RELATIONSHIP BETWEEN NON-CARIOUS CERVICAL LESIONS AND DENTINE HYPERSENSITIVITY AND THEIR IMPACTS ON ORAL HEALTH-RELATED QUALITY OF LIFE AMONG ADULT PATIENTS ATTENDING MUHIMBILI DENTAL CLINICS IN DAR ES SALAAM, TANZANIA

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MDent (Restorative Dentistry) Dissertation

Muhimbili University of Health and Allied Sciences.

October, 2024

Muhimbili University of Health and Allied Sciences

Department of Restorative Dentistry

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By

Gerad George Jubeck

A Dissertation submitted in (partial) fulfilment of the Requirements for the Degree of Master of Dentistry in Restorative Dentistry at

Muhimbili University of Health and Allied Sciences.

October, 2024

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation titled **" Relationship between non-carious cervical lesions and dentine hypersensitivity and its impact to oral health related quality of life among adult patients attending Muhimbili dental clinics in Dar-es-Salaam, Tanzania"** in (partial) fulfilment of the requirements for the degree of Master of Dentistry in Restorative Dentistry of the Muhimbili University of Health and Allied Sciences.

_____

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(Co-Supervisor)

Date: _____

DECLARATION AND COPYRIGHT

I, **Gerald George Jubeck**, declares that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other university for similar or any other degree award.

Signature…… **Date……**

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ACKNOWLEDGEMENT

I want to express my deepest gratitude and appreciation to all those who have contributed to completing this research work. First and foremost, to the almighty God for the gift of life, health, strength, and divine enablement without which this project would not have been possible.

I am immensely grateful to my supervisors Dr. Godbless Joshua Mandari and Dr. Lilian Ephreim Mkonyi for their incredible and unwavering support, expertise, guidance, and assistance in the conception, development, fieldwork, analysis, and write-up. Thanks to Muhimbili University of Health and Allied Sciences (MUHAS) for funding this study, the School of Dentistry (SoD), and the Restorative Dentistry Department (RD) for the training. I appreciate the support from hospital authorities of the Muhimbili National Hospital (MNH) and School of Dentistry-MUHAS, during the entire duration of this research work.

My heartfelt appreciation to all study participants for their willingness and dedication to participate in the study. Special thanks to Dr. Joyce Masalu for reviewing my work.

DEDICATION

I dedicate this dissertation to my family. I love you deeply with all my heart. To my Wife, you have been a listener and a supporter of all my endeavors. Your partnership, steadfastness, and love sustain me. To my daughters, Ivanna, Iliana and my sons, Ian and Ivan, remember all things are possible. Never be afraid to pursue your dreams and goals. You all are precious gifts from the Lord. I love you without measure. Thank you for your patience as I pursued and completed this degree. Thanks for being there for me during this rewarding journey. To my parents, thank you for raising your children to think for themselves. I am grateful for my dad who always told me I could achieve anything I chose to do. Finally, I dedicate this work to the Lord, God. All that I have, all that I am, and all that I do is because of and for You.

ABSTRACT

Background: Oral health-related quality of life in dentistry focuses on how individuals perceive the impact of their oral health on their overall well-being, assessing whether their current oral health status affects their quality of life. NCCLs describe tooth wear at the cementoenamel junction (CEJ) unrelated to caries or bacteria. The prevalence and severity of cervical tooth wear increase with age due to factors like bio-corrosion (erosion), friction (abrasion), and occlusal stress (abfraction). Erosion refers to the role of acids in tooth wear. NCCLs can appear as smooth saucer-like depressions or V-shaped notches, contributing to tooth hypersensitivity, increased caries incidence, compromised structural stability, and impacted plaque retention. DH is a prevalent condition causing temporary tooth pain triggered by various external factors. It can disrupt daily activities such as eating, drinking, tooth brushing, and even breathing. DH causes discomfort and inconvenience, impacting a person's ability to enjoy meals, maintain oral hygiene, and function during routine activities. The patient's quality of life may be significantly affected by these limitations. Recognizing the impact of DH is crucial for dental practitioners to provide appropriate management and improve the overall well-being of affected individuals

Objective: The aim of the study was to determine the relationship between non-carious cervical lesions and dentine hypersensitivity and their impacts on oral health-related quality of life among adult patients attending Muhimbili dental clinics in Dar es Salaam.

Methods: This was a hospital-based analytical cross-sectional study among 384 adult patients aged 18 years and above who attended the MUHAS and MNH-OPD dental clinics in Dar es Salaam from April to June 2024. A consecutive sampling technique was used. All patients awaiting dental treatment on a daily basis, totalling 325 participants aged 18 years and above who consented and met the inclusion criteria, were recruited into the study. Data on sociodemographic, economic characteristics and oral health related quality of life were assessed using Oral Impact on Daily Performance (OIDP) were recorded using a structured questionnaire. Oral examinations were performed, and NCCLs was scored according to the Smith and Knight index (1984). The presence and severity of DH were determined using the tactile stimulus response according to the Schiff ordinal scale (1994). The combination of these clinical variables resulted in categories of the independent variable: without DH or

NCCL, NCCL without DH, DH without NCCL, and both DH with NCCL. The covariables were socio-demographic, education level and economic factors. Statistical analysis was conducted using IBM SPSS Statistics for Windows, Version 26.0. Mean and standard deviation of variables were calculated. Association between dependent and independent variables were assessed through cross-tabulations and Chi-square tests. Modified poison regression analysis was used to evaluate variables related to OIDP. A Chi-square test was computed to determine statistically significant associations, with the threshold of significance set at a $p<0.05$. Odd ratios were calculated to indicate a statistically significant relationship between variables. A p-value of $p<0.05$ was set as a level of significance.

Results: A total of 325 (response rate of 91.3%) patients with age ranging from 18 to 77 years participated in the study with a mean age of 45±7 years. Majority of the participants were female 67.1% and majority (39.5%) being in the age group 36 – 55 years with most of the participants having no steady income (56.3%) and secondary level of education and above of (81.8%, n=266). The prevalence of NCCLs and DH were 45.8% and 36.5% respectively, NCCLs are more prevalent in males compared to females, while DH is more commonly observed in females. The occurrence of DH was predominantly moderate, with 15.1% reporting discomfort or pain. Most participants with dentin hypersensitivity (DH) experienced mild to moderate pain (78.4%), while nearly half of those with non-carious cervical lesions (NCCLs) had mild pain (45.1%). Severe pain was less common, affecting only 21.6% of DH participants and 15.2% of NCCL participants. A strong association was found between NCCLs and DH, with 88.8% of individuals with NCCLs also experiencing DH ($p = 0.000$). Conversely, 92.0% of individuals without NCCLs did not report DH. Of 277 adults, 85.2% had oral health impact and the most affected performance was eating and chewing food (76.0%), followed by difficult cleaning (43.1%, n =140). Higher frequency of OIDP was observed in adults with DH and NCCLs. Modified Poisson regression analysis indicated that OIDP was significantly associated with DH alone. The analysis showed that those with DH had higher ODDs of reporting at least one oral impact (aOR=2.83; 95% CI 1.04-1.25, p=0.005)

Conclusion: NCCLs and DH are prevalent conditions among adults, with DH having a notably higher impact on oral health. Irrespective of NCCL presence, DH significantly impacts the physical pain dimension of OHRQoL.

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ABBREVIATIONS

CEJ	Cemento-Enamel Junction
DH	Dentine Hypersensitivity
GR	Gingival Recession
GERD	Gastro-esophageal Reflex
MDent	Master of Dentistry
MNH	Muhimbili National Hospital
MUHAS	Muhimbili University of Health and Allied Sciences
NCCLs	Non-Caries Cervical Lesions
OIDP	Oral Impacts on Daily Performance
OHE	Oral Hygiene Education
OHRQoL	Oral Health Related Quality of Life
PD	Periodontal Disease
SPSS	Statistical Package for Social Sciences
TWI	Tooth Wear Index
WHO	World Health Organization

DEFINITION OF TERMS

Dentine Hypersensitivity is characterized by short, sharp pain arising from exposed dentine in response to stimuli, typically thermal, evaporative, tactile, osmotic, or chemical. This pain cannot be ascribed to any other dental defect or pathology(1)

Non-Carious Cervical Lesion refers to the loss of tooth structure that occur at the cervical area without the presence of dental caries (2)

Tooth wear refers to loss of tooth substance by means other than dental caries Tooth wear is predominantly the result of a combination of three processes; attrition, abrasion and erosion. These forms of tooth wear can further lead to a condition known as **abfraction.**

Abrasion description of mechanically induced loss of hard dental tissue (3)**.**

Erosion description of chemical destruction of hard dental tissue due to acids (3)**.**

Abfraction is the loss of tooth structure at the gum line due to biomechanical forces, specifically non-carious cervical lesions (4)**.**

Attrition is the loss of tooth structure/tissue caused by tooth-on-tooth contact.

Gingival recession is the gingival tissue margins' apical movement, exposing the root surfaces (5)

Oral habits are the frequent or constant practices or acquired tendency, which has been fixed by frequent repetition

Intensity refers to the strength of the disturbing force.

Severity is the word that describe extent of a condition or lesion.

Oral impacts refer to the consequences or effects that oral health conditions or problems can have on an individual's overall well-being, quality of life, and daily functioning.

Oral health-related quality of life defined as a “oral health-specific self-report that captures the functional, social, and psychological effects of dental illness (6).

Quality of life can be defined as an individual's view of their place in life, taking into account their expectations, aspirations, and worries, as well as the culture and value systems in which they live (7).

Oral Impacts on Daily Performance is a measurement tool or questionnaire used in oral health research and epidemiology to assess the impact of oral health conditions on an individual's daily life and functioning (8).

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background

Tooth wear (loss of tooth structure) is a physiological process associated with eating habits, aging, oral hygiene, and parafunctional behaviours that progress slowly, continuously, and irreversibly. The term "non-carious cervical lesion" (NCCL) describes tooth wear that is located at the cementoenamel junction (CEJ) and is not linked to caries or the presence of bacteria(9). The prevalence and severity of cervical tooth wear increase with age and it is generally accepted that the lesions are not generated by a single factor but a combination of factors(10). Among these factors, bio-corrosion (erosion), frictions (abrasion), and occlusal stress (abfraction) are proposed to be related to the formation and progression of NCCLs. The term "erosion" is also used to refer to the role of acids in tooth wear(11). Depending on the kind and severity of the underlying cause, NCCLs can have different clinical appearances such as smooth saucer-like depressions or V-shaped notches (10), these lesions then cause tooth hypersensitivity, caries incidence, structural stability, and pulpal vitality in addition to having an impact on plaque retention(5)(12).

Dentine hypersensitivity is characterized by a strong pain in response to a thermal evaporative tactile, osmotic, or chemical stimulation that cannot be related to any other pathological defect. It can be caused by exposed dentine (cervical dentine), with or without tooth attrition. Similar to NCCLs the prevalence of DH varies widely and the prevalence of DH worldwide is approximately 11.5%(13)**.** Regardless of the cause of dentin exposure, a common characteristic is the presence of open dentinal tubules, which serve as a direct connection between the external environment and the inner pulp of the tooth. When the exposed dentin encounters tactile, thermal, or chemical stimuli from the outside, it can lead to the onset of painful sensations(14). The identification of risk factors that contribute to the exposure of dentin tubular openings and the resulting pain, such as gingival recession caused by excessive oral hygiene practices and non-carious cervical lesions, remains a subject of controversy. While numerous factors have been identified, the primary key factors have not yet been definitively established(14).

