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**KNOWLEDGE, ATTITUDES, AND PRACTICES OF THE TREATMENT OPTIONS
FOR DENTAL CARIES AMONG THE ADULT PATIENTS FOR DENTAL CARIES
IN BUFFALO CITY METROPOLITAN MUNICIPALITY, IN EAST LONDON,
EASTERN CAPE, SOUTH AFRICA**

BY



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REQUIREMENTS FOR THE DEGREE OF MASTERS IN PUBLIC HEALTH (MPH)**

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DATE SUBMITTED : 09/11/2021

DECLARATION

I, Dr. Legy Veleekizhakethil, student number 201813661, do hereby declare that, with the exception of references to other works which I have duly acknowledged, this thesis is my own work and neither in whole nor in part have this work been presented for the award of another degree elsewhere.



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DECLARATIONS ON RESEARCH ETHICS CLEARANCE

I, Dr. Legy Veleekizhakethil, do hereby declare that I am fully aware of the University of Fort Hare's Policy on Research Ethics and I have taken every precaution to comply with the regulations. I have obtained an ethical clearance certificate from the University of Fort Hare's Research Ethics Committee and my reference is REC-100118-054 (APPENDIX 4).

I have also obtained permissions to conduct this research from:

1. Province of Eastern Cape, Department of Health Research Committee, Reference is EC_201910_011 (APPENDIX 5)
2. Buffalo City Metro Health District (APPENDIX 6)
3. Cecilia Makiwane and Frere Hospital Research Ethics Committee, Reference is FCMHREC/A035/2019 (APPENDIX 7)



09/11/2021

Signature of the student

Date

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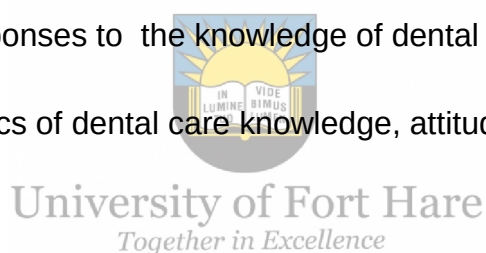
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ACRONYMS

AAP	American Academy of Periodontology
DFS	D- number of decayed teeth surfaces, F- filled/restored surfaces due to dental caries for primary teeth
DMFT	D- number of decayed teeth, M- missing and F- filled/restored for permanent teeth T-total
HBM	Health Belief Model
SES	Socio-economic status
TSL	Tooth surface loss
TW	Tooth wear
WHO	World Health Organisation



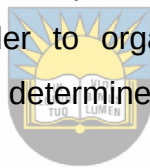
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ABSTRACT

Dentistry offers several caries-preventive measures, some of which emphasise not only patient's responsibility to manage their disease, but also how dental professionals should manage it. Consequently, this study aimed to examine the knowledge, attitudes, and practices of adult patients towards treatment options relating to dental caries in the geographical context of Buffalo City Metropolitan Municipality, situated in the Eastern Cape Province of South Africa.

Purpose

Firstly, this quantitative study set out to assess the existing oral health knowledge, attitudes, and practices among an adult population visiting dental health facilities in Buffalo City Metropolitan Municipality, in East London, Eastern Cape, South Africa. Secondly, it aimed to examine the prevalence of dental caries, periodontal diseases and tooth associated diseases in this specific setting. Furthermore, the study sought to provide baseline data in order to organise a successful dental prevention programme. The data obtained will determine the layout of policies to be put forward to the Department of Health.



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Methodology

The researcher took a quantitative approach and conducted descriptive surveys from November 2019 to March 2020. A close-ended, structured questionnaire for data collection was designed based on the aspects of knowledge, attitudes, practices and behaviour pertaining to the area of dental caries. A clinical examination of dental status was performed using dental probes, dental mirrors and tooth air-drying. All decay, and missing, filled or restored teeth due to dental caries, along with the presence of calculus, gingival, and periodontal lesions were recorded.

Results

Participants had an average knowledge score of 80% with a 95% confidence interval of (76%; 84%). The majority knew the importance of cleaning their teeth (88.9%), were aware of the effects of sugary diets (80.7%), avoided sugary foods (64.6%), and lastly were aware of the causes of dental caries (71.3%). However it is concerning that most had never visited a dentist, as reflected by 69.1% of participants agreeing or strongly

agreeing. At least 70% of those who responded were satisfied with their dentists in that they (the dentists) freely share ideas and opinions and provide advice on options for dental care. The study revealed a high prevalence of dental caries with a ratio of 6.23.

Conclusions

The majority of the participants affirmed the importance of visiting the dentist for a routine dental examination. In addition, the majority are aware that sugary diets are associated with dental caries. However, there is a high prevalence of dental caries among participants in this setting. Therefore, dentists should provide preventive measures, along with professional restorative and plaque removal ,to curb the burden of dental caries and periodontal diseases. The type and extent of preventive measures must be adjusted according to the patient's individual needs. Dental health professionals must collaborate with other health-care providers to promote preventive dental health.

Keywords: Dental caries, periodontal diseases, attrition, abrasion, erosion, descriptive, quantitative



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CHAPTER 1: INTRODUCTION

1.1 Introduction and background

Dental caries, better known as ‘tooth decay’, remain a major but neglected public health concern, both globally and in South Africa. This term refers to a chronic bacterial, infectious oral disease caused by acid-producing Mutants-*Streptococci* and *Lactobacilli* bacteria. While a nationwide South African survey conducted between 1999 and 2000 further proved that this country is not immune to this problem (Van Wyk, Louw & du Plessis, 2000), prevention programmes related to this problem are not given priority they deserve in the Eastern Cape Province. In addition, research has shown that roughly 84-90% of this specific population depend on public oral health services. However, it was noted in 2009 that only a quarter of South African dentists are employed by the public sector (Ramphoma, 2016).

Although the most common oral diseases, such as dental caries and periodontal disease are preventable, they still affect the quality of life of individuals of all ages. This may be due to fact that the majority of the population does not have access to oral health services. Oral health is integral to general health; poor oral health affects the well-being of individuals since it may cause both pain and disability. It affects the individual’s ability to speak, eat, and carry out daily activities. Domestically, the rate of caries prevalence is stable or decreasing, although there are differences along ethnic and socio-economic lines, and significant access-to-care issues (Wong, Dugoni & Subar, 2017).

Recent research by Molete has indicated that dental caries is associated with poor school performance among children (Molete, 2018). In South Africa specifically, over 60% of primary school children suffer from dental decay. An even more concerning fact is that over 80% of these children remain untreated due to the overburdened oral health system and poor health-seeking behaviour (Molete, 2018). In terms of the elderly residing in Johannesburg, the prevalence of missing teeth stand at 85%, while approximately 33% of these people are edentulous [lacking teeth] and in need of dentures [removal artificial teeth] (Molete, 2018).

According to previous studies there is a direct link between patients’ oral health status of patients and their socio-economic and education status (Maupomé, 2013; Oral

Health, 2014; Pahel, Rozier, Stearnes, & Quiñonez, 2011; White, 2012). Impoverished individuals and families have poorer oral health and decreased access to dental care than those from more affluent and educated backgrounds. Additionally, such persons, namely those lacking dental coverage are less likely to receive dental care they need. (Lida & Rozier, 2013; Isong, Dantas, Gerard, & Kuhlthau, 2015; Isong, Zuckerman, Rao, Kuhlthau, Winickoff, & Perrin, 2010). Furthermore, the numbers are compounded by several issues, including a lack of knowledge, a prevalence of bad attitudes and improper oral health practices since such individuals lack not only access to health centres but also the resources related to preventive oral services. Consequently, the researcher chose to examine the knowledge, attitudes, and practices of adult patients in selected health facilities in Buffalo City Metropolitan Municipality to address this social problem.

Despite large-scale efforts by both governments and private sectors including companies promoting oral hygiene, the majority of the world's population still suffers from the above-mentioned oral diseases, which are the main causes of tooth loss (Marcenes, 2013). More specifically, although dental caries, are preventable, they are still the most prevalent oral condition that detrimentally affects diverse demographic groups; subsequently they have an enormous impact on public health, in terms of oral and systemic health, social well-being, individuals' incomes and health-care systems (Al-Ansari, 2016).

One of the primary focuses of oral disease prevention – includes the implementation of population-level interventions tackling life-long social determinants of oral health, alongside targeted treatment-focused interventions. This approach may well prove to be the way forward in reducing the high prevalence of oral diseases. In addition, implementing such preventative measures may prevent financial burdens in future by addressing the current overall population with unmet normative demand for dental care (Kassebaum, Smith & Bernabé, 2015).

1.2 Statement of the problem

As previously established, research has indicated that dental caries is the major cause of tooth loss and remains a silent ailment among the general population on both a local and international scale. In fact, according to research tooth decay is one of the

significant and costly diseases in the world (Listl, Galloway & Mossey,2015). In light of this, strategies to reduce the risk of dental caries are vital and include the decrease of the growth or activity of oral bacteria, especially *streptococcus mutans*. However, prevention programmes are not given the priority they deserve in rural areas of Eastern Cape Province (Ncube, 2006).

The real disease burden of dental caries is the number of unmet needs of the population and untreated teeth. The prevalence of untreated decay in children, adolescents and adults aged 20 to 64 years is high (Heng,2016). Due to limited infrastructure and, resources coupled with a shortage of trained oral health-care providers in the public sector accessing oral health-care is difficult. Furthermore the South African oral health- care system, faces ongoing challenges in terms of access to and utilisation of public sector oral health-care, with little or no restorative or preventive care (Lambert, Yu, Orrell & Haberer,2019).

Nonetheless, extensive research has established that dental care, prevents oral diseases (Isong, Zuckerman, Rao, Kuhlthau, Winickoff, & Perrin, 2010; Maupomé, 2013; Oral Health, 2014). Subsequently, in order to make available and accessible, relevant and effective policies and guidelines can be made available to promote and prevent dental caries the prevalence of such diseases must be taken into account. However, at present, there are few to no effective evidence-based policy decisions being made to reduce the prevalence of dental caries and minimise the resulting social and health-care costs in South Africa (Truman, Gooch, Sulemana, Gift, Horowitz, Evans, Griffin, & Carande-Kulis 2002). Furthermore, most published and reviewed research pertains specifically to the prevalence of caries among preschool and school children and few other population groups in South Africa. In order to address this gap in the literature the researcher aimed to investigate the extent of knowledge, attitudes, and practices of adult patients about dental caries in selected health facilities in the Buffalo City Metropolitan Municipality.

1.3 Purpose of the study

As mentioned above the purpose of this study was to determine the knowledge, attitudes, and practices of patients about dental caries in selected health facilities in

the Buffalo City Metropolitan Municipality in order to address the prevalence of dental caries.

1.4 Research questions

In order to glean insight into this particular issue, the study sought to find answers to three fundamental questions, namely:

- Firstly, do patients with dental caries in Buffalo City Metropolitan Municipality have sufficient knowledge of oral health-care?
- Secondly, what are the above-mentioned patient's attitudes towards oral health-care?
- Lastly, which oral health practices do these patients undertake, specifically within the context of the Buffalo City Metropolitan Municipality?

1.5 Objectives

This study's objectives were threefold, namely to :

- firstly, examine the oral health knowledge of the patients with dental caries;
- secondly, examine the attitudes of patients with dental caries towards oral health; and,
- thirdly to identify oral health practices among patients with dental caries in selected health facilities.

1.6 Significance of the study

This study seeks to empower dental service providers with knowledge and skills for dental preventive care for them to offer quality service delivery. The results aim to equip community members with the necessary knowledge, behaviour and skills for the prevention of dental caries. The findings obtained aim to assist policy and programme planners to implement effective preventive and restorative dental services. Furthermore, the data collected can be used by the Eastern Cape Department of Health to plan oral health services. Lastly, the results and recommendations of this

study aim to help dental service providers in making decisions on preventive strategies.

1.7 Definition of terms

Dental caries: According to Sturdevant (2015), dental caries is defined as a multifactorial, transmissible, infectious, oral disease caused primarily by the complex interaction of cariogenic flora (biofilm) with fermentable dietary carbohydrates on the tooth.

Periodontal diseases: According to the American Academy of Periodontology, periodontal disease is an inflammatory disease that affects soft and hard structures that support the teeth.

Attrition: Attrition is defined as the wear process of the tooth tissue by direct tooth-to-tooth contact (Davies *et al.*, 2002; Chu *et al.*, 2002; Addy and Shellis, 2006; O'Sullivan *et al.*, 2013).

Abrasion: Abrasion is a type of TSL that is caused by the sliding or rubbing of abrasive external objects against the tooth surfaces (Addy & Shellis, 2006).

Dental erosion: Dental erosion is commonly defined as the termination of dental hard tissue caused by non-bacteriogenic acids (Meurman & Cate, 1996; Addy & Shellis, 2006).

1.8 Delimitations of the study

Dependent variables using (decayed, missing, filled teeth) DMFT index, were constructed for determining the extent and presence of untreated dental caries. The study focused only on patients that were attending dental clinics and hospitals in the Buffalo City Metropolitan Municipality and the rest of the population were excluded. Questionnaires were used to determine the knowledge, attitudes, and practices for dental caries among relevant adults who attended.

1.9 Chapter layout

The study is laid out as follows

Chapter 1: Overview of the study. This chapter provides the introduction and background of the study. It also outlines the study's research problem, objectives and research questions. The significance of the study and the study framework that guides this study is highlighted and the key concepts are defined.

Chapter 2: Literature review. The second chapter provides detailed literature on the factors that play a role in the development of dental caries and their complications. It then provides the desired health promotion and prevention of dental caries. The literature emphasises the importance of oral health as an integral part of an individual's general health. As indicated it also includes a literature review on the prevalence of dental caries in the world, sub-Saharan Africa, and South Africa, respectively.

Chapter 3: Methodology. This chapter describes the research methodology applied by this study. The methodological aspects used were quantitative and descriptive. Moreover, it discusses the overall research design, setting, population, sampling method and size, and pilot study. The validity and reliability of the research instrument are highlighted. Next the tools used to collect the data are outlined and the collection process is described followed by applying ethical principles to undertake data analysis.

Chapter 4: Research findings, presentation, interpretation and analysis. This chapter presents and analyses the empirical research findings. Furthermore it interprets its findings according to its research objectives based on responses from participants and integrated with the previously reviewed literature.

Chapter 5: This chapter presents a discussion of the findings, conclusions and recommendations and a summary for future studies and research.

1.10 Summary

In this chapter, the researcher identified the topic to be researched and introduced the background information. The objectives of the study were presented as follows to describe the knowledge and awareness of dental caries in Buffalo City Metropolitan Municipality and make appropriate recommendations based on the findings of the study. Finally, the study's research methodology and design were outlined.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

As previously indicated, this chapter will present a literature review which can be defined as a summation of scholarly works in the form of scholarly articles, books, and other academic sources to provide answers to a particular question of scientific interest (Burns & Grove, 2005: 93-95). It provides detailed literature on the factors that play a role in the development of dental caries and their complications; furthermore, it provides the desired health promotion and prevention strategies concerning dental caries. Relevant literature is discussed under the following topics: knowledge, attitudes, and practices; dental caries and periodontal disorders; oral health education, oral health promotion, the prevalence of dental caries globally and in Africa, and finally, the financial implications of dental caries treatment. The literature discussed was obtained from various journals and research papers on dental caries and oral health promotion.



2.2 Knowledge, attitudes, and practices

In a study conducted in Bangladesh, 48% of the participants reported irregular dental attendance and this finding is consistent with the findings of similar studies by Haque (Haque, Rahman, Itsuko, Mutahara, Kayako & Tsutsumi, 2016). The positive effect of school-based oral health education of preventing untreated dental caries and increasing the necessary dental knowledge, improving attitudes to, and practices of dental issues among children and adolescents was emphasised (Haque *et al.*, 2016). The study found that 77% of the participants were aware of the importance of regular dental attendance indicating that it is where they receive most of the information regarding dental care (Al-Hussainia, Al-Kandaria, Hamadia, Al-Mutawaa & Honkalab, 2003). Another recent study deduced that females with healthy lifestyles were found to have better oral habits (Elagra, Alzaid, Alsabeh, Altoub & Binhowaimel, 2020).

A high proportion of the subjects did not attend or disliked visiting dentists due to their fear of the needles (34%) or pain (38%) (Vigild, Petersen & Hadi 1999). Oral disease has a slow path that can be detected on time by the dentist, hence, educating the subjects about dental caries in this regard is vital (Haque *et al.*, 2016).

According to research by Jain, *et al.* (2012), the lack of knowledge and awareness about the crucial role of regular dental check-ups to prevent and detect dental diseases is another educational gap in terms of an impoverished population affected by inferior socio-economic conditions. A general lack of awareness seems to be the root cause of containing bad oral hygiene practices in this population. Subsequently, dentists are responsible for educating and encouraging people to visit them regularly, while the laborious task of spreading this awareness among the general masses will have to be achieved by utilising various outreach programmes and relevant public health measures though general masses will have to be achieved by various outreach programmes and relevant public health measures through different mediums, such as Print/Press Media, Audio/Radio/Television, Internet, and organising social activities (Jain, Mitra, Ashok, Dundappa, Soni & Ahmed, 2012).

Moreover, it should be understood that an irregular attendance pattern is highly associated with a certain level of dental anxiety, while dental anxiety is highly associated with having a previous badly perceived experience as well as a low level of education (Shah, Roslan, Zamansari, Rahimi, Ali, Rani, Mohd-Dom & Mohd-Said, 2020).



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2.3 Dental caries and periodontal disorders

Dental caries or ‘tooth decay’ as it is colloquially known, is a microbiologic disease that affects the oral cavity both locally and, in extreme cases, systemically that involves a process of rapidly alternating periods of tooth demineralisation and remineralisation over some time (Neel, 2016). This process includes interactions between tooth structure, the microbial biofilm formed on the tooth surface and sugars, as well as salivary and genetic influences (Department of Health and Human Services, Rockville Oral Health America, 2000). The knowledge of the risk factors towards dental caries affects the patient’s attitudes towards oral health-care ((Molete, Igumbor, Stewart & Yengopal, 2019).

For optimal care of teeth, the maintenance of mineral homeostasis in the mouth is necessary. Saliva is essential as it provides the minerals for remineralisation and also maintains beneficial oral microbiota by providing an optimal pH for their growth and metabolism. These microbiota consist of a diverse array of micro-organisms such as

bacteria, yeasts, viruses, mycoplasma and protozoa which repel invading microbial pathogens and thus contribute to the host's defences (Kilian, Chapple, Hannig, Marsh, Meuric & Pedersen, 2016). Dental plaque is an example of a biofilm and consists of oral microbiota that grows on tooth surfaces.

Periodontal disease is a disease of periodontal tissues that results in attachment loss and destruction of alveolar bone. The healthy periodontium is clinically visible as gingival tissues. Healthy gingival tissues are described as being stippled, pale pink, or oral pink, with various degrees of pigmentation (Daniel, Ho, Razvan, Luis, Herrera, Nikola, Rade & Paravina, 2015).

The gingival margin has a scalloped edge configuration highest interdentally, where it constitutes the interdental papilla and lowest buccally and lingually and is located at the cemento-enamel junction of the tooth. A gingival crevice is present where it abuts the tooth which in health is 1–3mm deep. The attached gingiva starts from the most apical extent of the free gingiva to the mucogingival junction which varies in width from 1 to 9mm. It has a stippled surface (Deepa, Visakan, Gomathy & Amarnath, 2014).

