid, 2014). Additionally, oral hygiene education in the sample countries was recorded with weak oral health habits, i.e. in (India, Nigeria, South Africa, Turkey), since dental education may not have been adequately incorporated into the secondary education system (Peltzer & Pengpid, 2014).

A similar study conducted at the University of Jordan in students studying in the field of health suggested that students had little to no knowledge about their oral health. This study was conducted in nursing students, and it also revealed that because oral health was not part of the curriculum, students had no interest or knowledge about oral health (Smadi & Nassar, 2016).

In a study conducted in Canada in 2010, 2 million days and 4 million workdays were wasted because of dental diseases, which could have been prevented through early dental education (Şahin & İlgün, 2018). Research conducted by Silva and Oliveira (2018) in Brazilian adults in factors associated with oral health self-perception yielded results that improve the population's oral health. It is important to improve individual living conditions and the implementation of public social policies. Furthermore, in the same study, the poor understanding of oral health in Brazil was related to low wages and education, degraded housing conditions, income distribution inequality, and other social factors. The research confirmed that the outcomes for primary care oral health services showed that areas with higher coverage for these services had higher incidences of bad self-perceived oral health (Silva & Oliveira, 2018).

Notable; in this research, it was found that compared to men, better oral health was observed in women, which disagrees with the outcomes of some researchers. However, the study further suggested that the results may be clarified because women typically have more oriented attitudes towards oral health care than men and thus express better oral health expectations (Silva & Oliveira, 2018). Research conducted by Zhu, Petersen, Wang, Bian and Zhang (2005) in a study about oral health knowledge in adults in China, further yielded results that suggested that more females brushed their teeth more than males (Zhu et al., 2005).

Another study conducted in China on oral health knowledge in adults suggested that 85% of 33-44-year-olds residing in urban areas brushed their teeth twice daily, but this was lesser in rural areas, and females brushed their teeth more than males (Bhadra, 2003).

More research done at Kuwait University on dental knowledge and attitudes revealed that 94% of students admitted to brushing their teeth once a day (Al-Hussaini et al., 2003). Girls indicated that they brushed twice a day more than the boys. There was a strong connection between the frequency of toothbrushing and subjective oral health (Al-Hussaini et al., 2003).

In general, females were more aware of oral health problems and more interested in dental behaviour than male students and were more concerned about them. Also evident was that students from wealthier homes brushed more regularly than those struggling financially (Al-Hussaini et al., 2003).

Literature suggests that this can be due to more favourable circumstances, such as the university dental hospital and the primary health centre dental clinic that the students from affluent families could afford to attend (Jaber et al., 2016). Therefore; there were excellent opportunities for students to promote their oral health. According to Jaber et al. (2016), the results above may be attributed to negligence, resource scarcity, insufficient information, and negative attitudes.

Further research supports the above statement in a study on oral health knowledge, attitude and behaviour among students of age 10–18 (Al Subait et al., 2016a). The study suggested that girls had a higher value in dental visits, including their general and oral health effects. Moreover, girls were more mindful than boys of their teeth' colour (Al Subait et al., 2016a).

Al Subait et al. (2016b), conducted a cross-sectional study in university students in Saudi Arabia. The results suggested that students had a clear knowledge of basic oral health interventions, but had weak oral health practices (Al Subait et al., 2016b). Oral health education programs should be conducted with encouragement to close the gap between awareness and implementation (Jaber et al., 2017). Further research supported that in universities, regular oral health examinations should involve analysing Oral Health-Related Quality of Life predictors (Taniguchi-Tabata et al., 2017).

Further research in a study at Rivers State Nigeria, to assess oral self-care practices and awareness among non-medical students at the University of Port Harcourt, indicated that students' oral hygiene habits were weak. Therefore, oral health education and promotion were required to improve oral hygiene and health among young adults and the general public (Bashiru & Anthony, 2014).

Folayan et al. (2013) in Nigeria researched preventive oral health behaviour among senior dental students specified that only about 46% accepted that fluoridated toothpaste is more relevant to caries prevention than tooth brushing technique. This may reflect that the current dental curriculum places much greater emphasis on traditional preventive measures focusing on oral hygiene aspects regarding caries prevention (Folayan et al., 2013).

Cross-sectional research by Azodo et al., (2010) conducted in students again in Nigeria concluded that most students were aware that oral health is an aspect of general health and that it influenced everyday life. More than half of the students perceived their oral health as healthy, but only a few realised that the percentage that perceived scaling and polishing as a therapeutic requirement requires a preventive approach to oral health (Azodo et al., 2010).

To support the research, Jaber et al. (2017) suggest that studies carried out in Spain and Kuwait have shown an interaction between enhanced awareness and better oral health in students. Formicola, 2017 and Formicola and Bailit (2012) also cited how attitudes towards oral health and habits play an important role in a person's oral hygiene. This is dependent on everyone, but cultural beliefs play a vital role and have a significant influence on the student's oral health (Formicola, 2017; Park, Timothé, Nalliah, Karimbux & Howell, 2011). The study showed that awareness of oral health among university students affects their attitude and actions positively. For students to close the gap between awareness and practice by shifting their mindset from negative to positive, oral health education programs should be improved (Jaber et al., 2017).

Literature suggests that research on young adults and older people in South Africa is limited. According to Dookie and Singh (2012), the Department of Health has imbalances in delivering oral health services, especially in rural areas, and oral health services must be uniformly provided and "basic oral health care package" (Dookie & Singh, 2012). According to the Department of Health, a basic oral health care package should include examining the patient, an x-ray, scaling and polishing, extraction, and a restoration (NDoH, 2002).

Bhayat and Chikte (2019) suggested that untreated and undetected oral diseases have a considerable effect on a person's life. Oral health disparities exist between and within different population groups worldwide and across the whole course of life as social determinants have a strong impact on oral health even though the primary level should provide preventive services and a basic oral health care kit (Bhayat & Chikte, 2019). Bhayat and Chikte (2019) further cited that although the number of health workers has risen, the burden of illness has increased over the past few years. Research provides evidence that unemployment also plays a huge role in the affordability of oral hygiene products necessary to avoid dental diseases (Thema & Singh, 2013).

In the Free State, a study conducted in Mangaung on oral health-related knowledge, attitudes, and practices of adult patients revealed that focusing on adults' control beliefs could help reinforce positive oral-health related behaviours (Modikoe et al., 2019).

However, a study conducted in Gauteng, South Africa, recorded that promoters of oral health from five out of the six districts in the province had a poor oral health experience and therefore did not have the expertise needed by a risk factor approach to promoting oral health (Molete, Daly & Hlungwani, 2013). While no other national survey has been conducted since 2002, a few local surveys indicate a comparable ongoing pattern in terms of the level of disease distribution in SA (Molete, 2018).

According to Singh (2011a), dental caries' prevalence remains high due to the lack of oral health services in communities and schools. Although there is little published literature about oral health services, data published reveals that the study conducted in 1999-2002 by the DoH to determine oral health status was only restricted to 4-6-year olds and 12-15-year old's in South Africa. This study was limited only to children and not young adults, and most often dental caries develops from as early as six years after the first permanent tooth has erupted up to 18 years when the last tooth erupts (Moleté, 2018).

Singh (2011b) cited that while there are school health programs currently running in South African schools, the literature suggests that little is done on oral health promotion and prevention which would curb dental caries from an early age (Singh, 2011b).

Studies reveal that more extractions are done to relieve pain and sepsis than restorative dentistry, which implies the quality of a person's life, i.e. a child who has their teeth extracted at a younger age develops fear dentistry. After losing their teeth, their nutrition is affected and if it is the front teeth that are extracted their level of confidence is affected, and that child is likely to be a loner and not socialise, and life, in general, is impacted (Singh, 2012).

A study published in 2018 and conducted at the University of KwaZulu-Natal, examined oral self-care attitudes among nursing students involved in oral health promotion. It yielded results that showed that more than half of the respondents had not visited a dentist in the previous year. Those who had had done so only when needed. Even though there was an understanding of the value of oral health and its relationship to general health, there were inconsistencies in oral self-care methods. Guidelines were given for the curriculum analysis required to ensure the prevention and promotion of oral diseases. (Kerr & Singh, 2018).

Singh and Pottapinjara (2017) suggested that the most common self-care practice in oral health is tooth brushing. This is done to prevent plaque formation and dental caries and can be achieved by using a toothpaste with fluoride. However, this alone does not necessarily clean the whole mouth as there are interproximal areas and cannot be reached with a toothbrush. Therefore, flossing plays a considerable role in this regard (Singh & Pottapinjara, 2017).

This study aimed to gain insights into the student's perceptions of oral health.

2.7 Conclusion

There is little literature published in SA with regards to student's attitudes towards dental care. Most people only visit the dentist when it is necessary and usually only when there is pain. They do not see the need to go for regular check-ups as they believe nothing is wrong if there is no pain. Healthy habits and good oral hygiene, including twice-daily tooth brushing, are critical in preventing gum disease and maintaining good oral health. In this chapter, the researcher described the literature. The methodology of this study follows in Chapter 4.

CHAPTER 3: SUBMISSION READY MANUSCRIPT

3.1 Introduction

This chapter presents the manuscript that has been submitted to an accredited peer-reviewed journal.

3.2 Publication details:

Title:	Knowledge, attitudes and practices concerning oral health care among undergraduate students in the Life Sciences Department at the Central University of Technology, Free State
Authors:	Mbele-Kokela FF, Moodley R
Journal:	International Journal of Dental Hygiene (Impact Factor 1.229)
Website	https://onlinelibrary.wiley.com/journal/16015037
Status:	Submitted to the International Journal of Dental Hygiene on 03 December 2020 (Reference Number: IDH-20-OA-3103) and currently under review.

3.2.1 Journal Information

International Journal of Dental Hygiene is the official scientific peer-reviewed journal of the International Federation of Dental Hygienists (IFDH). The journal brings the latest scientific news, high quality commissioned reviews as well as clinical, professional and educational developmental and legislative news to the profession worldwide. Thus, it acts as a forum for exchanging relevant information and enhancing the profession to promote oral health for patients and communities.

The International Journal of Dental Hygiene aims to provide a forum for the exchange of scientific knowledge in the field of oral health and dental hygiene. A further aim is to support and facilitate the application of new knowledge into clinical practice. The journal welcomes original research, reviews and case reports as well as clinical, professional, educational and legislative news to the profession worldwide.

Keywords: dental, dentistry, dental hygiene, dental hygienist, oral health

2.2.2 Publication Record

Submitted to the International Journal of Dental Hygiene on 03 December 2020 (Reference Number: IDH-20-OA-3103) and currently under review

2.2.3 Contribution record

FFMK conceptualised the study, collated the data, interpreted the statistical analysis and wrote the manuscript. RM reviewed the statistical analysis and the manuscript. All authors read and approved the manuscript.

3.3 Manuscript

Oral health knowledge, attitude and practice of undergraduate students at a South African University of Technology

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Abstract:

Background: Awareness of oral health is important for developing healthy habits, and a correlation between improved knowledge and better oral health has been shown to exist. Suppose a person feels a sense of greater control over their health with a better knowledge of diseases and their aetiology. In that case, optimal health-related activities are more likely to be taken up.

Objectives: To determine the knowledge, attitudes and practices regarding oral health care among undergraduate students in the Life Sciences Department at the Central University of Technology, Free State

Methods:

This descriptive study gives insights into the oral hygiene knowledge, attitudes and practices of undergraduate students in the Faculty of Health and Environmental Sciences, Department of Life Sciences at the Central University of Technology (CUT). Data were collected using an online questionnaire eliciting quantitative and qualitative data.

Results: The results revealed that most of the participants, 80% (n=178) understood that oral health is essential to their overall wellbeing. Overall; in this research, the findings of oral health education were

found not to be covered. However, both positive and negative associations were observed between the sources and oral health behaviour.

Conclusion: The study, therefore, concludes that oral health care knowledge, attitudes and practices are affected by education and show that advocacy for the promotion of oral health is significant for the students.

Keywords: oral health, oral health, knowledge, attitudes and practices, education

Introduction

Oral health is a primary predictor of fitness, nutrition and overall quality of life.¹ Glick et al. (2016) defined oral health as ‘the condition of being free from chronic mouth and facial pain’.² Furthermore, one should be free from oral and throat cancer, oral infection and sores, periodontal disease, tooth decay, tooth loss, and other diseases and any facial disorders that impair a person's ability to bite and chew.² However, in South Africa, oral disease is still a health problem and a considerable burden which often leads to pain and more significant loss of the tooth, a disease that affects appearance, quality of life, consumption of nutrients, and thus growth and development.³

The development and preservation of good general and oral health is a priority and a key factor in enabling adults to achieve overall wellbeing and enhanced quality of life. Therefore, it is important to determine how people rate their oral health status, their perceived dental needs, and the actual use of available dental services.⁴ Ghaffari et al. (2018) suggested research that supports the fact that better oral care practices are presented through proper oral health awareness.⁵ In addition to this, a positive attitude toward oral health practices facilitates improved oral health habits.⁵

The literature suggests that integrated dental services should be part of every educational institution where oral health education and oral health screening are provided. Students can access dental services

through funding, i.e. simple dental payment systems, including scaling and polishing, restorations, fissure sealants, and relief of sepsis, making things easy and accessible for all students.^{6,7}

Of concern among students is alcohol consumption, smoking, and sugary intake, which peaks between 18 and 25. University students in this age group are at particular risk for increased alcohol consumption than non-enrolled age-matched controls. It was observed that the overall trend of alcohol use increased.⁸ Ramphoma (2016) noted that even though the impact that oral health has on general health, in South Africa, it is still one of the most overlooked aspects of health.⁹

This is the first research study to evaluate oral health awareness and the practice of oral health behaviours among CUT students. Even though research suggests that structures are in place to promote behaviour practices in oral health, such as school health-based and community-based programmes, it is important to remember how the knowledge, attitude and practices (KAP) are applied, as investigated in this study.

Background

Oral health is now an important component of general health, and oral health awareness is growing worldwide. The Global Oral Health Program of the World Health Organization has done much in the past five years to raise awareness.⁸ (Afshin et al., 2019). Furthermore; 3.5 billion people worldwide suffer from oral diseases, with the most prevalent non-communicable diseases of untreated dental caries, with an established oral and general health relationship. For example, diabetes mellitus is associated with the development and progression of periodontitis. In addition to the previous statement, there is a causal correlation between high intakes of sugar and non-communicable disorders such as cardiovascular disease and diabetes.^{8,10}

Literature suggests that adults' periodontal health impacts their smiling patterns and their quality of life-related to smiles. Furthermore, poor periodontal health also prevents positive emotions from being expressed by adults, which can, in turn, affect their self-conception and social interactions.¹¹ Evidence

supports that problems with oral health can, in several ways, affect the quality of life. Poor oral health can stop students from expressing positive emotions that can affect their social interactions and how they feel about themselves.¹¹

According to Sheiham (2005), some of the risk factors causing oral health disorders worldwide are poor oral hygiene, diet and smoking.¹² Additionally; poverty remains the primary determinant of oral health disorders in Africa, predisposing people to a lack of information and poor lifestyle choices.¹³ In South Africa, there is a high dental caries rate despite public and private services being available. While access is a problem, the knowledge of preventative measures is also very low.^{14,15}

The outcomes of a study done about oral health-related knowledge, attitudes and practices of adult patients in Mangaung Metropolitan Municipality could be used to enlighten the planning of integrated oral health promotion plans, in Mangaung and the Free State Province of South Africa.¹⁵ A similar study done in KwaZulu-Natal among undergraduates about knowledge and attitudes in oral self-care practices showed that although oral diseases cannot be avoided, they can be prevented through simple measures such as tooth brushing twice a day with a fluoride toothpaste but that alone is also not enough.¹⁶ With an increased awareness of health and self-care in schools, this study aimed to establish the students' general knowledge, attitudes, and practices concerning oral health care.