From the relatively few studies dealing with the prevalence of dentine hypersensitivity, it can be concluded that it is a frequent condition. In the future, when older adults will be able to retain more teeth because of better prevention and intervention, it can be expected that the incidence of cervical dentin hypersensitivity will increase even more because the condition is related to the incidence of non-carious cervical lesions(15). Whereas many individuals do not seek treatment to desensitize their teeth because they do not perceive dentin hypersensitivity to be a severe oral health problem, a substantial segment of patients (10–25%) experience discomfort to the extent that it interferes with their eating, drinking, oral hygiene habits and sometimes even breathing. However, these symptoms are highly relevant from the patients' point of view and often have a considerable adverse impact on their daily quality of life(16)

In recent years, there has been a significant shift in the focus of quality-of-life research in the fields of medicine and dentistry(17), Quality of life (QoL) concerns are now at the center of public health policy. However, in the past, they were considered a secondary result, occasionally beneficial to supplement biological and clinical indicators of disease. A person's perspective on where they are in life, in relation to their expectations, objectives, and worries, as well as the culture and value systems in which they live, may be used to describe their quality of life(7). Health-related quality of life (HRQoL) is used to describe this association, according to Allen (2003), which appears to be an association between health and quality of life, though is not clearly defined"(18). There is no set definition for the phrase "health-related quality of life," yet it is generally accepted to be a multidimensional construct that captures people's impressions of significant aspects of their daily lives.

OHRQoL is a multidimensional concept that reflects the impact of oral health conditions on an individual's physical, psychological, and social well-being. It encompasses aspects such as pain, discomfort, functional limitations, psychological distress, and social interaction related to oral health problems. Because it may be used for a variety of illnesses, the notion of oral health-related quality of life, or OHRQoL, makes simpler to investigate how a disease affects a person's overall oral health. It explains the relationship between dental health and a person's capacity to function, psychological state, social circumstances, and level of pain and suffering.

Oral Health-Related Quality of Life measurements are instruments designed to measure the impact of oral health issues on an individual's overall well-being and ability to function in everyday life.

Oral health-related quality of life (OHRQoL) in patients with non-carious cervical lesions and dentine hypersensitivity is a major global concern because of the relationship between DH and the physical and psychological components of OHRQoL(9). One method frequently used to assess how oral health issues affect a person's ability to function on a daily basis and overall well-being is the OIDP. It evaluates elements that represent fundamental behaviours and tasks that span the social, psychological, and physical spheres of daily life in order to determine the oral influence on an individual's quality of life. Eating and enjoying food, speaking and pronouncing words, brushing one's teeth, sleeping and unwinding, grinning, laughing, and flashing one's teeth without feeling embarrassed, sustaining a regular emotional state without becoming agitated, performing important tasks or playing social roles, and taking pleasure in interacting with others are a few of these. This index is valid and reliable when used in a number of Tanzanian studies to evaluate the overall effect of oral problems on the quality of life of elderly, teenage, and child Tanzanians(8)(19)

This study aims to determine the relationship between non-carious cervical lesions and dentine hypersensitivity and their impacts on oral health-related quality of life among adult patients attending Muhimbili dental clinics (MNH and MUHAS) in Dar es Salaam.

This study is necessary due to the scant of available published data on the quality of life of the adult population in Tanzania, specifically concerning the impacts of DH and NCCLs on oral health.

1.2 Problem Statement

Non-carious cervical lesions (NCCLs) and dentine hypersensitivity (DH) are common dental conditions, particularly prevalent in elderly individuals, with a global average prevalence of 46.7% (11). In Tanzania the prevalence of the DH among adult population is 46.4% (20). The prevalence of NCCLs and DH increases with age, posing a significant dental health challenge. There is a positive correlation between the occurrence of NCCLs and DH, indicating that as NCCLs worsen, DH also tends to increase (21)(22).

NCCLs and DH negatively impact physical and psychosocial oral health, reducing OHRQoL. They cause pain, discomfort, disability, poor aesthetics, pulp problems, structural integrity loss, and increased plaque build-up, heightening the risk of periodontal disease and dental caries. These conditions also impair daily activities and food selection, affecting overall health status. According to the "Fifth National Oral Health Survey" of 2020, more than a third of adult Tanzanians experience oral impacts on daily performance, enduring pain, untreated disease, chewing difficulties, and reduced quality of life due to dental issues.

The previous OIDP study conducted in Tanzania did not address the oral health impacts related to DH and NCCLs, highlighting the necessity of conducting this study in Tanzania.

1.3 Conceptual Framework

The relationship between DH, NCCLs, and oral impacts is illustrated by a conceptual framework and its components. Here's a description of how they are related:

DH occurs when the dentin becomes exposed due to factors such as gingival recession, enamel erosion, or tooth wear. NCCL lesions are commonly associated with toothbrush-abrasion, chemical erosion, or mechanical stress. They can contribute to dentin hypersensitivity as they expose the dentin to the oral environment as well as affect the tooth's structural integrity. OHRQoL encompasses aspects such as pain, discomfort, functional limitations, psychological distress, and social interaction related to oral health problems.

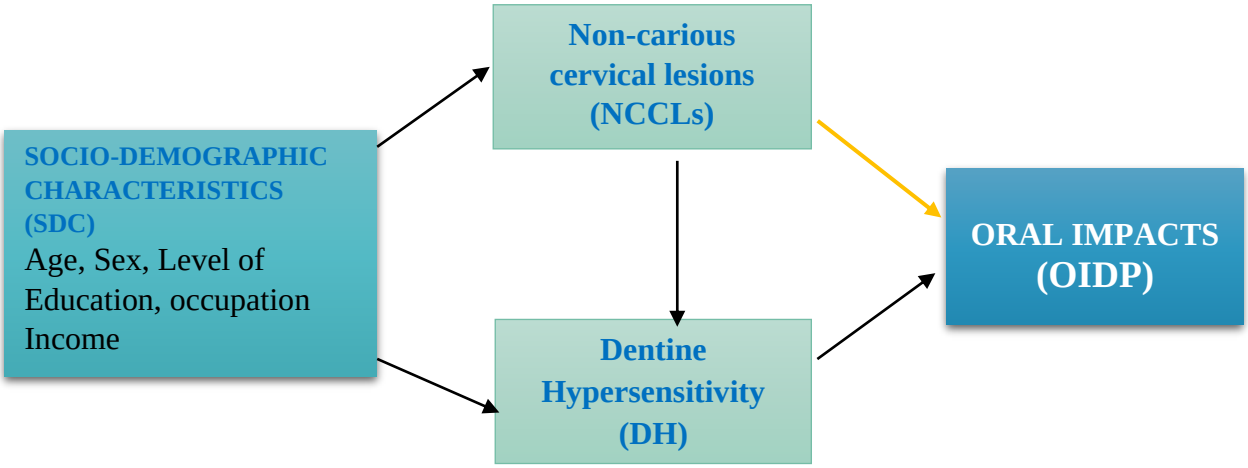


Figure 1. The conceptual framework showing the relationship of NCCL, DH and oral impacts.

In this framework, DH and NCCLs are direct linked. The exposure of dentin due to NCCLs contributes to DH, leading to pain and discomfort, this in turn, has an impact on the oral health-related quality of life. Those with DH and NCCLs may experience limitations in eating, drinking, oral hygiene practices, and overall oral health-related activities. The pain and discomfort associated with these conditions can also affect their psychological well-being and social interactions, leading to reduced quality of living.

The conceptual framework simplifies the complex interactions between these factors and is meant to provide a general understanding of their relationship. The actual relationships and mechanisms involved can vary between individuals and may be influenced by other factors such as individual susceptibility, oral hygiene practices, lifestyle habits, and overall oral health status.

1.4 The rationale of the study

An understanding of the prevalence and severity of NCCLs and DH, along with their impact on OHRQoL, can aid in developing preventive measures and suitable therapeutic interventions. By highlighting the prevalence, severity, and frequency of DH and NCCLs, practitioners can identify specific contributing factors and provide targeted interventions to mitigate the effects of these conditions on daily functioning**.**

Assessing the impact of these conditions on the quality of life among adults will contribute preventive measures to public health initiatives aimed at improving overall health outcomes in the Tanzanian population.

Preventive interventions should include oral health education and instructions, and counselling to encourage behavioural changes in patients, which depend on the underlying Etiology. The study will provide insights that can be incorporated into educational initiatives to raise awareness about oral health and promote preventive measures among the Tanzanian population.

1.5 Research Questions

1.5.1 Broad research question

What is the Relationship between non-carious cervical lesions and dentine hypersensitivity and their impacts on oral health-related quality of life among adult patients attending Muhimbili dental clinics in Dar es Salaam?

1.5.2 Specific research questions

1. What is the prevalence NCCLs and DH among adult patients attending MUHAS and MNH dental clinics in Dar es Salaam, Tanzania?
2. What is the severity of NCCLs and DH among adult patient attending MUHAS and MNH dental clinics in Dar es Salaam, Tanzania?
3. What is the association between DH with NCCLs and DH without NCCLs among adult patients attending MUHAS and MNH dental clinics in Dar es Salaam, Tanzania?
1. What oral health-related impacts are associated with the presence of NCCLs and DH among adult patients attending MUHAS and MNH dental clinics in Dar es Salaam, Tanzania?

1.6 Objectives

1.6.1 Broad objective

To determine the relationship between non-carious cervical lesions and dentine hypersensitivity and their impacts on oral health-related quality of life among adult patients attending Muhimbili dental clinics in Dar es salaam.

1.6.2 Specific objectives

1. To determine the prevalence of NCCLs and DH among adult patients attending the MUHAS and MNH-OPD dental clinics, Tanzania.
2. To assess the severity of NCCLs and DH among adult patients attending the MUHAS and MNH-OPD dental clinics, Tanzania
3. To determine the association between DH and NCCLs among adult patients attending the MUHAS and MNH-OPD dental clinics, Tanzania
4. To assess the presence of NCCLs and DH and its associated oral health related impacts among adult patients attending the MUHAS and MNH-OPD dental clinics, Tanzania

1.7 LITERATURE REVIEW

1.7.1 Prevalence of NCCL and DH

The prevalence of NCCls varies greatly around the world, as documented in various studies. This variation can be attributed to several factors, including differences in terminology, definitions, diagnostic criteria, assessment methods employed during the studies, geographical locations, periods of study, and the types of populations involved. DH and NCCls are prevalent disorders that affect adults. DH is significantly correlated with the effects of dental health on an individual's ability to function in everyday life and overall well-being. When it comes to eating, drinking, maintaining good oral hygiene practices, and occasionally even breathing, people with DH frequently endure physical pain and agony to the point that it becomes overwhelming.

According to a systematic review conducted by(11) the average prevalence of NCCls in the oral cavity has been reported to be 46.7%. However, this prevalence varies significantly across different regions. For instance, in Turkey, the reported prevalence is 9.1%, while in the German population over 30 years of age, it reaches as high as 93%. South America reports a prevalence of 69.0%, North America reports 19%, Europe reports 35%, and Asia reports a prevalence of 62%(11).

A prevalence study of NCCls and DH done among adult's Brazilian population reported a prevalence of NCCls of 63.6% which were close to the values observed also in studies from South America (69.0%) and also in patient aged 18 years old and more from a teaching Hospital in Sao Paul, Brazil (67.8%)(9). Another study involving 100 labour workers aged 20-68 years old from the state of Sao Paul reported a NCCLs prevalence of 76.84% higher than most of the studies in South America(23).

The disparities in prevalence rates among South American studies can be attributed to various factors such as age range, economic status, cultural norms, dental hygiene practices, eating habits, and health behaviours like alcohol and smoking. Nevertheless, study designs, diagnostic criteria, and methodology also contribute to these variations.

The higher occlusal stresses, the cervical morphology of the posterior teeth, especially the premolars, and the increasing development of posterior group occlusion all contributed to the higher occurrence of NCCLs on premolars.