Periodontitis is diagnosed by the presence of gingival changes characterised by the presence of reduced resistance of the tissues to periodontal probing with a deeper gingival sulcus or “pocket” which reflects the loss of periodontal attachment. The detection of attachment loss in furcations demands a sound knowledge of tooth and furcation anatomy, particularly the sites of the furcation openings on multi-rooted teeth. Departures from this concept of the healthy periodontium may suggest the presence of disease (Gouri, Ashish, Manish, & Sameer, 2015).

The clinical findings for periodontitis are tooth mobility and bleeding upon probing

- **Tooth mobility and migration**

Mobility and migration solely related to periodontitis are usually late symptoms of the disease and are of more importance in assessing prognosis and in treatment planning (Preshaw, 2015).

- **Bleeding on probing**

Bleeding on probing is used by clinicians as an indicator of periodontal disease. Suppuration has a high specificity for further disease progression in populations with a high prevalence of periodontitis (Highfield, 2009).

2.4 Tooth surface loss

Tooth surface loss (TSL) or tooth wear (TW) is an irrevocable loss of hard tooth structure caused by influences other than those answerable for dental caries and is observed clinically as attrition, abrasion, abfraction, and erosion. It may be associated with symptoms such as tooth hypersensitivity and function impairment and may lead to a change in the morphology of the affected tooth (Abdulhadi, Eyas, Mohammad, Ghanim & Ali Ashawish, 2019).

2.4.1 Attrition is defined as the wear process of the tooth tissue by direct tooth-to-tooth contact (Davies *et al.*, 2002; Chu *et al.*, 2002; Addy and Shellis, 2006; O'Sullivan *et al.*, 2013). It is usually seen as well-defined wear facets on the surfaces of teeth in one jaw which matches corresponding facets on opposing teeth in the other jaw. Attrition can be seen on cusps and guiding surfaces during empty-mouth grinding movements as in para-functional habits (i.e., bruxism). When the cause of attrition is lively, the TW is typically seen as shiny and definite facets (Kaidonis, 2008)

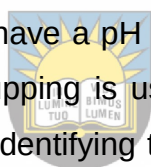
2.4.2 Abrasion is a type of TSL that is caused by the sliding or rubbing of abrasive external objects against the tooth surfaces (Addy & Shellis, 2006). Several factors are reported to cause such TSL. These factors include the use of abrasive toothpaste, hard bristles, and vigorous brushing technique (Litonjua, 2005). It may also be caused by the use of toothpicks (Warretha, Abuhijleh, Almaghribi, Mahwal, & Ashawish, 2020).

2.4.3 Dental erosion is commonly defined as the termination of dental hard tissue caused by non-bacteriogenic acids (Meurman & Cate, 1996; Addy & Shellis, 2006). The relentless damage caused by erosion is dependent on factors such as the type, concentration, and temperature of the acid and the period of contact with the tooth surfaces (West, 2000). Other influences that may come into play include the potential of Hydrogen (pH), titratable acidity, ion concentrations, and frequency and method of exposure (Barbour & Rees, 2006). The manner in which TSL lesions are distributed and the extent of their severity is dependent on how the acidic materials came into contact with the tooth surface from erosion being caused by gastro-

oesophageal regurgitation disorder (GERD). This occurs at the palatal aspect of the upper anterior teeth; despite the location, the lower posterior teeth are not affected as the tongue protects them. The teeth begin to erode when acidic drinks are excessively consumed and there is a prolonged activity of holding and swishing the acidic liquid in the mouth; the labial aspects of tooth surface are more likely to be affected first (Johansson, 2004). The softening of the tooth surface by acidic materials commonly identifies the onsets of erosion. When tooth enamel is exposed to acid, it loses minerals from its superficial layer, which extends to a depth of a few microns. The thickness of this softened layer ranges from 0.02 to 3 μm (Lussi, 2011). At the point of attack, the acid causes the softening process to continue; thereafter, the most superficial layer follows, and it is entirely lost (Barbour & Rees, 2006). The critical pH at which enamel becomes susceptible to erosion is estimated to be 5.5. Therefore, when an acidic material whose pH is at or below this level comes into contact with enamel often and for a prolonged time, enamel erosion occurs (Meurman & ten Cate, 1996). Erosion can be caused by both intrinsic and/or extrinsic acids and altered by changes in salivary flow and its related components. Intrinsic acid is gastric acid, which travels from the abdomen into the oesophagus and reaches the mouth as a result of regurgitation (gastric reflux), vomiting, or rumination (O'Sullivan, 2013). The pH of gastric juice is very low (Meurman & ten Cate, 1996) and contains hydrochloric acid and low concentrations of calcium and phosphate (Dawes, 2003). It has been reported that 64% of patients with palatal erosion had gastro-oesophageal regurgitation disorder (GERD) (Bartlett, 1996), which characterises a retrograde flow of gastric juice and/or duodenal contents into the distal oesophagus. However, it has also been stated that 30% of patients who presented with palatal erosions had no indications of GERD (Bartlett, 1996). Nonetheless, these patients are thought to be silent refluxers. Therefore, GERD should be considered as a cause of erosion in patients with indigestion, heartburn, or epigastric pain. Additionally, chronic coughing, asthma-like symptoms, and laryngitis may also be associated with GERD. Factors such as alcoholism-induced gastritis and hiatus hernia may also cause acid regurgitation and lead to erosion. In addition to these factors, conditions such as pregnancy and obesity which may cause an increase in gastric pressure, may, in turn, result in acid reflux and tooth erosion (Levrini, 2014).

Furthermore, such erosion is also related to frequent vomiting whether spontaneous or self-induced. While spontaneous vomiting may be a sign of an underlying medical condition, self-induced vomiting is collective among patients with eating disorders such as bulimia.

Conversely, extrinsic acids are found in foods such as wine, carbonated or fizzy drinks, citrus fruit and fruit juice. They may also be found in certain medicines, off-gases in the form of vaporised sulphuric acids from batteries, energy drinks, and swimming pools with poorly buffered chlorine sterilisation (Zebraskas, 2014). Abridged salivary flow following surgical removal of one or more major salivary glands, Sjögren's syndrome, drug intake (e.g., antidepressants, sedatives, tranquillisers), or radiotherapy in the head and neck area also affects a patient to dental erosion. Alcohol itself is erosive, although less so than acids; but ingesting it may encourage gastric acid reflux. Therefore, erosion related to alcohol ingestion may be activated by a combination of extrinsic (alcohol) and intrinsic acid sources (gastric acid) (O'Sullivan, 2013). Additionally, some mouthwashes have a pH below 5.5, which may also cause tooth erosion (Claffey, 2003). Since, cupping is usually deeper in cases of erosion than those of abrasion, this may aid in identifying the cause of TSL and, consequently, in diagnosis (Kaidonis, 2008).



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2.5 Oral health education

According to Priya and Harikiran (2013), oral health education is one of the most effective ways of refining the knowledge, attitude, and practice of oral health and of reducing plaque, bleeding on probing of the gingiva and caries increment. The need for such measures by dentists and any other oral health caregivers is vital to reduce instances of dental caries (Sonoda *et al.*, 2017) ;(Vignesh, Jessy & Jain, 2021). The importance of brushing teeth, a fundamental self-care behaviour, is the most common advice given concerning oral health hygiene, consistent with some previous studies (Holmes, 2016). The brushing and flossing of teeth lead to the removal of plaque and thus prevents dental caries (Gil *et al.*, 2015). In contrast improper and infrequent brushing methods leads to a greater risk of new carious lesions (Borgnakke & Brignardello-Peterson, 2017). Other studies have also deduced similar findings and stressed the same results (Tinaoff, 2017); For the maintenance of proper oral hygiene and reduction of dental caries and associated periodontal diseases, brushing at least

twice a day is necessary (Manz *et al.*,2019). Toothpastes containing fluoride are also necessary for decreasing the incidence of dental caries (Panchal, Jeevanandan & Subramanian, 2019), (Benson *et al.*, 2019). However, the increased frequency of brushing is irrelevant if there is a distinct lack of knowledge, and practice of the proper methods (Jeevanandan & Govindraju,2018). Studies on oral health education indicate that carious prevention is effective when undertaken along with oral prophylaxis, in the form of instructions, delivering written works of literature, demonstrations, and videos to educate the participants (Priya & Harikiran, 2013). Thus the knowledge of proper and healthy oral health practices must be instilled in patients, especially the brushing of their teeth (Dos Santos, de Oliveira & Nadanovsky,2018). To effectively educate patients [parents, children, teachers etc.], they must be provided with the information they require to make informed choices pertaining to lifestyle, healthy eating habits and options of professional services. The provision of educational materials including teacher's manuals, student handbooks, oral health education videos, and posters are useful for educating the public (Chen, Gao, Duangthip, Manlo & Chu,2019). The main message health-care providers should give patients is to comply with a prescribed self-maintained oral health-care regime (Priya & Harikiran, 2013). In addition to knowledge,however,patients' attitudes and behaviour towards self and oral care should be modified (Al Sadhan, Darwish, Al-Harbi, Al-Azman & Al-Anazi,2016). Other prevailing oral conditions such as oral cancer can be prevented and controlled by public education and motivation to a significant level through anti-tobacco campaigns (Gambhir & Gupta,2016). In the case of children, the dentists should inform parents about preventive procedures such as pit and fissure sealants and fluoride applications, regular dental visits, and other oral hygiene measures (Ahovuo-Saloranta *et al.*, 2013.). Dental sealants aim to prevent bacterial growth that promotes tooth decay in the grooves of back teeth. They are very effective in preventing caries mainly in children,and adolescents. (Saloranta, Forss, Walsh, Nordblad, Mäkelä & Worthington,2017).

The Health Belief Model (HBM), Locus of Control, Self-Efficacy, Stages of Change, and Reasoned Action theories are those most often associated with oral health (Shwetha, Rohini, Kadambari, Mrinal, Vishwas & Gaurav, 2016). Furthermore there are also economic considerations concerning oral health-care such as food consumption patterns; oral hygiene; income; education (Williams,1987); dental care-

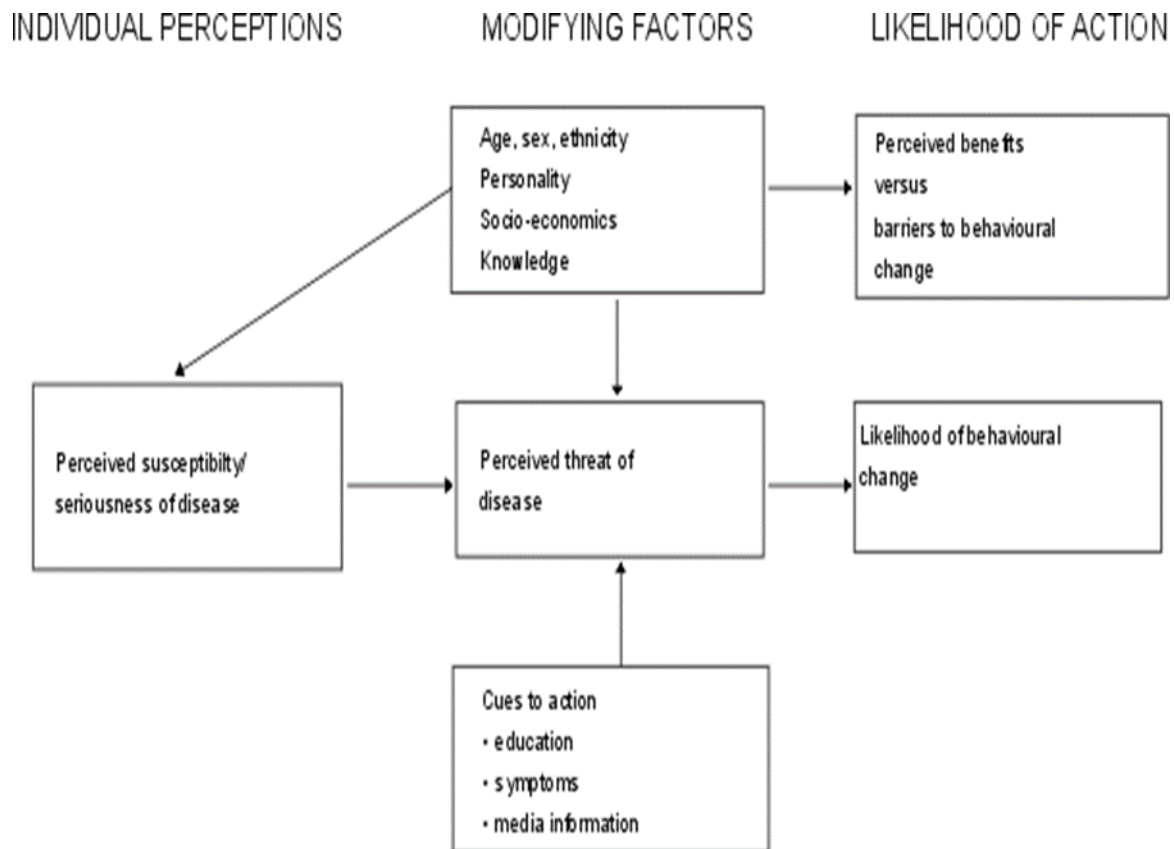
seeking behaviour; and barriers to access (price, time, psychological, and level of formal education). Research has shown that patients in underdeveloped countries had poor oral health beliefs and practices (Mamai-Homata *et al.*, 2016, Kateeb, 2012, Singh *et al.*, 2014, Fukai *et al.*, 1999, Al-Omari and Hamasha, 2005). Oral health education against frequent consumption of sugared snacks and drinks is an absolute necessity (Kutesa, Kasangaki, Nkamba, Muwazi, Okullo & Rwenyonyi, 2015).

The Sense of Coherence theory, introduced in the 1970s, is a theory that has recently been applied to oral health since chronic oral diseases such as dental caries and periodontitis are not only related to biological factors but may also be influenced by non-biological factors such as oral health behaviours and psychosocial and environmental factors. Socio-economic inequalities and social gradients exist in oral health in most countries (Sanders, 2006). The International Centre for Oral Health Inequalities Research and Policy (ICOHIRP) formed in 2013, is committed to tackling oral health inequalities both within and between countries; consequently, academics and policymakers from 15 countries have formed a global network to explore the nature of oral health inequalities and to inform policy recommendations. A large systematic review of the connections between socio-economic (SES) characteristics and dental caries in adults indicates that the data for social gradients were consistent across various indicators, including the level of education, income, occupation, social class, and measures of area-level socio-economic status (Costa, 2012). A commonly held perception is that there is no need for routine dental visits and that dentists offer a more clinical approach and attend only to patients' needs rather than provide a combination of prevention and clinical care. Therefore, health professionals must create awareness of the importance of oral hygiene. Research has further indicated that psychosocial and psychological characteristics of patients also influence their adherence to oral hygiene instructions (Oberoi, Mohanty, Mahajan & Oberoi, 2014). The theory has also been considered as a psychosocial determinant of oral health behaviours in adults, thus people who have a stronger SOC are more likely to attend regular dental check-ups, clean their teeth more often, and have healthier dietary habits compared to their counterparts with lower levels of SOC. By promoting salutary factors such as population ones, including levels of education, safe working and housing conditions and supportive public policies within communities, would ensure better oral health outcomes too. The active contribution of local communities in the

growth, planning and implementation of interventions is therefore critical and their active involvement in local health issues can stimulate a sense of belonging and community spirit and thereby increasing social capital within a particular community (Watt & Munksgaard, 2002). The theory of planned behaviour (TPB) created the platform by which to understand how adult patients' knowledge, attitudes and practices would inform their actual behaviour towards oral health (Christina & Seth, 2012).

The Health Belief Model is limited since supplying information alone is usually not enough to change health behaviours outcomes. The Transtheoretical Model and Stages of Change developed by Prochaska, Norcross, and DiClemente are other stage theories that measure an individual's readiness to adopt a new healthy behaviour which could prove useful (Shwetha, Patil, Ambildhok, Limaye, Vishwas Kadam & Patel, 2015).

The theoretical framework that underpins this study is the HBM since it can be used to explain why patients do not prevent dental caries from occurring as well as why those suffering from dental caries failed to visit the dentist. This theory is based on the threefold assumption that a person will take a health-related action if that he/she/they feel/s or believes that a negative health condition can be avoided (dental caries), if that person has a positive expectation that by taking a recommended action (regular mouth and dental care), will assist him/her/them to avoid a negative health condition (dental caries and removal of teeth); lastly, believes that he/she/they can successfully take a recommended health action (dental care and hygiene) (Glanz, Lewis & Rimer, 2002)



Source: Glanz, Lewis & Rimer (2002:52)

Figure 1: The six concepts of the Health Belief Model

The above-mentioned modules incorporate six concepts that can be applied to this study namely: perceived susceptibility, perceived barriers, benefits, perceived cost, efficiency, and cues to action. These six terms can be defined as follows

Individual perceptions: Individual perceptions include the following variables: Perceived susceptibility, perceived severity, perceived benefits, and perceived barriers.

Perceived severity: This indicates an individual's belief about the seriousness or severity of the disease toothache other complications

Perceived threat: When the perception of susceptibility to a disease is combined with an appropriate level of seriousness with which the disease is viewed, the perceived threat to the disease such as toothache, and subsequently rheumatic heart disease in some conditions.

Perceived barriers: This is an individual's evaluation of the obstacles in the way of him or her adopting a new behaviour (Karimy, Azarpira & Araban 2017; Glanz, Rimer & Viswanath, 2008).

Modifying factors that modify a person's perceptions include :

demographic variables such as age, gender, marital status, and ethnicity

Cues to action: Cues to action are events, people or things that move people to change behaviour like regular brushing of teeth.

Likelihood of action: This is the behaviour adopted to reduce the threat based on the perceived benefits and barriers of the behavioural change for example paying regular visits to the dentist will mean less invasive treatments in the long run.

Perceived benefits of the action: This is a person's opinion of the value or usefulness of adopting a new behaviour (such as maintaining good dental and mouth hygiene) to decrease the risk of developing the disease or alleviating the existing symptoms. The perceived benefits and barriers of a behavioural change for example to achieve a disease-free mouth with healthy teeth and gums (Glanz, Lewis & Rimer, 2002).

According to the Theory of Reasoned Action, which stresses the importance of attitudes and intentions in changing a behaviour, the most important determinant is intention (Hagger, 2019). It postulates that people make rational decisions based on their knowledge, personal values, practices, and attitudes and very few actions that produce a healthy outcome, such as, healthy teeth and periodontium, happen without ample knowledge and full intention to practice the healthy behaviour. Therefore, a person's intent to perform a certain action is the most immediate and relevant predictor of whether he/she will conduct the intended action (Hagger, 2019).

Two cognitive processes that are at work to develop healthy behaviours are, firstly, the belief about what is an individual's significance to others thinks and secondly personal motivation. Extraneous factors outside of the individual's control, such as fatigue or change of environment, may quickly change intentions, and may therefore change behaviours and outcomes (Hollister & Anema, 2004).

In the light of the above direct actions aimed at a behavioural change in terms of oral health practices among participants are necessary. This can be done by implementing

oral health-related educational and preventive programmes on the topics of oral hygiene and self-care, particularly aimed at communities in rural areas with poor socio-economic statuses. This means that the involvement of the dental profession is key to alleviate the severity of dental caries by using a population-focused prevention programme based on evidence .