Objectives of the study

The objectives were to determine the students' knowledge regarding oral health care, explore the students' attitudes towards dental care, and establish the students' practices regarding oral health and hygiene using an online questionnaire.

Methods

The study setting

The study was conducted among undergraduate students at the Central University of Technology (CUT). CUT is a University of Technology located in Bloemfontein in the Free State province of South

Africa. The current study was conducted in the Life Sciences Department that is housed within the Faculty of Health and Environmental Sciences.

Ethical clearance

Ethical approval was obtained from the Humanities and Social Sciences Research Ethics Committee from UKZN (HSSREC/00001570/2020) and thereafter from the CUT Life Sciences Department. All principles and policies of the UKZN HSSREC were adhered to, throughout the study. An online information sheet was uploaded on Question-pro for easy access for all participants in the study. Informed consent was obtained from the participants online. Participants could withdraw from the study at any stage.

Study population and sampling

The purposively sampled study participants were the entire student population in the Department of Life Sciences at the Central University of Technology (CUT) during October 2020. All 260 participants were invited to participate. The study included both males and females of all race groups in the department. A pilot study was conducted on ten students to determine if the project's students will understand the questionnaire. Thereafter minor changes were made to the research tool.

Study design

This was a cross-sectional descriptive study design that used both quantitative and qualitative methods.

Data collection and tools

Data were collected from an online survey questionnaire during October 2020 using Question-Pro. An email contact list was acquired through the programme coordinators, and the link to the study was sent to participants via email. Students were also sent the link via their WhatsApp groups. The questionnaire consisted of five sections viz—Demographics, Habits, Knowledge, Attitudes and Practices. A curriculum checklist was used to review the modules offered in the first year for both two programmes.

Data analysis

The primary data was extracted and captured into a Microsoft Excel ® spreadsheet using a data coding procedure until all the questionnaires were obtained. Both the researcher and the supervisor tested the captured details for accuracy and correctness. In this study, the data collected from the responses were analysed with SPSS version 26.0. The results present the descriptive statistics in graphs, cross-tabulations and other figures for the collected quantitative data. Inferential techniques included the use of correlations and chi-square test values, which were interpreted using the p-values. The traditional approach to reporting a result requires a statement of statistical significance. A p-value was generated from a test statistic. A significant result is indicated with “ $p < 0.05$ ”.¹⁷

The qualitative analysis was carried out, and the results from the groups were added to an excel spreadsheet and were compared, and a curriculum checklist was used. The method used to analyse qualitative data was content analysis by following the steps defined by Braun and Clarke (2006), using a thematic process.¹⁸ Therefore qualitative data in this study analysed the participant’s oral health knowledge and practices of oral health care in open-ended questions, and it was thematically analysed.

Results

Overall, the ratio of males to females was approximately 1:2.3 28.4% (n=62): 70.2% (n=153) with 1.4% (n=3) classifying themselves as other ($p < 0.001$). Within the age category of 22 to 24 years, 28.2% (n=60) were male. The age distributions are not similar as there are more respondents 90% (n=189) younger than 24 years ($p < 0.001$).

<Table 1: Demographic profile of participants>

The study reported many respondents lived at home 44.5% (n=97) and private residences 39.9% (n=87), while a smaller number lived on campus 15.6% (n=34) ($p < 0.001$).

Habits

Participants were asked about their habits pertaining to drinking alcohol and smoking. Nearly 72% (n=160) had never smoked while 26.6% (n=58) smoked. In this category; it was noted that more males smoke than females. An overwhelming 99.1% (n=218) of participants (n=220) have had an alcoholic drink. Over 60% (n=132) drink over (n=7) alcoholic drinks per week, and only 29% (n=64) had never had an alcoholic drink before in their lives. Habits were also structured around the participant's sugar intake, and in our study, over 80%; (n=187) of the participants agreed that they love sugar.

Figure 1 below provides data on habits about toothbrushing which show significantly different patterns ($p < 0.001$) where more than 63% (n=138) confirmed to brushing their teeth twice a day while only 31% (n=68) brushed once a day. In this study, 56.4% (n=123) of the participants confirmed that they had never flossed before, while 53.2% (n=116) stated they had never used a mouth-rinse before in their lives. 68.8% (n=150) of the participants provided information that suggested they brush their teeth twice a day, in the morning and before going to bed whilst a smaller number 5% (n=12) brushed three times a day.

<Figure 1: Brushing patterns>

The significance of the differences in habits was noted in the participants. The higher levels of disagreement imply that respondents consider their breath, teeth, and gums healthy or acceptable. A small number 13.8% (n=30) indicated that they had bad breath, and 31.7% (n=69) indicated that they had missing teeth. A further 24.7% (n=54) indicated that they had bleeding gums.

<Table 2: Participant's oral health care habits >

Knowledge

Participants provided significantly higher levels of agreement regarding their knowledge in oral health. Over 51% (n=112) agreed that smoking could affect their gums while 64,2% (n=159) believed that dental caries is caused by a combination of sugar, bacteria and poor oral hygiene. However, a significant 86,7% (n=189) supported the statement that supports brushing twice a day to keep their teeth clean and healthy.

Attitudes

The participant's responses towards their oral health care attitudes indicated that out of the participants (n=220), over 94% (n=206) agreed that taking care of their oral hygiene was important and about 67% (n=146) visited the dentist twice a year. Interestingly enough, only a few with a response of 8,4% (n=18) was recorded from the participants when they were asked if taking care of their oral hygiene was still important in the present time of Covid-19 with everyone wearing a mask.

Only a few of the participants, 29,4% (n=64) believed that one could get heart diseases from bad oral health.

Practices

This last section provided the participant's responses regarding their oral health practices, notably high levels of agreement. About 65% (n=141) participants believed they should brush their teeth for two minutes while 29,3% (n=63) suggested there is no need to visit a dentist if they have no problems orally. Oral hygiene techniques such as brushing twice daily (36.9%) and flossing (7.5%) were recorded and identified by many dental assisting students. Interestingly, most participants 64,9% (n=141) agreed that they had been taught about oral health in school, but their habits prove otherwise, as discussed above.

All open-ended questions are reported below. Participants were asked to reflect on their oral health care while exploring their knowledge, attitudes and practices. The responses were summarised from Question-Pro and supported with quotes, and these were analysed thematically.

Knowledge of Dental plaque

The participants were asked 'what is plaque?', out of (n=220), more than 41% (n=91) stated it was a layer of bacteria in the teeth.

The following quotes were recorded from the participants:

Respondent 334: "*Bacteria that forms on the teeth due to lack of oral health care.*"

Respondent 366: "*An accumulation of bacteria on teeth from food and liquids when teeth aren't brushed efficiently.*"

A few participants, 6.3% (n=14) stated that it is a hard deposit on teeth, and this is supported by the statements below:

Respondent 397: "*Hard substance on my tooth.*"

Respondent 444: "*Stone substance on teeth.*"

Respondent 428: "*Piece of wood.*"

However, the rest 37.9% (n=77) of the participants stated they did not know what plaque is.

Prevention of tooth decay

When they were asked 'How can you prevent tooth decay?' 90.2% (n=199) stated 'by brushing twice a day'. While there were multiple responses given, only a few did not know how 1.3% (n=3).

The participants were also asked what would happen if they did not clean their mouth. The responses indicated that they are aware that tooth decay is caused by bacteria and plaque build-up from not brushing regularly, and 62% (n=140) agreed with that statement.

Respondents were asked if they had ever been to a dentist, dental therapist or an oral hygienist. Overall, 58%; (n= 129) declared yes and 31.3% (n=69) have not been to either one.

Out of the 58% (n=129) that stated that they have been to one, and 36% (n=78) stated it was mainly for extraction:

Respondent 1037: *“To remove a tooth that had causes abscess in my mouth.”*

Respondent 914: *“Extraction of a rotten tooth.”*

The other responses were from participants going to clean their teeth 9.2% (n=22).

A slightly lower number 15% (n=34) stated they did not have money to go to a dentist/ therapist or a hygienist.

Respondent 942: *“I cannot afford to pay.”*

Respondent 990: *“Money is the problem.”*

Nearly 32% (n=72) of the participants did not understand how the state of one’s general health can affect their oral health. They indicated that they did not know the relationship between the two. In comparison, only 44.5% (n=98) had an idea.

Respondent 1136: *“Diseases such as diabetes can lower the body resistance to infection, making oral health problems more severe.”*

Respondent 1141: *“Gum disease play a role in some diseases such as diabetes, and HIV/Aids can lower the body’s resistance to infection, making oral health problem more severe.”*

Respondent 1133: *“Can lower the body’s resistance to infection, making oral health problems more severe.”*

Respondent 1120: *“I was told that oral decay, halitosis, periodontitis and other problems can cause heart problem, can cause stroke, premature for pregnant women.”*

The rest 22.7% (n=50) had no idea of the correlation.

Discussion

In this research, dental knowledge, attitudes, and oral health behaviours were researched. In this study population, we found that variations in the source of dental information were correlated with oral health behaviour; that is, both positive and negative associations were observed between the sources and oral health behaviour.

The ages of the participants in this study ranged from 18 to 24 years, with the majority being females, in line with South Africa's gender demographics. Overall, the ratio of males to females is approximately 1:2.3; 28.4% (n=62): 70.2% (n=153).

Participants reported to be living at home were 45% (n=97) which might influence their oral hygiene methods. Literature supports the statement in a study on oral health care knowledge, attitudes, and practices in adult patients in Mangaung, Free State.¹⁵ Modikoe et al. (2019) suggest that living at home could influence oral hygiene methods in a good or bad way to fight dental caries.¹⁵ However, the correlation between students staying at home and toothbrushing in our study revealed no degree of association or significance - between the number of household individuals and toothbrushing habits of the participants.¹⁵

Our research noted that significantly more males smoked than the other two groupings, out of (n=220) participants, 26.6% (n=58) smoked. Interesting enough, over 51% (n=114) in our study, agreed that smoking could influence their gums.^{6,19} Formicola (2017) and Park et al. (2011) found that tobacco use may influence students' oral hygiene methods.^{6,19} An analysis of smoking and bleeding gums was done, and no significant difference was found in our study.

Almost all the participants, 99.1% (n=218) have had an alcoholic drink, and of the 99%, over 60% (n=132) drink over (n=7) alcoholic drinks per week. These findings might influence the participants' oral hygiene as seen in a study conducted by Afshin et al. (2019).⁸ It was observed that the overall trend

of alcohol use increased in students. Furthermore, the study suggested that alcohol intake influenced students in all educational institutions regarding their lifestyle.⁸

The habits in this study were also structured around the participant's sugar intake as reported in a study conducted by Modikoe et al. (2019), whose findings indicated a low intake of vegetables and more sugary products in adults. In our study, over 80%; (n=187) of the participants agreed that they love sugar.¹⁵

Nearly 73% (n=159) participants believed that dental caries is caused by a combination of sugar, bacteria and poor oral hygiene but the results of their drinking and smoking habits prove otherwise as discussed in the statement above. Their intake of sugar is to be noted, as it was significantly high. There was a strong and significant positive correlation between high sugar levels, bad breath and missing teeth using the Pearson Chi-Squared Test (p=0.01).

Oral health knowledge

More than 63% (n=138) participants confirmed brushing their teeth twice a day, and 31% (n=68) brushed once a day. However, this research's findings further suggested that participants did not use oral hygiene strategies such as dental floss 56.4% (n=123) nor have they ever used a mouth-rinse 53.2% (n=116). In our study, the findings of oral health education were found not to be covered.

Oral health attitudes

In our research, an area of concern was when the participants were asked about why they had to visit a dentist, dental therapist or an oral hygienist.

Respondent 1037: *"To remove a tooth that had causes abscess in my mouth."*

However, some could not visit a dental clinic/surgery. Fifteen percent (n=36) indicated that they did not have money to go to a dentist/therapist or a hygienist. This is supported by a quote from:

Respondent 942: *"I cannot afford to pay."*

This was to be noted because pain and sepsis could hinder students from going about their daily life, as defined and supported through research by (Glick et al., 2016) through the FDI World Dental Federation's definition of oral health.²

Research further notes the mouth as a multifaceted that involves the voice, smile, smell, taste, touch, and chew. Additionally, it is used to swallow and communicate a spectrum of emotions through confident and painless facial expressions of the craniofacial complex.² Furthermore, poor oral health care could compromise the functioning of the oral cavity needed for mastication.²⁰ This literature is encouraged and supported in this study.

Peltzer and Pengpid (2014) conducted a study in developing countries, including SA. The results suggested that oral hygiene education in our country was associated with weak oral health habits.²¹ These findings suggest that oral hygiene may not have been adequately incorporated into the secondary education system.²¹ Notably, there were strength findings in toothbrushing rates from the participants in our study.

Dental care is expensive even in high-income environments, averaging five percent of overall health spending and 20% of out-of-pocket health expenditure.^{9,22} To add to the above statement Sarpkaya et al., (2018) suggested that the Universal Health Coverage should support activities that would help frame policy dialogue and resolve weak primary oral health programs and resolve high out-of-pocket oral health care costs in SA.^{9,22}

Oral health practices

This study's findings suggest that the majority 86,7% (n=191) supported the statement that supports brushing twice a day to keep their teeth clean and healthy. Most of the respondents rated their oral health as good, and 44.5% (n=98) agreed that oral health is a part of general health.

This is supported by research that suggests what university students know about oral health care.²³ The literature further supports the results of our study, cross-sectional research by Azodo et al., (2010) conducted among students again in Nigeria concluded that most students were aware that oral health is an aspect of general health and that it had an effect on the everyday life of a person.⁴

Furthermore, this study showed that a high percentage of 69% (n=154) of students brush their teeth more than once a day, although not all participants support this effort fully 29% (n=63). A correlation analysis was done between brushing habits and alcohol intake, and no significant difference was found.

Maintenance of proper oral health relies on implementing habits, such as dental check-ups, frequency of toothbrushing, food and sugar intake, use of dental floss, and other interproximal cleaning techniques. In the prevention of dental caries and periodontal disease, these practices play an important role as adequate oral hygiene habits and the frequent use of dental services have shown efficacy in reducing the prevalence of these diseases as well as in preventing them.²⁴

The study also explored students' results in Dental Assisting (DA), Environmental Health (EH). In our study, out of n=220 participants, 34% (n=75) were from dental assisting and 65.9% (n=145) from Environmental health. The participants could give multiple answers; therefore; the total might not add to 100%. The results indicated more than 30% (n=70) dental students knew what dental plaque was while there was a significant number 14% (n=8) from Environmental Health that stated that it was dirt on teeth 14% (n=38). The other respondents stated they do not know 37.9% (n=77).

Oral hygiene techniques such as brushing twice day were recorded (36.9%) and flossing (7.5%) have also been identified from DA students. The dental assisting group knew there was a correlation between oral health and general health. These findings could be justified by the modules taught in Dental assisting while a small number from DA and the EH had no idea 70% (n=156).

However; only a few participants, 29,4% (n=64) believed that one could get heart diseases from bad oral health from the DA group. The study reveals that higher levels of disagreement imply that respondents consider their breath, teeth, and gums healthy or acceptable than the environmental health group.

Lastly, in this study, we explored whether there is a course that focuses on students' oral and general health through a curriculum review.

A study conducted in oral and oral health knowledge and attitude among nursing students, the results revealed that because oral health was not part of the curriculum, students had no interest or knowledge about oral health.²⁵

Singh and Pottapinjara (2017) suggested a study conducted on KAP in undergraduates on oral health self-care.¹⁶ The respondents agreed and accepted that their experience and oral health self-care activities were affected by the dental undergraduate program.¹⁶

No module covers oral and general health for EH students, for DA students; oral and general health is covered in the modules, e.g. pharmacology, oral pathology, dental assisting theory and practical. Our study noted a marked difference between dental assistance and environmental health students in the reported oral health knowledge and practices. This could potentially be attributed to the structure of the curriculum. However, this study's findings suggested that both programmes did not feature a module that teaches them about self-care. This was verified through a curriculum checklist. Even though the DA might have a bit of knowledge in this research; more research and more thorough review of this learning process is required to unpack the dynamic realities of understanding health and oral disease systems.¹⁶

Despite the impact that oral health has on general health and the quality of life, in most developing countries including South Africa, it is still one of the most neglected aspects of health.⁹

Clinical relevance

This is the first research study to evaluate oral health awareness and oral health behaviours among CUT students. The dental clinic in the University will be presented with the results of this study, and this will provide the basis to modify the current teaching module to improve the outcomes and treatment services offered to students.