A study done in south China has reported the prevalence of NCCLs at 76.8% in the age group of 35-45 years, 81.3% among the age group 65-74 years old and it was associated with bad oral habits such as Tooth brushing (Lai *et al.*, 2015). In a study done in China prevalence of NCCLs and DH in the general population was 61.9% and 27.1%, respectively. The prevalence of NCCLs was higher than that in most previous studies, and the prevalence of CDH was similar to most of the studies. In Africa, a study done among prisoners in Senegalese reported the prevalence of NCCLs at 36.8% with a mean age of 35 years, this prevalence was associated with dietary habits such as acidic fruit juice, and alcoholic drinks abuse(24), and in another study done in Nigeria reported a prevalence of 62.3%(25). In the study done in Dar es salaam, Tanzania study reported that prevalence of clinically diagnosed DH among subjects was (46.4%) with first molars in lower jaw being most affected (63.5%) and it demonstrated that DH increased with age, tooth wear and gingival recession(20)

1.7.2 Association between DH, NCCLs, and Oral Health Impacts

DH is described a brief acute pain in response to thermal, evaporative, tactile, osmotic, or chemical stimuli that cannot be related to any other defect. Can be caused by exposed cervical dentin, with or without tooth attrition(9). An adult patient with dentine hypersensitivity but no NCCLs had greater oral health impacts, while the patient with or without NCCLs had higher prevalent physical pain impacts. This Brazilian study suggests that the existence of NCCLs alone is not connected with oral health impacts. The effect was not identified until the wear process in NCCLs had progressed to such a pathological degree that dentine exposure could happen, jeopardizing the structural integrity and life of the teeth. This might therefore have an effect on masticatory efficiency, which might have an effect on day-to-day activities(26)(9).

Another study from Brazil reported a positive correlation between the NCCLs (wedged-shaped lesions) and the DH levels, this association was highly attributed to the proximity of the lesions to the pulp especially in those deeper lesions and the number of dentinal tubules which increases the painful reactions hence impacting oral health(27). A Chinese study found a strong correlation between the severity of DH and the existence of NCCLs. The age range, level of profession, brushing technique, frequency, brushing technique, and

length of time spent using a toothbrush, other factors that were connected to the incidence of DH included gender, age group, type of occupation, and frequency of brushing(28).

In another clinical study conducted in German dental offices reported majority of patients seeking treatment for DH have significant impact on their OHRQoL, they also frequently had limitations in their ability to eat, drink, and practice good oral hygiene, such as brushing their teeth. Furthermore, 14.1% of these patients reported that they could not have their teeth cleaned by a dentist or hygienist without experiencing discomfort. These patients also frequently reported experiencing difficulty eating ice cream or drinking cold water(15). The University of São Paulo School of Dentistry conducted a study in São Paulo, Brazil, and found a substantial correlation between NCCLs and DH, which could be detected using air or probe testing. Even while there were more teeth overall that were sensitive to air than there were teeth detected by a probe, there was also a greater correlation between NCCLs and DH found by a probe, as well as a noteworthy correlation between DH and the intake of acidic fruit drinks(29) According to a study(30) in Riyad, Saudi Arabia, sex preferences had a greater influence on women than on men, with rates of 54% and 46%, respectively. Dentin hypersensitivity affects both quality of life and enjoyment of everyday activities, and many patients are unaware that it is a medical condition that can be treated. In the same study, it was reported that 90.99% of the participants had DH(30).

Similar findings by(31) showed that 65% of the patients had significant effects on their quality of life. These results are consistent with those of Lima *et al.*, (2017) in proving the value of questionnaire-based methods for evaluating the quality of life in DH patients and in identifying risk factors for choosing the best course of treatment. According to a Brazilian study, people who experience discomfort from dentin hypersensitivity often alter their regular routines, which can result in lifestyle modifications. One compelling argument for seeking dental care is the impact that hypersensitivity has on day-to-day functioning. These patients typically feel "very uncomfortable" and lament that they are unable to enjoy their favourite foods and beverages(32). The association of NCCLs with or without DH and the impact on oral health has not been reported in Tanzania, hence the need for this study.

1.7.3 Severity of NCCLs and DH

An increase in the lifetime of the teeth's capacity to continue their natural function and mastication is necessary to prolong human life. The use of a hard bristled toothbrush is considered as a risk factor while the Gingival recession and attrition as a predominant etiological factors for the dentine hypersensitivity(33). Additionally, regular brushing over sensitive gingival margins with various dental care products can be traumatizing and over time, may cause gingival recession and root exposure(34). Regardless the aetiology of NCCLs, the NCCL-affected tooth experiences continuous occlusal pressures, which may have an impact on how the defect develops during mastication(35). NCCLs frequently result in poor aesthetics, tooth hypersensitivity, pulp problems, loss of structural integrity, and increased plaque build-up that increases the risk of periodontal and dental caries. As NCCLs deteriorate with time, it's critical to look at the link between NCCL existence and depth to determine whether the disease's increased depth has an adverse effect on the tooth and how it is treated.

The above information has not been reported in the Tanzanian population hence widening the gap of information from the population, especially with the increasing age profiles and lifestyle in the population which has led to the conduct this research.

CHAPTER TWO

2.0 METHODOLOGY

2.1 Study design

The study was a hospital-based analytical cross-sectional study conducted among adult patients at the MUHAS and MNH dental clinics in Dar es Salaam.

2.2 Study area

The study was conducted at two dental clinics, MUHAS dental clinic (Restorative department) and MNH-OPD- (Upanga west) in Dar es salaam Tanzania. MUHAS Dental clinic and MNH-OPD dental department are public health facilities under the Muhimbili University and Muhimbili National Hospital, respectively. Both institutions share same location/compound in the city of Dar es Salaam and serve populations in and referred from different parts of the country.

2.3 Study population

The study involved adult patients aged 18 years and above attending the MUHAS and MNH-OPD dental clinics during the study period.

2.4 Sample size and selection

A consecutive sampling technique was used.

2.4.1. Sample size determination

The sample size was calculated from the following formula:

$$n = \frac{Z^2 P (1-P)}{e^2}$$

Where;

n = Sample size,

Z= Standard normal deviation, set at 95% (1.96),

P= Proportion (estimated) of outcome variable – current prevalence of OIDP in Tanzania which is 36.7% (19)

e = Desired level of precision (marginal error), set at 5% (0.05).

Calculation $n = \frac{1.96 \times 1.96 \times 0.367(1-0.367)}{0.05 \times 0.05} = 356$

The estimated **sample size** for this study will be **356 participants**

2.4.2. Sample Selection and enrolment of participants

Sampling was conducted in two stages;

1st stage - selection of dental clinic

MUHAS and MNH restorative dental clinics are purposely selected due to high number of patients, of different social demographic characteristics representative of the sample and also, they attend referred patients from different parts of the country.

2nd stage - selection of study participants

At each facility, the study was introduced to patients awaiting dental treatment on a daily basis and a total of 356 participants aged 18 years and above who consented and fulfilled the inclusion criteria are recruited into the study.

2.4.3. Inclusion criteria

All adult patients aged 18 years and above attending the clinics during the study period who had consented in writing (Appendix 1: Consent form).

2.4.4. Exclusion criteria

The study excluded from participation all eligible patients who was *very ill*; *mentally challenged*; on *anti- inflammatory/ analgesic prescriptions/desensitizing therapy* during the study period. Also, those with *dental caries (cervical carious lesions) or tooth/root fracture*; *root canal treated tooth/teeth (RCT)*; *on)*; *on fixed or removable prosthesis or orthodontic appliances*. Patients with oral tumours/cancers and those unable to open mouth for oral examination was NOT included.

2.5 Description of variables

2.5.1 Independent variables

- **Social and demographic information**
    a. Age: was mentioned in years and later been categorised 1. young adulthood (18 to 35 years), 2. middle age (36 to 55 years), and 3. older adulthood (56 years and older).
    b. Sex: male 1, female 2.
    c. Education level: no formal education 1, Primary education 2, Secondary education 3, Tertiary education 4, certificate, diploma, degree, master's degree
    d. Occupation status: 1 unemployed, 2 self-employed, 3 employed.

- **Prevalence and severity of NCCLs**
- **Prevalence and severity of DH**
- **DH and NCCls combined variable**
    1. DH with NCCLs
    2. DH without NCCLs
    3. NCCLs without DH
    4. DH and NCCLs

2.5.2 Dependent variable

- Oral health-related quality of life (OHRQoL) was determined using the Oral Impacts on Daily Performance (OIDP) questionnaire2.6 Data collection

2.6.1 Data collection tools

1. ***Questionnaire***

   The questionnaire (Appendix 2: Questionnaire - English and Kiswahili versions) inquired about the participants' socio-demographic characteristics and tooth hypersensitivity.

   The questionnaire also evaluated oral impacts (OHRQoL) using OIDP through the effects of oral health in relation to seven different aspects/items: social impairment and handicap, physical pain, psychological discomfort, functional limitation, and psychological and physical disabilities. By choosing from the following

alternatives, participants assessed the frequency of each situation: never, barely ever, sometimes, pretty often, and very often. Participants who responded to at least one OIDP item with "fairly often" or "very often" were deemed to have an impact. This tool collected data on the eight OIDP domains through 16 questions. It had been modified from the instrument that was utilized in a different Tanzanian study.(8).

2. ***Dental clinical tool***

   DH and NCCLs were determined through clinical examination of the participants' oral/dental status using a clinical assessment tool. (Appendix 3: Clinical examination form - English).

2.6.3 Data Collection Method

Data collection involved clinical examination and a questionnaire. All participants were requested to read and sign the translated informed consent form before participating in the study. Information on socio-demographic factors and perceived oral impacts was gathered using a structured questionnaire that was administered by the researcher and assistants.

Socio-demographic characteristics (SDC)

- Age; was assessed in number recorded in years.
- Sex; was assessed and scored as 1= male, and 2= female
- Occupation status: 1= unemployed, 2= self-employed, 3= employed.
- Level of education: 1= no formal education, 2= not completed primary education, 3= completed primary education, 4= not completed secondary education, 5= completed secondary education, 6= tertiary education.

The questionnaire also evaluated oral impacts (OHRQoL) using OIDP through the effects of oral health in relation to seven different aspects/items: social impairment and handicap, physical pain, psychological discomfort, functional limitation, and psychological and physical disabilities. By choosing from the following alternatives, participants assessed the frequency of each situation: never, barely ever, sometimes, pretty often, and very often. Participants who responded to at least one OIDP item with "fairly often" or "very often" were deemed to have an impact. This tool collected data on the eight OIDP domains through 16 questions. It had been modified from the instrument that was utilized in a different Tanzanian (8).

Clinical examination

The principal investigator (GG) conducted the examination on a subject who was seated in a dental chair. The patient was illuminated by both natural and artificial light, and the recorder documented the findings on the clinical examination form. For the examination, a mouth mirror, an explorer, a tweezer, gauze, and a WHO/William's Periodontal Probe were utilized. After drying each tooth with gauze or a cold air blast, each tooth was examined both visually and tactilely. The cement-enamel interface was examined using a dental mirror and a World Health Organization probe positioned perpendicular to the buccal and lingual/palatal surfaces. Using the gingival edge of the neighbouring teeth as a reference point and the connection between the apical and gingival margins of the lesion as parameters, the probe was introduced to the bottom of the gingival sulcus up to about half of the tooth surface height.

To detect the presence and severity of NCCLs

NCCLs is considered if loss of dental tissue near the cemento–enamel junction is found in the absence of caries.

The tip of the probe will be placed into the gingival sulcus and kept parallel to the line angle of the root of the tooth. If the Williams probe is retained because of some irregularities in the cervical surface, tooth wear is measured according to the Smith and Knight tooth wear index (TWI) by Smith Knight (1984) (36).

The TWI scores will be classified as 0 (no loss of enamel surface characteristic, no loss of contour), 1 (minimal loss of enamel contour), 2 (defect <1 mm in depth), 3 (defect 1–2 mm in depth) or 4 (defect >2 mm in depth/pulp exposure/secondary dentine exposure).

The letter R will be employed to mark the surfaces that will not be evaluated according to TWI (restored surface, a surface that is fractured as a result of extensive caries and a surface covered with plaque or dental calculus). The differentiation in these cases is provided by comparing the affected tooth with the morphology of the same area observed on adjacent and contralateral teeth.

According to the presence or absence of an NCCL, the respondents was allocated into one of two groups: a group with NCCLs and group without NCCLs.