2.6 Oral health promotion

According to Honkala (1993), oral health campaigns focuses either on ways to preclude oral health disease before it occurs or on ways to reduce the impact of oral health disease through a range of strategies or community-based initiatives that aim to improve and maintain the population's oral health. Oral health promotion, with its core ideas of equity and equality, empowerment, and advocacy, provides a novel though the complex approach to improving oral health. It shifts the responsibility for the oral health-care system to individuals, communities, and decision-makers at all levels of society. Preventive programmes and facilities represent sound speculation in the health of the nation and lessen future restorative oral health-care expenses. Recall intervals and recall need integration for patients was stressed and important according to the patient caries risk (Patel, Bay & Glick, 2010; Patrick et al., 2020) .This highlights the fact that dentists can accurately assess patients' risk of oral health problems and allocate an appropriate recall interval based on this risk assessment (Fee, Richards & Clarkson, 2020). Community dental clinics are highly dedicated to delivering meaningful and accessible oral health promotion. Some initiatives that have been undertaken can be listed as follows:

- To increase awareness of prevention and early intervention of dental caries and periodontal disease.
- To educate parents and caregivers through oral health promotion information sessions at schools and clinics.
- To provide training for staff such as dental hygienists and other dental auxiliaries to enhance their knowledge and skills in oral health promotion and ensure that the community is given standardised messages that include topics in the sessions, including how to care for your teeth, maintaining a healthy mouth, diet tips, common

oral disease, denture care, access to clinical services, and commitment in oral health improvement and research.

- Mobile and portable dental services may offer a viable option to address the issues of oral health-care delivery to extensive and underserved population in developing countries with scarce resources (Gambhir & Gupta, 2016).

The World Health Organisation (WHO, 2007; WHA60,17) encourages the building of healthy populations involving all communities by combating every possible illness and thus has recommended a strategic framework focusing on and guided oral health promotion activities/programmes. The World Health Assembly passed a resolution (WHA60.17) on oral health: Action Plan for Promotion and Integrated Disease Prevention, which emphasises the responsibility of countries to develop appropriate public health actions to prevent oral disease and promote health. Likewise, it highlights the unique role played by the research community and oral health professionals in building countries' capacities for providing adequate oral health (Petersen, Baez & Ogawa, 2020):



- To Reduce oral disease/condition afflictions and disabilities, especially in poor and marginalised populations.
- To promote healthy lifestyles and reduce risk factors to oral health that arise from environmental, economic, social, and behavioural causes.
- To develop financially-fair oral health systems that equitably improve oral health outcomes, able to respond to people's legitimate demands.
- To frame oral health policies, based on the integration of oral health into national and community health programmes, and promote oral health as an effective dimension for the development policy of society.

While aspects such as strategic planning, integrative activities, evidence-based concepts, evaluation, and policy making are involved in oral health promotion (Niranjan, Kathuria & Salve, 2017). But with the advancing burden of new diseases, like COVID-19 coupled with population explosion challenges means a reorientation of health services is inevitable. Such an intervention that can assist the creation of

healthy, supportive environments for oral health includes the provision of fluoridated toothpaste at a subsidised cost to low-income groups, media coverage of healthy food choices which encourage oral health, and lastly oral health awareness and promotion through social marketing campaigns. The community can be engaged to support water fluoridation/de-fluoridation and encourage safe water supply and participate in school oral health programmes through leadership activities. Public health professions can empower communities with healthy eating programmes that enhance oral health. There are specific target-oriented oral health improvement programmes based on community cultures. Oral health literacy provides information, education, and skills for oral health improvement and thus helps increase the available resources that encourage people to exercise more control over their health and environments. Oral health is promoted through guided tooth brushing using fluoridated toothpaste as a self-care habit and educating all health professionals about the preventive and social components of oral health promotion (Niranjan, Kathuria & Salve, 2017).

2.7 Prevalence of dental caries globally and in Africa

Dental caries has been identified as the most common chronic childhood disease in the United States, more common than asthma and hay fever (World Health Organization Oral Health Fact Sheet, 2012). While there has been a decrease in dental caries in the developed countries, this disease is most prevalent in developing countries such as Lithuania 78.3%, Brazil 75%, Kenya, and Sudan showed about 30 to 40 %. As previously highlighted contributing factors include lack of knowledge of the causes of dental caries and preventive methods of the disease, sweet foods in the developing countries, poor tooth brushing habits, poor oral hygiene, and low level of awareness. Furthermore, research shows that eating habits, social status and socio-demographic factors also contribute to the problem (Tafere, Chanie, Dessie & Gedamu, 2018). Globally, 60-90% of children and nearly 100% of adults have teeth affected by dental caries (WHO, 2012). According to the Global Burden of Diseases 2010 study, oral diseases like dental caries and periodontal diseases are still the most prevalent diseases in humanity affecting about 3.9 billion people of which untreated caries in the permanent teeth was the most prevalent condition. High numbers of decayed, missing and filled teeth (DMFT) were observed in children (below 5 years) in Myanmar ranged from 5 to 7, and adults aged 35-44 years and aged 65 to 74

respectively. This may be due to barriers in receiving appropriate oral health-care services, an insufficient number of dental professionals and a lack of awareness as to how to achieve proper oral health among people in Myanmar (Aung, Maung, Zaitso & Kawaguchi, 2019). Although effective oral hygiene practices are well established in developed countries, there is still often a lack of knowledge and awareness about good oral hygiene practices. For example, in India, the people living in the rural areas, continue to follow their tradition and culture and still use charcoal, mishri, miswak/chew sticks, and their fingers to clean their teeth (Salunke, Shah, Ostbye, Phalguna, Ogundane & Sable, 2019). Based on the 2017 Thai Health and Welfare Survey, the number of the Thais who visited a dentist within a period of the year increased from 7.4 in 2006 to 9.6 percent in 2017 (Nso, 2018). Therefore, it should be stressed further that the most important means of maintaining oral hygiene is using a toothbrush. Tooth brushing at least twice daily with a small-headed, medium hardness brush will reduce caries if fluoride toothpaste is used. However, tooth brushing removes plaque only from smooth dental surfaces and not from the depths of contact areas, pits, and fissures; consequently regular flossing is needed to ensure more effective interdental plaque removal (some flosses also contain fluoride) (Ghazaryan, 2007).

2.8 Prevalence of dental caries in South Africa

Oral diseases are still a major problem in most developing countries. Within the Republic of South Africa, there remain areas where few to no studies have been done on oral health status. The results of the last National Oral Health Survey (1999-2002) reveal that approximately 45-60% of children living in South Africa require treatment for dental decay (Petersen, Bourgeois, Ogawa, Estupinan-Day & Ndiaye, 2005). More specifically in the Western Cape Province alone, 80% of children needed dental care. It was further indicated that 32% of children require orthodontic treatment as a result of premature dental extractions (Estupinan-Day & Ndiaye, 2005). In South Africa, dentists are not familiar nor comfortable with the incorporation of preventive strategies in their practices, strategies that may be more time-consuming. They prefer a more invasive mode of restorative treatment (Adam, 2021).

2.9 Financial implications of dental caries treatment

Besides the implications for personal and public health, dental caries also has a strong economic impact. Oral diseases are the fourth most expensive ailment to treat in the industrialised world (Widstrom & Eaton, 2004). An estimated 5-10% of public health expenditures in these countries are for oral health. It should be noted that not all patients who would benefit from dental treatment in industrialised countries would seek it and are likely also influenced by economics (Yee & Sheiham, 2002).

2.10 Disease complications related to dental caries

A considerable majority of adolescents and adults present with gingivitis and periodontal diseases. With the high occurrence of HIV/AIDS, many sick patients also suffer oral HIV-associated lesions (Petersen, 2005). Oral health disparities continue to widen, more so among disadvantaged and vulnerable groups in which the vast majority of the individuals experience the highest burden of oral diseases (National Oral Health Survey, 1999-2002). Furthermore, there is a general lack of oral health facilities and workforce, which is exacerbated by an unequal distribution of dental services in the country. To compound the matter even further, the high burden of infectious diseases, such as HIV and TB faced by the country impacts budgetary priorities, reducing the availability of funding for oral health matters (Petersen, 2005). Dental caries is an infectious disease that can affect infants, children, adults, and the elderly alike. Caries can result in the inflammation of the dental pulp and associated tissues which can ultimately lead to tooth loss, cellulitis and rarely to brain abscesses. Oral streptococci are associated with systemic diseases such as endocarditis, meningitis, hepatic disease, and vertebral osteomyelitis (Petersen, 2005). Almost 50% of tooth loss occurs due to dental caries and their related complications. Poor oral hygiene, a high number of cariogenic micro-organisms, reduced saliva, inadequate exposure to fluoride, low socio-economic status, and improper feeding habits in infants are all risk factors for caries (Sheiham & Dent, 2006). A study conducted in Nigeria found that most of the participants were knowledgeable and aware of the detrimental effects of sweets and tobacco on dental health. But there was a high prevalence of caries (Ogunrinde, Ovwale, & Dosumu 2015).

In children, the consumption of sugar-containing foods, socio-economic status, and poor perceptions of mothers' dental health is strongly linked to dental caries. Caries can compromise well-being; nonetheless their treatment can advance the growth, development, and cognitive learning in children (Sheiham & Dent, 2006).

According to Sheiham and Dent (2006), systemic diseases, higher use of medication, physical and mental inability to maintain oral hygiene and changes in diet predispose the elderly population to increased risk of dental caries. As previously stated dental caries, though preventable, is the most prevalent oral condition to detrimentally affect different demographic groups, and as such, can have an enormous impact on the oral and systemic health of a country, as well as affect social well-being, the income of individuals and health-care systems (Sheiham & Dent, 2006).

The traditional global index used to quantify caries in epidemiological studies, but not in clinical practice, is the DMF (Decayed, Missing and Filled) index, which is a numerical count of affected teeth per individual collected at either the tooth (DMFT) or tooth surface level (DMFS). The count of DMFT for an individual or group records their caries experience (that is, the total of both current and past caries). This index can be used at the different diagnostic thresholds, which affect both the mean DMFT, and the proportion of individuals affected (Sheiham & Dent, 2006).

According to Selwitz, Ismail and Pitts (2007) dental caries are multifactorial, and harmonising interventions may be more effective than any one single interventions. The WHO's oral health action plan emphasises the need for combining oral health deterrence programmes with other chronic disease prevention and educational programmes and strategies sharing common risk factors. In the future, shared electronic health records, mobile smart devices and social media may assist in these efforts. Advocacy and education efforts include increasing public consciousness and behavioural changes to improve oral hygiene and decrease sugar consumption while advancing research and clinical caries management. Since many water provisions contain naturally occurring amounts of fluoride community water fluoridation and the change of fluoride levels to community water supplies to obtain optimal levels for caries prevention is a cost-effective, equitable population approach that best meets public health criteria that will benefit all age groups. More specifically salt fluoridation, often combined with iodised salt, is also an effective, frequently used population-based

method of caries prevention used primarily in Europe and Central and South America in areas with low levels of water fluoridation with other forms of fluoride are used less frequently. The fluoride concentration in salt is usually 250–300 parts per million (Ppm). It is the least expensive method of caries prevention. Milk fluoridation programmes have also been used in some countries, such as Hungary and the United Kingdom. Dental sealants are professionally applied resin materials that are brushed onto the caries-prone pit and fissured grooves of the occlusal chewing surfaces of children's molars (the back teeth) to prevent disease in healthy teeth or arrest progression of initial non-cavitated carious lesions. Local anaesthesia is not required; however, and therefore sealants can be applied in school-based programmes with portable equipment. This particular method has proven effective within a community context and can mitigate prices when applied to children. Although preventive strategies should be cost-effective and result in societal cost savings, prevention programmes sustain many up-front costs, whereas the savings gained by averted disease and treatment may take years to accrue. The impact of dental pain and infection on an individual's quality of life also needs to be considered. Economic assessments of preventive strategies depend on many factors, including caries prevalence, personnel and material costs, intervention effectiveness and time frame factors (Selwitz, Ismail, & Pitts 2007:51–59).

2.11 Summary

This chapter provided detailed literature on the factors associated with the development of dental caries and periodontal diseases. Furthermore it also provided information about oral health education and promotion, in addition to related oral health behavioural theories that prove useful for the prevention of dental caries.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter reviewed and examined the literature on aspects regarding the knowledge, attitudes, and practices of patients pertaining to dental caries in selected health facilities in the Buffalo City Metropolitan Municipality.

Consequently, this chapter outlines the research methodology applied during this study. It includes the study design, study setting, the study population, sampling procedure followed, data collection method, data analysis, and ethical considerations.

3.2 Research design and approach

This study utilised a quantitative approach and conducted a non-experimental descriptive survey since it involved the use of structured procedures and formal instruments, such as a questionnaire to collect data, which was appropriate (Brink, 1996:13).



3.2.1 Descriptive design

As previously mentioned, a descriptive design was chosen to describe patients' knowledge and awareness of dental caries within the context of Buffalo City Metropolitan Municipality. This design was appropriate to the study since the purpose of descriptive studies is to observe and document a phenomenon as it naturally occurs and to sometimes serve as a starting point for hypothesis generation or theory development (Polit & Beck, 2014). It involves the use of structured procedures and formal instruments, such as a questionnaire, to collect data (Brink, 1996:13). All adult participants between 19-70 years of age, visiting dental clinics and hospitals who agreed to voluntarily participate and sign the consent form were included in the study.

Participants with severe toothache during the data collection period were then excluded.

3.2.2 Survey design

The survey technique of data collection is an approach in which questionnaires or interviews are used to gather data from an identified population to obtain information

about the prevalence, distribution, and interaction of variables within a particular population. It is non-experimental research that obtains information about people's activities, beliefs, preferences, and attitudes by means of direct questioning (Polit & Beck, 2014). The researcher chose a survey approach because of the broadness of scope which can be applied to large samples of populations.

3.3 Procedure for survey

Each participant was requested to sit comfortably on a dental chair with a backrest for the clinical and visual examination of the teeth; and all patients were examined in standard lighting with the aid of a dental lamp, using an oral mirror and a WHO periodontal probe for probing. Tooth surfaces that were considered sound and not affected by dental caries were excluded from the study sample. Radiographic detection of dental caries was also excluded. The level of dental caries was assessed along with dental plaque, the number of gum bleeding sites and loss of attachment after probing.



Data collection procedures were divided into two parts, as follows:-

Part 1. All patients selected for the research study were given an informed consent form to sign. A self-developed questionnaire was administered to each participant by the researcher on a one-to-one basis to facilitate the interpretation of the items on the questionnaire. These items on the questionnaire consisted of the following five aspects: firstly, the demographic data of the participants, secondly their awareness of dental caries preventive measures; thirdly information received regarding options for dental care, next, the treatment and preventive options offered them by the dentist related to dental care, and lastly their knowledge of dental caries-related complications.

Part 2 of the study consisted of an intraoral assessment, using a dental mirror and the WHO probe, and was based on the diagnostic criteria recommended by the World Health Organisation. This intraoral assessment was done before any oral treatment procedures were performed to identify dental caries.

The indices used for the assessment for dental caries were DMFT for permanent teeth and DFS for primary teeth; if present, D- number of decayed teeth, M-missing due to

caries and F-filled/restored due to dental caries. Thereafter, the DMFT indexes are calculated, consisting of the sample's total average number of teeth decayed, missing, and filled.

Four levels of dental caries prevalence severity are defined using the following table: (Veiga, 2015): very low prevalence: ≤ 1.1 ; low prevalence: 1.2-2.6; moderate prevalence: 2.7-4.4; high prevalence: 4.5-6.5; very high prevalence: > 6.5)

To ensure validity, the investigator conducted an extensive literature review of journal articles and publications addressing the concept of dental caries and carefully selected relevant items to be included in the questionnaire with care. The questionnaire was reviewed by the study supervisors.

3.4 Study population

The study population were all adult patients with dental caries at Buffalo City Metropolitan Municipality in the Eastern Cape Province.

3.5 Target population

The target population consisted of patients with dental caries between 19 to 70 years old visiting Cecilia Makiwane Hospital and Frere Hospital dental clinic, and the dental clinics of Empilweni, Gompo, and Duncan Village Community Health Centres during the data collection period.

3.6 Study sample and sampling procedure

A non-probability, convenience sample of participants was used in this study. The sampling frame was obtained from dental clinic registers at the above-mentioned dental clinics. The sample was based on the number of patients appearing in the dental register. An average of 50 patients visits a dental clinic monthly. Therefore, a sample of 50 participants was selected from each clinic. A total number of 226 patients were then identified for participation in this study. Participants who were willing to participate in the study were then selected.

3.7 Inclusion criteria

All included participants were adults between the ages of 19-70 years, visiting the dental clinics and hospitals who agreed to participate and signed the consent form.

3.8 Exclusion criteria

Participants with severe toothache at the clinics during the data collection period were excluded.

3.9 Data collection procedure

The data collection procedure was divided into two parts, namely, the signing of an informed consent form and answering a questionnaire, followed by an intraoral assessment of each participant, which was undertaken by the researcher. This descriptive quantitative study was conducted in the clinics and hospitals located in Buffalo City Metropolitan Municipality. The researcher made appointments with the managers of the selected hospitals and clinics before the commencement of the study. All patients selected for this research study were given the informed consent form. Secondly, the intraoral assessment, using a dental mirror and the WHO probe, based on the diagnostic criteria recommended by the World Health Organisation, was used. The intraoral assessment was done before any oral treatment procedures were performed to identify dental caries.

3.10 Data collection instruments

3.10.1 Structured questionnaire

The researcher administered a structured self-developed questionnaire with closed-ended questions was administered to each participant by the researcher on a one-to-one basis to facilitate interpretation of the items on the questionnaire. Each participant was taken to a consulting room. During the consultation, permission was requested and, thereafter those participants who were selected for the research study were given the informed consent form to sign and then the questionnaire was administered.

The participants were asked elementary questions to assess their oral health knowledge, attitudes and practices based on their experience of dental pain, reasons

for a visit to a dentist and any prior information they may have received related to oral health. Other questions asked were causes of tooth decay, reasons for cleaning teeth, brushing habits, and brushing frequency along with tools used to assess oral hygiene practices. The raw data was then captured into an Excel sheet for later analysis. Lastly, they were transferred to facilitate statistical analysis.

In particular the items on the questionnaire consisted of the following:

Section A – participants' demographic data ,

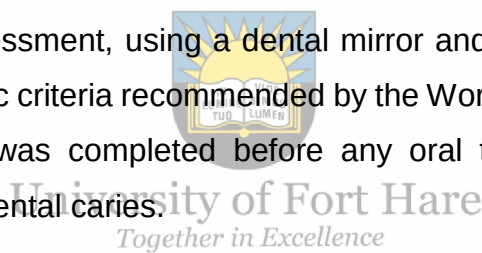
Section B – their awareness of dental caries preventive measures,

Section C – the information they received regarding their options for dental care,

Section D – the treatment and preventive options offered to them by the dentist as related to dental care, and

Section E –their knowledge of dental caries-related complications.

Next, an intraoral assessment, using a dental mirror and the WHO probe was done based on the diagnostic criteria recommended by the World Health Organisation. This intraoral assessment was completed before any oral treatment procedures were performed to identify dental caries.



The indices used for the assessment for dental caries were DMFT for permanent teeth and DFS for primary teeth; if present, D- number of decayed teeth, M-missing due to caries and F-filled/restored due to dental caries. Then, the DMFT indexes are calculated, consisting of the sample's total average number of teeth decayed, missing, and filled.