In CUT, Free State, this study's results can be used to inform the planning of integrated oral health promotion strategies. The results can be used to design standard treatment possibly suited for university students. Noting that there is a shortage of oral health research at the university, this study's results be a catalyst for more oral health research. This research has implications for social change because it can provide valuable expertise in designing oral health strategies for the dental clinic staff on campus to cover the students' oral health care needs.

Although research recognises that knowledge does not always translate into action, the disparities found in this study may be primarily resolved using community and individual-based oral health education, promotion and prevention strategies and services. These can be integrated into the National Health Insurance planning for University students in South Africa.

Conclusion

The study aimed at exploring the students' oral health care methods and thereafter make them aware of measures such as the use of fluoridated toothpaste and application of topical fluoride. Curative measures are available, but the achievement of lower dental caries rates in SA could be through community campaigns and oral health programs. Although these are already in place, the coverage needs to be increased and include tertiary institutions. Oral health promotion should be community-based and must also be included in the course designed for University students.

DECLARATIONS

Ethical considerations

Ethical approval was obtained from the University of KwaZulu-Natal's Human and Social Science Research Ethics Committee (HSSREC/00001570/2020). Permission was obtained from the Life Sciences Department, CUT before data collection and consent were obtained from all the participants in the study.

Limitations of the study

The study participants were drawn from a single place, and therefore, the results cannot be generalised to other departments. However, to the researcher's knowledge, no study of such nature has been explored in CUT. This study, with its limitations, can provide insight into students' oral health care knowledge. Further research about oral health care knowledge still needs to be explored in all the university departments. The other limitation of the study was the time constraints due to Covid-19. In our study, the DMFT index could not be performed due to the Covid-19 pandemic.

Acknowledgements

The researcher would like to thank the participants who contributed to this study.

Conflict of Interest

The authors declare no financial or personal relationship(s), which may have inappropriately influenced them in writing this article.

Source of Support

The authors received financial support for the research, authorship, and publication of this article from the Department of Higher Education and Training (DHET) via the Research Grant and Scholarship Committee (UCDR R&D) from the Central University of Technology.

Disclaimer

The articles' views expressed in the submitted article are the authors' own and not the institution's official position.

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Contribution

The principal author (FFMK) made a substantial contribution to the conception and design, data acquisition, analysis, and interpretation of data. The co-author (RM) assisted with the discussion and literature review. All authors critically revised the article for valuable intellectual content and approved the final version to be published.

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Table 1: Demographic profile of participants

Age (years)		Gender			Total
		Male	Female	Other	
16 - 18	Count	5	13	0	18
	% within Age	27.8%	72.2%	0.0%	100.0%
	% within Gender	8.1%	8.5%	0.0%	8.3%
	% of Total	2.3%	6.0%	0.0%	8.3%
19 - 21	Count	25	81	1	107
	% within Age	23.4%	75.7%	0.9%	100.0%
	% within Gender	40.3%	52.9%	33.3%	49.1%
	% of Total	11.5%	37.2%	0.5%	49.1%
22 - 24	Count	20	49	2	71
	% within Age	28.2%	69.0%	2.8%	100.0%
	% within Gender	32.3%	32.0%	66.7%	32.6%
	% of Total	9.2%	22.5%	0.9%	32.6%
>24	Count	12	10	0	22
	% within Age	54.5%	45.5%	0.0%	100.0%
	% within Gender	19.4%	6.5%	0.0%	10.1%
	% of Total	5.5%	4.6%	0.0%	10.1%
Total	Count	62	153	3	218
	% within Age	28.4%	70.2%	1.4%	100.0%
	% within Gender	100.0%	100.0%	100.0%	100.0%
	% of Total	28.4%	70.2%	1.4%	100.0%

Table 2: Participant’s oral health care habits

		Strongly agree		Agree		Unsure		Disagree		Strongly disagree		Chi-Square p-value
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	
I have bad breath	B15	10	4.6%	20	9.2%	44	20.2%	89	40.8%	55	25.2%	<0.001
I have missing teeth	B16	15	6.9%	54	24.8%	18	8.3%	72	33.0%	59	27.1%	<0.001
I have bleeding gums	B17	11	5.0%	43	19.7%	43	19.7%	75	34.4%	46	21.1%	<0.001

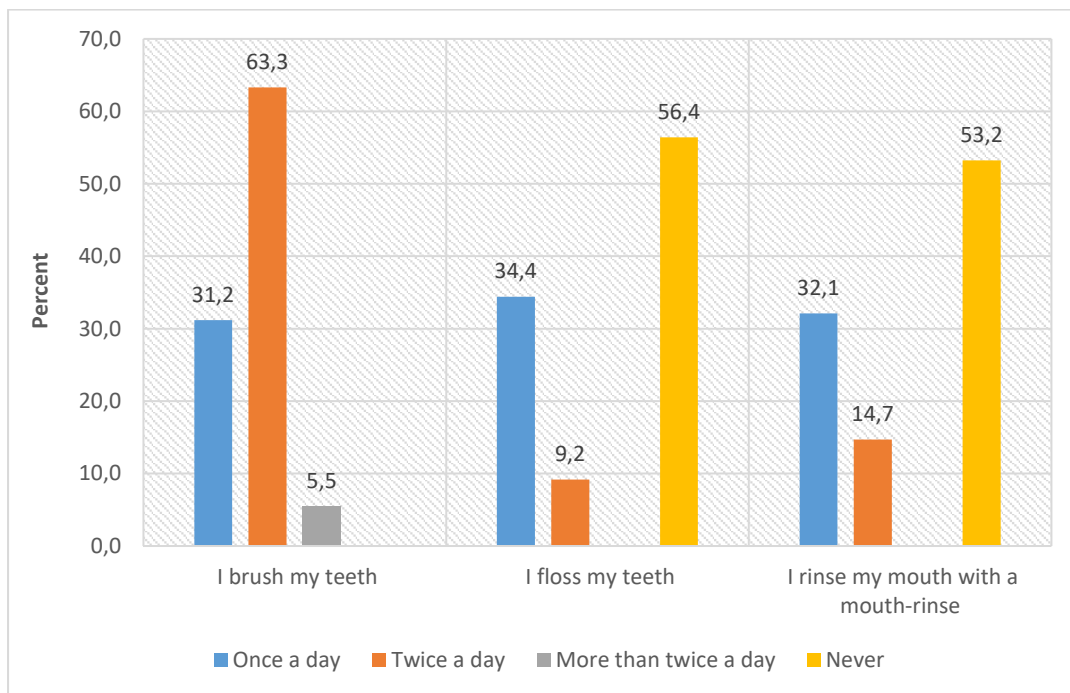


Figure 1: Brushing patterns

CHAPTER 4: METHODOLOGY

4.1 Introduction

This chapter provides a discussion of the methodology used. The researcher discusses the research design, settings, population and sample size, data collection methods, analysis, and data management. Limitations of the research, pilot study, validity and reliability, and ethical considerations are also discussed.

This was a descriptive study where qualitative and quantitative methods of research were applied. As described by the Centre for Evidence-Based Medicine, Study Designs (2016), descriptive studies merely seek to explain the data on one or more aspects of a group of people. They do not attempt to answer questions or generate interactions between variables. Babbie (2013) and Botma, Greeff, Mulaudzi and Wright (2010) referred to quantitative analysis as studying a phenomenon that transforms data to a numerical format (Babbie, 2013; Botma et al., 2010). A non-experimental quantitative study was one of the methods used to collect data in this study, whereby a set of questions was used and answered by the participants. Quantitative data in response to each question was entered into an Excel spreadsheet. The results were tabulated, and the statistical analysis of the data was carried out.

Braun and Clarke (2006) referred to a qualitative study as primarily exploratory research (Braun & Clarke, 2006). It is used to obtain an understanding of motives, beliefs, and motivations that are central. Qualitative data were collected in this study by using open-ended questions in the questionnaire. A qualitative analysis was carried out, and the results from the groups were added to an excel spreadsheet and analysed.

4.2 Research design

The study survey used a questionnaire to test the attitudes, opinions and status of the population. Surveys obtain information from large samples of populations, and the results can be applied to broader population contexts (Babbie, 2013). Furthermore, questionnaires allow data to be obtained more easily than interviews, so it is possible to access larger samples, choosing that method by the researcher. The present thesis included a comparatively high degree of analysis. The questionnaire layout further helped to present information in a structured way; hence, the questionnaire was used for data collection. Quantitative data were collected and analysed for the study from the close-ended questions (Babbie, 2013; Braun & Clarke, 2006).

Qualitative research offers insights into the issues or helps to generate ideas for future quantitative analysis or theories. Qualitative research is often used to identify patterns in thinking and perceptions

and to dig deeper into a problem (Braun & Clarke, 2006). The method used to analyse qualitative data was content analysis by following the steps defined by Braun and Clarke (2006), using a thematic process. Therefore, qualitative data in this study analysed the participant's oral health knowledge and practices of oral health care in open-ended questions, and it was thematically analysed. A coding guide was then created to help the coding process. The inductive reasoning of the emerging themes was made possible by this coding method (Theron, 2015). The guidelines for implementing each code to ensure rigour and thoroughness were also included (Braun & Clarke, 2006).

The study was conducted with 260 participants in the Faculty of Health and Environmental Sciences, Department of Life Sciences at the Central University of Technology (CUT). Data were collected from an online survey questionnaire. Data from a large population were obtained from the questionnaire, which enabled the researcher to collect oral healthcare-related data and explain definitions related to students' knowledge, attitudes, and practices. Data were summarised and aggregated using numerical formats, and the responses related to the KAP of students were numerically coded, which helped to interpret the results (Babbie, 2013).

4.2.1 Gatekeeper permission

Ethical approval was obtained from the University of KwaZulu-Natal's Human and Social Science Research Ethics Committee (HSSREC/00001570/2020). Permission was obtained from the Life Sciences Department, CUT before data collection and consent were obtained from all the study participants (**Appendices 1, 2, 3 and 4**).

4.3 Study setting

The study was conducted among undergraduate students at the CUT. The Central University of Technology (CUT) is a University of Technology located in Bloemfontein in the Free State province of South Africa (**Figures 1 & 2**). It was established in 1981 as the Free State Technikon. As part of the South African government's restructuring of tertiary education for the new millennium, it was promoted to University of Technology status. The study site is in an urban area. In 2020, the Central University of Technology employed over 800 academic and research staff spread across four faculties. The current study was conducted among 260 students in the Life Sciences Department that are housed within the Faculty of Health and Environmental Sciences (CUT 2020 stats www.cut.ac.za).



Figure 1. Map showing Bloemfontein

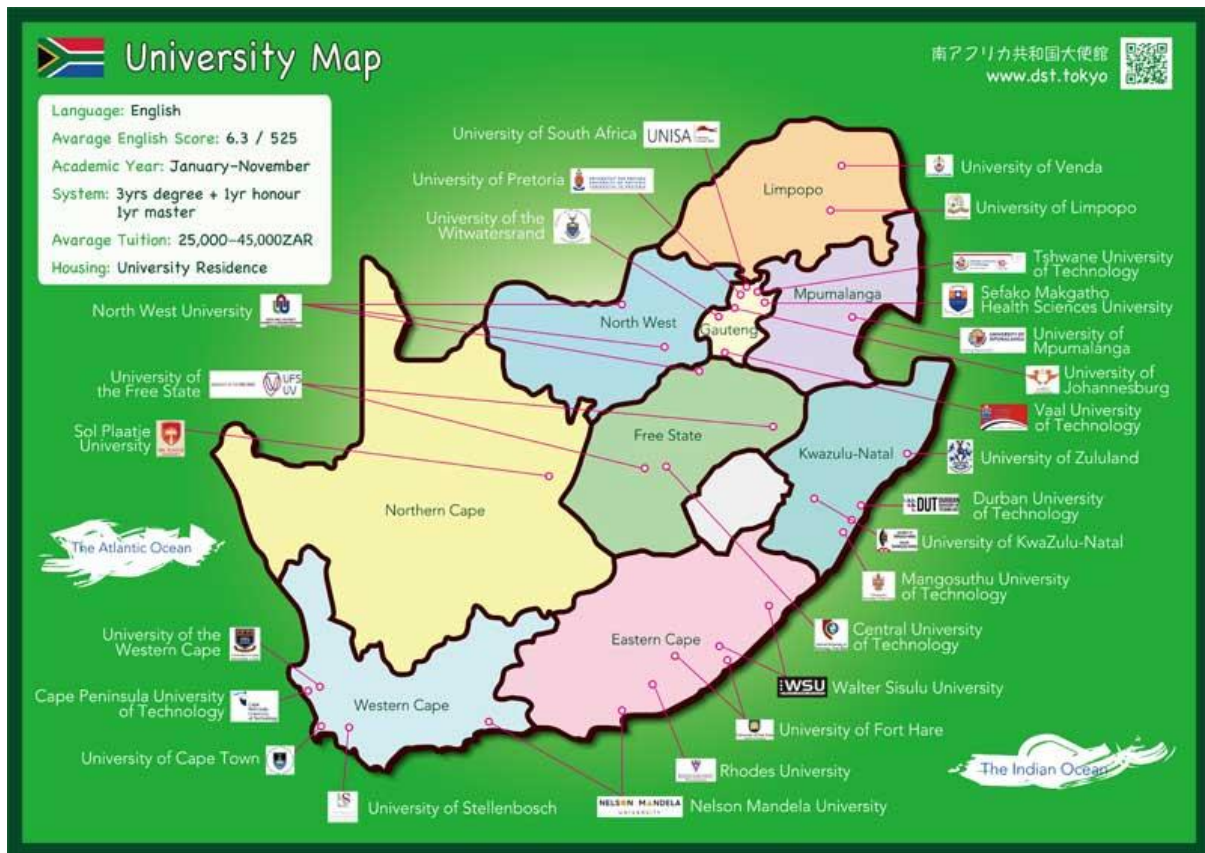


Figure 2. Map showing CUT

4.4 Study population

The Department of Life Sciences had 260 students, and all students were selected for the study, i.e. the total sample (n=260). The Dental Assisting program had 75 students, and the Environmental Health had 185 students. The study included both males and females of all race groups in the department.

4.5 Study sample and size

All 260 students were selected for this study. The 260 students were given a link to an online survey questionnaire. A list of all students was obtained from the programme coordinators in the Faculty of Health and Environmental Sciences and Department of Life Sciences. The students gave their online consent to participate in the study. The minimum response rate that was required was 156, where purposive sampling was used calculated with 95% confidence level. The study was limited to students who were in their first, second, third or fourth year of studying towards an undergraduate degree and were willing to participate in the Life Sciences Department study.

4.5.1 Inclusion criteria

All students who were in their first, second, third or fourth year of studying towards an undergraduate degree and were willing to participate and complete the questionnaire in 2020 were included. Both male and female participants were included in the study.

4.5.2 Exclusion criteria

Postgraduate students were excluded from the study, and eligible participants who answered the questionnaire outside the times and dates of data collection were excluded. Participants who did not give consent to the study were also excluded.

4.6 Sample size

Rutberg and Bouikidis (2018) defined sampling as the practice of choosing a smaller part of the population to represent an entire population so that generalisations can be made about the population. The researcher used purposive sampling, where all 260 students from the Life Sciences Department had access to the online survey. The main objective was to generate a sample representing the population (Rutberg & Bouikidis, 2018).