Presence and severity of DH was determined using the tactile stimulus response.

To perform the clinical assessment of DH, individuals were seated in a dental chair with an overhead light. All tooth surfaces were gently dried with cotton gauze before the presence or absence of DH was determined using the tactile stimulation response. All teeth, except the third molars, underwent the tactile stimulus test of lateral movements using a WHO probe. The test began with a low scrubbing force (equivalent to five grams) and gradually increased to the threshold level (not exceeding twenty grams). Respondents were asked to use a five-point numerical verbal rating scale (VRS) ranging from 0 to 4 to indicate the degree of pain or discomfort they experienced while probing.

0 signified no discomfort/pain while
1 mild discomfort/pain
2 moderate discomforts/pain
3 severe pains only during application of stimulus
4 severe pains persisting after the removal of the stimulus

Patient's responses for each tooth were recorded in the clinical record form. Those who scored zero (0) for all teeth were considered as not having DH, while those who scored 1 to 4 for any tooth were considered to have DH. Cleaning of the instruments and sterilization were done daily at the MNH-OPD dental department and MUHAS Dental School accordingly.

2.6.4 Validity

Although the validity of the tool had been tested in previous studies, a pilot study was conducted among 35 (10% of the sample) of patients attending the MUHAS dental clinic before data collection. The pilot study tested the data collection tool to ensure it gathered the intended data, assessed its clarity, identified any challenges with the translated version, and evaluated the time required to complete the questionnaire and clinical examination. The principal investigator conducted the clinical examination, which was calibrated by an expert clinician (Dr Mandari) as a gold standard. The validity of the data collection tools had been tested in previous studies (Kida et al., 2006).

2.6.5 Reliability

Inter examiner consistency ensured through prior calibration of the principal investigator by an experienced clinical expert at MUHAS Restorative. Measures of agreement of the various scores for each tooth on DH were compared and reported using Cohen's Kappa statistics. A Kappa value ranged from 0.67-0.97, indicating strong agreement.

2.7 Data Management and Analysis

Data from completed questionnaires and clinical observation forms were fed into a computer, cleaned, and analysed using the software Statistical Package for Social Sciences (SPSS, version 26.0) at the end of the working day. Before data analysis in line with each specific objective, some information was transformed to suit data analysis. The characteristics of variables were described using frequency distribution for categorical variables, and for discrete variables, the mean and standard deviation were applied. A Chi-square test was used to test the relationship between independent variables and dependent variable. Additionally, the outcome variable (OIDP) was common, so using conventional logistic regression would have overestimated the odds ratio. To address this issue, we employed weighted modified Poisson regression with robust standard errors to estimate the prevalence ratio. Poisson regression models were used to investigate the association between the presence of DH (with or without NCCL) and the presence of physical and psychosocial oral health impacts. The level of statistical significance was set at $p < 0.05$. The analysis was designated for each specific objective.

Perceived impact

For cross-tabulation analysis, each item was dichotomized into categories 0 = ‘affected less than once a month or never’ and 1 = ‘perceived impacts at least once a month’ (including the categories 2, 3, 4, and 5). The total OIDP score was constructed in two ways. First, by adding the 8 performance scores as originally scored (1–5) into an OIDP additive score (ADD) (range 8–40). Second, the OIDP simple count (SC) score (range 0–8) was constructed by summing the dichotomized frequency items of (1) affected and (0) not affected. The level of statistical significance was set at 0.05.

2.8 Ethical Issues

The Muhimbili University of Health and Allied Sciences (MUHAS) Research and Ethics Committee was contacted via the School of Dentistry (SoD) to obtain ethical approval. The administrative authorities of MUHAS and MNH were consulted to get permission to conduct the study in the two dental clinics. The management of the two dental institutions listed was contacted to request permission to perform the research.

Study participants were required to read and sign a written informed consent form (Appendix 1) before participating in the study.

Prior to filling out the consent form, a thorough spoken description of the nature and goals of the study was provided. Participants were guaranteed the privacy of the information they provided, had the unrestricted right to withdraw at any time, and were assured that the information collected would only be used for the stated purpose. Oral health education (OHE) was given to all study participants who consented to participate after the clinical examination. Those who were found to have NCCLs and DH were treated at their respective dental clinics, while others were transferred to the respective clinical departments as per their needs. Individuals identified with oral-related conditions or problems were referred to MNH-OPD and MUHAS dental clinics for further management.

CHAPTER THREE

3.0 RESULTS

3.1 Socio-demographic characteristics of the participants

A total of 325 (response rate of 91.3%) dental patients were examined from two dental clinics. The age of participants ranged from 18 years to 77 years with mean of 45±7 years with majority (39.5%) in the age group 36-55 years. There was a female predilection of 67.1%. With most of the participants had no steady income 56.3%. By education a dominance 81.8% of secondary level and above was observed.

Table 1: Distribution of study participants according to socio-demographic characteristics

SDC	Variable	Frequency n (%)
Sex	Male	107 (32.9)
	Female	218 (67.1)
Age group	18-35 years	109 (33.5)
	36-55 years	128 (39.4)
	56+	88 (27.1)
Dental clinic	MUHAS	225 (69.2)
	MNH	100 (30.8)
Occupation status	Retired	35 (10.8)
	Self employed	96 (29.5)
	Employed	107 (32.9)
	Unemployed	87 (26.8)
Education level	No formal education	2 (0.6)
	Completed STD VII	57 (17.5)
	Completed secondary	86 (26.5)
	Tertiary education	180 (55.4)

3.2 The prevalence of the NCCLs and DH among the study participants

The prevalence of dentin hypersensitivity (DH) among the study participants was 36.5%, (Figure 1 A) with a higher occurrence in females (39.0%) than in males (37.4%). (Table 2). Most participants experienced moderate pain (15.1%, n=49) or mild pain (13.5%, n=44), while severe pain that persisted after stimulus removal was reported by 2.5% (n=8) of the participants.

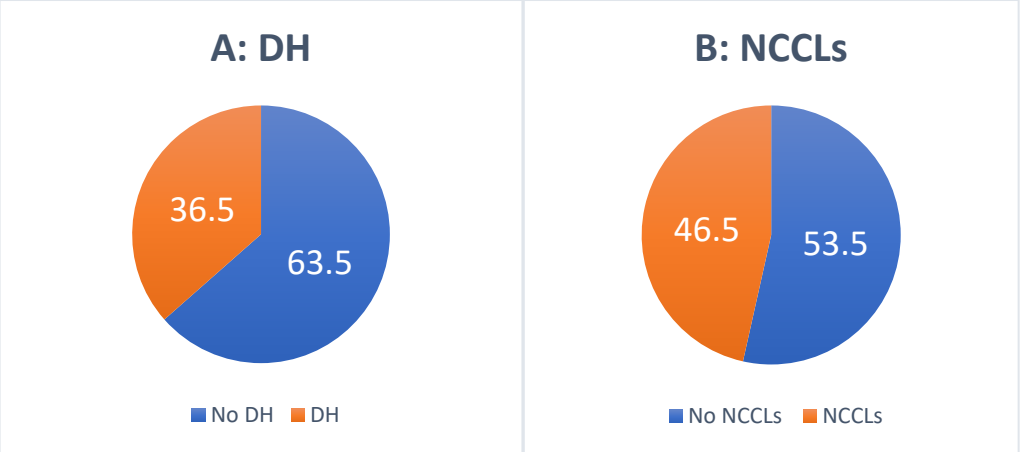


Figure 2: Pie charts A and B showing prevalence of DH and NCCLs respectively

The study also found the prevalence of NCCls to be 45.8% (Figure 1 B). Males were more affected than females, with prevalence rates of 61.7% and 38.3%, respectively, a difference that was highly statistically significant (p = 0.001), (Table 2). The age group most affected by NCCLs was the 36–55-year-olds (49.0%), followed closely by those aged 56 and older (48%).

Table 2: Prevalence of NCCLs and DH according to Socio-Demographic Characteristics

SDC		NCCLs			DH		
		Yes	No	*p-value*	Yes	No	*p-value*
		n (%)	n (%)		n (%)	n (%)	
Sex	Male	66(61.7)	41(38.3)	.000	40(33.3)	67(32.7)	.000
	Female	83(38.1)	135(61.9)		80(66.7)	138(67.3)	
Age	18–35-year-olds	4(2.6)	105(60.3)	.000	7(5.6)	102(51.0)	.000
	36–55-year-olds	74(49.0)	54(31.0)		64(51.2)	64(32.0)	
	56+ year-olds	73(48.3)	15(8.6)		54(43.2)	34(17.0)	
Occupation	Steady income	65(43.0)	77(44.3)	.000	55(44.0)	87(43.5)	.000
	Unsteady income	86(57.0)	97(55.7)		70(56.0)	113(56.5)	
Education level	Primary or less	36(23.8)	23(13.2)	.000	39(31.2)	20(10.0)	.000
	Secondary + more	115(76.2)	151(86.8)		86(68.8)	39(31.2)	

3.3 The intense (severity) of pain due to DH and NCCLs among the study participants

Table 3, presents the intensity of pain due to DH and NCCLs among the study participants. Majority of participants (78.4%). with DH exhibited mild or moderate pain whereas 45.1% of those with NCCLs presented with mild pain. Only 21.6% and 15.2% of the participants with DH and NCCLs respectively had severe pain.

Table 3: Intensity of pain due to DH and NCCLs among participants, (N=325)

Intensity of pain	**DH**	**NCCLs**
	n (%)	**n (%)**
Mild severity	49(39.2)	68(45.1)
Moderate severity	49(39.2)	60(39.7)
Intense severity	27(21.6)	23(15.2)
Total	125	151

3.4 The association between DH and NCCLs among study participants

Among the participants, 80% of those without DH also has no NCCLs, while 11.2% had DH without NCCLs. Additionally, 12.3% had NCCLs without DH, and 111 (34.2%) participants had both NCCLs and DH, (Table 4). About 111 of participants with NCCLs also experienced DH. Conversely, 160 (49.2%) of participants without NCCLs did not exhibit DH. These findings are statistically significant, with a *p-value of 0.000*.

Table 4: Association between NCCLs and DH among participants

Variable	**Category**	**Hypersensitivity**			
		No	Yes	Total	*p-value*
NCCLs	No	160(80.0%)	14(11.2%)	174 (53.5%)	*.000**
	Yes	40(20.0%)	111(88.8%)	151(46.5)	
DH		**NCCLs**			
	No	160 (80.0%)	40(20.0%)	200 (63.5%)	***.000****
	Yes	14(11.2%)	111(88.8%)	125(36.5%)	

***p<0.05**

3.5 The distribution of oral impacts on daily performance (OIDP) in the study sample

Distribution of affected oral performances of OIDP (oral impacts) in the study sample is shown in Figure 1. Chewing difficulty was the most frequent (25.4%) followed by difficulty in cleaning (14.4%) with speaking difficulty the least common (6.7%).