3.10.2 Examination of the mouth

3.10.2.1 Dental caries

The indices used for the assessment for dental caries were DMFT for permanent teeth and DFS for primary teeth: D- number of decayed teeth;, M - missing due to caries; and F - filled/restored due to dental caries. Thereafter, the DMFT indexes are calculated, consisting of the sample's total average number of teeth decayed, missed and filled.

Furthermore, five levels of dental caries prevalence severity were defined using the following system (Veiga, 2015):

very low prevalence: ≤ 1.1 ;

low prevalence: 1.2–2.6;

moderate prevalence: 2.7–4.4;

high prevalence: 4.5–6.5;

very high prevalence: > 6.5 .

The dental caries was recorded for the DMFT index using the following criteria:

Firstly, caries should be registered only if it is a manifest lesion, regardless of the number of affected surfaces.

Secondly, root residues were to be registered as carious lesions.

Thirdly, teeth especially third molars are excluded.

3.10.2.2 Periodontal lesions



Periodontal lesions were recorded using the following criteria: (Hoath, Wiebe, Fulle De Owen, Giannelis & Larjava, 2016). A diagnosis of localised periodontal disease was defined as involvement of $\leq 30\%$ of sites, whereas a diagnosis of generalised disease was defined as involvement of $> 30\%$ of sites. Here criteria were used to deduce the periodontal diseases during an examination of teeth.

Missing teeth counting criteria:

- Missing third molars were excluded.
- The root remains would not be registered as missing.

Table 3.1: Diagnosis of periodontal diseases

	Probing depths	Clinical signs of inflammation/bleeding on probing
Healthy reduced periodontium	≤3 mm	NO SIGNS
Gingivitis on a reduced periodontium	≤3 mm	SIGNS PRESENT
Mild chronic periodontitis	≥3 mm and <5 mm	SIGNS PRESENT
Moderate chronic periodontitis	≥5 mm and <7 mm	SIGNS PRESENT
Advanced chronic periodontitis	≥7 mm	SIGNS PRESENT

3.10.2.3 Tooth wear

For examining teeth, the following criteria were applied, according to Lithonjua, Andreana, Bush and Cohen (2003),

- **ATTRITION** - facets of teeth affected are flat, well-defined, and demarcated; they appear shiny to visual inspection, especially following recent active progression; furthermore, matching facets are often identified in opposing teeth, as wear progresses from tooth-to-tooth interaction.
- **ABRASION** - on the incisal edges of the incisor teeth, thin enamel margins and peripheries are prone to chipping; the dentine is deeply scooped out and lesions are not as well-defined; on maxillary incisor teeth, in addition to thinning of the incisal edge, the palatal surface is susceptible to erosion.
- **EROSION** - bluish-grey regions of translucency through the thinned enamel shell, wedge-shaped, saucer-shaped, or dish-shaped, cervical lesions are flattened, irregular and concave.

3.11 Validity of the research instrument

In this study, a pre-test consisting of ten patients was used but were not used as participants in the main research project to identify gaps in the questionnaire. This pre-test was used to check or assess if whether the instrument measured what it was intended to. A structured questionnaire was designed to show evidence of content and face validity. This questionnaire contained questions reflecting the knowledge, attitudes, and practices of oral health as expressed by the respondents (Brink, 2018).

3.12 Reliability of the research instrument

A pilot study with similar characteristics to the study sample and consisting of 10 participants were used for consistency purposes. The instruments administered to all the 10 participants were pilot tested to determine the clarity of questions, effectiveness of instructions, the completeness of response sets, the time required to complete the questionnaire, and the success of the data collection technique (Brink, 2018). Thereafter the questionnaires were distributed to the selected participants of the study.

3.13 Data collection and analysis

The raw data was edited and converted into a form useful for data analysis by assigning numeric values for each response. Data were inspected for outliers, after which it was cleaned, and special variables were created and entered into the computer. The Statistical Package of Social Sciences (SPSS) software, Version 22 was used to analyse the data with the assistance of a statistician. Descriptive statistics (percentages, mean and frequency distribution) were used to describe and summarise the data. The results of this study are presented in percentages, tables, and histograms. A p-value of 0.05 was considered statistically significant.

3.14 Ethical considerations

The study was approved by the Research Ethics Committee of the University of Fort Hare, reference number: REC-100118-054 (Appendix 4). Thereafter permission to conduct the study was obtained from the Eastern Cape Department of Health Research and Ethics Committee EC_201910_011 (APPENDIX 5). Later, permission was obtained from the Manager of the Buffalo City Metropolitan Municipality to conduct the study at Empilweni Gompo clinic and Duncan Village day clinics (Appendix 6). Separate ethical clearance was obtained for conducting the study at the hospitals, Cecilia Makiwane Hospital and Frere Hospital dental clinic. Moreover, a separate clearance from each hospital was also obtained (FCMHREC/A035/2019 (Appendix 7)).

This particular research study was conducted in full accordance with the World Medical Association's Declaration of Helsinki. All participants read and signed the informed consent form before participating in any part of the study. All participants

were provided with an informed consent form that was signed by them or their legal representative (in instances where they could not sign and complete it by themselves). The ethical principles considered as the standards for this research are listed here below:

3.14.1 Informed consent

Participants were informed of the scope, aims and objectives of the study before being asked to provide their consent. They were allowed to read and understand the consent form before signing it. All participants were assured that their privacy would be maintained.

3.14.2 Confidentiality and anonymity

Before engaging in the research, participants were informed that anonymity would be maintained by omitting their names when completing the questionnaire; instead, they were given allocated code numbers (Brink, 2006:133). Anonymity and confidentiality were maintained since no names were mentioned and the participant information was not divulged to any other parties. The participants were informed that they could withdraw from the study at any time if they desired to do so without any penalty.

3.14.3 Risks to respondents minimised

Patients were not harmed or exploited in any way. The reasonable risk and discomfort associated with the study were discussed openly with the participants and they were assured that these would be minimised. The participant's right to refuse to participate or withdraw from the study was respected. No risk of physical or psychological harm to the participants was observed (Brink, 2006:133).

3.15 Chapter summary

The research methodology chapter has presented in detail the methods used for conducting this research. For this study, a quantitative and descriptive approach was implemented along with an intraoral assessment, using a dental mirror as part of a survey for the prevalence of dental caries. Participants were requested to complete a questionnaire that was deemed appropriate for determining and describing their

knowledge, attitudes, behaviour, and practices regarding the prevention of dental caries.



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CHAPTER 4: DATA ANALYSIS AND DISCUSSION OF FINDING

4.1 Introduction

Chapter 3 above discussed how the research was conducted. It addressed the research methodology, sample, and sampling technique. The chapter further explained the procedure followed when implementing the research, the data gathering instruments used, and the plan for the analysis. Consequently, this chapter will present the results of the study and a discussion of the findings.

4.2 Demographic characteristics of participants

The distribution of demographic characteristics of participants is shown in Table 4.1. The majority of the participants were female participants (62.0%), who were single (69.4%), with a secondary school education (50.5%) and were employed (61.1%). With respect to health characteristics, the majority were non-smokers (72.2%), non-diabetic (86.6%), not on medication (69.0%) and non-allergic (79.2%)

Table 4.1: Demographic and health characteristics of the participants

Variable	Category	Frequency	Percentage
Age	Under 30 years	91	42.1
	30-40 years	54	25.0
	Over 40 years	71	32.9
Gender	Male	82	38.0
	Female	134	62.0
Marital status	Single	150	69.4
	Married	46	21.3
	Other	20	9.3
Education	Primary	74	34.3
	Secondary	109	50.5
	Tertiary	33	15.3
Income source	Unemployment	84	38.9
	Employment	132	61.1
Smoking	Yes	60	27.8
	No	156	72.2
Medical status	Yes	70	32.4
	No	146	67.6
Diabetes	Yes	29	13.4
	No	187	86.6
Medication	Yes	67	31.0
	No	149	69.0

Allergy	Yes	45	20.8
	No	171	79.2

4.3 Analysis of knowledge, attitudes, and practices

4.3.1 Knowledge

When participants were asked whether their mothers and/or their teachers ever told them about cleaning their teeth, the majority of them disagreed or strongly disagreed, with totals of 140 (67.0%) and 139 (67.2%), for home and school care respectively. In terms of the importance of dentist visits, the majority of the participants agreed or strongly agreed (85.6%). Concerning their awareness of the causes of dental caries and their association with sugary diets, the majority agreed or strongly agreed with (70.4%) and (77.1%) respectively (Table 4.2).

Table 4.2: Distribution of responses to items on knowledge of dental caries

Statement	SA n(%)	A n(%)	N n(%)	D n(%)	SD n(%)
My mother never told me about cleaning my teeth at home care (n=209)	34 (16.3)	25 (12.0)	10 (4.8)	64 (30.6)	76 (36.4)
My teacher never told me about cleaning my teeth at school care (n=207)	30 (14.5)	26 (12.6)	12 (5.8)	61 (29.5)	78 (37.7)
A visit to the dentist is important (n=201)	98 (48.8)	74 (36.8)	9 (4.5)	9 (4.5)	11 (5.5)
I am aware of the fact that a sugar-related diet is one of the main causes of dental caries (n=98)	36 (36.7)	33 (33.7)	9 (9.2)	8 (8.2)	12 (12.2)
I am aware of the causes of dental caries (n=83)	31 (37.3)	33 (39.8)	8 (9.6)	6 (7.2)	5 (6.0)

4.3.2 Attitudes

Most participants agreed or strongly agreed with all the items on attitudes towards dental caries. Of concern, however, is the fact that the majority had never visited a dentist as reflected by (69.1%) of them agreeing or strongly agreeing. In addition, the majority know the importance of cleaning their teeth (88.9%), are aware of the effects

of sugary diets (80.7%), avoid sugary foods (64.6%) and are aware of the causes of dental caries (71.3%) (see Table 4.3 below).

Table 4.3: Distribution of responses to items on attitudes towards dental caries

Statement	SA n(%)	A n(%)	N n(%)	D n(%)	SD n(%)
I have never visited a dentist for cleaning my teeth or general oral check-up (n=201)	68 (33.8)	71 (35.3)	9 (4.5)	24 (11.9)	29 (14.4)
I know the importance of my brushing teeth (n=207)	107 (51.7)	77 (37.2)	10 (4.8)	3 (1.4)	10 (4.8)
I am aware of the fact that a sugar-related diet is one of the main causes of dental caries (n=187)	78 (41.7)	73 (39.0)	18 (9.6)	7 (3.7)	11 (5.9)
I avoid diets with sugar to prevent dental caries (n=178)	63 (35.4)	52 (29.2)	35 (19.7)	17 (9.6)	11 (6.2)
I am aware of the causes of dental caries (n=87)	36 (41.4)	26 (29.9)	19 (21.8)	1 (1.1)	5 (5.7)
I use toothpaste and a toothbrush for cleaning my teeth (n=192)	117 (60.9)	61 (31.8)	6 (3.1)	3 (1.6)	5 (2.6)
I avoid diets with sugar to prevent dental caries (n=185)	58 (31.4)	54 (29.2)	35 (18.9)	26 (14.1)	12 (6.5)
I brush my teeth when I wake up and after I eat (n=180)	75 (41.7)	61 (33.9)	24 (13.3)	12 (6.7)	8 (4.4)
I use dental floss and other interdental aids to clean my gums (n=174)	42 (24.1)	37 (21.3)	19 (10.9)	41 (23.6)	35 (20.1)
I visit my dentist yearly (n=135)	16 (19.8)	14 (17.3)	10 (12.3)	27 (33.3)	14 (17.3)

4.3.3 Practices

Concerning their dental health practices, the majority of participants agreed or strongly agreed that they use toothpaste and toothbrushes (92.7%), avoid sugary diets (60.6%), and brush their teeth upon waking up and after eating (75.6%). Participants were almost equally distributed between those who use dental floss/interdental aids

(45.4%) and those who do not (43.7%), while the rest were neutral. About half of the participants visit their dentists yearly (50.6%) (Table 4.4).

Table 4.4: Distribution of responses to oral health practices information

Statement	SA n(%)	A n(%)	N n(%)	D n(%)	SD n(%)
The dentist encourages me to share ideas and opinions about dental care (n=203)	75 (36.9)	88 (43.3)	20 (9.9)	15 (7.4)	5 (2.5)
The dentist provides options to dental care and uses the dental aids to educate (n=216)	68 (34.2)	96 (48.2)	20 (10.1)	10 (5.0)	5 (2.5)
The dentist makes sure that I understand the information he/she provides (n=204)	77 (37.7)	94 (46.1)	15 (7.4)	12 (5.9)	6 (2.9)
The dentist contributes preventive options for the well-being of my mouth and checks my mouth (n=101)	40 (39.6)	43 (42.6)	10 (9.9)	6 (5.9)	2 (2.0)
The dentist explains and gives reasons for the treatment options that are appropriate (n=99)	39 (39.4)	45 (45.5)	7 (7.1)	6 (6.1)	2 (2.0)
The dentist provides satisfactory and affordable preventive options for dental care (n=98)	35 (35.7)	48 (49.0)	9 (9.2)	4 (4.1)	2 (2.0)
The dentist stresses that change is possible with preventive measures for dental care (n=96)	35 (36.5)	35 (36.5)	15 (15.6)	7 (7.3)	4 (4.2)
The dentist does not care about preventive measures, only about treatment for now (n=99)	22 (22.2)	19 (19.2)	16 (16.2)	26 (26.2)	16 (16.2)
The dentist and staff protect your privacy (n=2)	1 (50.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)

4.4 Treatment and preventive options

Table 4.5 shows the distribution of participants according to their responses to items on dental treatment and preventive options. The majority (70%) agreed or strongly agreed with 22 of the 28 items listed in this section. Given that these 22 items are positively worded, these results suggest that patients were satisfied and happy with their clinics and the dental staff. The remaining six items were negatively worded and the responses to these items are distributed differently. For these six, the results show that (47.8%) of participants had experienced problems with scheduling appointments (agree/strongly agree), while (41.1%) felt the dentist did not clearly explain treatment options (agree/strongly agree), furthermore, (39.6%) expressed dissatisfaction with treatment received (agree/strongly agree), (52.1%) have experienced problems with follow up visits due to distance from the clinic (agree/strongly agree), while (56.7%) had had referrals made for them (agree/strongly agree) and (41.5%) felt that their dentist did not care about their general health condition (agree/strongly agree).



Table 4.5: Distribution of responses to treatment and preventive options

Statement	SA n(%)	A n(%)	N n(%)	D n(%)	SD n(%)
The dentist addressed me accordingly for the reason for the visit and problem (n=201)	89 (44.3)	83 (41.3)	10 (5.0)	13 (6.5)	6 (3.0)
The treatment was completed on time and in an efficient manner (n=190)	75 (39.5)	84 (44.2)	16 (8.4)	8 (4.2)	7 (3.7)
The dentist carried out procedures pain free and with utmost care to avoid infection (n=195)	80 (41.0)	84 (43.1)	19 (9.7)	9 (4.6)	3 (1.5)
The clinic and equipment were clean and presentable (n=193)	90 (46.6)	84 (43.5)	14 (7.3)	3 (1.6)	2 (1.0)
The dentist explained to me before each procedure and step of treatment (n=192)	90 (46.9)	80 (41.7)	14 (7.3)	5 (2.6)	3 (1.6)

The dentist gave me choices for my treatment and let me decide what to do (n=192)	76 (39.6)	82 (42.7)	16 (8.3)	11 (5.7)	7 (3.6)
I received the treatment service I needed during my visit (n=189)	82 (43.4)	85 (45.0)	11 (5.8)	7 (3.2)	4 (2.1)
The dentist talked to me with respect and listened carefully and encouraged me to ask him/her questions (n=197)	100 (50.8)	80 (40.6)	10 (5.1)	2 (1.0)	5 (2.5)
The dentist explained the treatment he/she offered clearly (n=196)	85 (43.4)	85 (43.4)	14 (7.1)	6 (3.1)	6 (3.1)
I was pleased with the assistant dentist/staff (n=199)	94 (47.2)	77 (38.7)	15 (7.5)	9 (4.5)	4 (2.0)
The Department of Health should make changes to this clinic/ hospital, as dental care could be better (n=184)	76 (41.3)	56 (30.4)	22 (12.0)	23 (12.5)	7 (3.8)
I recommend this clinic/hospital to my friends/relatives (n=195)	71 (36.4)	85 (43.6)	25 (12.8)	13 (6.7)	1 (0.5)
The dentist, reception and staff were professional and courteous (n=197)	82 (41.6)	86 (43.7)	20 (10.2)	6 (3.0)	3 (1.5)
If this was your first visit, you were given information and appointments for further visits and the importance of taking care of your teeth was stressed (n=194)	78 (40.2)	84 (43.3)	18 (9.3)	8 (4.1)	6 (3.1)
Appointment options were given that fit my daily schedule (n=186)	67 (36.0)	70 (37.6)	27 (14.5)	19 (10.2)	3 (1.6)
There were problems in scheduling appointments (n=186)	56 (30.1)	33 (17.7)	24 (12.9)	56 (30.1)	17 (9.1)

The preventive options were given by the dentist (n=98)	39 (39.8)	31 (31.6)	15 (15.3)	11 (11.2)	2 (2.0)
The dentist gave specific instructions such as frequency of brushing, method of brushing, time and duration, and rinsing behaviour (n=99)	41 (41.4)	41 (41.4)	8 (8.1)	6 (6.1)	3 (3.0)
The dentist gave dietary advice (n=98)	42 (42.9)	33 (33.7)	8 (8.2)	11 (11.2)	4 (1.9)
The dentist provided general advice on improving oral health and care (n=102)	44 (43.1)	42 (41.2)	7 (6.9)	7 (6.9)	2 (2.0)
The dentist provides information verbally/leaflets (n=97)	27 (27.8)	42 (43.3)	11 (11.3)	11 (11.3)	6 (6.2)
The dentist did not explain treatment options clearly (n=95)	22 (23.2)	17 (17.9)	15 (15.8)	33 (34.7)	8 (8.4)
I am not satisfied with the dental treatment received (n=91)	20 (22.0)	16 (17.6)	12 (13.2)	32 (35.2)	11 (12.1)
I will follow accordingly as per the dentist's treatment and make a follow up (n=94)	37 (39.4)	42 (44.7)	7 (7.4)	6 (6.4)	2 (2.1)
I cannot make a follow up and the dental clinic is too far to visit again (n=94)	32 (34.0)	17 (18.1)	11 (11.7)	21 (22.3)	13 (13.8)
The dentist made a referral appointment for me (n=90)	27 (30.0)	24 (26.7)	19 (21.1)	16 (17.8)	4 (4.4)
The dentist did not care about my general condition and did not make any referral (n=94)	29 (30.9)	10 (10.6)	9 (9.6)	31 (33.0)	15 (16.0)

4.5 Knowledge of complications of dental caries

The results show that the response rate for all items regarding the knowledge of complications of dental caries was less than 100%. However, most items had response rates of at least 88% except for oral health promotion and regular dentist visits. Overall, for all items, the combined proportion of those that strongly agreed and those that agreed was at least 60%, while the rest were either neutral or disagreed or strongly disagreed (Table 4.6)

Table 4.6: Distribution of responses to knowledge of dental caries complications

Knowledge item	SA n(%)	A n(%)	N n(%)	D n(%)	SD n(%)
Failure to visit dentists regularly and maintenance of oral hygiene results in loss of teeth due to dental caries	84 (42.4)	65 (32.8)	20 (10.1)	18 (9.1)	11 (5.6)
Dental caries are an irreversible condition and can be prevented	59 (30.4)	68 (35.1)	20 (10.3)	29 (14.9)	18 (9.3)
Dental caries can be prevented by regular brushing, cleanliness of teeth and a proper diet	89 (46.4)	74 (38.5)	13 (6.8)	14 (7.3)	2 (1.0)
Sugary drinks and foods must be avoided to prevent dental caries	96 (49.7)	68 (35.2)	19 (9.8)	7 (3.6)	3 (1.6)
Dentists encourage us to adopt a healthy lifestyle for a healthy mouth as well	104 (54.5)	66 (34.6)	11 (5.8)	8 (4.2)	2 (1.0)
There is a need for oral health promotion programmes in the clinic and hospital on the importance of good oral health	58 (59.2)	30 (30.6)	4 (4.1)	3 (3.1)	3 (3.1)
Do you feel regular/periodic check-ups with dentists cause complications with teeth and gums?	36 (38.3)	26 (27.7)	7 (7.4)	19 (20.2)	6 (6.4)

4.6 Knowledge, attitudes, practices scores

The results show that the lowest values were (20%) for knowledge, (11.1%) for information and (17.9%) for treatment options, while for the rest of the variables it was 0%. The highest score was 100% for all the variables except knowledge of complications of dental caries which had a maximum score of (85.7%). The lowest lower quartile value (Q1) was (57.1%) for the complications variable while the rest of the lower quartile values were at least (60%). This means that (75%) (three-quarters) of the participants scored at least 60% on those variables. The median, the mode, and the upper quartile (Q3) were all greater than (70%) for all the variables, which is an indication that the participants generally scored high on all variables (see Table 4.7). This suggests, as mentioned earlier, that the participants were highly knowledgeable, had very positive dental health attitudes and practices and were highly satisfied with the oral health information and treatment options available to them.