4.7 Limitations of the study

Babbie (2003) suggested that quantitative research could inherit superficial information and lose meaning. The researcher's goal was to restrict the potential impact on the research that such limitations may have. In this study, the participants had access to the questionnaire's online survey, which could have been subjective and influenced their answers. Students could have given biased answers to only want to portray the right answers about their oral health (Babbie, 2003).

4.8 Methodology table

Table 1 includes the data collection methods used in the study, such as the objectives, the sample size, and how data were collected and analysed.

Table 1. Methodology table

Objective	Sample	Data collection tool	Data analysis
i. To determine the students' knowledge regarding oral health care	All 260 students	An online survey of questionnaire	Quantitative data in response to each question was entered into an Excel spreadsheet. The results were tabulated, and the statistical analysis of the data was carried out. The qualitative data was analysed using thematic analysis
ii. To explore the students' attitudes towards dental care	All 260 students	An online survey of questionnaire	Quantitative data in response to each question was entered into an Excel spreadsheet. The results were tabulated, and the statistical analysis of the data was carried out. The qualitative data was analysed using thematic analysis
iii. To establish the students' practices with regards to oral health and hygiene	All 260 students	An online survey of questionnaire	Quantitative data in response to each question was entered into an Excel spreadsheet. The results were tabulated, and the statistical analysis of the data was carried out. The qualitative data was analysed using thematic analysis
iv. To compare results between students in Dental Assisting, Environmental Health and students taught Generic Base Subjects in Environmental Health.	All 260 students	Themes were highlighted and calculated	Qualitative analysis was carried out, and the results from the groups were added to an excel spreadsheet and were compared.
v. To establish whether there is a course that focuses on students' oral and general health through a curriculum review.	The curriculum of the two programmes	A checklist	Qualitative analysis was carried out, and a summarized curriculum review checklist was used to give data for the study.

4.9 Research methods

The procedures for obtaining information from the participants constituted a testing technique (Rutberg & Bouikidis, 2018). In this study, a standardised questionnaire was selected as a method for collecting data. The questionnaire consisted of fixed questions with pre-coded answer options that did not require participants to respond or give reasons for their answers (Botma et al., 2010). The questionnaire was adapted from the open-access WHO Oral Health Questionnaire for Adults by the researcher (WHO, 2013). The questionnaire comprised 29 questions in total, nine were open-ended questions, and 20 were pre-coded close-ended questions. Open-ended and close-ended questions give various structure levels to the questionnaire (Botma et al., 2010).

4.10 Data collection tools

An online survey of the questionnaire was used to collect data on knowledge, attitudes and practices about dental practices of the students (**Appendix 5**). A series of 29 questions were used with 20 pre-coded answers and nine open-ended questions. A curriculum checklist was used to review the modules offered in the first year for both two programmes.

4.11 Pilot study

Botma et al. (2010) described a pilot study to evaluate the data collection instrument using a specific group of population participants targeted for the analysis. After ethical clearance was gained from HSSREC (HSSREC/00001570/2020) and a permission letter received from the Life Sciences Department, the researcher conducted a pilot study to ensure the study's reliability and validity. This was conducted among ten students to determine if the project's students would understand the questionnaire. The pilot study was also done to test the methods that were used in the study. The completion of the questionnaire lasted approximately eight minutes, and participants could comment and critique the questionnaire. The researcher noted all comments and difficulties.

4.12 Data collection process

Data were collected through an online survey using Question-Pro. An email contact list was acquired through the programme coordinators, and the link to the study was sent to participants via email. Students were also sent the link via their WhatsApp groups. The questionnaire consisted of five sections viz—Demographics, Habits, Knowledge, Attitudes and Practices. A curriculum checklist was used to review the modules offered in the first year for both programmes.

Demographic information

This section had four questions, e.g. age, gender, year of study.

Habits

There were 17 questions asked about their attitudes towards dentistry, e.g. toothbrushing times, flossing and mouth-rinse use, sugary contents intake, smoking and alcohol intake, bleeding gums and missing teeth’.

Knowledge

The knowledge was asked in eight questions. Included in this section were, e.g. ‘can the status of your oral health affect general health?’.

Attitudes

This section consisted of 11 questions. Long questions in the survey for the participants included, e.g. ‘have you have ever been to a dentist, dental therapist or an oral hygienist?’.

Practices

The student’s practices were ascertained in the form of eight questions.

Participants had to give online consent before filling in the questionnaire. Data were collected during October 2020.

4.13 Data analysis

The primary data were extracted and captured into a Microsoft Excel ® spreadsheet using a data coding procedure until all the questionnaires were obtained. Both the researcher and the supervisor tested the captured details for accuracy and correctness. In this study, the data collected from the responses were analysed with SPSS version 26.0. The results presented the descriptive statistics in graphs, cross-tabulations and other figures for the collected quantitative data. Inferential techniques included the use of correlations and chi-square test values, which were interpreted using the p-values. The traditional approach to reporting a result requires a statement of statistical significance. A p-value is generated from a test statistic. A significant result is indicated with “p <0.05”.

The qualitative analysis was carried out, and the results from the groups were added to an excel spreadsheet and were compared using a curriculum checklist. The method used to analyze qualitative data were content analysis by following the steps defined by Braun and Clarke (2006), using a thematic

process. Therefore, qualitative data in this study analyzed the participant's oral health knowledge and practices of oral health care in open-ended questions, and it was thematically analysed.

4.14 Data management

Data were handled online by the researcher and was then captured on a computer. The computer was password-protected, and data will be kept for five years. Access was only granted to the researcher and the supervisor. All data from Question-Pro was stored on a password-protected USB flash drive and put in a locked cupboard at the research and supervisor office for five years after the study is completed. Digital information will then be double deleted.

4.15 Scientific validity and reliability of the study

Babbie (2013) referred to validity as the degree to which an instrument calculates what it is supposed to measure. It also refers to the true value of a process, test or study tool. In the study, validity was maintained in the structured questionnaire whereby all participants were asked the same questions. The questionnaire was adapted from the WHO Oral Health Questionnaire for adults (WHO, 2013). In the questionnaire, questions related to oral health knowledge were per behavioural values, normative beliefs, subjective norms, beliefs of control and perceived behavioural control. Oral health practice was clarified by questions relating to intention, real regulation of actions and behaviour. Furthermore, in this study, the questions were worded and were likely to obtain the information needed, and the sequence of questions was fair and helpful to ensure validity.

Reliability is the degree of coherence with which an attribute is evaluated by the instrument (Rutberg & Bouikidis, 2018). If an instrument has a reliability issue, this automatically means that validity issues can occur. The researcher took steps to enhance the reliability of outcomes, thereby enhancing rigour. Furthermore, reliability was ensured using internal consistency, thereby ensuring that the same straightforward, valid and unambiguous questions were equally posed to the study participants to achieve similar results. Peer analysis of data and quality tests was performed and cross-checked by the researcher—this ensured reliability and the efficiency of the open-ended data intercoder and data collection accuracy on spreadsheets. **Table 2** below reflects the Cronbach's alpha score for all the items that constituted the questionnaire.

Table 2. Cronbach's alpha score

	Section	Number of Items	Cronbach's Alpha
B	Habits	2	0.602
C	Knowledge	5	0.802
D	Attitudes	7	0.614
E	Practices	4	0.820

The reliability scores for all sections exceed the recommended Cronbach's alpha value. This indicates a degree of acceptable, consistent scoring for these sections of the research.

4.16 Ethical consideration

Rutberg and Bouikidis (2018) referred to ethics and a moral value system that deals with the study's legitimacy, professional, and social responsibilities (Rutberg & Bouikidis, 2018). As such, in this study, the research participants' identity was protected, and the confidentiality of research data was preserved. Before the study's commencement, ethical approval was obtained from the Humanities and Social Sciences Research Ethics Committee from UKZN (HSSREC/00001570/2020) and thereafter from the CUT Life Sciences Department (**Appendices 1 and 2**). All principles and policies of the UKZN HSSREC were adhered to, throughout the study. An online information sheet (**Appendices 3 and 4**) was uploaded on Question-pro for easy access for all participants in the study, and they had access to a copy with all objectives of the study. Participants could withdraw from the study at any stage.

4.17 Conclusion

This chapter addressed in detail all the steps involved in the research methodology that directed the analysis. The study settings and the study sample were described. It further defined the methods used for data collection—the questionnaire comprised of close-ended and open-ended questions, which guided this study. Furthermore, the method for data collection and data analysis was discussed. This chapter explored ethical issues as well as validity and reliability. Chapter 5 follows hereafter, and this includes the results.

CHAPTER 5: RESULTS

5.1 Introduction

This chapter presents the results and discusses the questionnaire's findings (**Appendix 5**) in this study. The questionnaire was the primary tool that was used to collect data and was distributed to (n=260) participants. The data collected from the responses were analysed with SPSS version 26.0. The results present the descriptive statistics in graphs, cross-tabulations and other figures for the collected quantitative data. Inferential techniques include the use of correlations and chi-square test values, which are interpreted using the p-values. The traditional approach to reporting a result requires a statement of statistical significance. A p-value is generated from a test statistic, and a significant result is indicated with " $p < 0.05$ " (Cochran, 2007).

5.2 Demographics

For this study, an online survey of a questionnaire was used. The total sample that the study was distributed to was (n=260). A total of (n=220) participants completed the questionnaire. The research instrument consisted of 50 items, with a level of measurement at a nominal or an ordinal level. The questionnaire was divided into five sections which measured various themes: Biographical data, Habits, Knowledge, Attitudes and Practices.

5.2.1 Biographical Data

This section summarises the biographical characteristics of the respondents. **Table 3** below describes the overall gender distribution by age. Overall, the ratio of males to females was approximately 1:2.3 (28.4% (n=62): 70.2% (n=153) with 1.4% (n=3) classifying themselves as other ($p < 0.001$). Within the age category of 22 to 24 years, 28.2% (n=60) were male. This category of males between 22 and 24 years formed 9.2% (n=20) of the total sample. The age distributions are not similar, as there are more respondents, 90% (n=189) younger than 24 years ($p < 0.001$).

Table 3. Demographic profile of participants

Age (years)		Gender			Total
		Male	Female	Other	
16 - 18	Count	5	13	0	18
	% within Age	27.8%	72.2%	0.0%	100.0%
	% within Gender	8.1%	8.5%	0.0%	8.3%
	% of Total	2.3%	6.0%	0.0%	8.3%
19 - 21	Count	25	81	1	107
	% within Age	23.4%	75.7%	0.9%	100.0%
	% within Gender	40.3%	52.9%	33.3%	49.1%
	% of Total	11.5%	37.2%	0.5%	49.1%
22 - 24	Count	20	49	2	71
	% within Age	28.2%	69.0%	2.8%	100.0%
	% within Gender	32.3%	32.0%	66.7%	32.6%
	% of Total	9.2%	22.5%	0.9%	32.6%
>24	Count	12	10	0	22
	% within Age	54.5%	45.5%	0.0%	100.0%
	% within Gender	19.4%	6.5%	0.0%	10.1%
	% of Total	5.5%	4.6%	0.0%	10.1%
Total	Count	62	153	3	218
	% within Age	28.4%	70.2%	1.4%	100.0%
	% within Gender	100.0%	100.0%	100.0%	100.0%
	% of Total	28.4%	70.2%	1.4%	100.0%

Figure 3 below indicates the place of residence of the respondents where similar and large numbers of respondents lived at home 44.5% (n=97) and private residence 39.9% (n=87), while a smaller number lived on campus 15.6% (n=34) (p<0.001).

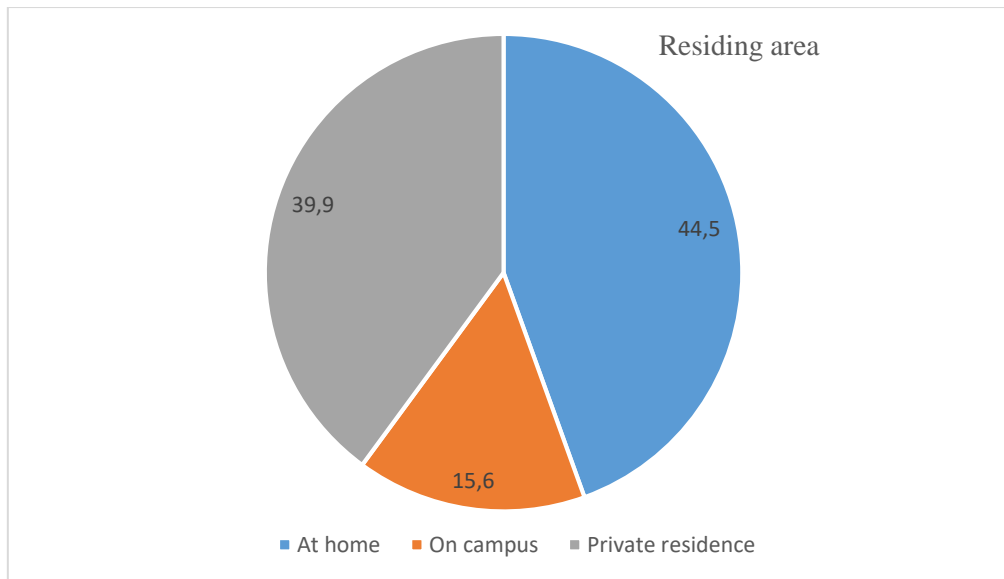


Figure 3. Biographic data

Participants were asked where they reside. Most of the participants stayed at home 45% (n=97) and above 39% (n=87) lived in a private residence. Fifty-one percent (n=114) were in their first year of study, 23.4% (n=51) were in their second year, while 18.8% (n=41) were in their third year of study.

5.2.2 Habits

This section deals with the habits of the respondents. Participants were asked about their habits pertaining to drinking and smoking. Nearly 72% (n=160) had never smoked while 26.6% (n=58) smoked. Within the 26.6% (n=58) in the group that smoked, only 22% (n=48) smoked more than (n=3) cigarettes per day. Furthermore, in this category; it was noted that more males smoked than females.

Out of participants (n=220), an overwhelming 99.1% (n=218) had an alcoholic drink and over 60% (n=132) drank over (n=7) alcoholic drinks per week, however; 29% (n=64) had never had an alcoholic drink before in their lives. Habits were also structured around the participant's sugar intake, where over 85.8% (n=187) agreed that they loved sugar, whereas a few 14% (n=34) stated they do not like sugar. In this category, nearly 22.9% (n=50) stated that they take sugar more than three times a day.

Figure 4 below provides data on habits about toothbrushing which show significantly different patterns ($p < 0.001$) where more than 63% (n=138) confirmed to brushing their teeth twice a day while only 31% (n=68) brushed once a day. In this study, 56.4% (n=123) of the participants confirmed that they had never flossed before, while 53.2% (n=116) stated they have never used a mouth-rinse before in their lives. 68.8% (n=150) of the participants provided information that suggested they brush their teeth twice a day, in the morning and before going to bed whilst a smaller number 5% (n=12) brushed three times a day (**Figure 5**).