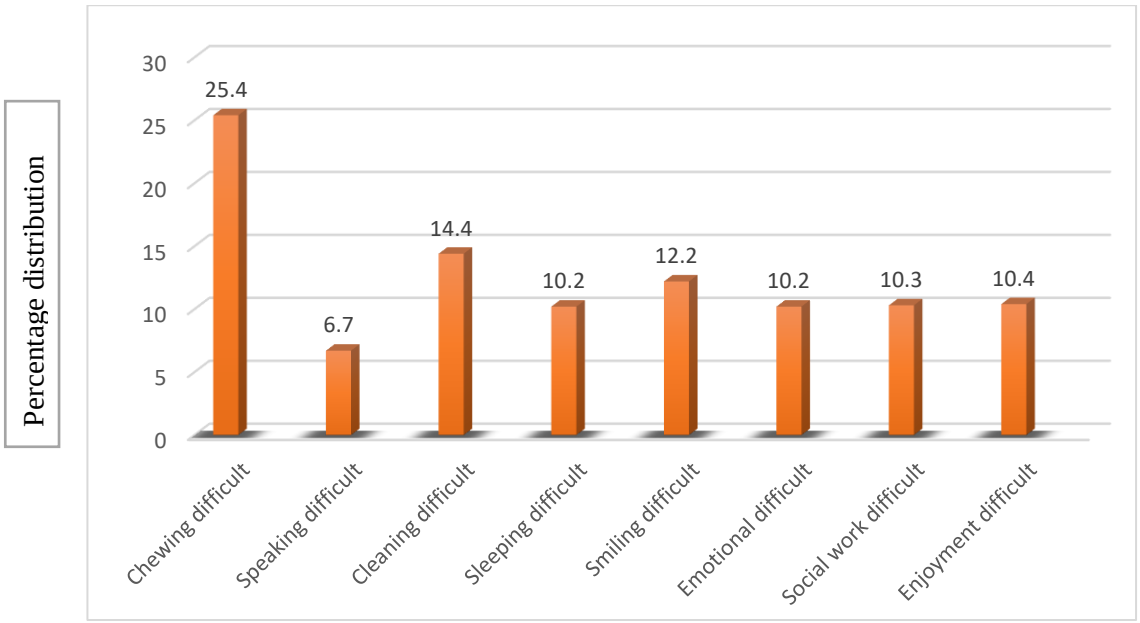


Figure 3: Distribution of oral impacts in the study sample

The prevalence of OIDP (percentage of participants who reported at least one oral impact on their daily performance in their past six months, in the study sample) was 85.2% and the most affected performance was chewing (76.0%), followed by difficult in cleaning (43.1%).

3.6 Association between severity of DH and NCCLs with oral impacts among participants

Participants with moderate and severe pain were more likely to report at least one oral impact compared to those with mild pain. Additionally, all participants with NCCLs deeper than 2 mm and all participants with severe pain reported experiencing at least one oral impact. These findings were statistically significant (p = 0.000).

Table 5: Association between severity of NCCLs (n=151) and DH (n=125) with oral impacts

Variable	Category	OIDP=0 n (%)	OIDP≥1 n (%)	Total n (%)	*p-value*
NCCLs	Minimal loss of contour	4(6.1)	62(93.9)	66	***.000****
	Less than 1 mm deep	0(0.0)	60(100.0)	60	
	1-2 mm deep defect	2(13.0)	14(87.0)	16	
	More than 2 mm deep	0(0.0)	9(100.0)	9	
DH	Mild discomfort	6(13.0)	38(86.0)	44	***.000****
	Moderate pain	4(8.0)	45(92.0)	49	
	Severe pain	0(0.0)	32(100.0)	32	

p<0.05

3.7 The association between DH with or without NCCLs and NCCLs without DH

Participants with both dentin hypersensitivity and non-carious cervical lesions (i.e., DH+NCCLs) were more likely to report at least one Oral Impact on OIDP than those with DH alone (75.2%, *p=0.018*) (Table 6). In contrast, patients with NCCLs only (i.e., without DH), were the least likely to report at least one Oral Impact on OIDP than those with both DH and NCCLs (24.8% and 75.2%, respectively; *p=0.043*).

Table 5: Association between the DH with NCCLs, DH without NCCLs, NCCLs without DH and OIDP

Participants with NCCLs				
Dependent	No DH	DH	NCCls	*P-value*
NO OIDP	4(66.7%)	2(33.3%)	6(100%)	*0.043**
OIDP	36(24.8)	109(75.2%)	145(100%)	
Total	40(24.8%)	111(75.2%)	151(100%)	
Participants without NCCLs				
Dependent	No DH	DH	No NCCls	*P-value*
No OIDP	42(100%)	0(0%)	42(100%)	***0.018****
OIDP	118(89.4%)	14(10.6%)	132(100%)	
Total	160(92.0%)	14(8.0%)	174(100%)	

p<0.05*

3.8 Presence of NCCLs and DH and associated oral health related impacts among participants

Table 7 shows that only sex was not statically significantly associated with having an oral impact on daily performance, significantly participants with age group 56+ years all showed high occurrence of impacts 100% compared to another group followed with age group 36-55years 85.9% (p-value = 0.000) and also participants with unsteady income and primary education and less has highest incidence of impacts of 89.1% and 98.3% respectively

Adult with DH showed high occurrence of OIDP about 98.4% and 95.8% of studied who had no DH had no OIDP too. In those Participants with NCCLs, 96.0% had shown impacts. These results are statically significantly p-value 0.000.

A statistically significant association was observed to the reported tooth sensitivity variable (p=0.000), those who reported to have tooth sensitivity (n=110, 33.8%) all of them were more likely to have OIDP (100%) compared to those who had no reported tooth sensitivity (77.7%)

Table 6: Distribution of DH, NCCLs and socio-demographic characteristics with Oral Impacts (OIDP), N=325.

Variables	OIDP Occurrence			*p-value*
	No	**Yes**	**Total**	
	n (%)	**n (%)**	**n (%)**	
Sex				
Female	33(15.1%)	185(84.5%)	218(100%)	0.465
Male	15(14.0%)	92(86.0%)	107(100%)	
Age				
18-35 years	30(27.5%)	79(72.5%)	109(100%)	
36-55 years	18(14.1%)	110(85.9%)	128(100%)	**0.000***
56+ years	0(0.0%)	88(100.0%)	88(100%)	
Occupation				
No steady income	20(10.9%)	163(89.1%)	183(100%)	**0.020***
Steady income	28(19.7%)	114(80.3%)	142(100%)	
Education				
Primary and less	1(1.7%)	58(98.3%)	59(100%)	**0.000***
Secondary and above	47(17.7%)	219(82.3%)	266(100%)	
NCCLS				
No NCCLs	42(24.1%)	132(75.9)	174(100%)	**0.000***
Yes NCCLs	6(4.0%)	145(96.0%)	151(100%)	
DH				
No DH	46(23.0%)	154(77.0%)	200(100%)	**0.000***
Yes DH	2(1.6%)	123(98.4)	125(100%)	
Total	48(14.8%)	277(85.2%)	325(100%)	

p<0.05

3.9 Factors associated with OIDP – Modified poison regression analysis

After conducting modified poison regression on the variables that showed significant associations with OIDP in the bivariate analysis (age, occupation, education level, and clinical criteria - NCCls, DH), it was found that only DH remained statistically significant after adjusting for potential confounding factors. The analysis showed that those with DH had higher ODDs of reporting at least one oral impact (aOR=2.83; 95% CI 1.04-1.25, *p=0.005*).

Table 7: Association of clinical indicators and socio-demographic characteristics with OIDP N=325.

Variables	OIDP≥1 n (%)	c0R(95%CI)	p-value	aOR(95%CI)	p-value
Age					
Young adult	79(28.5)	Ref	**0.000***	Ref	0.147
Older adult	198(71.5)	4.18(2.20-7.92)		1.45(0.75-3.60)	
Occupation					
Unsteady income	163(89.1)	Ref	**0.029***	Ref	0.089
Steady income	114(80.3)	0.5(0.27-0.93)		-1.70(0.26-1.02)	
Education					
Primary less	58(98.3)	Ref	**0.014***	Ref	0.298
Sec.and above	219(82.3)	0.08(0.01-0.60)		-1.04(0.87-1.04)	
NCCLs					
No NCCLs	132(75.2)	Ref	**0.000***	Ref	0.179
Yes NCCLs	145(96.0)	7.69(3.17-18.67)		1.34(0.96-1.22)	
DH					
No DH	132(77.0)	Ref	**0.000***	Ref	**0.005***
Yes DH	123(98.4)	18.37(4.37-77.18)		2.83(1.04-1.25)	

***P<0.05, cOR=crude OR, aOR=adjusted OR**

CHAPTER FOUR

4.0 DISCUSSION

This was an analytical hospital-based cross-sectional study aimed at collecting information on the prevalence and severity of Dentinal Hypersensitivity (DH) and Non-carious cervical lesions (NCCLs), as well as the association between DH, NCCLs and OHRQoL by using the oral impacts on daily performance index (OIDP). Also, it aimed at providing baseline data on DH, NCCLs and its association with oral health related quality of life for insight on the magnitude of the problem in Dar es Salaam and Tanzania as a whole.

The study was carried out among patients attending the Muhimbili dental clinics (MNH and MUHAS) in Dar es salaam. The modified version of OIDP by Locker (1988) was adopted as research tool. The OIDP questionnaire has good, acceptable reproducibility and reliability (37), and has been validated for use in Tanzania among older adults and elderly people (Swahili version) (8).

In the current study, there were large percentage (67.1%, n=218) of females, with a mean age of 40 years. This occurrence might be explained by the common observation that females have higher health seeking behaviours as compared to males, hence a higher proportion. Comparable results are also reported by Carneiro et al., (2020) who had more female subjects 52% (20) Soares et al., 2021) also reported more females than males (38). Others authors reported similar findings with more female participants than their males' counterparts (39)(40)(16). In Nigeria, it was reported that about 60% of the study participants were female (41). Several studies conducted in Africa also reported more females than their counterparts (42)(41)Traditionally across the region, and locally in Tanzania it has been observed that females are more service seekers, conscious and more sensitive to health compared to males hence a higher proportion as compared to male (20).

The distribution of non-carious cervical lesions (NCCLs) differs between men and women, likely due to men's greater masticatory strength causing higher stress on dental structures. Women, however, are more likely to present with dentin hypersensitivity (DH), possibly due to healthier oral habits, frequent intake of acidic foods, and a lower pain threshold compared to men(22).

The present study demonstrated that DH is a discomfort associated with the physical dimension of OHRQoL regardless of the presence of NCCLs(43)(44), although it is not considered a severe oral health problem by individuals and professionals (44)(45). DH and its severity must be assessed in the oral examination and appropriate treatment should be provided for better comfort and well-being of those affected.

The prevalence of NCCLs (45.8%) in the current study is slightly lower than those observed in other studies. A study in Brazil reported a prevalence of 63.6% (9) 62.5% (46), and 67.8% (47) with different age groups. Similar results have also been reported in South America 62.2% (47), 69.0% (11) and in in some studies in China 63%(48)(49)(50). Lower prevalence was reported from studies conducted in Bosnia 52% (51) among 13–74-year-olds and highest prevalence reported in southern China (76.8%) among middle aged and 81.3% among elderly (46). Similarly, from the state of Sao Paulo (Brasil), a prevalence of 76.84% in age group of 20-68 years (23). The lowest prevalence was reported in a study in Brazil with a 39.5% (52) among average of 27 years old and in Senegal about 36.8% among 16 years and above (53)(24). A similar prevalence of about 46.7% was estimated in a meta-analysis(38)(11) study from several. A study in Tanzania by Carneiro et al., (2020) reported the prevalence of NCCLs of 45.5%(20). Several factors may contribute to and explain the differing prevalence rates of DH and NCCLs observed among the studies. These factors include variations in age range, socio-economic and cultural factors, eating habits, tooth brushing habits, and health behaviours such as smoking and alcohol consumption. Additionally, differences in study design, diagnostic criteria, and methodologies also play a significant role (54)(51).

In the present study, the prevalence of DH was significantly higher in female subjects (66.7%). Several studies have reported a higher prevalence of DH in female subjects than in male subjects in general populations (14)(55)(56)(57). In contrast, a recent study reported a female-to-male hypersensitivity ratio of 2:1; however, this difference was not statistically significant ($p = 0.465$). The generally higher prevalence of DH in female subjects may be attributed to several factors such that enhanced oral hygiene awareness and dietary differences between sexes can lead to distinct patterns of dentine abrasion and erosion. Additionally, the lower pain threshold observed in female subjects is likely to contribute to the reported differences in DH prevalence.