Table 4.7. Descriptive statistics of dental care knowledge, attitudes, and practices (n=216)

Variable	Min	Q1	Mean	Median	Mode	Q3	Max
Knowledge	20.0	60.0	78.7	80.0	100.0	100.0	100.0
Attitude	0.0	60.0	71.3	80.0	80.0	80.0	100.0
Practice	0.0	60.0	74.4	80.0	100.0	100.0	100.0
Information	11.1	77.8	81.7	88.9	88.9	88.9	100.0
Options	17.9	67.9	73.2	78.6	78.6	78.6	100.0
Complications	0.0	57.1	60.6	71.4	71.4	71.4	85.7

The variables are graphically presented using box plots below. The graphs show the minimum, maximum, lower and upper quartiles, mean (diamond point) and median (line).

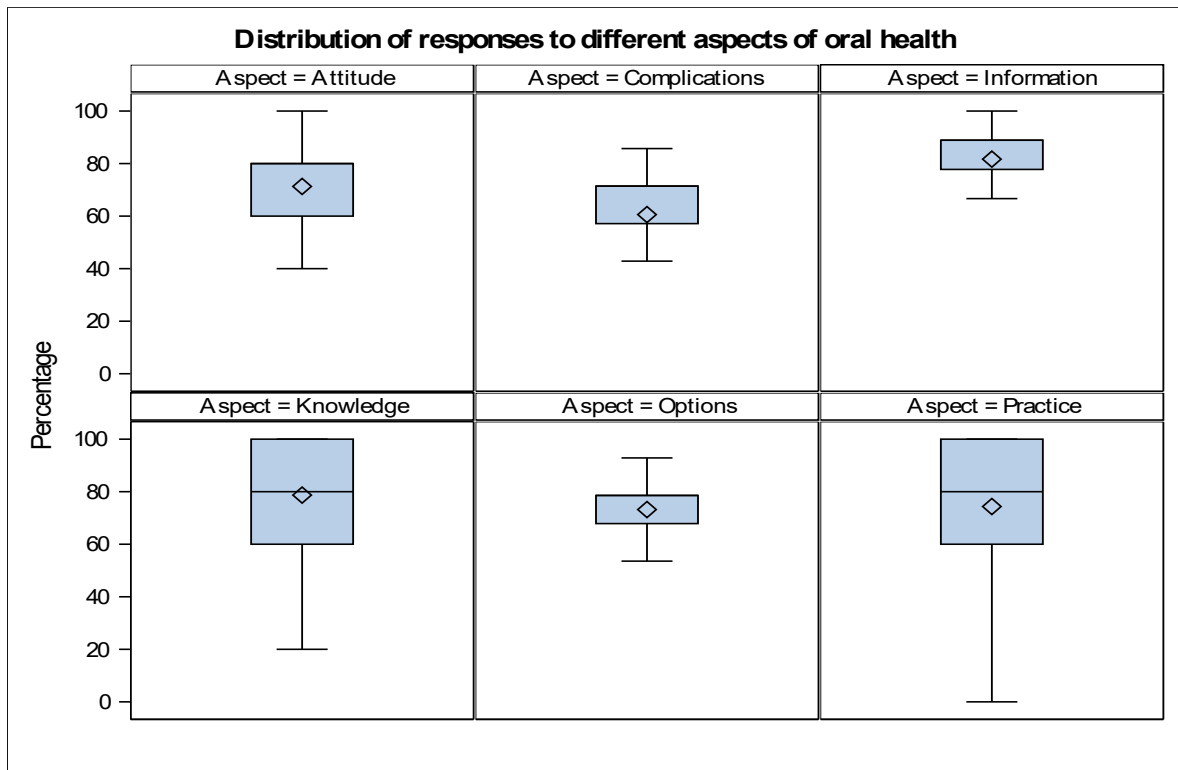


Figure 4.6: Distribution of responses to different aspects of oral health

4.7 Association of knowledge of dental caries with demographic variables

Table 4.8 shows the results of the testing of the hypothesis that dental care knowledge was independent of the demographic characteristics of participants. Based on the p-values, dental care knowledge was found to be significantly associated with age, ($p=0.028$) allergy ($p=0.012$) status and being on medication ($p=0.011$). Dependence was found to be such that those over 40 years old, those with allergies, and those not on medication had significantly less dental care knowledge compared to those under 40 years old, those without allergies and those on medication. The non-parametric counterparts of the two-sample t-tests and the one-way analysis of variance, namely, Mann-Whitney and Kruskal-Wallis tests, respectively, were used for comparing two samples and more than two samples, respectively. This was done since all the derived variables were not normally distributed, one of the central assumptions for using the parametric statistical tests. All tests for statistical significance were carried out at a 5% level of significance.

Table 4.8: Comparison of dental care knowledge scores across demographic characteristics

Characteristic	Category	Mean	Median	Test Statistic	p-value
Age group	1_ Under 30 years (n=91)	81.3	80.0	7.1	0.0287 ^s
	2_ (31-40) years (n=54)	81.1	90.0		
	3_ Over 40 years (n=71)	73.5	60.0		
Gender	Female (n=134)	79.3	80.0	-0.5	0.6357
	Male (n=82)	77.8	80.0		
Marital status	Married (n=46)	73.9	70.0	3.5	0.1746
	Other (n=20)	81.0	80.0		
	Single (n=150)	79.9	80.0		
Educational level	1_ Primary (n=74)	74.9	80.0	3.5	0.1750
	2_ Secondary (n=74)	81.1	80.0		
	3_ Tertiary (n=33)	79.4	80.0		
Income source	Employment (n=132)	79.8	80.0	-1.0	0.3190
	Unemployment (n=84)	76.9	80.0		
Smoking status	Non-smoker (n=156)	78.7	80.0	-0.2	0.8584
	Smoker (n=60)	78.7	80.0		
Diabetes status	Diabetic (n=29)	73.1	80.0	-1.2	0.2330
	Non-diabetic (n=187)	79.6	80.0		
Allergy	Allergic (n=45)	71.6	60.0	-2.5	0.0127 ^s
	Non-allergic (n=171)	80.6	80.0		
Medical status	Good	77.7	80.0	1.2	0.2147
	Not good	80.9	80.0		
Medication	Off	81.2	80.0	-2.5	0.0119 ^s
	On	73.1	60.0		

^s statistically significant at a 5% significance level

Based on the p-values, dental care knowledge was found to be significantly dependent and associated with age($p=0.028$), allergy status($p=0.012$) and being on medication($p=0.011$). The dependence was found to be such that those who were over 40 years old, those with allergies and those not on medication had significantly less dental care knowledge compared to those under 40 years old, those without allergies and those on medication. This was done because all the derived variables were not normally distributed, which is one of the central assumptions for using the parametric statistical tests. All tests for statistical significance were carried out at a 5% level of significance.

4.8 Association of attitudes of dental caries with demographic variables

The hypothesis of interest is that attitudes towards dental care are independent of demographic characteristics. Dental care attitudes were independent of all demographic characteristics, except age group ($p=0.016$). The dependence on age group is such that those in the 30-40 years' age group have significantly more positive attitudes than those older or younger than them (Table 4.9).

Table 4.9: Comparison of dental care attitude scores across demographic characteristics

Dental care aspect	Age group	Mean	Median	Test statistic	p-value
Age group	1_ Under 30 years (n=91)	67.9	80.0	8.2	0.0165 ^s
	2_ (31-40) years (n=54)	76.7	80.0		
	3_ Over 40 years (n=71)	71.5	80.0		
Gender	Female (n=134)	74.0	80.0	-1.9	0.0620
	Male (n=82)	66.8	80.0		
Marital status	Married (n=46)	69.1	80.0	4.3	0.1152
	Other (n=20)	80.0	80.0		
	Single (n=150)	70.8	80.0		
Educational level	1_ Primary (n=74)	70.8	80.0	2.3	0.3201
	2_ Secondary (n=74)	70.1	80.0		
	3_ Tertiary (n=33)	76.4	80.0		
Income source	Employment (n=132)	71.8	80.0	-0.3	0.7824
	Non-employment (n=84)	70.5	80.0		
Smoking status	Non-smoker (n=156)	71.2	80.0	-0.1	0.9775
	Smoker (n=60)	71.7	80.0		
Diabetes status	Diabetic (n=29)	64.8	80.0	-1.2	0.2467
	Non-diabetic (n=187)	72.3	80.0		
Allergy	Allergic	69.8	80.0	0.3	0.7537
	Non-allergic (n=187)	71.7	80.0		
Medical status	Good	71.1	80.0	0.6	0.5420
	Not good	71.7	80.0		
Medication	Off	70.9	80.0	0.9	0.3466
	On	72.2	80.0		

^s statistically significant at a 5% significance level

All p-values, except the one for the age group ($p=0.001$), are greater than 5%. This means dental care attitudes are independent of all demographic characteristics, except age group. The dependence on age group is such that those in the 30-40 years

age group have significantly more positive attitudes than those older or younger than them.

4.9 Association of practices of dental caries with demographic variables

The hypothesis of interest is that the dental care practices of participants are independent of demographic characteristics. The dental care practices were independent of all demographic characteristics, except the age group. The dependence on age group is such that those over the age of 40 years have significantly more positive practices than those in the 30-40 years age group, who have a higher practices score than those younger than 30 years respectively (Table 4.10). This suggests that the older one gets, the more positive one's dental care practices become.

Table 4.10: Comparison of dental care practices scores across demographic characteristics

Dental care aspect	Age group	Mean	Median	Test statistic	p-value
Age group	1_Under 30 years (n=91)	67.0	60.0	13.6	0.0011 ^s
	2_(31-40) years (n=54)	76.7	80.0		
	3_Over 40 years (n=71)	82.0	100.0		
Gender	Female (n=134)	76.3	80.0	-1.2	0.2310
	Male (n=82)	71.2	80.0		
Marital status	Married (n=46)	79.1	80.0	3.0	0.2231
	Other (n=20)	78.0	80.0		
	Single (n=150)	72.4	80.0		
Educational level	1_Primary (n=74)	77.6	80.0	2.5	0.2855
	2_Secondary (n=74)	73.9	80.0		
	3_Tertiary (n=33)	68.5	60.0		
Income source	Employment (n=132)	73.5	80.0	0.9	0.3633
	Non-employment (n=84)	75.7	80.0		
Smoking status	Non-smoker (n=156)	74.2	80.0	0.3	0.7561
	Smoker (n=60)	74.7	80.0		
Diabetes status	Diabetic (n=29)	78.6	80.0	1.2	0.2260
	Non-diabetic (n=187)	73.7	80.0		
Allergy	Allergic	72.4	80.0	-0.2	0.8229
	Non-allergic (n=187)	74.9	80.0		
Medical status	Good	73.3	80.0	0.6	0.5530
	Not good	76.6	80.0		
Medication	Off	73.4	80.0	1.1	0.2562
	On	76.4	80.0		

^s statistically significant at a 5% significance level

4.10 Association of dental care information with demographic variables

The hypothesis of interest is that satisfaction with the dental care information they receive is independent of demographic characteristics. All p-values are greater than 5%, which means satisfaction with treatment options does not depend on any of the demographic characteristics (Table 4.11).

Table 4.11: Comparison of dental care information scores across demographic characteristics

Dental care aspect	Age group	Mean	Median	Test statistic	p-value
Age group	1_ Under 30 years (n=91)	81.1	88.9	1.6	0.4433
	2_ (31-40) years (n=54)	80.0	88.9		
	3_ Over 40 years (n=71)	83.7	88.9		
Gender	Female (n=134)	82.4	88.9	-1.0	0.3348
	Male (n=82)	80.5	88.9		
Marital status	Married (n=46)	81.4	88.9	0.7	0.7031
	Other (n=20)	83.9	88.9		
	Single (n=150)	81.5	88.9		
Educational level	1_ Primary (n=74)	83.2	88.9	0.1	0.9643
	2_ Secondary (n=74)	82.0	88.9		
	3_ Tertiary (n=33)	77.4	88.9		
Income source	Employment (n=132)	81.0	88.9	1.4	0.1545
	Non-employment (n=84)	82.8	88.9		
Smoking status	Non-smoker (n=156)	81.4	88.9	0.2	0.8061
	Smoker (n=60)	82.4	88.9		
Diabetes status	Diabetic (n=29)	80.8	88.9	-0.2	0.8331
	Non-diabetic (n=187)	81.8	88.9		
Allergy	Allergic	81.2	88.9	0.1	0.9061
	Non-allergic (n=187)	81.8	88.9		
Medical status	Good	82.5	88.9	0.6	0.5196
	Not good	80.0	88.9		
Medication	Off	82.7	88.9	-0.8	0.4086
	On	79.4	88.9		

4.11 Association of dental treatment and preventive options with demographic variables

The hypothesis of interest is that the satisfaction of participants with treatment and preventive options provided is independent of demographic characteristics. All p-values are greater than 5%, which means satisfaction with treatment options does not depend on any of the demographic characteristics (Table 4.12).

Table 4.12: Comparison of dental care options scores across demographic characteristics

Dental care aspect	Age group	Mean	Median	Test statistic	p-value
Age group	1_ Under 30 years (n=91)	72.2	78.6	1.2	0.5593
	2_ (31-40) years (n=54)	74.3	78.6		
	3_ Over 40 years (n=71)	73.6	78.6		
Gender	Female (n=134)	73.0	78.6	0.1	0.9342
	Male (n=82)	73.5	78.6		
Marital status	Married (n=46)	70.8	78.6	1.9	0.3821
	Other (n=20)	72.3	78.6		
	Single (n=150)	74.0	78.6		
Educational level	1_ Primary (n=74)	72.5	78.6	3.6	0.1629
	2_ Secondary (n=74)	74.8	78.6		
	3_ Tertiary (n=33)	69.5	75.0		
Income source	Employment (n=132)	73.0	78.6	-0.2	0.8649
	Non-employment (n=84)	73.5	78.6		
Smoking status	Non-smoker (n=156)	72.7	78.6	0.4	0.7093
	Smoker (n=60)	74.4	78.6		
Diabetes status	Diabetic (n=29)	71.7	75.0	-1.4	0.1541
	Non-diabetic (n=187)	73.4	78.6		
Allergy	Allergic	73.7	78.6	-0.4	0.6770
	Non-allergic	73.1	78.6		
Medical status	Good	73.3	78.6	-0.9	0.3857
	Not good	73.1	78.6		
Medication	Off	72.9	78.6	-0.3	0.7416
	On	73.9	78.6		

4.12 Association of complications of dental caries with demographic variables

The hypothesis of interest is that knowledge of patients of complications of dental caries is independent of demographic characteristics. All p-values are greater than

5%, which means their knowledge of complications of dental caries does not depend on any of the demographic characteristics (Table 4.13).

Table 4.13: Comparison of dental care complications scores across demographic characteristics

Dental care aspect	Age group	Mean	Median	Test statistic	p-value
Age group	1_ Under 30 years (n=91)	60.8	71.4	0.8	0.6725
	2_ (31-40) years (n=54)	59.0	71.4		
	3_ Over 40 years (n=71)	61.6	71.4		
Gender	Female (n=134)	62.0	71.4	1.4	0.1653
	Male (n=82)	58.2	71.4		
Marital status	Married (n=46)	60.9	71.4	1.4	0.5068
	Other (n=20)	58.6	57.1		
	Single (n=150)	60.8	71.4		
Educational level	1_ Primary (n=74)	59.5	71.4	1.0	0.5941
	2_ Secondary (n=74)	61.9	71.4		
	3_ Tertiary (n=33)	58.9	57.1		
Income source	Employment (n=132)	60.7	71.4	0.2	0.8129
	Non-employment (n=84)	60.4	71.4		
Smoking status	Non-smoker (n=156)	59.2	71.4	1.7	0.1908
	Smoker (n=60)	64.0	71.4		
Diabetes status	Diabetic (n=29)	58.6	57.1	-1.2	0.2247
	Non-diabetic (n=187)	60.9	71.4		
Allergy	Allergic	60.3	71.4	-1.1	0.2665
	Non-allergic	60.7	71.4		
Medical status	Good	60.3	71.4	-0.1	0.9161
	Not good	61.2	71.4		
Medication	Off	60.2	71.4	-0.2	0.8202
	On	61.4	71.4		

Table 4.14: Distribution of responses to the knowledge items

Knowledge aspect	Response	
	Yes	No
Lack of regular dentist visits results in loss of teeth	149 (75.3)	49 (24.7)
Dental caries is preventable but irreversible	127 (65.5)	67 (34.5)
Regular teeth brushing can prevent dental caries	163 (84.9)	29 (15.1)
Avoiding sugary diets prevents dental caries	164 (85.0)	29 (15.0)
Dentists encourage healthy lifestyle for the mouth	170 (89.0)	21 (11.0)
There is a need for oral health promotion	88 (89.8)	10 (10.2)
Regular check-ups cause dental complications	62 (66.0)	32 (34.0)

4.13 Survey for dental caries examination of the mouth

GROUP AVERAGE

$$\frac{\text{TOTAL DMF (BOTH MALES \& FEMALES)}}{\text{TOTAL NUMBER OF PARTICIPANTS}} = \frac{1408}{226} = 6.23$$

According to Viega, 2015:

The ratio of 6.23 indicates a high prevalence of dental caries in Buffalo City Metropolitan Municipality

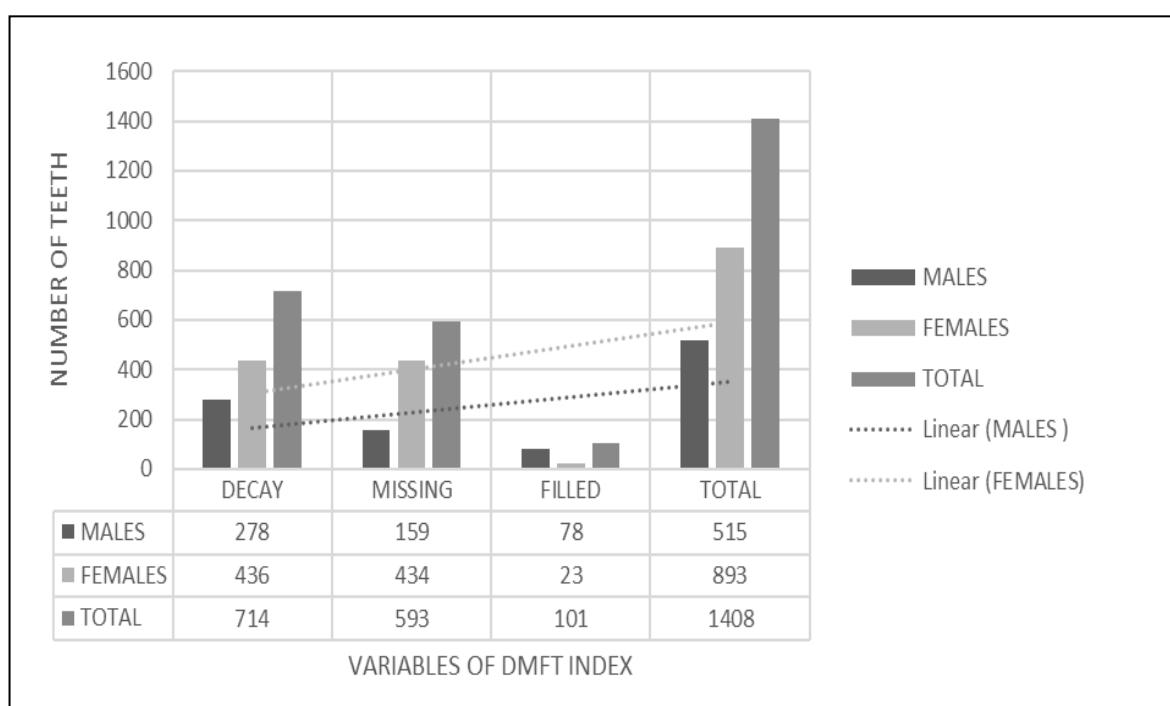


Figure 4.7: Prevalence of dental caries

The missing component of the DMFT index (42%) is higher than the filled component (7%), which indicates that there is more removal of teeth due to dental caries than caries restorative procedures. The decay prevalence was higher in females (61%) than in males (39%), and the missing prevalence was 73% in females versus (27%)

in males. The study deduced a high caries prevalence and severity with minimal restorative procedures.