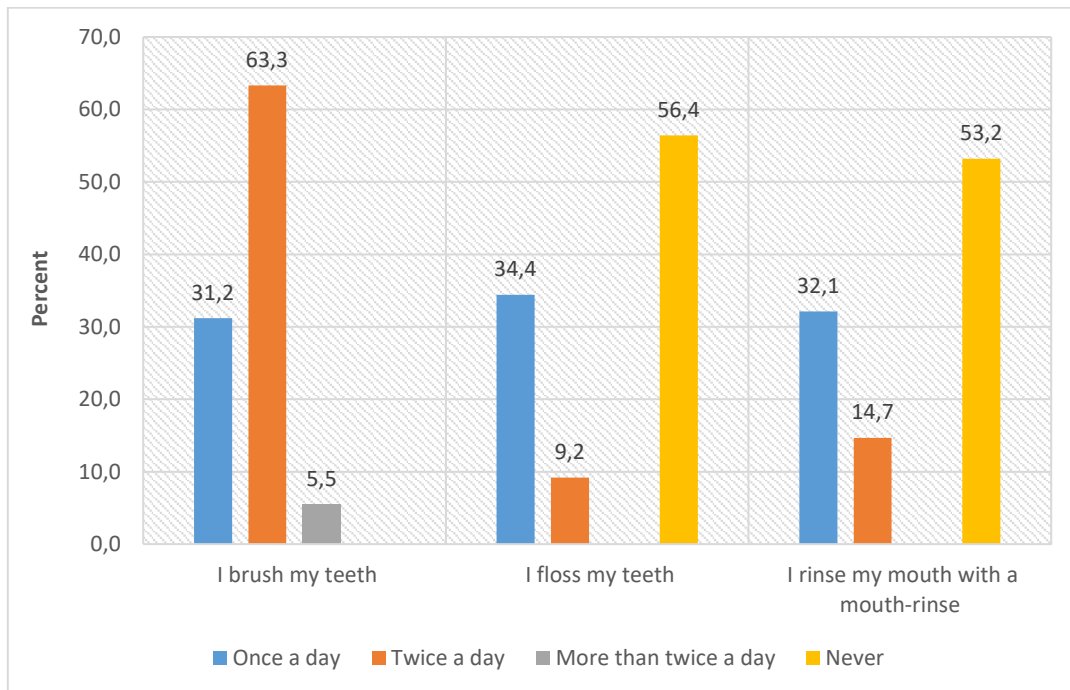


Figure 4. Brushing patterns

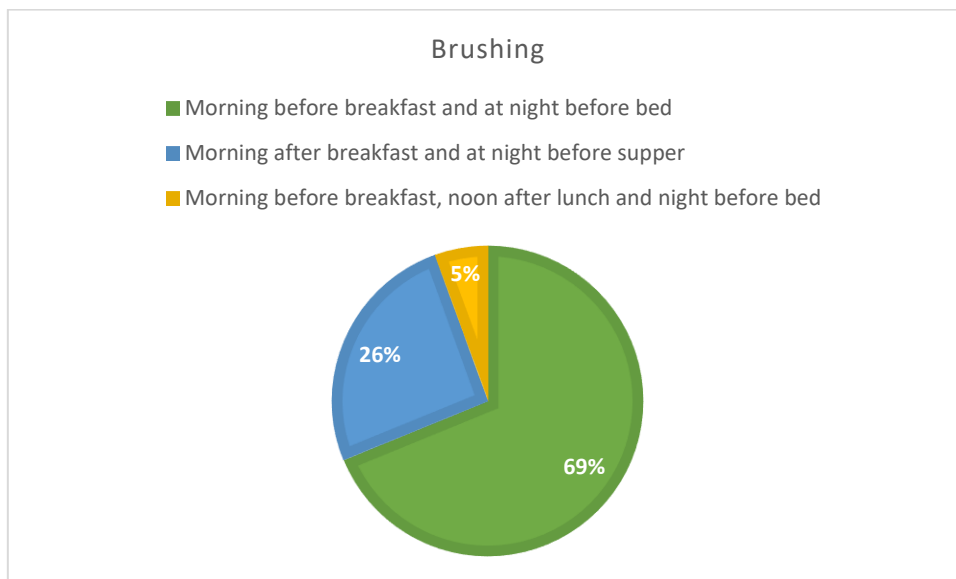


Figure 5. Brushing times

Below is the summary of the scoring patterns which are first presented using summarised percentages for the variable. The following patterns were observed: all statements showed significantly higher levels of disagreement, in total the participant's level of disagreement towards the oral health care habits was 40.8% (n=89) whilst other levels of agreement were lower: 4.6% (n=10) but still greater than levels of disagreement. There were no statements with higher levels of agreement in this category.

The significance of the differences is tested and shown in **Table 4** and **Figure 6** below. The higher levels of disagreement imply that respondents consider their breath, teeth, and gums healthy or acceptable. Although a small number 13.8% (n=30) indicated that they had bad breath, 31.7% (n=69) indicated missing teeth. A further 24.7% (n=54) indicated that they had bleeding gums.

Table 4. Participant’s oral health care habits

		Strongly agree		Agree		Unsure		Disagree		Strongly disagree		Chi-Square p-value
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	
I have bad breath	B15	10	4.6%	20	9.2%	44	20.2%	89	40.8%	55	25.2%	<0.001
I have missing teeth	B16	15	6.9%	54	24.8%	18	8.3%	72	33.0%	59	27.1%	<0.001
I have bleeding gums	B17	11	5.0%	43	19.7%	43	19.7%	75	34.4%	46	21.1%	<0.001

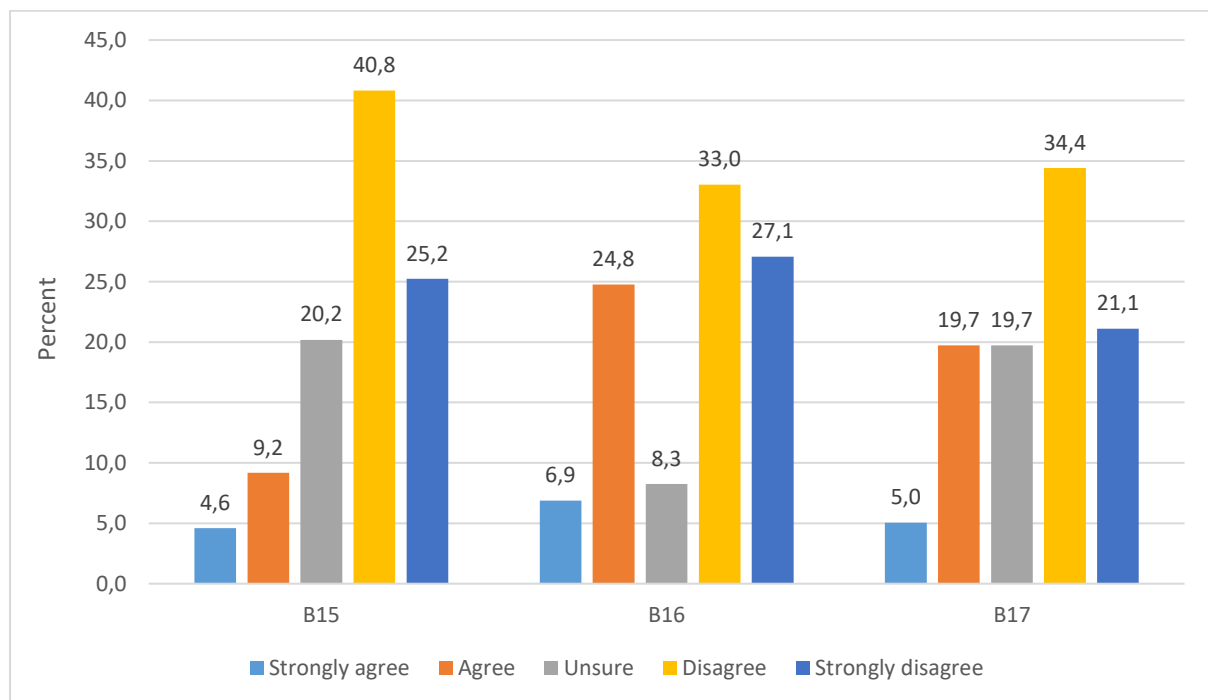


Figure 6. Summary of oral health care habits

5.2.3 Knowledge

Participants provided the following information regarding their oral health knowledge in this section, as demonstrated in **Table 5** below and **Figure 7**, where there were significantly higher agreement levels. Over 51% (n=112) agreed that smoking could affect their gums while 64,2% (n=159) believed that dental caries is caused by a combination of sugar, bacteria and poor oral hygiene. However, a significant 86,7% (n=189) supported the statement that supports brushing twice a day to keep their teeth clean and healthy.

Table 5. Participants' oral health care knowledge

		Strongly agree		Agree		Unsure		Disagree		Strongly disagree		Chi-Square p-value
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	
Smoking has an effect to my gums	C1	59	27.1%	53	24.3%	60	27.5%	22	10.1%	24	11.0%	<0.001
Bleeding gums means there is a problem/ infection in the mouth	C2	57	26.1%	83	38.1%	63	28.9%	11	5.0%	4	1.8%	<0.001
Tooth decay is caused by a combination of bacteria, sugary foods and not cleaning my teeth well	C3	86	39.4%	73	33.5%	47	21.6%	12	5.5%	0	0.0%	<0.001
A medium to soft toothbrush is suitable for brushing	C4	54	24.8%	72	33.0%	77	35.3%	12	5.5%	3	1.4%	<0.001
Brushing teeth twice a day will keep them clean and healthy	C5	90	41.3%	99	45.4%	22	10.1%	6	2.8%	1	0.5%	<0.001

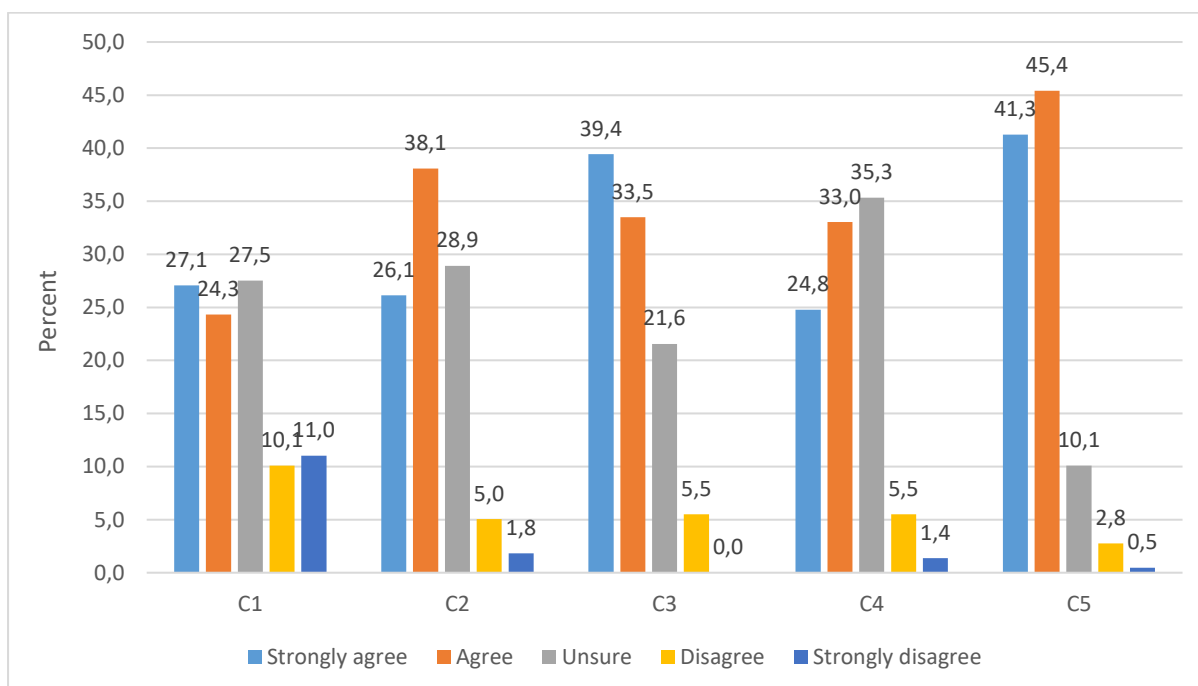


Figure 7. Participant’s oral health care knowledge

5.2.4 Attitudes

This section provided varying patterns, as seen in **Table 6** and **Figure 8** below. The participant’s responses towards their oral health care attitudes indicated that out of the participants (n=220), over 94% (n=206) agreed that taking care of their oral hygiene was important and about 67% (n=146) visited the dentist twice a year. Only a few with a response of 8,4% (n=18) was recorded from the participants when they were asked if taking care of their oral hygiene was still important in the present time of Covid-19 with everyone wearing a mask. Only a few participants, 29,4% (n=64) believed that one could get heart diseases from bad oral health.

Table 6. Participants summary of oral health care attitudes

		Strongly agree		Agree		Unsure		Disagree		Strongly disagree		Chi-Square p-value
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	
Taking care of my oral health is important to me	D1	116	53.2%	90	41.3%	12	5.5%	0	0.0%	0	0.0%	<0.001
I don't have to worry about my Oral health because I wear a mask due to Covid-19	D2	8	3.7%	10	4.6%	21	9.6%	76	34.9%	103	47.2%	<0.001
I should visit the dentist twice a year	D3	58	26.6%	88	40.4%	58	26.6%	7	3.2%	7	3.2%	<0.001
My oral health is my dentist's problem	D4	10	4.6%	34	15.6%	30	13.8%	74	33.9%	70	32.1%	<0.001
It is necessary for me to determine what dental treatment I need	D5	44	20.2%	85	39.0%	58	26.6%	24	11.0%	7	3.2%	<0.001
I should brush my teeth twice a day	D6	90	41.3%	102	46.8%	11	5.0%	12	5.5%	3	1.4%	<0.001
I can clean my teeth without toothpaste	D7	6	2.8%	42	19.3%	71	32.6%	47	21.6%	52	23.9%	<0.001
I can get heart diseases from bad oral health	D8	29	13.3%	35	16.1%	108	49.5%	25	11.5%	21	9.6%	<0.001
Decayed teeth affect appearance	D9	86	39.4%	68	31.2%	56	25.7%	6	2.8%	2	0.9%	<0.001

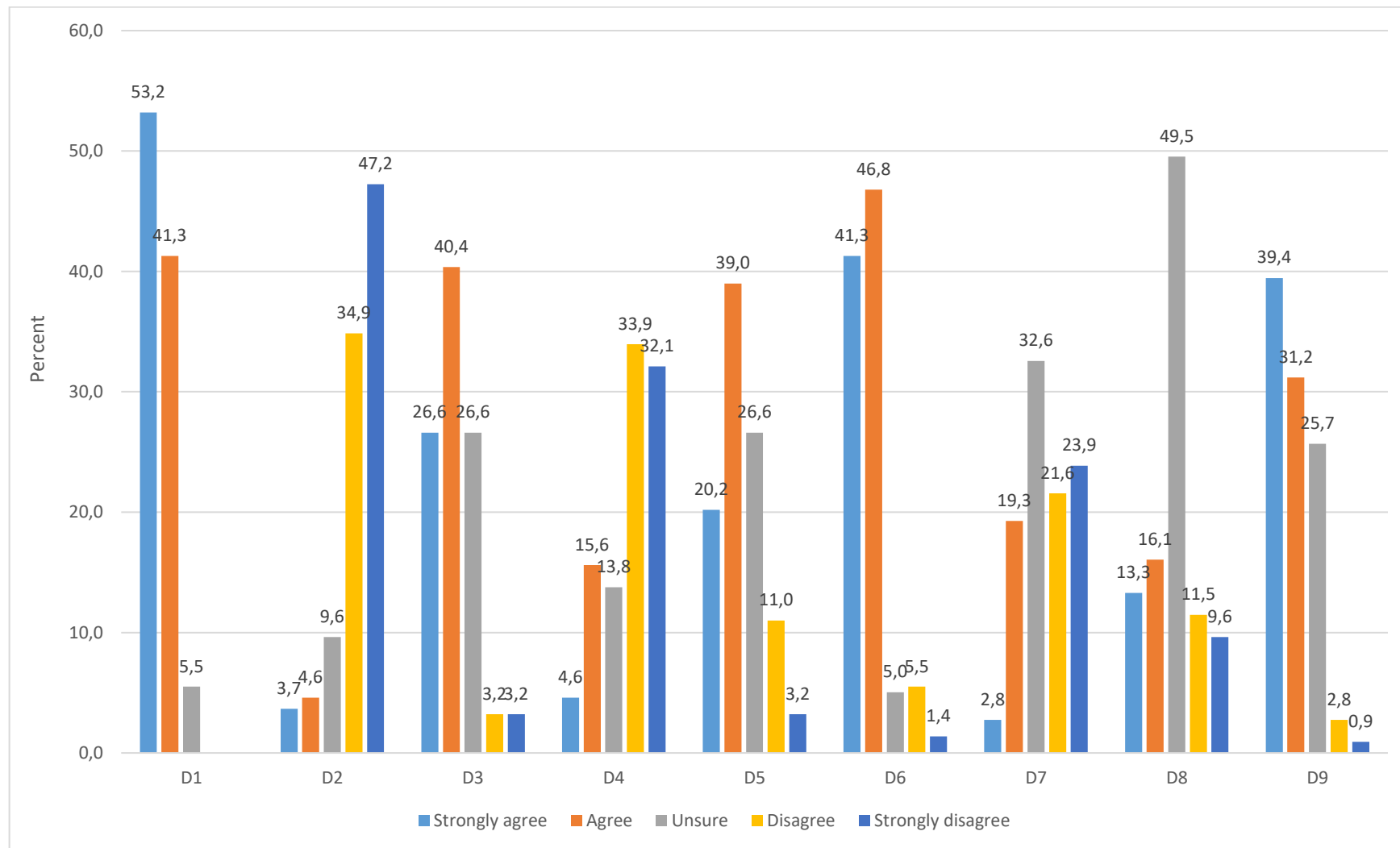


Figure 8. Summary of the respondent's attitudes towards oral health care

5.2.5 Practices

This last section provided the participant's responses regarding their oral health practices, where there were notably high levels of agreement. **Table 7** and **Figure 9** below show that about 65% (n=141) participants believed they should brush their teeth for two minutes while 29,3% (n=63) suggested there is no need to visit a dentist if they have no problems orally. Oral hygiene techniques such as brushing twice day were recorded (36.9%) and flossing (7.5%) have also been identified from many of the Dental Assisting students. Interestingly, most participants 64,9% (n=141) agreed that they had been taught about oral health in school, but their habits prove otherwise, as discussed above.