Approximately 38.7% of participants had NCCLs with less than 1 mm of wear, a higher prevalence than that was observed in a Chinese study with adults aged 35–44 years (58)(9), probably due to the greater age range in the present study since the severity of NCCL tends to increase with age (59)(50)(48)(9) and once tooth wear occurs, dental treatment is needed to avoid worsening of the condition. Age is a significant factor in the prevalence of NCCLs, older individuals are more likely to have been exposed to etiological factors, experience gingival recession, and have exposed roots susceptible to acids and abrasions (12),(22). Additionally, they tend to have fewer teeth to bear the occlusal load, reduced saliva quality and quantity, and age-related structural changes in enamel and dentine (60)(56). These findings also suggest that the severity of non-carious cervical lesions (NCCLs) and dentin hypersensitivity (DH) is greater in older individuals compared to younger ones.

In this study, 85.2% of the participants reported experiencing at least one oral impact, with no statistically significant difference between sex. However, participants older than 55 years showed a high occurrence of oral impacts, at 100%. The most frequently reported cause of the impact was toothache (65%), while the least reported cause was bad breath (1.5%). These results are higher when compared to other studies conducted in South America and Brazil, which reported a prevalence of 59.3%. (9), this difference may be attributed to variations in age groups, socio-economic and cultural factors, eating habits, tooth brushing practices, and health behaviours such as smoking and alcohol consumption. Additionally, differences in study design, diagnostic criteria, and methodologies could also contribute to the observed discrepancy. Adults with DH but no NCCL showed higher overall oral impact after adjusting for potential confounding factors. Participants with DH, with or without NCCL, presented a higher prevalence of oral impacts (OIDP). The most commonly reported oral impact was difficulty chewing, based on self-reported tooth pain and discomfort when eating certain types of foods. DH is perceived as a painful symptom that makes eating and chewing difficult, thereby restricting food choices. It causes greater discomfort when consuming cold, sugary, hot, or bitter foods, as well as ice cream. Additionally, it increases difficulty during dental care and necessitates careful food selection due to chewing problems (30). Older adults aged 56 and above were more likely to experience at least one oral impact compared to younger adults. This is likely due to

their increased exposure to NCCLs, which exposes the dentine and makes them more prone to DH, thereby impairing their quality of life.

In the present study, the presence of NCCLs without DH was not statistically significantly associated with an oral health impact (p=0.186) after controlling for confounders in modified poison regression analysis DH was the only factor significantly associated with oral impacts after adjusting for potential confounding factors (p=0.005). This suggests that once the wear process in NCCL reaches pathological levels, dentine exposure and DH can occur, compromising tooth vitality and structural integrity. Consequently, this could lead to the loss of masticatory units, thus impacting the performance of daily activities (2)(9)(14). More severe tooth wear had a greater negative impact on the dimensions of limitation and psychological discomfort. Additionally, these lesions can cause food impactions, necessitating frequent cleaning of the teeth after eating. As these lesions lead to dentine exposure, they cause dentine hypersensitivity (DH), which may be associated with the overall consequences of the condition (61).

In the present study, DH with or without NCCLs was unrelated to functional limitation, such as problems speaking or altered food taste. There was no significant association with psychological discomfort, such as anxiety and stress because of mouth problems, and there was also no association with physical, psychological, and social disabilities, such as impaired eating, interrupted meals, difficulty relaxing, feeling ashamed, irritation with others, or challenges in performing daily activities. Additionally, no significant association was observed with handicap, such as feeling that life has worsened or an inability to perform daily activities. Despite the pain and discomfort caused by DH, affected individuals likely develop adaptive strategies to maintain their normal daily activities. (62). Consistent with the literature, there was a higher prevalence of oral health impact among those with lower educational level (26)(49). A study in China (48) showed that the NCCLs presence was strongly associated with DH.

The presence of DH and NCCLs not only raise aesthetic and pain concerns but also significantly impact functionality, potentially leading to compromised chewing ability. This is a crucial issue because impaired chewing is the most commonly reported cause of OIDP. Therefore, the high prevalence of DH and OIDP among older adults underscores the

crucial need for early and effective oral health education provided by dentists and public health authorities. This includes promoting regular dental check-ups and care to facilitate early detection and prevent the progression of NCCLs into more severe forms such as DH and associated oral impacts. Ultimately, this proactive approach can significantly enhance overall quality of life and oral health awareness, thereby reducing the need for future restorations of affected teeth.

It is necessary that dental practice be oriented based on the epidemiological reality of the populations and individual perception of health. The demonstration of the prevalence of common oral conditions, such as NCCL and DH, guides professionals to identify factors that can lead to the development or worsening of these diseases at an individual level and provide suitable interventions to control the impact of oral diseases in everyday life.

CHAPTER FIVE

5.0 STUDY LIMITATION AND MITIGATION

5.1 Study limitation

- The time provided for conducting and completion the study is fairly short given that data has to be collected from two centres. Part of the time earmarked for data collection coincided with lectures and clinical work.
- Patients tended to answer questions in a manner that would be viewed favourably due to social desirability.
- A few participants did not remember encountering changes in their oral health, and some were not ready to fully participate because they felt intimidated or exposed by our presence.

5.2 Study mitigation

- The principal investigator aimed to complete and submit the proposal for ethical clearance early to facilitate data collection during the long vacation. The Department of Restorative was requested to allow more time for data collection throughout the period when the university was closed.
- All participants were reassured that no invasive procedures would be performed during the study, and their safety would be guaranteed.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

DH is usually treated on the basis of providing symptomatic relief using various DH agents. However, the current study results suggest that the multifactorial causes of DH need to be ascertained and evaluated. It is important to identify the factors causing DH and their risk factors. The treatment of DH should be approached by minimizing or eliminating the cause of DH and by the use of DH agents, via professional and personal (patient based) approaches, to relieve discomfort. The prevalence of DH peaked in subjects between 36 and 45 years of age. DH was significantly correlated with gender, age, occupation and education level of the participants.

NCCL and DH are common conditions among adults and DH alone without NCCLs is associated with oral health impact. Regardless of the presence of NCCL, DH is associated with impact in the physical pain dimension of OHRQoL.

6.2 Recommendations

1. The presence of NCCLs is linked to a higher incidence of DH, Therefore, early management of NCCLs is essential to prevent severe DH.
2. Implementing preventive measures and timely interventions by NCCLS and DH will greatly reduce discomfort and long-term dental issues associated with DH.
3. A common risk factors approach should be advocated to enhance both general health and oral health, ultimately leading to a better quality of life.
4. The high prevalence of OIDP highlights the significant burden of oral diseases, such as NCCLs and DH, among adult patients. Emphasis should be placed on implementing oral health promotion and structured oral health care for these individuals. Additionally, the elevated OIDP prevalence calls for ministries and policymakers to amend policies to include oral health education and coaching in dental clinics and hospitals. These measures will enhance oral health and improve the overall quality of life.

6.3 Dissemination of Results

The findings of this study will be presented in partial fulfilment of the Master of Dentistry degree at Muhimbili University of Health and Allied Sciences. They will also be shared as an abstract at scientific seminars and conferences, and included in manuscripts submitted to relevant journals. Additionally, a copy will be provided to the Ministry of Health and Social Welfare of the United Republic of Tanzania, the main stakeholder in the country's health sector.

REFERENCES

1. Martin A. Dentine hypersensitivity : new perspectives on an old problem. Int Dent J. 2002;52(5):367–75.
2. Sadaf D, Ahmad Z. Role of brushing and occlusal forces in non-carious cervical lesions (NCCL). International Journal of Biomedical Science. 2014;10(4):265–8.
3. Ganss C, Lussi A, Schlueter N. The histological features and physical properties of eroded dental hard tissues. Monogr Oral Sci. 2014;25:99–107.
4. El Marakby AM, Al Sabri FA, Alharbi SA, Halawani SM. Noncarious Cervical Lesions as Abfraction: Etiology, Diagnosis, and Treatment Modalities of Lesions: A Review Article. Dentistry. 2017;07(06).
5. Mostafa D, Fatima N. "Gingival Recession And Root Coverage Up To Date, A literature Review." Dentistry Review. 2022;2(1):100008.
6. Szentkirályi A, Novák M. Health-related quality of life. Encyclopedia of Sleep and Circadian Rhythms: Volume 1-6, Second Edition. 2023;169–74.
7. WHO. WHO_MSA_MNH_PSF_97.4.pdf. 2012. p. 1–13.
8. Kida IA, Åstrøm AN, Strand G V., Masalu JR, Tsakos G. Psychometric properties and the prevalence, intensity and causes of oral impacts on daily performance (OIDP) in a population of older Tanzanians. Health Qual Life Outcomes. 2006;4:1–11.
9. Soares AR dos S, Chalub LLFH, Barbosa RS, Campos DE de P, Moreira AN, Ferreira RC. Prevalence and severity of non-carious cervical lesions and dentin hypersensitivity: association with oral-health related quality of life among Brazilian adults. Heliyon. 2021 Mar 1;7(3).
10. Peumans M, Politano G, Van Meerbeek B. Treatment of noncarious cervical lesions: when, why, and how. Int J Esthet Dent. 2020;15(1):16–42.

11. Teixeira DNR, Thomas RZ, Soares PV, Cune MS, Gresnigt MMM, Slot DE. Prevalence of noncarious cervical lesions among adults: A systematic review. Vol. 95, Journal of Dentistry. Elsevier Ltd; 2020.

12. Aw TC, Lepe X, Johnson GH, Mancl L. Characteristics of noncarious cervical lesions A clinical investigation.

13. Favaro L, Vinícius P, Cunha-cruz J. Prevalence of dentin hypersensitivity : Systematic review and meta-analysis. J Dent. 2019;(October 2018):0–1.

14. Haneet RK, Vandana LK. Prevalence of dentinal hypersensitivity and study of associated factors: A cross-sectional study based on the general dental population of Davangere, Karnataka, India. Int Dent J. 2016 Feb 1;66(1):49–57.

15. Bekes K, John MT, Schaller HG, Hirsch C. Oral health-related quality of life in patients seeking care for dentin hypersensitivity. J Oral Rehabil. 2009;36(1):45–51.

16. Bekes K, John MT, Schaller HG, Hirsch C. Oral health-related quality of life in patients seeking care for dentin hypersensitivity. J Oral Rehabil. 2009 Jan;36(1):45–51.

17. Slade GD, Spencer AJ. Development and evaluation of the Oral Health Impact Profile. Community Dent Health. 1994 Mar;11(1):3—11.

18. Finbarr Allen P. Assessment of Oral Health Related Quality of Life. Health and Quality of Life Outcomes. Health Qual Life Outcomes. 2003;8(40):1–8.

19. Fifth THE, Health O. the Fifth Tanzania National Oral Health Survey Report of 2020 the United Republic of Tanzania Ministry of Health , Community Development , Gender , Elderly and Children the Fifth Tanzania National Oral Health Survey Report. 2020;(December).

20. Carneiro LC, Minja AA. Prevalence of Dentine Hypersensitivity among Adult Dental Patients in Dar-es-salaam, Tanzania. Dental Research and Oral Health. 2020;03(02).

21. Kehua Q, Yingying F, Hong S, Menghong W, Deyu H, Xu F. A cross-sectional study of dentine hypersensitivity in China. International dental journal. 2009 Dec 1;59(6):376–80.

22. Teixeira DNR, Zeola LF, Machado AC, Gomes RR, Souza PG, Mendes DC, et al. Relationship between noncarious cervical lesions, cervical dentin hypersensitivity, gingival recession, and associated risk factors: A cross-sectional study. J Dent. 2018 Sep 1;76:93–7.

23. Bomfim RA, Crosato E, Mazzilli LEN, Frias AC. Prevalence and risk factors of non-carious cervical lesions related to occupational exposure to acid mists. Braz Oral Res. 2015;29(1):1–8.

24. B F, M S, FL B, D N, K B, CM L, et al. Prevalence and Etiologic Factors of Non Carious Cervical Lesions among Prison's Population in Dakar. Journal of Dentistry and Oral Care Medicine. 2015;1(3):1–6.

25. Oginni AO, Olusile AO, Udoye CI. Non-carious cervical lesions in a Nigerian population: Abrasion or abfraction? Int Dent J. 2003;53(5):275–9.