4.14 Survey for tooth tissue loss examination of the mouth

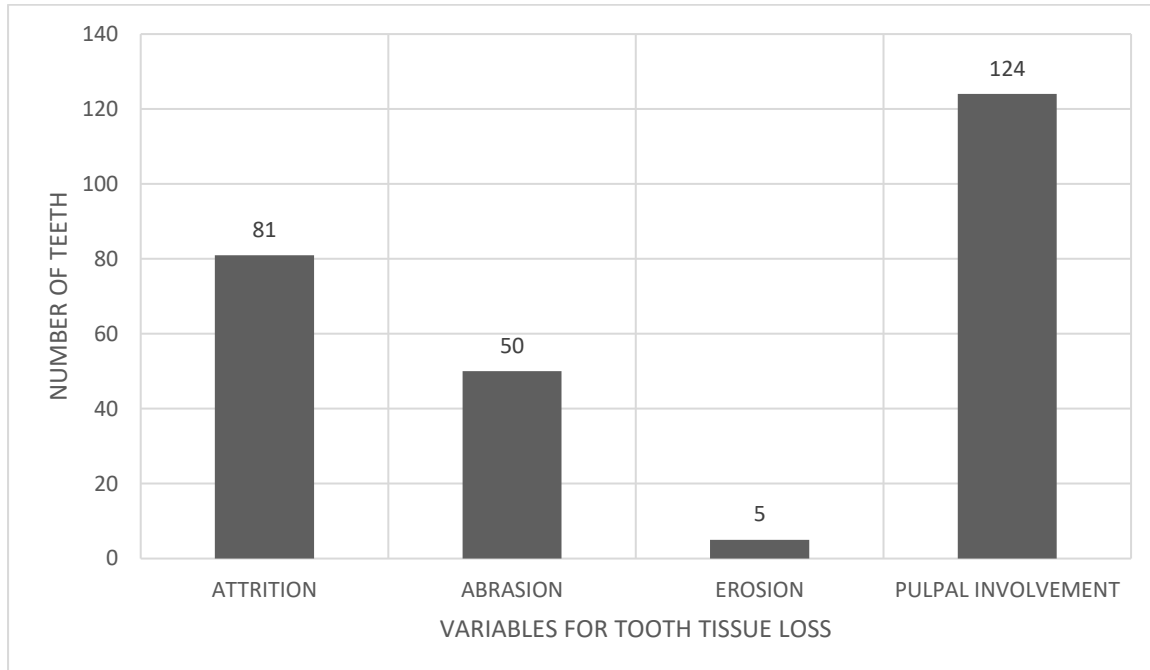


Figure 4.8: Survey for tooth tissue loss examination of the mouth

The study survey indicated a high prevalence of pulpal involvement (48%), and attrition (31%) followed by abrasion of teeth (19%) and erosion (1.9%). The pulpal involvement indicates the severity of dental caries.

4.15 Survey for periodontal conditions examination of the mouth

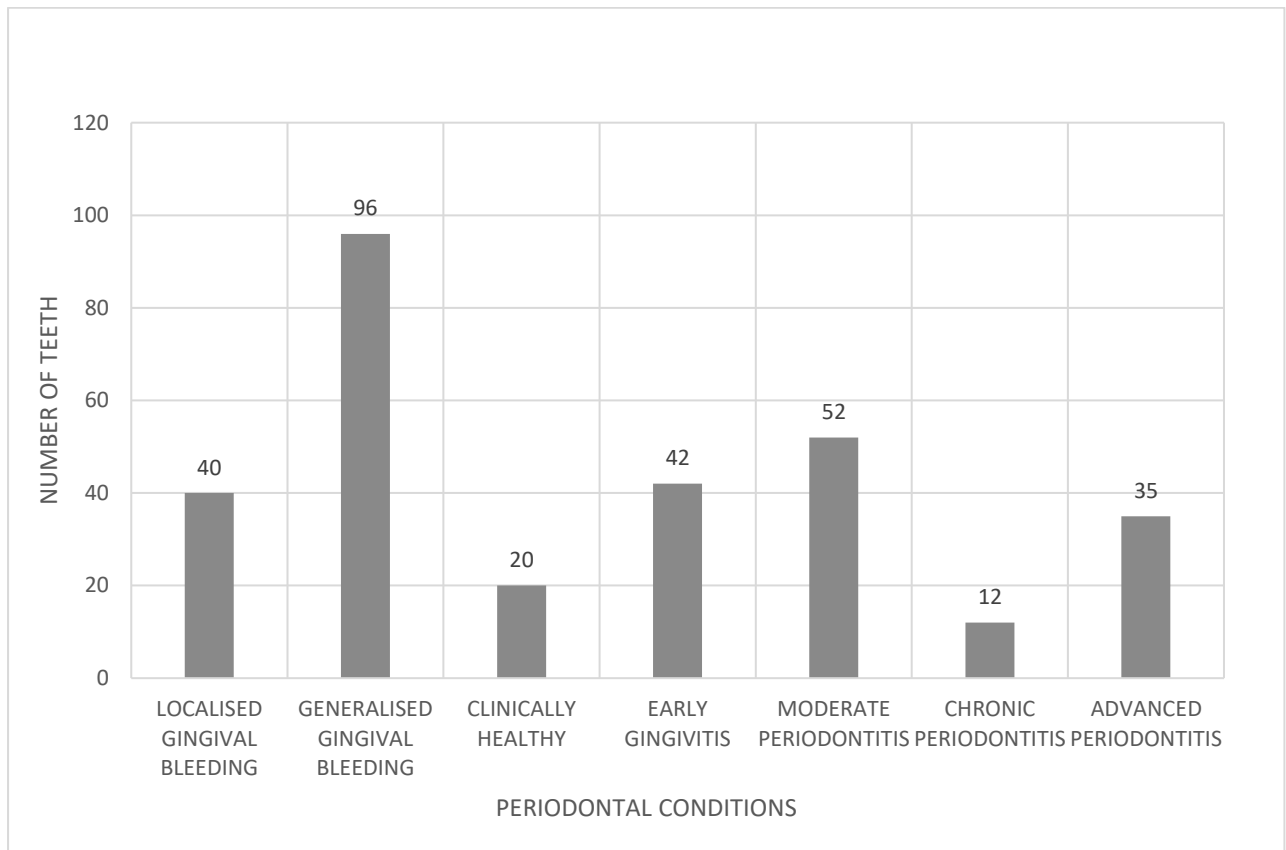


Figure 4.9: Survey for periodontal conditions

The study survey showed a high prevalence of generalised gingival bleeding (32%), while advanced (12%) to moderate periodontitis (18%) was the most prevalent of the periodontal conditions.

4.16 Discussion

4.16.1 Oral health knowledge, attitudes, and practices

Knowledge

Since little or no recent research on the trend of dental caries in the country exists, the researcher was motivated to conduct the present study. This study was aimed to determine the knowledge, attitudes and practices of patients relating to dental caries

and investigate the prevalence of dental caries among a particular population. The study identified that the majority of the participants knew the causes and methods of prevention of dental caries. The study indicated that approximately 88.9% of participants knew the importance of cleaning their teeth and about 80.7% were aware of the effects of sugary diets. These results supported the results of a previous study conducted in Nigeria where most participants were knowledgeable and aware of the detrimental effects of sweets and tobacco on their dental health. But there was a high prevalence of caries (Ogunrinde, Ovwole, & Dosumu 2015). The increased frequency of brushing is irrelevant if there is a lack of knowledge for the practice of proper methods (Jeevanandan & Govindraju, 2018). This supports another study conducted by Al-Hussainia, *et al.* (2003) where it was stated that most participants (77%) were made aware of the importance of regular dental attendance and have received this information about dental care from school.

Attitude and practices

The study deduced that only half of the participants visit their dentists yearly (50.6%), which may be due to the dental anxiety highly associated with having had a previous bad experience as well as a low level of education (Milgrom *et al.*, 2010). These results were also consistent with the results from a study that was conducted in Bangladesh in which most subjects reported 48% irregular dental attendance (Haque, *et al.*, 2016). Although the majority agree on the importance of dental visits, the patients' perception of the quality of dental care providers and their intent to re-accessing a dental service is also associated with a practitioner's professionalism, empathy, and delivery of oral hygiene advice (Mahajan & Oberoi, 2014). Similarly in a study in Pretoria, a poor perception of the importance of primary teeth, and a lack of knowledge and awareness of the significance of oral health, particularly among parents with little education contributed to the prevalence of dental caries in children (Kolisa, 2016). The study emphasises that it is the dentists' responsibility to educate and motivate people to visit them regularly. The findings imply that with the help of the Department of Health, dentists and dental auxiliaries need to spread this awareness among the general masses through various outreach programmes. Public health awareness measures through various mediums, such as Print/Press Media, Audio/Radio/Television, the Internet, and organising social activities, should be targeted at community members

of ages below 30 and above 40 years (Jain, Mitra, Ashok, Dundappa, Soni & Ahmed,2012). This reflects a study conducted among children by Chen in Hong Kong that found the need for oral health promotion campaigns to improve the public's poor attitude and awareness of dental health. According to a study conducted by Jain *et al.* (2012),a lack of knowledge and awareness of regular dental check-ups to detect and to prevent dental diseases is another gap in public education of a population affected by poor socio-economic conditions. Concerning practices, 92.7% of participants agreed or strongly agreed that they use toothpaste and toothbrush , 60.6% avoided sugary diets and 75.6% brush their teeth upon waking up and after eating. These results are in consistent with a study conducted in 2020 by Elagra, *et al.* in which it was reported that females with healthy lifestyles were found to have better oral habits, while in another study the participants demonstrated poor knowledge and awareness of the relationship between general and oral health, but their oral health practices were satisfactory (Sharma, *et al.* 2020). Knowledge of the risk factors associated with dental caries also affects the patients' attitudes and practices (Molete *et al.*2019).

Information



In terms of oral health information, the majority of participants, (75%) agreed or strongly agreed with the statements of the items on oral health information. Given that the statements were positively worded; these results suggest that the participants were generally satisfied with the oral health information they received. Concerning treatment and preventive measures, a clear majority of the participants agreed or strongly agreed on almost all the statements. This suggest that participants were generally satisfied with the treatment and preventive options availed to them. Similarly, the majority of participants were knowledgeable of the complications of dental caries. These findings are consistent with findings from another study that was conducted in Kuwait by (Al-Hussainia, *et al.* 2003). Although, the patients are receiving information from the dentist, factors such as poor access to public health facilities, fear and anxiety towards treatment, patients are irregular in their dental recall appointments. This adds to high patients loads and limitations of time preventing them from getting adequate information (Molete *et al.*2019).

The participants reported that they visited the dentist only when they felt pain. Most of them have reported that toothache and swellings were the driving factors for their visits

to clinics. Only 58 % of the study population reported that they felt the need for oral health promotion and were aware of the importance of regular dental visits. About 26-36% of the study population responded about visits to a dentist and about 50.6 % of the subjects visited dentists yearly and sought only examination (clinical and/or radiographic) and routine check-ups on their visits, while the rest presented to have certain treatments such as fillings, scaling, and extractions. Out of fear, dental visits are not regular. These findings are consistent with similar studies that were conducted in Kuwait by (Vigild, Petersen & Hadi 1999). The absence of toothache and high costs of dental care (although it is a public hospital or clinic) were also among the reasons for not visiting the dentist regularly. Recall intervals and recall need integration for patients was stressed and important according to the patient caries risk. (Patel, Bay & Glick,2010; Patrick *et al.* 2020). It was highlighted the fact that dentists can accurately assess patients' risk of oral health problems and allocate an appropriate recall interval based on this risk assessment (Fee, Richards & Clarkson,2020)



The majority of the study sample reported that their dentist did provide proper care and explained dental procedures (43%) to them and gave them preventive instructions but the prevalence of decay and missing was higher in females (61%) than in males (39%). This indicates a high caries prevalence and severity is present. The decay component (DT) was the primary contributor to the DMFT. The mean DT was the most contributing index score while the mean filled teeth (FT) was the least. This further emphasises the fact that most caries goes untreated. The high number of missing teeth is consistent with the type of treatment available, which is mainly the removal of teeth. The patients come to the clinic when they have extreme pain and this mode of treatment for dental caries has been instilled over the years. A similar study was conducted in Myanmar and a high DMFT score was observed in children (below 5 years), and adults aged 35-44 years and aged 65 to 74. This may be due to barriers in receiving appropriate oral health-care services, an insufficiency of dental professionals and a lack of peoples' awareness on proper oral health among the people in Myanmar (Aung, Maung, Zaitso & Kawaguchi,2019). A high number of untreated dental caries among adults may have been attributed to their limited access to dental care and insufficient oral health education and promotion measures (Ogunrinde, Ovwale, & Dosumu 2015).

Prevalence and severity of dental caries were also significantly found to be associated with increasing age. However, a high percentage of participants reported cleaning their teeth at least once a day and using toothpaste, an indication of fair oral hygiene practices. It should be stressed that the most important means of maintaining oral hygiene is using a toothbrush. Tooth brushing at least twice daily with a small-headed, medium hardness brush will help to reduce caries if fluoride toothpaste is used. However, tooth brushing removes plaque only from smooth dental surfaces and not from the depths of contact areas, pits and fissures; therefore, more effective interdental removal requires regular flossing (some flosses also contain fluoride) (Ghazaryan, 2007).

4.16.2 Findings from examination of dental caries

The study revealed that the prevalence and severity of dental caries and periodontal diseases were significantly found in females above 40 years of age. The overall prevalence of dental caries was high with the missing component in the DMFT score highest which may be attributed to the type of treatment available, mainly the removal of teeth. This finding is supported by a study conducted in Tshwane in 2019, in which gender, location and services rendered by dentists were other key associated factors in dental caries (Moleté, Igumbor, Stewart & Yengopal, 2019). The study provides evidence that the practice of dentistry in South Africa has not kept pace with the advances made in the methods of restorative treatment for dental caries and periodontal diseases .

4.17 Summary

The data explains participants' knowledge, attitudes, and practices towards dental caries and the prevailing dental caries situation. Preventive programmes must be instilled in people at the earliest possible time in order to address the rising epidemic and burden of dental caries and periodontal diseases in Buffalo City Metropolitan Municipality. Comprehensive dental care, as well as preventive approaches and programmes along with cost-effective interventions seem to be the most sustainable alternatives to tackle the seemingly overwhelming problem of dental caries. Dental caries is a disease with a prevalence and economic burden that merits careful attention. The Department of Health should conduct more oral health education camps

for this target population to encourage them to maintain optimal oral hygiene along with routine reviews at periodic intervals. More surveys should be conducted on such participants in different regions to evaluate their awareness levels on caries and prevention strategies.



CHAPTER 5: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

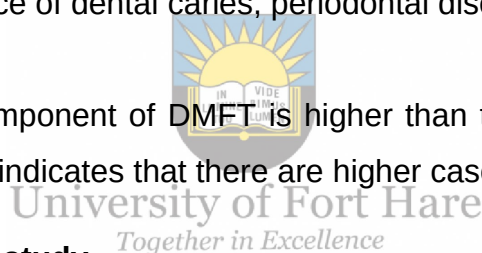
5.1 Introduction

The purpose of this chapter is to summarise the study's findings, draw conclusions, and suggest recommendations in terms of the knowledge, attitudes, and practices on treatment options on dental caries performed in Buffalo City Metropolitan Municipality. It discusses the overall limitations and strengths of the study, makes recommendations for future studies, and suggests measures to curb the high prevalence of dental caries.

5.2 Major findings of the study

This study has revealed the following findings:

- The relatively low level of oral health knowledge, awareness, practices, and behaviours of dental caries among the adult population below 40 years of age.
- A high prevalence of dental caries, periodontal diseases, and associated tooth disorders.
- The missing component of DMFT is higher than that of the filled component which suggests indicates that there are higher cases of tooth extraction



5.3 Limitations of the study

The study was limited in how it was conducted as well as the outcomes it achieved. Due to its nature, the researcher found it difficult to prove the association between dental caries and the frequent consumption of sugar-derived diets and snacks among the chosen population. The incidence of dental caries cannot be calculated properly. The assessment of incidence is difficult, costly, time-consuming and subject to the loss of follow up of cases. The caries was examined at the cavitated level only and the lack of radiographs to detect interproximal lesions meant that the study could not accurately count the total carious lesions in the mouth (Ghazal,2017). In addition, the results of the study may not be reasonably representative for all adults in East London as only four of the local health institutions were included in the study; however the sample size was sufficiently large enough to conduct the research. Since participants were adults with varying levels of language ability as well as various levels of completing questionnaires, this may have influenced the selection of

responses. Therefore, the study may be limited due to the possible misinterpretation and misunderstanding of questionnaire items of participants although it was thoroughly explained to them. Furthermore, the researcher was always available during the completion of the questionnaire, and participants were encouraged to approach her whenever they needed clarification of any point. The DMFT index also has its limitations. The values do not provide any indication to the number of teeth at risk or data useful for treatment needs. It only accounts for teeth lost due to dental caries but does not specify which tooth surfaces are affected by dental caries. Furthermore, it does not record whether dental caries are active or arrested and cannot define what stage caries have reached. Lastly, the study findings do not explain the relation of severity of dental caries prevalence with the socio-economic status of the participants.