Table 7. Participant's summary in oral health practices

		Strongly agree		Agree		Unsure		Disagree		Strongly disagree		Chi-Square p-value
		Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	Count	Row N %	
I brush my teeth at least for 2 minutes	E1	62	28.6%	79	36.4%	57	26.3%	19	8.8%	0	0.0%	<0.001
I must brush my tongue as well	E2	95	43.8%	75	34.6%	23	10.6%	21	9.7%	3	1.4%	<0.001
I rinse my mouth often after eating	E3	43	19.8%	72	33.2%	33	15.2%	62	28.6%	7	3.2%	<0.001
There is no reason to visit a dentist twice a year if I have no teeth problems	E4	18	8.3%	43	19.8%	50	23.0%	68	31.3%	38	17.5%	<0.001
At school, I was taught about oral health	E5	45	20.7%	96	44.2%	32	14.7%	36	16.6%	8	3.7%	<0.001

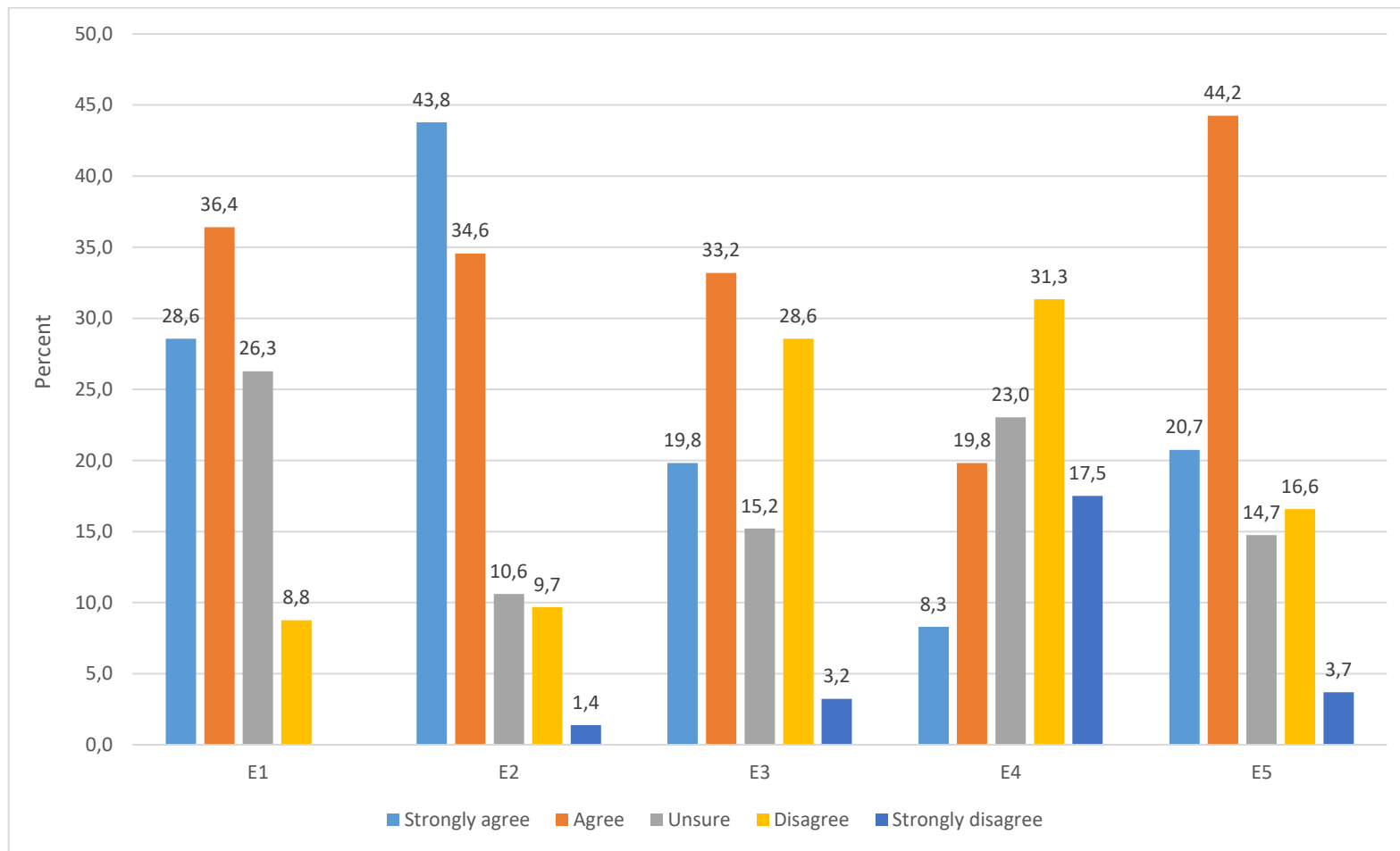


Figure 9. Participant's practices regarding oral health

All open-ended questions are reported below. Participants were asked to reflect on their oral health care while exploring their knowledge, attitudes and practices. The responses were summarized from QuestionPro and supported with quotes, and these were analysed thematically. In our study, out of n=220 participants, 34% (n=75) were from Dental Assisting and 65.9% (n=145) from Environmental Health. It must be noted that the participants could give multiple answers; therefore, the total might not add to 100%. No module covers oral and general health for Environmental Health students. For Dental Assisting students; the above oral and general health is covered in pharmacology, oral pathology, dental assisting theory and practical (**Appendix 6**). The results indicated more than 30% (n=70) Dental Assisting (DA) students knew what dental plaque was and the rest of Environmental Health (EH) 11% (n=21), while there was a significant 14% (n=8) from Environmental Health that stated it was dirt on teeth. The rest of the participants stated that they did not know what plaque was 37.9% (n=77).

The participants were asked ‘what is plaque? Out of (n=220), more than 41% (n=91) stated it was a layer of bacteria in the teeth. A few participants, 14%; (n=38) stated it was dirt on the teeth, while a 6.3% (n=14) believed that it was a calcified deposit on teeth. However, the rest 37.9% (n=77) of the participants stated they did not know what plaque was. The themes and frequencies are shown below.

Table 8. Knowledge of dental plaque

Theme	Frequency (n; %)	Supporting evidence or quotes
Bacterial layer on teeth	91; 41%	Respondent 334: “Bacteria that forms on the teeth due to lack of oral health care.” Respondent 366: “An accumulation of bacteria on teeth from food and liquids when teeth aren’t brushed efficiently.” Respondent 375: “Bacteria that make teeth yellow.” Respondent 373: “Bacteria that causes damage to the teeth.”
Hard layer on teeth	14; 6.3%	Respondent 397: “Hard substance on my tooth.” Respondent 444: “Stone substance on teeth.” Respondent 428: “Piece of wood.”
“Dirt” layer on teeth	38; 14%	Respondent 345: “Dirt on teeth which has bacteria.” Respondent 380: “Build-up of dirt on teeth.” Respondent 387: “Dirty inside the mouth.”
Did not know	77; 37.9%	Respondent 398: “Have no idea”

Participants reflection on the prevention of tooth decay

Participants were asked: How can you prevent tooth decay? 90.2% (n=199) responded ‘by brushing twice a day.’ While there were multiple responses, only a few did not know how 1.3% (n=3). The themes and frequencies are shown below.

Table 9. Prevention of tooth decay

Themes	Frequency (n; %)	Supporting evidence or quotes
Brushing	199; 90.2%	Respondent 479: “Brush teeth at least twice a day after meals. Avoid eating sugary stuff. Do not smoke Floss at least once a day.”
fluoride	20; 9%	Respondent 471: “Brush teeth using fluoride toothpaste Drink water regularly Eat tooth-healthy food.”
Healthy foods	2; 0.9%	Respondent 467: “Avoid eating too much sugar and brush your teeth two times a day”. Respondent 471: “Eat tooth-healthy food.”
Flossing	12; 5.4%	Respondent 491: “Brush your teeth at least twice a day with a fluoride-containing toothpaste. Clean between your teeth with a floss”.
Avoiding sugars	29; 13.1%	Respondent 469: “Avoiding over-consumptions of sugary drinks and food, brushing teeth regularly twice a day, flossing at least once at the end of the day”. Respondent 524: “Brush teeth and eat less sugar.”
Rinsing after foods	3; 1.3%	Respondent 1458: “I brush my teeth and tongue with a fluoride toothpaste and rinse with a mouthwash sometimes with plain water.” Respondent 486: “Brush with fluoride toothpaste after eating or drinking. Rinse your mouth. Visit your dentist regularly

		Consider dental sealants. Drink some tap water. Consider fluoride treatment”. Respondent 510: Brushing twice a day with fluoride toothpaste Rinse your mouth after eating. Visit your dentist twice a year.”
Did not know	3; 1.3%	Respondent 1137: “Don't know”

Participants reflection on the sequelae of poor oral hygiene

Participants were asked; What happens if you do not clean your mouth?. The responses indicated that they are aware that tooth decay is caused by bacteria and plaque build-up from not brushing regularly. Below are themes and frequencies.

Table 10. Poor oral hygiene knowledge

Themes	Frequency (n; %)	Supporting_evidence_or quotes
Bacterial build up	140; 62%	Respondent 808: “bacteria cause tooth decay.”
Accumulation of plaque and calculus	2; 0.9%	Respondent 706: “Plaque and tartar will grow on teeth, demineralizing teeth and weakening the gingival structure. (Decay, gingivitis etc.)”
halitosis	24; 10.9%	Respondent 622: “A person may experience halitosis which is an offensive bad breath, this may also lead to tooth decay or even worse oral diseases such as gingivitis and periodontal disease.”
Bleeding gums, gum disease	8; 3.6%	Respondent 750: “You might bad breath and bleeding gums.”
Tooth decay	4; 1.8%	Respondent 711: “Rotten teeth.”
I don't know	5; 2.2%	Respondent 734: “Unsure.”

Reason for visiting a dentist

Respondents were asked if they had ever been to a dentist, dental therapist or an oral hygienist. Overall, 58% (n= 129) stated yes and 31.3% (n=69) had not been to either one. Out of the 58% (n=129) that stated they have been to one, majority 36% (n=78) indicated that it was mainly for extraction.

Table 11. Oral health care practitioner visit

Themes	Frequency (n; %)	Supporting evidence or quotes
No time	7; 3.1%	Respondent 892: "Because I don't have time to visit the dentist".
Dental check-up	20; 9%	Respondent 1026: "Teeth check-up and washing of teeth." Respondent 1016: "One of the reasons why I visited them was because I was going on a Church mission in Madagascar and a dental check-up was a must do for me." Respondent 1015: "Nothing specific, just check up if my teeth are in good health."
Pain	3; 1.3%	Respondent 1018: "Painful teeth".
Gold teeth	2; 0.9%	Respondent 902: "Cleaning my teeth and putting on a gold tooth". Respondent 903: "Cleaning my teeth, tooth extraction, insertion of gold and silver teeth".
Cleaning	25; 11.3%	Respondent 1033: "To clean my teeth".
Restorative care	4; 1.8%	Respondent 992: "For cleaning and a filling".
Extraction	78; 36%	Respondent 1037: "To remove a tooth that had causes abscess in my mouth." Respondent 914: "Extraction of a rotten tooth."
Ortho	5; 2.2%	Respondent 959: "I had to put on braces".

A slightly lower number 15% (n=34) stated they did not have money to go to a dentist/therapist or a hygienist:

Table 12. Reason for not visiting

Themes	Frequency (n; %)	Supporting evidence or quotes
Healthy mouths	5; 2.2%	Respondent 944: I care for my teeth and never had problems with my teeth and so didn't see any need to see a dental practitioner". Respondent 938: "Healthy teeth".

Fear	1; 0.3%	Respondent 987: "I'm scared of dentists".
Affordability	34; 15%	Respondent 942: "I cannot afford to pay." Respondent 990: "Money is the problem."
No reason to visit	23; 10.4%	Respondent 1001: "No need for me".

Nearly 32% (n=72) of the participants did not understand how the state of one's general health can affect their oral health. They indicated that they did not know the relationship between the two. In comparison, only 44.5% (n=98) had an idea. The rest 22.7% (n=50) had no idea of the correlation. Themes and frequencies in the table below.

Table 13. General health

Themes	Frequency (n; %)	Supporting evidence or quotes
Appearance	4; 1.8%	Respondent 1174: "If you have unhealthy teeth, they might affect your general appearance".
Lowering resistance	6; 2.7%	Respondent 1133: "Can lower the body's resistance to infection, making oral health problems more severe."
Diabetes	11; 5%	Respondent 1136: "Diseases such as diabetes can lower the body resistance to infection, making oral health problems more severe." Respondent 1172: "If you have chronic condition like sugar diabetes".
HIV	2; 0.9%	Respondent 1141: "Gum disease play a role in some diseases such as diabetes and HIV/Aids can lower the body's resistance to infection, making oral health problem more severe."
Periodontal diseases	13; 5.9%	Respondent 1127: "If teeth are not taken care of, they may lead to infections which might spread across the body." Respondent 1120: "I was told that oral decay, halitosis, periodontitis and other problems can cause heart problem, can

		cause stroke, premature for pregnant women.”
Don't know	50; 22.7%	Respondent 1157: “I have no idea”.

Lastly, the respondents were asked what methods they used to clean their teeth. Majority 99% (n=218) stated they brushed with toothpaste and a toothbrush. Table 14 shows the statements and frequencies.

Table 14. Methods of Cleaning Teeth

Themes	Frequency (n; %)	Supporting evidence or quotes
Toothbrush and toothpaste	218; 99%	Respondent 1401: “Brush my teeth with toothpaste and rinse with water.” Respondent 1469: “I use a soft toothbrush brush and a fluoridated toothpaste, and I brush for two minutes, and I visit a dentist twice a year.”
Mouth-rinse	13; 5.9%	Respondent 564: “By mouth wash and using a healthy dental diet”.
Salt and water	4; 1.8%	Respondent 1513: “Toothpaste and toothbrush, water and sometimes salt and water solution.
Don't know	3; 1%	Respondent 1451: “don't know.”