26. Favaro Zeola L, Soares PV, Cunha-Cruz J. Prevalence of dentin hypersensitivity: Systematic review and meta-analysis. Vol. 81, Journal of Dentistry. Elsevier Ltd; 2019. p. 1–6.

27. Teixeira DNR, Zeola LF, Machado AC, Gomes RR, Souza PG, Mendes DC, et al. Relationship between noncarious cervical lesions, cervical dentin hypersensitivity, gingival recession, and associated risk factors: A cross-sectional study. J Dent. 2018 Sep 1;76:93–7.

28. Bekes K, Hirsch C. What is known about the influence of dentine hypersensitivity on oral health-related quality of life? Vol. 17, Clinical Oral Investigations. 2013. p. 45–51.

29. Yoshizaki KT, Francisconi-dos-Rios LF, Sobral MAP, Aranha ACC, Mendes FM, Scaramucci T. Clinical features and factors associated with non-carious cervical lesions and dentin hypersensitivity. J Oral Rehabil. 2017;44(2):112–8.

30. Salam T.A. A, Mubarak Algharbi E, Ibrahim Alsane M, Ibraheem Alhaji M, Ahmed Aldohayan N, Saud Albarrak A, et al. Assessment of Patients' Experience and Perception Toward Dentinal Hypersensitivity for Its Diagnosis and Management: A Cross-Sectional Study. Cureus. 2023;15(2).

31. Barri RM, Haroun NB, Mohammed HA, Faya AS, Murshid LE, Alothman SM, et al. Knowledge of Students and General Practitioners regarding the Treatment of Dentine Hypersensitivity. International Journal Of Pharmaceutical Research And Allied Sciences. 2022;10(4):67–75.

32. Lima TC, Vieira-Barbosa NM, Grasielle de Sá Azevedo C, de Matos FR, Douglas de Oliveira DW, de Oliveira ES, et al. Oral Health-Related Quality of Life Before and After Treatment of Dentin Hypersensitivity With Cyanoacrylate and Laser. J Periodontol. 2017;88(2):166–72.

33. Idon P, Esan T, Bamise C. Etiological factors for dentine hypersensitivity in a Nigerian population. South African Dental Journal. 2018;73(5):362–6.

34. Jati AS, Furquim LZ, Consolaro A. Gingival recession: Its causes and types, and the importance of orthodontic treatment. Dental Press J Orthod. 2016;21(3):18–29.

35. Du JK, Wu JH, Chen PH, Ho PS, Chen KK. Influence of cavity depth and restoration of non-carious cervical root lesions on strain distribution from various loading sites. BMC Oral Health. 2020;20(1):1–10.

36. López-Frías FJ, Castellanos-Cosano L, Martán-González J, Llamas-Carreras JM, Segura-Egea JJ. Clinical measurement of tooth wear: Tooth wear indices. J Clin Exp Dent. 2012;4(1):48–53.

37. Sheiham A, Steele JG, Marcenes W, Tsakos G, Finch S, Walls AWG. Prevalence of impacts of dental and oral disorders and their effects on eating among older people; a national survey in Great Britain. Community Dent Oral Epidemiol. 2001;29(3):195–203.

38. Soares AR dos S, Chalub LLFH, Barbosa RS, Campos DE de P, Moreira AN, Ferreira RC. Prevalence and severity of non-carious cervical lesions and dentin

hypersensitivity: association with oral-health related quality of life among Brazilian adults. Heliyon. 2021;7(3).

39. Gomes RR, Zeola LF, Barbosa TAQ, Fernandes Neto AJ, de Araujo Almeida G, Soares PV. Prevalence of non-carious cervical lesions and orthodontic treatment: a retrospective study. Prog Orthod. 2022 Dec 1;23(1).

40. Zuza A, Racic M, Ivkovic N, Krunic J, Stojanovic N, Bozovic D, et al. Prevalence of non-carious cervical lesions among the general population of the Republic of Srpska, Bosnia and Herzegovina. Int Dent J. 2019;69(4):281–8.

41. Savage KO, Oderinu OH, Oginni AO, Uti OG, Adegbulugbe IC, Dosumu OO. Dentine hypersensitivity and associated factors: A Nigerian cross-sectional study. Pan African Medical Journal. 2019;33:1–12.

42. Oderinu OH, Savage KO, Uti OG, Adegbulugbe IC. Prevalence of self-reported hypersensitive teeth among a group of Nigerian undergraduate students. Niger Postgrad Med J. 2011;18(3):205–9.

43. Splieth CH, Tachou A. Epidemiology of dentin hypersensitivity. Clin Oral Investig. 2013;17(SUPPL.1):3–8.

44. Wagner TP, Costa RSA, Rios FS, Moura MS, Maltz M, Jardim JJ, et al. Gingival recession and oral health-related quality of life: a population-based cross-sectional study in Brazil. Community Dent Oral Epidemiol. 2016;44(4):390–9.

45. Douglas de Oliveira DW, Marques DP, Aguiar-Cantuária IC, Flecha OD, Gonçalves PF. Effect of Surgical Defect Coverage on Cervical Dentin Hypersensitivity and Quality of Life. J Periodontol. 2013;84(6):768–75.

46. Penoni DC, Da Silva Nunes Gomes Miranda ME, Sader F, Vettore MV, Leão ATT. Factors Associated with Noncarious Cervical Lesions in Different Age Ranges: A Cross-sectional Study. Eur J Dent. 2021;15(2):325–31.

47. Title S, Yoshizaki KT, Angela M, Sobral P, Cec A, Mendes FM, et al. No Title. 2016;

48. Yang J, Cai D, Wang F, He D, Ma L, Jin Y, et al. Non-carious cervical lesions (NCCLs) in a random sampling community population and the association of NCCLs with occlusive wear. J Oral Rehabil. 2016;43(12):960–6.

49. Odontotherapy R, Between C, Stress O. Correlations Between Ocluzal Stress and the Occurence of Abfraction Lesions. 2019;XVIII(1):51–7.

50. Que K, Guo B, Jia Z, Chen Z, Yang J, Gao P. A cross-sectional study: Non-carious cervical lesions, cervical dentine hypersensitivity and related risk factors. J Oral Rehabil. 2013;40(1):24–32.

51. Zuza A, Racic M, Ivkovic N, Krunic J, Stojanovic N, Bozovic D, et al. Prevalence of non-carious cervical lesions among the general population of the Republic of Srpska, Bosnia and Herzegovina. Int Dent J. 2019;69(4):281–8.

52. Sivaramakrishnan G, Sridharan K. Fluoride varnish versus glutaraldehyde for hypersensitive teeth: a randomized controlled trial, meta-analysis and trial sequential analysis. Clin Oral Investig. 2019;23(1):209–20.

53. Benoist FL eye, Ndiaye FG aye, Faye B, Bane K, Ngom PI brahima, Ndong PM arie K. Knowledge of and management attitude regarding dentin hypersensitivity among dentists from a West African country. J Contemp Dent Pract. 2014;15(1):86–91.

54. Jiang H, Du MQ, Huang W, Peng B, Bian Z, Tai BJ. The prevalence of and risk factors for non-carious cervical lesions in adults in Hubei Province, China. Community Dent Health. 2011;28(1):22–8.

55. Gillam DG, Seo HS, Bulman JS, Newman HN. Perceptions of dentine hypersensitivity in a general practice population. J Oral Rehabil. 1999;26(9):710–4.

56. Lai ZY un, Zhi QH ui, Zhou Y, Lin HC ai. Prevalence of non-carious cervical lesions and associated risk indicators in middle-aged and elderly populations in Southern China. Chin J Dent Res. 2015;18(1):41–50.

57. Que K, Ruan J, Fan X, Liang X, Hu D. A multi-centre and cross-sectional study of dentine hypersensitivity in China. J Clin Periodontol. 2010;37(7):631–7.

58. Araújo KG de, Câmara JVF, Silva Thiel Ribeiro M, Pereira GD da S. Prevalence of non-carious cervical injuries and their associations with risk factors: integrative literature review. Research, Society and Development. 2022;11(3):e57411326645.

59. Borcic J, Anic I, Urek MM, Ferreri S. The prevalence of non-carious cervical lesions in permanent dentition. J Oral Rehabil. 2004;31(2):117–23.

60. Kolak V, Pešić D, Melih I, Lalović M, Nikitović A, Jakovljević A. Epidemiological investigation of non-carious cervical lesions and possible etiological factors. J Clin Exp Dent. 2018;10(7):e648–56.

61. Li MHM, Bernabé E. Tooth wear and quality of life among adults in the United Kingdom. J Dent. 2016;55:48–53.

62. Porritt JM, Sufi F, Barlow A, Baker SR. The role of illness beliefs and coping in the adjustment to dentine hypersensitivity. J Clin Periodontol. 2014;41(1):60–9.

APPENDICES

Appendix I - Informed Consent (English version).

Relationship Between Non-Carious Cervical Lesions and Dentine Hypersensitivity and Their Impacts on Oral Health-Related Quality of Life Among Adult Patients Attending Muhimbili Dental Clinics in Dar Es Salaam, Tanzania

ID no. … Age….. (Yrs.) Sex: (M=1, F=2)

Consent to participate in a study: Greetings! My name is Gerad George a postgraduate student at Muhimbili University of Health and Allied Sciences. I am doing research on dentin hypersensitivity and non-carious cervical lesions among adult patients at the MUHAS and MNH-OPD dental clinics: association with oral health-related quality of life in Dar es salaam

The purpose of the study: The goals of this study are to determine the prevalence and severity of NCCL and DH as well as the relationship between DH (with or without NCCL) and the presence of oral health impacts on the physical and psychological levels in Dar es Salaam.

What participation involves: If you consent to take part in the study, the researcher will inspect your mouth cavity and ask you to respond to questions on the questionnaire during an interview.

Confidentiality: Each questionnaire will have a unique number that will be used to input all of the data that is gathered. In order to protect confidentiality during the study, the surveys will be treated with extreme confidentiality.

Risks: Regarding this study, there is no direct danger.

Right to withdraw and alternatives: Participation in this research is entirely optional. We will understand if you decide not to participate in the study.

Benefits: If you consent to participate in this study, you will get detailed information about the state of your dental health as well as referrals for treatment if necessary.

We do not anticipate that your involvement will do you any damage, should it occur.

Who to contact: If you have any questions about the study, you should contact Dr. Gerad George on +255719302353? If you ever have questions about your rights as a participant, you may call, Dr Nahya Masoud, Chairperson of MUHAS research and publication committee telephone no +2552150302 or Supervisor of this study Dr. Godbless Mandari. (Phone 06548174228)

Signature

I …… have read the content of this form. My questions have been answered. I agree to participate in this study.

Signature of participant ……. Signature of witness ……...

Date of signed consent …/…/ 2024

Participant agrees □ Participant does NOT agree on □

Appendix II - Informed Consent (Swahili Version).

Relationship Between Non-Carious Cervical Lesions and Dentine Hypersensitivity and Their Impacts on Oral Health-Related Quality of Life Among Adult Patients Attending Muhimbili Dental Clinics in Dar Es Salaam, Tanzania

Namba ya usajili └┴┴┴┘| **Umri….. (Miaka) Jinsia: (me=1, ke=2)** └┴┘

Ridhaa ya kushiriki kwenye utafiti

Salaam! Naitwa Daktari Gerald George mwanafunzi wa uzamili katika chuo kikuu cha Tiba za Afya cha Muhimbili. Ninafanya utafiti kubaini dentin hypersensitivity and non-carious cervical lesions among adult patients at the MUHAS and MNH-OPD dental clinics: association with oral health-related quality of life in Dar es salaam

Lengo la utafiti : The aim of the study is to estimate the prevalence and severity of NCCL and DH and the association of DH (with or without NCCL) with the presence of physical and psychosocial oral health impact s in Dar es salaam

Ushiriki wako ni wa namna gani? Ikiwa unakubali kushiriki kwenye utafiti, utaombwa kujibu maswali utakayoulizwa kwenye dodoso na kisha utachunguzwa afya yako ya kinywa na meno

Usiri: Taarifa zote zitakazochukuliwa kupitia dodoso letu, pamoja na vipimo vitatambulika kwa namba na siyo jina ili kuongeza usiri. Usiri huo utalindwa hata baada ya kukamilika kwa utafiti huu.