5.4 Strength of the study

To the best of my knowledge as a researcher, no study exists of knowledge, attitudes, and practices of treatment options of dental caries in Buffalo City Metropolitan Municipality district of the Eastern Cape Province in South Africa. Therefore, the findings may provide a true reflection of the severity of dental caries among this community. The tragedy of this widespread non-communicable disease is that both dental caries and periodontal diseases are preventable, but due to neglect of oral health-care professionals they have become another burden of disease. Since dental caries are a multifactorial disease, factors such as oral hygiene and access to the fluoridated products are determinants of the carious process and should be addressed for caries prevention and treatment. Policies on the role of fluoride in caries prevention should be implemented by the fluoridation of community water. Therefore, providing and implementing preventive, therapeutic, and informative programmes for controlling dental caries in all age groups is necessary for oral health workers and policymakers.

5.5 Summary

This study offered a comprehensive synopsis of the knowledge, attitudes and practices of dental caries and the periodontal status and oral health behaviour, of the community of Buffalo City Metropolitan Municipality. The goal and purpose of this epidemiological study were to acquire evidence and understand the patterns of dental

caries disease, and the associated risk factors and determinants to find ways in which to reduce the disease burden. Such epidemiological studies for dental caries are critical since the carious lesions treated only by extraction (or surgically) have been substantially modified by newer strategies that stress disease prevention. This study may assist in improving the public's views and knowledge of dental caries as they attend dental surgeries seeking treatment, where they may receive more professional advice in this regard.

The findings of this study spotlight the importance of the Department of Health in adopting strategies aimed to increase awareness about oral health among the community. It is also recommended that the government with the involvement of the private sector take action, provide support to the vulnerable subjects and thus reduce socio-economic inequalities to improve the oral health outcomes.

The public health policy should focus, not only on improving oral health, but also, more specifically, on methods of dental caries prevention and on reducing social inequalities in oral health. This requires coordinated action across disciplines and organisations on the social determinants of health (Commission on Social Determinants of Health, 2008). Dentists and their teams should focus on giving chairside educational advice in the clinical setting, or on delivering oral health education programmes in schools and other community settings. They should change the mode of treatment and emphasise restorative and prosthetic procedures.

5.6 Recommendations

This study has deduced the level of knowledge, awareness, and practices of the adult population of the treatment options for dental caries and provided recommendations which are discussed in the following categories:

- policymakers, programme designers and oral health workers;
- research;
- education and introduction of dental caries prevention materials; and
- service delivery implications.

5.6.1 Policymakers, programme designers, oral health service researchers and public health workers' implications

Compliance monitoring and evaluation tools should be developed and tested. Programme guidelines should be developed for community oral health workers to use when doing house-to-house visits and providing oral health education to clients in health-care facilities. Therefore, emphasis on the prevention of dental caries should be given utmost priority with training and development of the workforce, such as dental assistants and nurses, and the management of health systems and dental services. A balance should be sought between oral health workers and public health specialists suited to deal with the oral health needs of each population; moreover, it should be combined, with efforts to increase the diversity, capacity and flexibility of the workforce. The results of this study may also help to evaluate the efficacy of public oral health education and promotion programmes in the future.

5.6.2 Research implications

A similar study of primary and secondary school children should be conducted in Buffalo City Metropolitan Municipality. The results from such a study could guide the development of appropriate guidelines that can be utilised by school teachers and school nurses. These particular role-players should educate the community and create an awareness of all the precautionary measures available for widespread oral health-care. Advice to curb the consumption of sugary snacks and drinks is part of the general dietary counselling since diet is a common risk factor for other chronic diseases such as obesity and diabetes. Healthy foods should be included in the feeding programmes. A diet with sugars, particularly non-milk sugars, in items other than fresh fruits and vegetables, is the major dietary cause of caries. There is a direct relation between sugars and caries (Lagerweij, van Loveren, 2019). In terms of older children and adults snack foods and especially drinks should be sugar-free and frequent consumption of carbonated and cola-type drinks should be discouraged. Water, milk, and sugar-free fruit juices are preferred options for children and adults to avoid the risk of erosion and caries (Ghazaryan, 2007). The policies should be developed and advocated. Concerning the community-based programmes and oral health-care facilities within health systems, it is important to track current efforts towards reforming the oral health sector and improve its funding and management for universal coverage, all-

inclusiveness and equity of care. Systems for the monitoring, surveillance and evaluation of population-wide strategies related to fluoridated water, salt, and toothpastes must be maintained (Frazão, 2012).

5.6.3 Education and treatment implications

The curriculum offered to health professionals and dental practitioners should include specific modules on health promotion in oral health-care. In light of this, it is necessary to evaluate patients' dietary habits to propose a realistic change that may lead to the re-establishment of the balance between demineralisation and remineralisation of teeth. Dental health education should be incorporated into the existing school curriculum. The four most accepted measures along with professional plaque removal for prevention of dental caries and its complications are oral hygiene, dietary counselling, fluoride, and fissure sealant. The first two measures do not require much expenditure. Consequently, there is a need to educate patients on the correct motion for tooth brushing to ensure that their teeth are thoroughly brushed (Ghazaryan, 2007).

5.6.4 Development of dental caries prevention materials

Dental caries prevention materials should be developed that include preventive measures such as oral hygiene instructions, chlorhexidine mouthwashes, dietary counselling on the information of the role of dental plaque and sugars in the caries process, and advice on home use of fluorides to prevent the onset of caries and arrest the progression of caries lesions manifesting both sub-clinically and clinically and even to mend them. They are designed to provide evidence-based messages about preventing caries and can be used to introduce key oral health messages to parents and caretakers, as well as to reinforce previous educational messages. Posters and leaflets should also be used in oral health clinics and centres, and with preschool and school oral health programmes.

5.6.5 Service delivery implications

Since the majority of the participants utilise public oral health services, the provision of restorative, prosthetic, scaling and polishing preventive measures, as well as topical fluoride and sealant applications should be emphasised by the dentists in these centres in addition to tooth extraction for the relief of pain and sepsis. Accessibility of

these services should be made possible to the unemployed and socio-economically disadvantaged populations through mobile outreach programmes. More dental screenings should be offered as the core of school-based oral health programmes and community outreach programmes with oral health promotion targeted at schools and other learning institutions. Most participants were aware of the detrimental effects of sweets, and smoking, tobacco on dental health although there was not as much awareness regarding the adverse effects of various oral habits. More enlightenment activities need to be done in this area as much of the damage is preventable by intercepting these habits at an early age. Oral health professionals are encouraged to pass on oral health knowledge and influence people to make the right choices to prevent dental caries. In addition, they should persuade their patients to adopt special dietary programmes, educate, and motivate them to alter their customary dietary behaviour (Gupta, Gupta, Pawar, Birajdar, Natt & Singh, 2013). Associations within the health-care sector and health promotion programmes, including other medical and paramedical and dental health specialists may lead to prospects for improvements in oral health and overall health.



5.7 Conclusions

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The results of this study indicated that the majority of the participants know the importance of visits to a dentist and their treatment modalities. The adequacy and appropriateness of the oral health services in East London were evaluated from the questionnaire and the responses were favourable and equally divided. These observations can be ascribed to the deficiency of appropriate oral health education and promotion programmes which might have made the dental treatment redundant. Therefore, more measures should be undertaken to prevent dental caries and related tooth disorders. It is recommended that future large-scale dental caries surveys be undertaken, like that on the state level or national surveys should be conducted and the data obtained be used to formulate better dental health programs for our country.

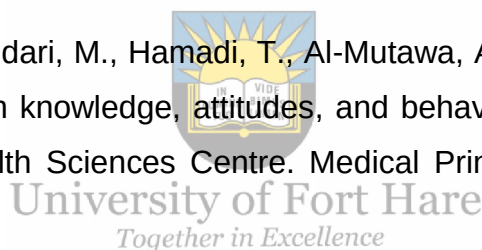
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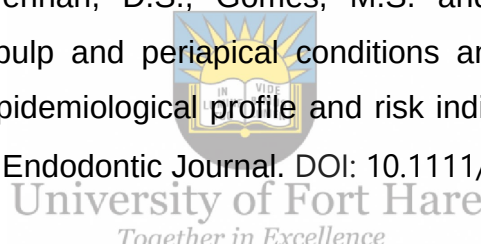
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APPENDIX 1: QUESTIONNAIRE

SECTION A: DEMOGRAPHIC DATA

1. What is your age?

Under 20 years	1
21-30 years	2
31-40 years	3
41-50 years	4
51-60 years	5
61-70 years	6



2. Marital status

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Single never married	1
Married	2
Widow	3
Divorced	4
Separated	5

3. Education: What is the highest degree or level of school you have completed?

No schooling completed	1
Nursery school to Grade 7	2

High school graduate, no diploma	3
Trade, technical, vocational training	4
Bachelor's degree, professional degree	5

4. Professional or employment status

Unemployed	1
self-employed	2
Employed for wages	3
Unable to work	4
Retired	5



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**SECTION B: KNOWLEDGE, ATTITUDES AND PRACTICES OF DENTAL CARIES
PREVENTATIVE MEASURES**

	STRONGLY AGREE 1	AGREE 2	NEUTRAL 3	DISAGREE 4	STRONGLY DISAGREE 5
KNOWLEDGE					
1.My mother never told me about cleaning my teeth at home care					
2.My teacher never told me about cleaning my teeth at school care					
3.A visit to the dentist is important					
4.I am aware that a sugar related diet is one of the main causes of dental caries					
5.I am aware of the causes of dental caries					
ATTITUDE					
1.I have never visited a dentist for cleaning my					

teeth or general oral check-up					
2.I know the importance of brushing teeth					
3.I am aware of the fact that a sugar related diet is one of the main causes of dental caries					
4.I avoid diets with sugar to prevent dental caries					
5.I am aware of the causes of dental caries					
PRACTICES					
1.I use toothpaste and a tooth brush for cleaning my teeth					
2.I avoid diets with sugar to prevent dental caries					
3.I brush my teeth when I wake up and after I eat					
4. I use dental floss and other interdental aids to clean my gums					



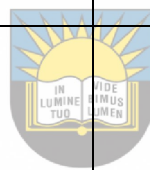
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5.I visit my dentist yearly				

SECTION C: INFORMATION RECEIVED REGARDING ORAL HEALTH PRACTICES

	STRONGLY AGREE 1	AGREE 2	NEUTRAL 3	DISAGREE 4	STRONGLY DISAGREE 5
1.The dentist encourages me to share ideas and opinions about dental care					
2.The dentist provides options to dental care and used the dental aids to educate					
3.The dentist makes sure that I understand the information he provides					

4.The dentist contributes to preventive options for the well-being of my mouth and checks my mouth					
5. The dentist explains and gives reasons for the treatment options that are appropriate					
6.The dentist provides satisfactory and affordable preventive options for dental care					
7. The dentist stresses that change is possible with preventive measures for dental care					
8.The dentist does not care about preventive measures but only for treatment for now					
9.The dentist and staff protected your privacy					

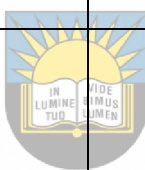


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SECTION D: TREATMENT AND PREVENTIVE OPTIONS OFFERED BY THE DENTIST RELATED TO DENTAL CARE

	STRONGLY AGREE 1	AGREE 2	NEUTRAL 3	DISAGREE 4	STRONGLY DISAGREE 5
1. The dentist addressed me accordingly for my reason for the visit and the problem					
2.The treatment was completed on time and in an efficient manner					
3.The dentist conducted procedures pain free and with utmost care to avoid infection					
4.The clinic and equipment were clean and presentable					
5.The dentist explained to me before each procedure and step of treatment					
6. The dentist gave me choices for my					

treatment and let me decide what to do					
7.I received the treatment service I needed during my visit					
8.The dentist talked to me with respect and listened carefully and encouraged me to ask him questions					
9.The dentist explained the treatment he offered clearly					
10. I was pleased with the assistant dentist /staff.					
11.The Department of Health should make changes to this clinic/ hospital. Dental care could be better					
12. I recommend this clinic/hospital to my friends/relatives					
13. The dentist, reception and staff were professional and courteous					



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14 If this was your first visit, you were given information, appointments for further visits and the importance of taking care of your teeth was stressed					
15.Appointment options were given that fit my daily schedule					
16.There were problems in scheduling appointments					
17.The preventive options were given by the dentist					
18.The dentist gave specific instructions such as frequency of brushing, method of brushing, time and duration, rinsing behaviour					
19. The dentist gave dietary advice					
20.The dentist provided general advice on					

improving oral health and care					
21.The dentist provide information verbally/leaflets					
22.Dentist did not explain treatment options clearly					
23 I am not satisfied with the dental treatment received					
24.I will follow accordingly as per the dentist's treatment and make a follow up					
25 I cannot make a follow up and the dental clinic is too far to visit again					
26.The dentist made a referral for me					
27 The dentist did not care about my general condition and did not make any referral.					



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SECTION E: KNOWLEDGE OF COMPLICATIONS OF DENTAL CARIES

	STRONGLY AGREE 1	AGREE 2	NEUTRAL 3	DISAGREE 4	STRONGLY DISAGREE 5
1.Failure to visit dentists regularly and lack of maintenance of oral hygiene results in loss of teeth due to dental caries					
2.Dental caries is an irreversible condition and can be prevented					
3.Dental caries can be prevented from regular brushing and cleanliness of teeth and proper diet					
4.Sugary drinks and foods must be avoided to prevent dental caries					
5.Dentists encourage to adopt a healthy lifestyle for the mouth as well					

6. There is a need for oral health promotion programmes in the clinic and hospital on the importance of good oral health					
7. Do you feel regular/periodic check-up with dentists causes complications to teeth and gums?					



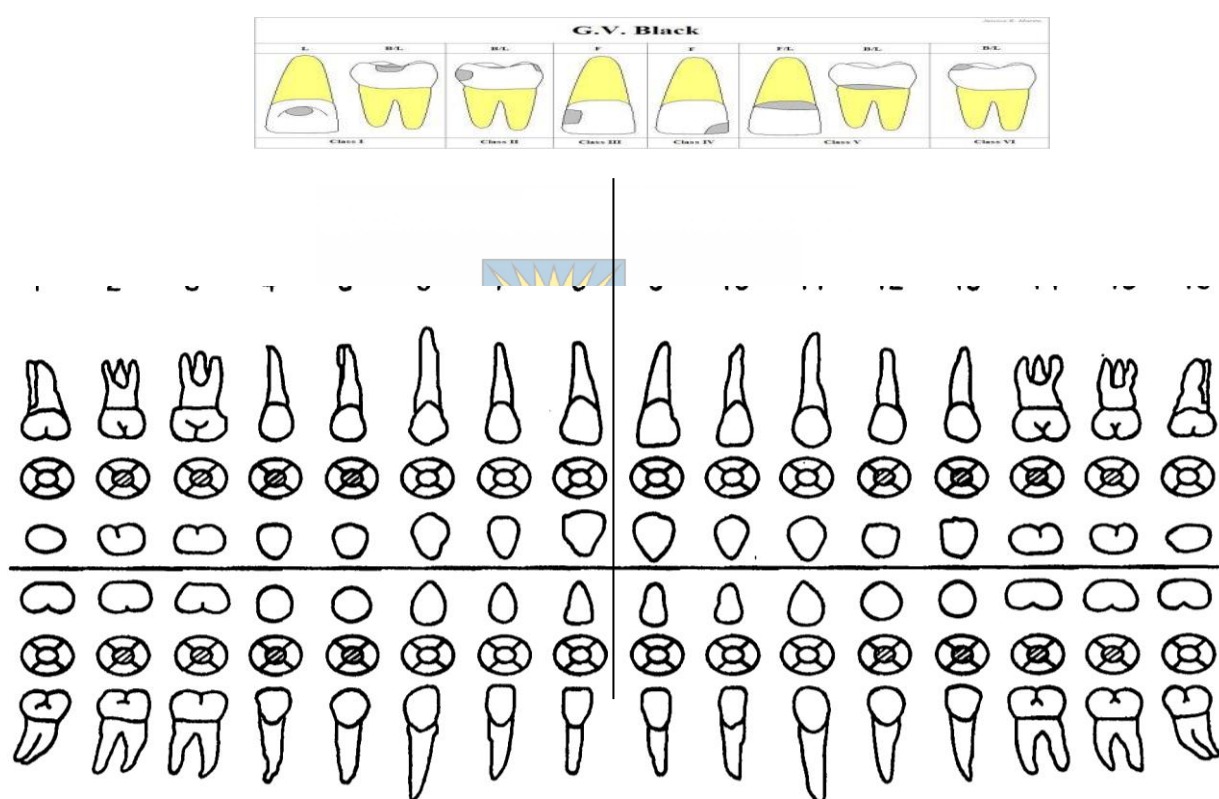
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APPENDIX 2: EXAMINATION OF DENTITION

EXAMINATION OF DENTITION

Maximum score of DMFT= 32; minimum score of DMFT =zero DMFS=D+M+F X EXTRACTED PERMANENT TOOTH

D component: Decayed teeth – tooth with primary caries; filled tooth with recurrent decay (secondary caries); tooth with temporary filling A tooth with restoration and caries is counted as decayed D. **M component:** Missing teeth due to caries ----- **F component:** Filled teeth due to caries tooth with one or more permanent restorations; tooth with a crown because of previous decay; tooth without secondary (recurrent) caries ; tooth without other area of primary caries.



CRITERIA FOR DIAGNOSIS OF CARIES

0	SOUND
1	ACTIVE LESION IN ENAMEL,WITHOUT CAVITY (OPAQUE ENAMEL WITH A WHITE SPOT ON THE SURFACE)
2	INACTIVE LESION IN ENAMEL,WITHOUT CAVITY (BRIGHT SURFACE WITH BROWN DISCOLOURATION)
3	ACTIVE CAVITY IN ENAMEL (OPAQUE ENAMELSURFACE AND LOSS OF SUBSTANCE)
4	INACTIVE CAVITY IN ENAMEL (BRIGHT SURFACE,BROWN DISCOLORATION AND LOSS OF SUBSTANCE)

5	ACTIVE CAVITY IN ENAMEL/DENTIN (YELLOW OR LIGHT BROWN DISCOLORATION, WET DENTIN)
6	INACTIVE CAVITY IN ENAMEL/DENTIN(DARK BROWN DISCOLORATION,HARD AND DRY DENTIN)
7	PULPAL INVOLVEMENT OR ROOT STUMPS
8	FILLED TOOTH
9	MISSING TOOTH

Extraoral assessment : lymph nodes, temporomandibular joints, and muscles of mastication. **Intraoral examination** of oral soft tissues (lips, tongue, palate, buccal mucosa, floor of mouth, and oropharynx). **BLEEDING ON PROBING**: LOCALISED /GENERALISED GINGIVITIS / LOCALISED /GENERALIZED PERIODONTITIS **PIGMENTATION ON GINGIVA**,RAISED NODULESBLACK/PURPLISH

1	0	3
2	2	4*

Code	Criteria
0	No pockets >3.5 mm, no calculus/overhangs, no bleeding after probing (<i>black band completely visible</i>)
1	No pockets >3.5 mm, no calculus/overhangs, but bleeding after probing (<i>black band completely visible</i>)
2	No pockets >3.5 mm, but supra- or subgingival calculus/overhangs (<i>black band completely visible</i>)
3	Probing depth 3.5–5.5 mm (<i>black band partially visible, indicating pocket of 4–5 mm</i>)
4	Probing depth >5.5 mm (<i>black band entirely within the pocket, indicating pocket of 6 mm or more</i>)
*	Furcation involvement

Both the number and the * should be recorded if a furcation is detected - e.g. the score for a sextant could be 3* (e.g. indicating probing depth 3.5–5.5 mm PLUS furcation involvement in the sextant).