Our study noted a marked difference between a dental assistant and environmental health students in the reported oral health knowledge and practices. This could be because no module covers oral and general health for Environmental Health students, for dental assisting students; oral and general health is covered in pharmacology, oral pathology, dental assisting theory and practical (**Appendix 6**).

5.3 Conclusion

The results chapter offered a detailed overview of dental students' oral health conduct, know-how, and attitudes. This is to the best of the researcher's knowledge, represents the first study among students in CUT, Bloemfontein that explored these problems. The next chapter will focus on the discussion and recommendations for the study.

CHAPTER 6: DISCUSSION, RECOMMENDATIONS AND CONCLUSION

6.1 Introduction

This chapter will discuss assessing the knowledge, attitudes and practices concerning oral health care in CUT students. It will also provide an analysis of how the objectives were addressed. The limitations of the research are outlined thereafter, and the recommendations and the conclusion follow.

Poor oral health has a significant effect on the patient's general health and quality of life. The preservation of good general and oral health is a priority and a key factor in adults for overall well-being and enhanced quality of life. Therefore; it is important to determine how people rate their oral health status, their perceived dental needs, and the actual use of available dental services (Azodo et al., 2010). Structures are in place to promote oral health behaviour, but it is important to remember how the knowledge, attitude and practices (KAP) are applied, as investigated in this study.

6.2 Discussion

This is the first research study to evaluate oral health awareness and practice of oral health behaviours among CUT students. In this research, we concentrated on the relationships between the source of dental knowledge, attitudes, and oral health behaviours. In this study population, we found that variations in the source of dental information were correlated with oral health behaviour; that is, both positive and negative associations were observed between the sources and oral health behaviour.

The 2020 mid-year population estimates from Statistics South Africa (Stats SA) were estimated at 59.62 million. Around 51,1% (about 30.5 million) of the population is female. The ages of the participants in this study ranged from 18 to 24 years, with the majority being females, in line with South Africa's gender demographics. Overall, the ratio of males to females is approximately 1:2.3; 28.4% (n=62): 70.2% (n=153).

Participants reported to be living at home were 45% (n=97) which might influence their oral hygiene methods. Literature supports the statement in a study on oral health care knowledge, attitudes, and practices in adult patients in Mangaung, Free State conducted by Modikoe et al., 2019. Modikoe et al. (2019) suggested that living at home could influence the oral hygiene methods in a good or bad way to fight dental caries. However, the correlation between students staying at home and toothbrushing in our study revealed no degree of association or significance - between the number of household individuals and toothbrushing habits of the participants (Modikoe et al., 2019).

In our research, it was noted that significantly more males smoked compared to the other two groupings. Out of (n=220) participants, 26.6% (n=58) smoked and in the same category of smokers, 22% (n=48) of them smoked more than (n=3) cigarettes per day. Interesting enough, over 51% (n=114) in our study, agreed that smoking could affect their gums. This is in line with the Formicola (2017) and Park et al., (2011), in their study, they found that tobacco use may influence students' oral hygiene methods. An analysis of smoking and bleeding gums was done, and no significant difference was found in our study.

Almost all the participants, 99.1% (n=218) have had an alcoholic drink, and of the 99%, over 60% (n=132) drink over (n=7) alcoholic drinks per week. These findings might influence the participants' oral hygiene as seen in a study conducted by Afshin et al. (2019), it was observed that the overall trend of alcohol use increased in students. Furthermore; the study suggested that alcohol intake influenced students in all educational institutions regarding their lifestyle.

This study's habits were also structured around the participant's sugar intake as reported in a study conducted by Modikoe et al., (2019), whose findings indicated a low intake of vegetables and more sugary products in adults. In our study, over 80%; (n=187) of the participants agreed that they love sugar and only 14%; (n=32) do not like sugar. Over 22%; (n=50) stated that they take sugar more than three times a day. This finding is also to be noted as 72.2% (n=159) participants believed that dental caries is caused by a combination of sugar, bacteria and poor oral hygiene but the results of their drinking and smoking habits prove otherwise as discussed in the statement above. Their intake of sugar is to be noted, as it is significantly high. There was a strong and significant positive correlation between high sugar levels, bad breath and missing teeth using the Pearson Chi-Squared Test ($p=0.01$).

Objective 1- Oral health Knowledge

Taniguchi-Tabata et al., 2017 found that oral health education successfully modified oral health behaviour in students, and our findings support this. Objective 1 in our study was to determine the students' knowledge regarding oral health care through an online survey questionnaire (Taniguchi-Tabata et al., 2017).

More than 63% (n=138) of the participants confirmed that they brushed their teeth twice a day, and 31% (n=68) brushed once a day. This research further suggested that participants did not use oral hygiene strategies such as dental floss (56.4%; n=123) or used a mouth-rinse (53.2%; n=116). In our study, the findings of oral health education were found not to be covered.

The findings in our study are close to that of a research carried out by Ghaffari et al., (2018) where it was concluded that oral health problems have a considerable effect on the quality of life of individuals. A simple dental payment system would assist the students, as cited in Formicola (2017) study. Similar

patterns were observed in another study where it was indicated that school is important as a source of dental awareness for oral health education. In addition, dental awareness from dental clinics may effectively improve oral health behaviour, as Taniguchi-Tabata et al. (2017) cited. This study's outcomes suggest that oral health care campaigns would benefit the students and free oral health screening and discounted dental services could be offered to students.

Good oral hygiene reflects the self-care habits of an individual (Blaggana et al., 2016). Blaggana et al. (2016) further cited that the mouth is known as the gateway to good health and is considered a mirror of how the body is perceived. Health-related behaviours are more likely to be followed if a person has greater control over his or her health with a better understanding of diseases and their aetiology (Blaggana et al., 2016). The study was conducted to explore and assess the student's oral health perspectives through dental education, emphasising oral health promotion. Objective 1 would then be realised as the study will significantly affect students because they would have gained a broad degree of understanding about oral health attitudes and behaviours concerning their oral health through prevention.

Objective 2- Attitudes in oral health care

The outcomes for primary care oral health services have shown that areas with higher coverage for dental services are more prone to oral health problems than similar research explored by Silva and Oliveira (2018).

The second objective of our study was to explore the students' attitudes towards dental care. In our research, an area of concern was highlighted when the participants were asked about why they had to visit a dentist, dental therapist or an oral hygienist. Respondent 1037 stated, "To remove a tooth that had causes abscess in my mouth".

However, some could not visit a dental clinic/surgery. Fifteen percent (n=36) indicated that they did not have money to go to a dentist/therapist or a hygienist.

This is supported by a quote from respondent 942 "I cannot afford to pay". This was to be noted because pain and sepsis could hinder students from going about their daily life. As defined and supported through research by (Glick et al., 2016) through the FDI World Dental Federation's definition of oral health, the mouth is a multifaceted and involves the ability to voice, smile, smell, taste, touch, chew, swallow and communicate a spectrum of emotions through painless facial expressions.

Therefore, this status will be realised when there is an absence of conditions involving various mouth structures, such as those that cause potential discomfort, mouth lesions, tooth decay and gum conditions. Previous studies in other populations have confirmed such results (Glick et al., 2016; Petersen, 2009).

Peltzer and Pengpid (2014) conducted a study in developing countries, including SA. The results suggested that oral hygiene education in our country was associated with weak oral health habits. Furthermore; these findings suggest that oral hygiene may not have been adequately incorporated into the secondary education system (Peltzer & Pengpid, 2014). In our study, there were strength findings in toothbrushing rates from the participants.

Dental care is expensive even in high-income environments, averaging five percent of overall health spending and 20% of out-of-pocket health expenditure (Sarpkaya et al., 2018; Ramphoma, 2016).

To add to the above statement Sarpkaya et al., (2018) suggested that the Universal Health Coverage should support activities that would help frame policy dialogue and resolve weak primary oral health programs and resolve high out-of-pocket oral health care costs in SA (Ramphoma, 2016).

Research that is similar to that of our findings in the study was again conducted by Thema and Singh (2013). They cited that dental services should form an important part of general health as early as possible. Additionally, poor oral health care could compromise the functioning of the oral cavity that is needed for mastication (Thema & Singh, 2013). This literature is encouraged and supported in this study.

Furthermore, with regards to objective 2 in our study, our survey results showed that most students know oral health is an aspect of general health and that it influences the everyday life. More than half of the students perceived their oral health as healthy, but only a few realised that the percentage that perceived scaling and polishing as a therapeutic requirement requires a preventive approach to oral health.

A study conducted in Lesotho on oral health knowledge, attitudes and behaviour among nursing staff revealed a good response. Nurses reported having positive attitudes towards oral health and giving oral education to patients and encouraging good oral hygiene practices. It was recommended that more emphasis be placed on training nurses with hands-on clinical training that would include oral examinations and diagnosis of oral diseases in patients and referral of the patient to the relevant person (Walid, Nasir & Naidoo, 2004).

Maintenance of proper oral health relies on implementing habits, such as dental check-ups, toothbrushing frequency, less food and sugar intake, use of dental floss, and other interproximal cleaning techniques. In the prevention of dental caries and periodontal disease, these practices play an essential role as good oral hygiene habits, and the frequent use of dental services has shown efficacy in reducing the prevalence of these diseases and preventing them (Graça et al., 2019). Therefore; oral health programs should not stop at schools but should be reinforced at university through self-care courses.

Objective 3- Oral health care Practices

Oral diseases directly affect everyday activities, such as consuming food, speaking, and swallowing, and have been assessed in many studies using the Life Quality of Oral Health Index and the Index of Impact on Oral Health (Petersen et al., 2007). Objective 3 in this study was to establish the students' practices regarding oral health and hygiene using an online survey questionnaire. As conducted in research by Peltzer and Pengpid (2014), university students who are in a transition phase may be more prone to personal responsibility for oral health behaviours and may be potential role models and leaders in their communities (Peltzer & Pengpid, 2014; Formicola & Bailit, 2012). It is relevant that most of the participants, 80% (n=178) understood that oral health is important to their overall well-being.

The findings of this study suggest that majority 86,7% (n=191) supported the statement that supports brushing twice a day to keep their teeth clean and healthy, as most of the respondents rated their oral health as good and 44.5% (n=98) agreed that oral health is a part of general health. This is supported by research that suggested what university students know about oral health care (Al-Hussaini et al., 2003). The literature further supports the results of our study, cross-sectional research by Azodo et al., (2010) conducted among students again in Nigeria concluded that most students were aware that oral health is an aspect of general health and that it had an effect on the everyday life of a person (Azodo et al., 2010).

Furthermore, this study showed that a high percentage of 69% (n=154) of students brush their teeth more than once a day, although not all participants support this effort fully 29% (n=63). A correlation analysis was done between brushing habits and alcohol intake, and no significant difference was found. It is stated that an individual's self-perception of oral health is determined by oral clinical conditions and the impact of oral health on everyday life (Petersen et al., 2007). With regards to objective 3 in this research; problems with oral health can, in many ways, affect the quality of life. Bad oral health can prevent positive feelings from being expressed by students, influencing their social experiences and how they feel about themselves. Adults' periodontal wellbeing influences their smiling habits and their quality of life linked to smiles. Bad periodontal health can also prevent positive feelings from being

expressed by adults, which may, in turn, influence their self-concept and social interactions (Petersen et al., 2007).

Objective 4 compares results between students in Dental Assisting (DA) and Environmental Health (EH). In our study, out of n=220 participants, 34% (n=75) were from dental assisting and 65.9% (n=145) from Environmental health. The participants could give multiple answers; therefore, the total might not add to 100%. The results indicate more than 30% (n=70) dental students knew what dental plaque was while there was a significant 14% (n=8) from Environmental Health that stated it was dirt on teeth 14% (n=38). The other respondents stated they did not know 37.9% (n=77).

Oral hygiene techniques such as brushing twice day were recorded (36.9%) and flossing (7.5%) have also been identified from DA students. The dental assisting group knew there was a correlation between oral health and general health. These findings could be justified by the pharmacology, oral pathology, dental assisting theory and practical (**Appendix 6**) while a small number from DA and the EH had no idea 70% (n=156). However; only a few participants, 29,4% (n=64) believed that one could get heart diseases from bad oral health from the DA group. The study reveals that higher levels of disagreement imply that respondents consider their breath, teeth, and gums healthy or acceptable than the environmental health group.

Despite the impact that oral health has on general health and the quality of life, it is still one of the most neglected aspects of health (Ramphoma, 2016).

Objective 5 in this study was to establish whether a course focuses on students' oral and general health through a curriculum review.

A study conducted in oral and oral health knowledge and attitude among nursing students, the results revealed that because oral health was not part of the curriculum, students had no interest or knowledge about oral health (Smadi & Nassar, 2016). Additionally, Sabbah et al. (2019) further suggested that oral diseases' possible effect on chronic systemic conditions was further studied later. Periodontal disorders have been related to cardiovascular diseases, high blood pressure, stroke, diabetes, dementia, respiratory diseases and mortality, where an inflammatory mechanism has been shown to name a few (Sabbah et al., 2019).

Another line of research explored the relationship between the number of teeth, serious dental caries, and general health among older people in adults and infants (Sabbah et al., 2019). The study indicated that a dietary pathway was a link between general and oral health (Sabbah et al., 2019). Singh & Pottapinjara (2017) suggested in a study conducted on KAP in undergraduates on oral health self-care.

The respondents agreed and accepted that their experience and oral health self-care activities were affected by the dental undergraduate program (Singh & Pottapinjara, 2017).

No module covers oral and general health for EH students, for DA students; oral and general health is covered in pharmacology, oral pathology, dental assisting theory and practical (**Appendix 6**). Our study noted a marked difference between Dental Assistance and Environmental Health students in the reported oral health knowledge and practices. This could potentially be attributed to the structure of the curriculum. Even though the DA might have a bit of knowledge; more research and more thorough review of this learning process is required to unpack the dynamic realities of understanding health and oral disease systems (Singh & Pottapinjara, 2017).

The study aimed at exploring the students' oral health care methods and thereafter make them aware of measures such as the use of fluoridated toothpaste and application of topical fluoride. Curative measures are available, but the achievement of less dental caries in SA could be through community campaigns and school health programs that are already in place.

In CUT, Free State, this study's results can be used to inform the planning of integrated oral health promotion strategies. Noting that there is a shortage of oral health research at the university, this study's results be a catalyst for more oral health research. Although research recognises that knowledge does not always translate into action, the disparities found in this study may be primarily resolved using community and individual-based oral health education, promotion and prevention strategies and services.

This research has implications for social change because it can provide valuable expertise in designing oral health strategies for the dental clinic staff on campus to cover the students' oral health care needs.

This would also allow students to access oral health information and free dental check-ups, thereby achieving the significant social change objective.

6.3 Limitations

The study participants were drawn from a single place, and therefore the results cannot be generalised to other departments. However, to the researcher's knowledge, no study of such nature has been explored in CUT. This study, with its limitations, can provide insight into students' oral health care knowledge. Further research about oral health care knowledge still needs to be explored in all the university departments. The other limitation in the study was the time constraints and the amount of time it took to get ethical approval, due to Covid-19. Again, in our study, the DMFT index could not be

performed in students due to Covid-19. This would have added to the data collected in the number of carious teeth and general oral hygiene in students.

6.4 Strengths

A subjective indicator of an individual's understanding of his or her oral health is perceived as oral health. The self-perception of oral health by a person is said to be determined by oral clinical conditions and the effect of oral health on everyday life. Taniguchi-Tabata et al., (2017) cited dentists, dental therapists and oral hygienists are effective oral disease prevention sources for the population, therefore; dental clinics may be the most important place for university students to enhance oral health behaviour (Taniguchi-Tabata et al., 2017).

The study aimed to gain data so that the researcher can understand the students' oral health behaviours and thereafter; students could then take responsibility for their oral health behaviours as they are future leaders and role models in the societies (Peltzer & Pengpid, 2014). The Dental Clinic in the University will be able to assess students' knowledge on oral health through the data collected as it will provide the basis to modify the current teaching module to improve the outcomes and treatment services offered to students.

It was also anticipated that the study would be presented to the Dean of the Faculty to influence and introduce a course to first years on dental and general self-care. Lastly, the researcher has submitted an article to be published one in an accredited journal. The study will also be presented at a conference in South Africa.

6.5 Significance of the study

This study's results will be presented to the Dean of the Faculty of Health and Environmental Sciences and the Department of Life Science's Head for review and recommendations. The findings will be published in an accredited journal, and a copy of the thesis will be made available to the participants.

The study results will serve as the Dental Clinic's baseline data in the Life Sciences Department, Central Technology University.

This research has implications for social change because it can provide valuable expertise in designing oral health strategies for the dental clinic staff on campus to cover the students' oral health care needs.

This would also provide students with access to oral health information and free dental check-ups, thereby achieving the significant social change objective. The study aimed at imparting students with

good oral health knowledge, they then can share the knowledge with their family, friends and the community as well.

6.6 Recommendations

The following recommendations were made:

- Promoting oral health and awareness campaigns to inform the students about the importance of oral health and oral health care.
- In order to provide appropriate and relevant data, educational campaigns should be introduced on campus.
- The initial phase of incorporating oral health into general health requires quality training and education for oral health staff, stakeholders and decision-makers to convey significant oral health messages to the population.
- Pamphlets or websites can have online education programmes to encourage students to learn about Oral health.
- Data collected will provide the basis to modify the current teaching module to improve the outcomes. A module about oral and general health care for Environmental Health students is suggested to be added to the first years' curriculum.
- Noting that there is little research done on oral health in CUT, more research on KPA in students needs to be conducted.
- The faculty could use this research as a starting point to better understand the great need for oral hygiene and dental care for university students.

6.7 Conclusion

Oral health is now an important component of general health, and oral health awareness is growing worldwide. The Global Oral Health Program of the World Health Organization has done a lot in the past five years to raise this awareness. This study has generally shown that students have good oral health care behaviour. However, this study's results can be used to form a baseline to other departments in the plight to fight dental caries and promote good oral health care to students.

Within the study's limitations, the findings show that advocacy for oral health promotion is significant for the students. As much as oral health promotion is available in school-health programmes, evidence demonstrating the sustainability and success is questionable. Students in the universities are mostly regarded as role models to the youth, and that is why it is essential to take preventative measures for oral hygiene as early as possible and throughout life in general.

Problems with oral health can affect the quality of life in many ways. What can be noted is that good oral hygiene plays a huge role in nutrition, which equates to a healthy body, a healthy mind, which is what this study aimed at achieving. It was found that the use of other suggested oral hygiene strategies such as dental floss and mouthwash oral health education was important. The study findings indicate that general and oral health would benefit students in Environmental Health programme, as recommended for inclusion in the curriculum syllabus attached (**Appendix 6**) as there is one already in place for dental assisting students.

More emphasis on oral health promotion and preventive measures (such as the use of fluoridated toothpaste and application of topical fluoride) is suggested instead of curative measures. Oral health promotion should be an awareness and should be community-based and must be included in the curriculum for all students with more emphasis on preventative than curative measures. This can be achieved through community campaigns and school health programs already in place in South Africa. Subsequently, it is proposed that oral health education and prevention programmes be established, and they should aim to gain the support of the entire society (leaders, educators, healthcare practitioners, decision-makers) to ensure the effectiveness of the oral health education and promotion programme

The study, therefore, concludes that oral health care knowledge, attitudes and practices are enhanced by education.

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APPENDICES

APPENDIX 1: HUMANITIES AND SOCIAL SCIENCES RESEARCH ETHICS COMMITTEE OF UNIVERSITY OF KWAZULU-NATAL – LETTER OF APPROVAL



09 September 2020

Mrs Feziwe Flora Mbele (200104710)
School of Health Sciences
Westville Campus

Dear Mrs Mbele,

Protocol reference number: HSSREC/00001570/2020

Project title: Knowledge, Attitudes and Practices concerning Oral Health Care among Undergraduate students in the Life Sciences Department at the Central University of Technology, Free State

Degree : Masters

Approval Notification – Expedited Application

This letter serves to notify you that your application received on 19 April 2020 in connection with the above, was reviewed by the Humanities and Social Sciences Research Ethics Committee (HSSREC) and the protocol has been granted FULL APPROVAL

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number. PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

This approval is valid until 10 September 2021.

To ensure uninterrupted approval of this study beyond the approval expiry date, a progress report must be submitted to the Research Office on the appropriate form 2 - 3 months before the expiry date. A close-out report to be submitted when study is finished.

All research conducted during the COVID-19 period must adhere to the national and UKZN guidelines.

HSSREC is registered with the South African National Research Ethics Council (REC-040414-040).

Yours sincerely,

Professor Dipane Hlalele (Chair)

/ms

Humanities & Social Sciences Research Ethics Committee
UKZN Research Ethics Office Westville Campus, Govan Mbeki Building
Postal Address: Private Bag X54001, Durban 4000
Tel: +27 31 260 8350 / 4557 / 3587
Website: <http://research.ukzn.ac.za/Research-Ethics/>

Founding Campuses: ■ Edgewood ■ Howard College ■ Medical School ■ Pietermaritzburg ■ Westville

INSPIRING GREATNESS

APPENDIX 2: GATEKEEPER APPROVAL



FACULTY OF HEALTH AND ENVIRONMENTAL SCIENCES

Dear Mrs F Kokela

RE: PERMISSION TO CONDUCT POSTGRADATE RESEARCH

I have the pleasure informing you that permission has been granted to you to collect data in the Department of Life Sciences, Faculty of Health and Environmental Sciences, Bloemfontein towards your Master's degree for the project entitled Knowledge, attitudes and practices concerning oral health care in undergraduate students in the Life Sciences Department, CUT. This permission is granted due to the Full ethical approval letter received from the University of KwaZulu-Natal HSSREC.

Regards

Dr SJ Nkhebenyane (HOD: Life Science Department, CUT)

A handwritten signature in black ink, appearing to be 'SJ Nkhebenyane'.

.....

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APPENDIX 3: INFORMATION SHEET

Date: September 2020

Dear Sir/Madam

Study title: Knowledge, attitudes and practices concerning oral health care among undergraduate students in the Life Sciences department at the Central University of Technology, Free State.

Overview

I'm a registered master's student with the University of KwaZulu-Natal (UKZN). You are being invited to consider participating in a study that involves research.

The research is being conducted due to reports of high rates of dental caries (tooth decay) in South Africa despite public and private services being available; not only is access a problem but also the knowledge of preventative measures is low.

The study aims at establishing the knowledge and attitudes of the students towards dentistry and to determine if they practice good oral care. It is hoped that with this study the student's attitudes will be impacted with good knowledge, attitudes and practices when it comes to their dental hygiene and that dentistry is not only about extractions but about preventative measures that can help them preserve their teeth throughout their lifetime.

Purpose of the study

Oral disease is health problem of considerable burden which often leads to pain and more significant tooth loss; a condition that affects the appearance, quality of life, nutritional intake. This study will be of great value as it will inform if there is a need to establish a course that focuses on oral and general health for students and will inform the future of the dental clinic on campus. In order to carry out this study and obtain information on knowledge, attitudes and practices about dental practices an online survey with a questionnaire will be used to collect data. The duration of your

participation if you choose to enrol and remain in the study is expected to take 20 minutes of your time.

Participation in this research is voluntary, participants may withdraw participation at any point of participation. The study will not involve any risks and/or discomforts and there will be no incentives or reimbursements for participation in the study, and there will be no costs that might be incurred by participants as a result of participation in the study. No names will be used in the reports of this study. All information collected will be maintained and stored in such a way as to keep it as confidential as possible.

Should you be willing to partake in the study, kindly sign and return the consent form.

The researcher would like to publish the findings of the study in an accredited journal and at local or international congresses. No information about any single participant will be published.

Thank you in advance for your participation. It is highly appreciated

Regards

Feziwe Kokela

Masters student

Junior Lecturer: Dental Assisting program, Department of Life Science. Central University of Technology, Telephone: (051) 507- 3240; cell: 071 1321 920; email:

fkokela@cut.ac.za

Supervisor: Dr R Moodley

Discipline of Dentistry, School of Dentistry, Westville Campus, University of KwaZulu-Natal. Telephone: (031) 260- 8871; Mobile: 084 413 2660; email: moodleyra@ukzn.ac.za

University of KwaZulu-Natal Research office contact details:

Ms. Phumelele Ximba : Research Office, University of KwaZulu-Natal, Westville Campus, Private bag X54001, Durban, 4000, South Africa Telephone: (+27) 31- 260 3587, Fax No. : (+27) 31 260 2384 E-mail: ximbap@ukzn.ac.za

APPENDIX 4: INFORMED CONSENT DOCUMENT

Date: September 2020

Re: Consent to participate in a research project

Study title: Knowledge, attitudes and practices concerning oral health care among undergraduate students in the Life Sciences department at the Central University of Technology, Free State.

I _____ have been informed about the study, I understand the purpose and procedures of the study.

I have been given an opportunity to answer questions about the study and have had answers to my satisfaction.

I declare that my participation in this study is entirely voluntary and that I may withdraw at any time, moreover my information is confidential and will not be shared using my identity.

Thank you for your participation.

Signature of Participant

Date

Feziwe Kokela

Masters Student

Junior Lecturer: Dental Assisting program, Department of Life Science. Central University of Technology, Telephone: (051) 507- 3240; cell: 071 1321 920; email: fkokela@cut.ac.za

Supervisor: Dr R Moodley: Discipline of Dentistry, School of Dentistry, Westville Campus, University of KwaZulu-Natal. Telephone: (031) 260- 8871; Mobile: 084 413 2660; email: moodleyra@ukzn.ac.za

APPENDIX 5: QUESTIONNAIRE – ONLINE STUDY

Dear Participant

You are invited to participate in our survey with the topic: **Knowledge, attitudes and practices concerning oral health care among undergraduate students in the Life Sciences Department at the Central University of Technology, Free State.**

It will take approximately **10 minutes** to complete the questionnaire.

Your participation in this study is completely voluntary. There are no foreseeable risks associated with this project. However, if you feel uncomfortable answering any questions, you can withdraw from the survey at any point. It is very important for us to learn your opinions.

Your survey responses will be strictly confidential and data from this research will be reported only in the aggregate. Your information will be coded and will remain confidential. If you have questions at any time about the survey or the procedures, you may contact the researchers via email at the email addresses specified below.

Ethical approval has been received from the Humanities & Social Science Research Ethics Committee. Protocol Reference Number: **HSSREC/00001570/2020**. The survey will be open for two weeks (2) for you to be able to complete

Thank you very much for your time and support.

If you give consent and agree to participate, please start with the survey now by clicking on the **Next** button below.

Regards

Feziwe Kokela

Department of Life Sciences, Telephone: 051 507 3240 Mobile: 071 1321 920 E-mail: fkokela@cut.ac.za

Supervisor: Dr R Moodley

Discipline of Dentistry, School of Dentistry, Westville Campus, University of KwaZulu-Natal.
Telephone: (031) 260- 8871; Mobile: 084 413 2660; email: moodleyra@ukzn.ac.za

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Research Office, University of KwaZulu-Natal, Westville Campus, Private bag X54001, Durban, 4000, South Africa Telephone: (+27) 31- 260 3587, Fax No. : (+27) 31 260 2384 E-mail: ximbap@ukzn.ac.za

Demographic information – please select correct statement

1. Male		Female		Other	
2. Where are you residing?	At home	On campus	Private residence	Other (specify)	
3. Year of study	Year 1	Year 2	Year 3		
4. Age	16 – 18 years	19 - 21	22-24	Over 24	

Habits

1. Do you smoke	Never	Yes	Only socially
2. How many cigarettes a day?	1-3	4-6	Over 7 None
3. Do you consume alcohol?	Never	Yes	Only socially
4. The number of drinks per week	1 to 3	3 to 6	Over 7 None
5. I love sugar	Yes	No	Sometimes
6. I eat a lot of sweet sugary foods	Most likely	Sometimes	Unlikely
7. How often do I have sugary stuff?	Once a day	Twice a day	More than 3 times a day Never
8. I brush my teeth	Once a day	Twice a day	More than twice a day
9. I floss my teeth	Once a day	Twice a day	Never
10. I rinse my mouth with a mouth rinse	Once a day	Twice a day	Never
11. When do I brush my teeth?	Morning before breakfast and at night before bed	Morning after breakfast and at night before supper	Morning before breakfast, noon after lunch and night before bed
12. Do I have to brush my tongue?	Yes	No	Sometimes
13. What else do I use to clean my mouth?	Mouth rinse	Salt and water	Just water Other

14. How often do I have to replace my toothbrush?	3 months		6 months		Never	
Please rate the following statements:						
	Strongly agree	Agree	Unsure	Disagree	Strongly Disagree	
15. I have bad breath						
16. I have missing teeth						
17. I have bleeding gums						

Knowledge

Please rate the following statements:

Statement	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
1. Smoking has an effect to my gums.					
2. Bleeding gums means there is a problem/ infection in the mouth.					
3. Tooth decay is caused by a combination of bacteria, sugary foods and not cleaning my teeth well.					
4. A medium to soft toothbrush is suitable for brushing.					
5. Brushing teeth twice a day will keep them clean and healthy.					
Please briefly answer the questions below:					
6. What is Plaque?					

7. How can you prevent tooth decay?

8. What happens if you do not clean your mouth?

Attitudes

Please rate the following statements:

Statement	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
1. Taking care of my oral health is important to me					
2. I don't have to worry about my oral health because I wear a mask due to Covid-19.					
3. I should visit the dentist twice a year.					
4. My oral health is my dentist's problem					
5. It is necessary for me to determine what dental treatment I need					
6. I should brush my teeth twice a day.					
7. I can clean my teeth without toothpaste.					
8. I can get heart diseases from bad oral health?					
9. Decayed teeth affect appearance.					

Please answer briefly the questions below:

10. Have you ever visited the dentist, oral hygienist or dental therapist?

11. What was your reason for the visit? If you didn't, why not?

Practices

Please rate the following statements:

Statement	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
1. I brush my teeth at least for 2 minutes					
2. I must brush my tongue as well.					
3. I rinse my mouth often after eating.					
4. There is no reason to visit a dentist twice a year if I have no teeth problems.					
5. At school I was taught about Oral health.					

Please briefly answer the questions below:

6. How can the health of your teeth affect the general health of the body?

7. What do you think is the purpose of cleaning your teeth?

8. What methods do you use to clean your mouth?

APPENDIX 6: CURRICULUM CHECKLIST

Dental knowledge	Targeted course	Targeted course	Main oral health content
	Dental assisting module	Environmental Health	
Understanding the impact of Oral health education	Included	Not included	Dental assisting theory and practical
Oral health conditions	Included	Not included	Oral Pathology
Understanding substance abuse and general health	Included	Not included	Pharmacology
Alcohol use	Included	Not included	Pharmacology
Smoking and oral health		Not included	Pharmacology
Toothbrushing methods	Included	Not included	Dental assisting theory and Practical
Self-care	Not included	Not included	

APPENDIX 7: CORRESPONDENCE WITH THE INTERNATIONAL JOURNAL OF DENTAL HYGIENE

From: [Editorial Office](#)
To: [Rajeshree Moodley](#); fkokela@cut.ac.za
Subject: Submission of Manuscript ID IDH-20-OA-3103 - International Journal of Dental Hygiene
Date: Thursday, 03 December 2020 13:10:06

03-Dec-2020

Dear Dr. Moodley:

You have been listed as (co-)author for the manuscript. If this is not the case, please reply to this email.

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Manuscript ID	IDH-20-OA-3103
Title	Knowledge, attitudes and practices concerning oral health care among undergraduate students in the Life Sciences Department at the Central University of Technology, Free State
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Date Submitted	03-Dec-2020

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