CASE TYPE	DEFINITION	CLINICAL ATTACHMENT LOSS (CAL)
CASE TYPE 0	CLINICALLY HEALTHY	NO CAL
CASE TYPE 1	EARLY /CHRONIC GINGIVITIS	NO CAL, LESS THAN 4MM
CASE TYPE 2	ESTABLISHED GINGIVITIS/EARLY PERIODONTITIS	SLIGHT CAL 1-2MM LESS THAN 5MM NO FURCS ,REDNESS,SUPPURATION
CASE TYPE 3	MODERATE /CHRONIC PERIODONTITIS	MODERATE CAL 3-4MM,EARLY FURCS,REDNESSS,SUPPURATION
CASE TYPE 4	ADVANCED PERIODONTITIS	SEVERE CAL MORE THAN 5MM LESS THAN 7MM ,ADVANCED FURSCS,REDNESS,SUPPURATION
CASE TYPE 5	REFRACTORY PERIODONTITIS	ADVANCED FURCS, REDNESS SUPPURATION,PT LESS THAN 30YRS OLD

. Miller classification (tooth mobility)

Class I	Tooth can be moved less than 1 mm in the buccolingual or mesiodistal direction 0/1	
Class II	Tooth can be moved 1 mm or more in the buccolingual or mesiodistal direction No mobility in the occlusoapical direction (vertical mobility)	2
Class III	Tooth can be moved 1 mm or more in the buccolingual or mesiodistal direction Mobility in the occlusoapical direction is also present	3

DENTAL WEAR: ATTRITION ABRASION EROSION



APPENDIX 3: INFORMED CONSENT FORM

Knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan District, East London, South Africa

Dear research participants,

You are asked to participate in a research study conducted by Dr Legy Veleekizhakethil, an MPH degree student, at the University of Fort Hare, School of Health Sciences.

PURPOSE OF THE STUDY

The purpose of this study will be to determine the knowledge, attitudes, and practices of patients about dental caries and awareness of treatment options for dental caries in the selected health facilities. I would also like to determine the severity of dental caries and the level of understanding of the risk factors that cause dental caries and the availability of preventative methods to the public in the Buffalo City Municipality.



PROCEDURES

If you agree to participate in the research study, you would be asked to sign a written informed consent form, answer the questionnaire and you would be subjected to an examination of the mouth.

POTENTIAL RISKS AND DISCOMFORT:

- You will not be exposed to any form of risks or discomfort in this study
- You are only expected to answer questions on the questionnaire
- I will be asking some questions that you may not have thought about before, and which also involve thinking about the past or the future.
- I know that you cannot be certain about the answers to these questions but we ask that you try to think about these questions.

PAYMENT FOR PARTICIPATING IN THE STUDY

You will not receive any payment for participating in this study

PARTICIPATION IN THE STUDY

Participation in this study is strictly voluntary, and you can decide whether to participate in this study or not. You are also free to stop participating in this study when you choose not to participate. Should you decide not to participate or to discontinue participating in the research there will be no consequences.

However, we would really appreciate it if you do share your thoughts with us.

Confidentiality will be observed professionally, and data obtained will be anonymised for the protection of identities of participants at all stages of the research.

ANTICIPATED BENEFITS

The study aims to obtain knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan District, East London, South Africa

CONSENT

I hereby agree and consent to participate in research regarding knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan District, East London, South Africa. I confirm that I have read and understood the information about the research.

I understand that I am participating freely and without being forced in any way to do so. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this is a research study whose purpose is not necessarily to benefit me personally. I consent to the use of the data in research, publications, sharing and archiving.

I understand that this consent form will not be linked to the questionnaire, and that my answers will remain confidential.

I agree and consent to answer the questionnaire and also subject to examination of the mouth by the researcher.

I understand that when the original questionnaire is translated into another language, one cannot simply assume that the translated items are valid. This is due to the fact that validity is content-specific, and it cannot be translated in a literal manner. Also, the cultural context of the second language, such as the words used, is different from the original language. Thus, I understand and agree with the researcher that the content of the questionnaire and the informed consent is in English.

.....

:

Signature of participant

Date

IDENTIFICATION OF INVESTIGATORS



Should you have any questions or concerns please feel free to contact:

University of Fort Hare
Together in Excellence

.....

Signature of researcher

Date:.....

Principal Investigator: Dr Legy Veleekizhakethil,

University of Fort Hare: Faculty of Health Sciences, East London

APPENDIX 4: ETHICAL CLEARANCE FROM UNIVERSITY OF FORT HARE

**FACULTY OF HEALTH SCIENCES
Research Ethics Committee**

P.O Box 1054
East London 5200
Tel: +27 (0) 43 704 7368
E-mail: dgoon@ufh.ac.za



**ETHICAL CLEARANCE CERTIFICATE
REC-100118-054**

Certificate Reference Number:	Ref # 2019=10=008=VeleekizhakethilL
Project title:	Knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan Municipality, South Africa
Nature of Project	Masters of Public Health
Principal Researcher:	Veleekizhakethil L
Student Number:	201813661
Supervisor:	Dr U Obi
Co-supervisor	Dr FB Mayeye

On behalf of the Faculty of Health Sciences Research Ethics Committee (FHREC), I hereby give ethical approval in respect of the undertakings contained in the above-mentioned project and research instruments(s). Should any other instruments be used, these require separate authorization. The Researcher may therefore commence with the research as from the date of this certificate, using the reference number indicated above.

Please note that the FHREC must be informed immediately of

- Any material change in the conditions or undertakings mentioned in the document
- Any material breaches of ethical undertakings or events that impact upon the ethical conduct of the research

The Principal Researcher must report to the FHREC in the prescribed format, where applicable, annually, and at the end of the project, in respect of ethical compliance:

www.ufh.ac.za

PAGE 2 ETHICAL CLEARANCE FROM UNIVERSITY OF FORT HARE

**FACULTY OF HEALTH SCIENCES
Research Ethics Committee**

P.O Box 1054
East London 5200
Tel: +27 (0) 43 704 7368
E-mail: dgoon@ufh.ac.za



The FHREC retains the right to

- Withdraw or amend this Ethical Clearance Certificate if
 - Any unethical principles or practices are revealed or suspected
 - relevant information has been withheld or misrepresented
 - regulatory changes of whatsoever nature so require
 - the conditions contained in the Certificate have not been adhered to
- Request access to any information or data at any time during the course or after completion of the project.
- In addition to the need to comply with the highest level of ethical conduct principal investigators must report back annually as an evaluation and monitoring mechanism on the progress being made by the research. Such a report must be sent to FHREC monitoring@ufh.ac.za.

The Ethics Committee wishes you well in your research endeavours.

Yours sincerely



Professor DT Goon
Chairperson: FHREC
18 October 2019

www.ufh.ac.za

APPENDIX 5: ETHICAL CLEARANCE AND APPROVAL FROM DEPARTMENT OF HEALTH, EASTERN CAPE



Enquiries: Zonwabele Merile

Tel no: 083 378 1202

Email: zonwabele.merile@echealth.gov.za

Fax no: 043 642 1409

Date: 28 October 2019

RE: Knowledge and awareness of treatment options for dental carries in Buffalo City Metropolitan Municipality, South Africa. (EC_201910_011)

Dear Dr. L. Veleekizhakethil

The department would like to inform you that your application for the abovementioned research topic has been approved based on the following conditions:

1. During your study, you will follow the submitted protocol with ethical approval and can only deviate from it after having a written approval from the Department of Health in writing.
2. You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality of their identities and shall remove or not collect any information which can be used to link the participants.
3. The Department of Health expects you to provide a progress update on your study every 3 months (from date you received this letter) in writing.
4. At the end of your study, you will be expected to send a full written report with your findings and implementable recommendations to the Eastern Cape Health Research Committee secretariat. You may also be invited to the department to come and present your research findings with your implementable recommendations.
5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with the Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

SECRETARIAT: EASTERN CAPE HEALTH RESEARCH COMMITTEE

APPENDIX 6: ETHICAL CLEARANCE FROM BUFFALO CITY METRO HEALTH DISTRICT



BUFFALO CITY METRO HEALTH DISTRICT

OFFICE OF THE SUB-DISTRICT MANAGER

9 Vincent Road • Vincent • East London • 5247 Eastern Cape
Private Bag X 9015 • Main Post Office, East London • 5200 • Eastern Cape
Tel.: +27 (0)43 7111100 • Fax: +27 (0)43 7211972 • Website: www.ecdoh.gov.za

Enquiries: Ms N. Ntamo

INTERNAL MEMORANDUM

To:	Community Health Centre Manager: Duncan Village & Empilweni Gampo
From:	Buffalo City Sub-district Manager
Subject:	Permission to conduct Research Study: Dr Legy Veleekizhakethil
Date:	8 November 2019

Purpose

The purpose of this memorandum is to inform relevant Buffalo City Health District staff and patients of permission granted on research study to be conducted Dr Legy Veleekizhakethil towards a Research project with the University of Fort Hare.

Background and Exposition of Facts

Dr Legy Veleekizhakethil is currently studying towards her Masters of Public Health with the University of Fort Hare. The title of her research study is **Knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan Municipality, South Africa.**

She has requested for permission to do research in Buffalo City Metro Health District in the following facilities: Duncan Village CHC and Empilweni Gampo CHC. Dr Legy Veleekizhakethil has submitted all the required documents for a research study in the Eastern Cape Department of Health facilities and as such permission has been granted to her by the Research unit to conduct the study in terms of her research protocol and methodology.

Approval by the district

1. Kindly note that this memorandum serves as an approval at district level for Dr Legy Veleekizhakethil to conduct her research study in terms of the approved research protocol, ethical clearance and permission letter from the research unit subject to her producing all necessary supporting documentation on request to prospective participants in the research study and management of the district;
2. All posters advertising the research must first be tabled with Sub-District Manager to ensure compliance with departmental policies;

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Fraud prevention line: 0800 701 701
24 hour Call Centre: 0800 032 364
Website: www.ecdoh.gov.za



PERMISSION TO CONDUCT RESEARCH STUDY: DR LEGY VELEEKIZHAKETHIL

3. Patient details and addresses will only be provided to the researcher on those who have consented to participate in the research subject to the terms and condition of the letter of approval from the Research Unit of the Eastern Cape Department of Health.

APPROVED



**DM LUSASA
SUB-DISTRICT MANAGER
BUFFALO CITY METRO HEALTH DISTRICT**

11/11/2019
DATE



APPENDIX 7: ETHICAL CLEARANCE FROM CECILIA MAKIWANE AND FRERE HOSPITAL ETHICS COMMITTEE

EASTERN CAPE PROVINCE



DEPARTMENT OF HEALTH

ISEBE LEZEMPILO

CECILIA MAKIWANE AND FRERE HOSPITALS RESEARCH ETHICS COMMITTEE

DEPARTMENT OF INTERNAL MEDICINE
PRIVATE BAG X 9047
EAST LONDON
5200

Cell: 082 5765930
E-mail: andygp@mweb.co.za

Assoc Prof AG Parrish
23 January 2020

Protocol Status: Final approval

To Dr Legy Veleekizhakethil

Dear Legy

Re: Knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan Municipality

Application number: FCMHREC/A035/2019

The proposed changes to the consent form have addressed the concerns of the committee

The study was approved, and may proceed.

Period of approval: one year from the date of this letter.

Please note that the clinical governance structure of the institution(s) in which you intend to perform this structure still need to be contacted both for permission to work within their clinical domain, and also so that they are aware of your activity on site.

Yours sincerely

Assoc Prof AG Parrish
MBChB, DA(SA), MMed(Med), MMedSci, FCP(SA)
Chair, CMH and Frere Ethics Committee

APPENDIX 8: ETHICAL CLEARANCE FROM CECILIA MAKIWANE HOSPITAL



Office of Senior Manager Medical Services • Cecilia Makiwane Hospital
Private Bag X 9047 • East London • 5200 • South Africa
Tel: 043 708 2132 E-mail: bongiwe.yose-xas@echealth.gov.za: website: www.ecdoh.gov.za

27 February 2020

**RE: KNOWLEDGE AND AWARENESS OF TREATMENT OPTIONS FOR DENTAL
CARRIES IN BUFFALO CITY METROPOLITAN MUNICIPALITY, SOUTH AFRICA.
(EC_201910_011)**

Dear Dr L. Veleekizhakethil

Permission is hereby granted for you to conduct the above mentioned research study at Cecilia Makiwane Hospital subject to the following:

1. Complying with the provision of the permission letter dated 28 October 2019.
2. Complying with your Research Methodology Plan as approved by the relevant ethics committees.
3. Introducing yourself to the relevant management division of the hospital and providing the necessary documentation showing permission and approval of research study to be conducted at the hospital.
4. Ensuring minimal disturbance to the day to day operations of the relevant department of the hospital.
5. Observe the confidentiality of information and participants.

Your compliance in this regard will be highly appreciated and wishing you all the best in your research study.

Dr B.A. Yose-Xasa
Senior Manager Medical Services

27/02/2020
Date



Province of the
EASTERN CAPE
HEALTH

Office of Senior Manager Medical Services • Cecilia Makiwane Hospital
Private Bag X 9047 • East London • 5200 • South Africa
Tel: 043 708 2132 E-mail: bongiwe.yose-xasa@echealth.gov.za; website: www.ecdoh.gov.za

Enquiries: Dr BA Yose-Xasa

To	Dr L. Veleekizhakethil, Masters Student, University of Fort Hare
From	Dr B.A Yose-Xasa; Senior Manager Medical Services
Cc	Dr D. Simpraga; HOD: Dental, Cecilia Makiwane Hospital Mr S. Mfengu; Nursing Manager, Cecilia Makiwane Hospital Mrs N. Tshangana; Quality Assurance Manager, CMH
Subject	Research Request: " Knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan Municipality, South Africa"
Date	27 February 2020

Your correspondence for the above Research Request refers. Your request to access Cecilia Makiwane Hospital has been approved.

It is requested that a copy of the completed analysis be submitted to this office for record purposes.

You can liaise with the following persons to coordinate the research:

1. Dr D. Simpraga, Tel: 043 708 2318
2. Mr S. Mfengu, Tel: 043 708 2516
3. Mrs N. Tshangana, Tel: 043 708 2127

Regards,

Dr B.A Yose-Xasa

Senior Manager: Medical Services

APPENDIX 9: ETHICAL CLEARANCE FROM FRERE HOSPITAL

	
Province of the EASTERN CAPE HEALTH	
Non Interventional Hospital Review Board	
Postal Address:	Physical Address:
Frere Hospital	Frere Hospital
Private bag x 9047	4 th Floor Room 4.18
Amalinda	Amalinda
East London	East London
5200	5200
Enquiries: B. Willie	Tel: 043 709 2389 Email: babalwa.willie@echealth.gov.za

23 January 2020

Dr L. Veleekizhakethil
Fort Hare University
Faculty of Health Sciences
East London
5200

RE: REQUEST FOR APPROVAL TO CONDUCT RESEARCH STUDY

"Knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan Municipality, South Africa."

We acknowledge receipt of the above mentioned proposal.

Having gone through your proposal, the committee has no ethical problems noted.

Please be advised that the committee has granted you the consent to do the research and confidentiality to be maintained.

Yours sincerely

 23/01/2020

Mrs J. Scholl
Acting Clinical Governance Frere Hospital



Province of the
EASTERN CAPE
HEALTH

EAST LONDON HOSPITAL COMPLEX
Frere Hospital, Amalinda, Private Bag/Ingxowa Eyodwa X 9047, East London, 5200
South Africa • Tel: (043) 709 2135 • Fax: (043) 709 2443 • Website: www.ecdoh.gov.za

INTERNAL MEMORANDUM

To:	Dr L. Veleekizhakethil, Masters Student, University of Fort Hare
From:	Mrs. J. Scholl; Acting Director Clinical Governance, Frere Hospital
CC:	Mrs. L. Trollope; Acting Clinical Support Services, Frere Hospital Dr E. Morkar; HOD: Maxilla-Facial, Frere hospital Mrs. V. Lujiza; Deputy Director Nursing services, Frere Hospital Mrs. N. Nxelewa; Deputy Director Administration, Frere Hospital
Subject:	Research Request: "Knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan Municipality, South Africa."
Date:	23 January 2020

Your correspondence for the above Research Request refers. Your request to access Frere Hospital has been approved.

It is requested that a copy of the completed analysis be submitted to this office for record purposes.

You can liaise with the following persons to coordinate the research:

1. Dr Morkar, Tel: (043) 709 2087
2. Mrs. V. Lujiza, Tel: (043) 709 2781
3. Mrs. N. Nxelewa, Tel: (043) 709 2429

Regards,

J. Scholl 23/01/2020

Mrs. J. Scholl
Acting Clinical Governance Director: Frere Hospital

United in achieving quality health care for all

24 hour call centre: 0800 0323 64
Website: www.ecdoh.gov.za



Isimvo eliqoqambileyo!

APPENDIX 10: STATISTICAL CONSULTANCY SERVICE CONFIRMATION



StatAnalysis
Consulting
5 Boqwana Place, Lolo Park, Bhisho 5605
Tel: +27-40-635 0278
Cell: +27-78-966 6219

To whom it may concern

RE: Confirmation of provision of Statistical Consultancy Services

This serves to confirm that LEGY VELEEKIZHAKETHIL received the following services from **StatAnalysis Consulting** (Research Consultants).

Job No:	201005
Contact Statistician:	A. Mandeya
Qualifications:	Lic. Ed Mathematics-ISPEJV (Cuba), MSc Biostatistics-LUC (Belgium), MPH-UFH (South Africa).
Project:	Knowledge and awareness of treatment options for dental caries in Buffalo City Metropolitan Municipality, Eastern Cape province, South Africa.
Commencement data:	7 September 2020
Job description:	Statistical consultancy services Statistical analysis and Report Writing
Completion date:	7 October 2020

In the event that you need further details of the services, feel free to contact your contact statistician on the details provided above.



APPENDIX 11: CONFIRMATION FOR LANGUAGE EDITING



EDITING CERTIFICATE

02 September 2021

To whom it may concern

DECLARATION OF LANGUAGE EDITING

Re: KNOWLEDGE, ATTITUDES, AND PRACTICES OF THE TREATMENT OPTIONS FOR DENTAL CARIES AMONG THE ADULT PATIENTS FOR DENTAL CARIES IN BUFFALO CITY METROPOLITAN MUNICIPALITY, IN EAST LONDON, EASTERN CAPE, SOUTH AFRICA

This serves to confirm that I, Tanya-Lee Ruby Stewart, a SATI-registered translator undertook the language editing of the above-mentioned document on behalf of L VELEEKIZHAKETHIL, student number: 201813661, for the purpose of submission in partial fulfilment of a Master's Dissertation in Public Health.

Changes were suggested in track changes and per email. Implementation was left up to the author.

Should you have any queries please contact me on +27 84 556 7745.

Yours sincerely

TR Stewart

Member: South African Translators' Institute

SATI registration no: 1003470