Madhara : Hatutarajii kwamba utapata madhara yoyote kutokana na utafiti huu.

Faida : Kama ulikuwa haujui undani juu ya afya ya kinywa chako, utapata bahati ya kufahamu na kama una tatizo utapata ushauri husika.

Haki ya kujitoa : Ushiriki wako ni wa hiari, unaweza kujitoa wakati wowote katika utafiti huu. Ukiamua kutokushiriki hautalaumiwa

Mawasiliano : Ukiwa na maswali kuhusu utafiti huu wasiliana nami Dr. Gerad George kwa nambari ya simu +255719302353

Kama una swali kuhusu stahiki zako kama mshiriki unaweza kumpigia simu, Mwenyekiti wa kamati ya Utafiti na Uchapishaji, S.L.P 65001, Simu: 255 22 2152489 Dar es Salaam au msimamizi wa utafiti huu Dr. Godbless Mandari. (Simu 06548174228)

Mimi _____ nimekubali kushiriki utafiti huu baada ya maswali yangu yote kujibiwa.
Sahihi ya mshiriki _____
Sahihi ysa shahidi _____ Tarehe __/___/2024

Mshiriki amekubali □ Amekataa □

Appendix III - Questionnaire (English Version)

Relationship Between Non-Carious Cervical Lesions and Dentine Hypersensitivity and Their Impacts on Oral Health-Related Quality of Life Among Adult Patients Attending Muhimbili Dental Clinics in Dar Es Salaam, Tanzania

ID NO ---------- DATE------/--------/----------

SEX Male ☐ Female ☐

AGE _____

NAME OF THE DENTAL CLINIC: MUHAS DENTAL ☐ MNH-OPD ☐

1. Occupation status
    a. Retired
    b. self-employed
    c. employed
    d. unemployed (no source of income).
2. Level of education:
    a. no formal education
    b. not completed primary education
    c. completed primary education
    d. not completed secondary education
    e. Completed secondary education
    f. tertiary education.

Oral Impact on Daily Performance (OIDP)

Can you tell us how problems with your mouth and teeth impacted your daily performance?

PLEASE INDICATE BY PUTTING A TICK '√' IN THE APPROPRIATE CIRCLE

1) During the past 6 months –how often have problems with your mouth and teeth caused you any difficulty in eating and chewing food?
    a) Never
    b) Less than once a month
    c) Once or twice a month

d) Once or twice a week
e) 3-4 times a week
f) Every or nearly every day.

2) What was the actual problem(s) that caused your difficulty with eating and chewing food?

Condition	Yes	No
Toothache		
Loose tooth		
Gum abscess		
Bad breath		
Bleeding gums		
Teeth sensitivity		

Other,
(specify)…….……...

3) During the past 6 months –how often have problems with your mouth and teeth caused you any difficulty in speaking and pronouncing clearly?
   a) Never
   b) Less than once a month
   c) Once or twice a week
   d) 3-4 times a week
   e) Every or nearly every day

4) What was the actual oral problems that caused your difficulty with speaking and pronouncing clearly?

Condition	Yes	No
Toothache		
Loose tooth		
Gum abscess		
Bad breath		
Bleeding gums		
Teeth sensitivity		

Other, specify…….

5) During the past 6month how often have problems with your mouth and teeth caused you any difficulty with cleaning teeth
   a) Never
   b) Less than once a month
   c) Once or twice a week
   d) 3-4 times a week
   e) Every or nearly every day

6) What was the actual oral problem(s) that caused the difficulty with cleaning teeth?

Condition	Yes	No
Toothache		
Loose tooth		
Gum abscess		
Bad breath		
Bleeding gums		
Teeth sensitivity		

Other, (specify)……

7) During the past 6month –how often have problems with your mouth and teeth caused you any difficulty in sleeping and relaxing?
   a) Never
   b) Less than once a month
   c) Once or twice a month
   d) Once or twice a week
   e) 3-4 times a week
   f) Every or nearly every day

8) What was the oral problem (s) that caused your difficulty with sleeping and relaxing?

Condition	Yes	No
Toothache		
Loose tooth		
Gum abscess		
Bad breath		
Bleeding gums		
Teeth sensitivity		

Other, (specify)……

9) During the past 6 month –how often have problems with your mouth and teeth caused you any difficulty in smiling, laughing, and showing teeth without embarrassment?
   a) Never
   b) Less than once a month
   c) Once or twice a week
   d) 3-4 times a week
   e) Every or nearly every day

10) What was the actual oral problem(s) that caused difficulty with smiling, laughing and showing teeth without embarrassment?

Condition	Yes	No
Toothache		
Loose tooth		
Gum abscess		

Bad breath		
Bleeding gums		
Teeth sensitivity		

Other (specify)…….

11) During the past 6 months –how often have problems with your mouth and teeth caused you any difficulty in maintaining your usual emotional state without being irritable?
    a) Never
    b) Less than once a month
    c) Once or twice a week
    d) 3-4 times a week
    e) Every or nearly every day
12) What was the actual oral problem (s) that caused you difficulty with maintaining usual emotional state without being irritable?

Condition	Yes	No
Toothache		
Loose tooth		
Gum abscess		
Bad breath		
Bleeding gums		
Teeth sensitivity		

Other (specify)……

13) During the past 6months –how often have problems with your mouth and teeth caused you any difficulty in carrying out major work or social role.
    a) Never
    b) Less than once a month
    c) Once or twice a week
    d) 3-4 times a week
    e) Every or nearly every day
14) What was the actual problem(s) that caused your difficulty with carrying out major work and social roles?

Condition	Yes	No
Toothache		
Loose tooth		
Gum abscess		
Bad breath		
Bleeding gums		
Teeth sensitivity		

Other (specify)…….

15) During the past 6 months –how often have problems with your mouth and teeth caused you any difficulty in enjoying contact with people?
    a) Never
    b) Less than once a month
    c) Once or twice a week
    d) 3-4 times a week
    e) Every or nearly every day
16) What was the actual oral problem(s) that caused you difficulty with enjoying contact with people?

Condition	Yes	No
Toothache		
Loose tooth		
Gum abscess		
Bad breath		
Bleeding gums		
Teeth sensitivity		

Other (specify)……

Appendix IV – Questionnaire (Swahili Version)

DODOSO LA UTAFITI WA

Relationship Between Non-Carious Cervical Lesions and Dentine Hypersensitivity and Their Impacts on Oral Health-Related Quality of Life Among Adult Patients Attending Muhimbili Dental Clinics in Dar Es Salaam, Tanzania

Nambari ya Dodoso---------- Tarehe------/--------/----------

Kiume ☐ Kike ☐

Umri _____

Jina la kliniki ya Meno _____

1. Kazi unayojishughulisha nayo
   1 Mstaafu
   2 Nimejiajili
   3 Nimeajiliwa
   4 Sijaajiliwa (sina chanzo cha fedha)
2. Kiwango cha elimu
   1. Sijaenda shule kabisa
   2. Sijamaliza shule ya msingi
   3. Nimemaliza shule ya msingi
   4. Sijamaliza shule ya sekondari
   5. Nimemaliza shule ya sekondari
   6. Elimu ya juu

Maswali yafuatayo yanahusiana na jinsi afya ya kinywa na meno inavyoathiri ubora wa Maisha.

1) Katika kipindi cha miezi sita iliyopita ni mara ngapi umekuwa na tatizo katika mdomo wako na meno yaliyokuletea matatizo wakati wa **kula au kutafuna chakula**.

- Sijapata tatizo
- Chini ya mara moja kwa mwezi
- Mara moja au mbili kwa mwezi
- Mara moja au mbili kwa wiki
- Mara 3-4 kwa wiki
- Kila siku au karibu kila siku

2) Nini hasa tatizo lako la kinywa lililosababbisha upate matatizo wakati wa **kula au kutafuna chakula?**

Hali	**Ndiyo**	**Hapana**
Maumivu ya Jino		
Jino linalolegea		
Jipu la ufizi		
Harufu mbaya		
Fizi zinazotoa damu		
Ganzi kwenye meno		

Jingine: (taja) _____

3) Katika kipindi cha miezi sita iliyopita ni mara ngapi umekuwa na tatizo katika mdomo wako na meno yaliyokuletea matatizo katika **kuzungumza na kutamka maneno vizuri.**

- Sijapata tatizo
- Chini ya mara moja kwa mwezi
- Mara moja au mbili kwa mwezi
- Mara moja au mbili kwa wiki
- Mara 3-4 kwa wiki
- Kila siku au karibu kila siku

4) Kulikuwa na tatizo gani hasa la kinywa lililokufanya kupata taabu katika **kuzungumza na kutamka maneno vizuri**?

Hali	**Ndiyo**	**Hapana**
Maumivu ya Jino		
Jino linalolegea		

Jipu la ufizi		
Harufu mbaya		
Fizi zinazotoa damu		
Ganzi kwenye meno		

Jingine, (taja) _____

5) Katika kipindi cha miezi sita iliyopita ni mara ngapi umekuwa na tatizo katika mdomo wako na meno lililokufanya kupata taabu katika **kusafisha meno yako**?
   - o Sijapata tatizo
   - o Chini ya mara moja kwa mwezi
   - o Mara moja au mbili kwa mwezi
   - o Mara moja au mbili kwa wiki
   - o Mara 3-4 kwa wiki
   - o Kila siku au karibu kila siku
6) Kulikuwa na tatizo gani hasa la kinywa lililokufanya kupata taabu katika **kusafisha meno yako**?

Hali	**Ndiyo**	**Hapana**
Maumivu ya Jino		
Jino linalolegea		
Jipu la ufizi		
Harufu mbaya		
Fizi zinazotoa damu		
Ganzi kwenye meno		

Jingine, (taja) _____

7) Katika kipindi cha miezi sita iliyopita ni mara ngapi umekuwa na tatizo katika mdomo wako na meno lililokufanya **kupata taabu katika kulala na kupumzika**?
   - o Sijapata tatizo
   - o Chini ya mara moja kwa mwezi
   - o Mara moja au mbili kwa mwezi
   - o Mara moja au mbili kwa wiki
   - o Mara 3-4 kwa wiki

o Kila siku au karibu kila siku

8) Ulikuwa na tatizo gani la kinywa lililokupa taabu ya **kulala au kupumzika**?

Hali	**Ndiyo**	**Hapana**
Maumivu ya jino		
Jino linalolegea		
Jipu la ufizi		
Harufu mbaya		
Fizi zinazotoa damu		
Ganzi kwenye meno		

Jingine, (taja) _____

9) Katika kipindi cha miezi sita iliyopita ni mara ngapi umekuwa na tatizo katika mdomo wako na meno lililokufanya kupata taabu katika **kutabasamu, kucheka na kuonyesha meno yako bila kuona aibu**?

o Sijapata tatizo

o Chini ya mara moja kwa mwezi

o Mara moja au mbili kwa mwezi

o Mara moja au mbili kwa wiki

o Mara 3-4 kwa wiki

o Kila siku au karibu kila siku

10) Ulikuwa na tatizo gani hasa la kinywa lililokupa taabu ya **kutabasamu, kucheka na kuonyesha meno bila kuoa aibu**?

Hali	**Ndiyo**	**Hapana**
Maumivu ya Jino		
Jino linalolegea		
Jipu la ufizi		
Harufu mbaya		
Fizi zinazotoa damu		
Ganzi kwenye meno		

Jingine, (taja) _____

11) Katika kipindi cha miezi sita iliyopita ni mara ngapi umekuwa na tatizo katika mdomo wako na meno lililokufanya kupata taabu katika **kuwa katika hali yako ya kawaida (ya mhemko) bila kukereka.**

- o Sijapata tatizo
- o Chini ya mara moja kwa mwezi
- o Mara moja au mbili kwa mwezi
- o Mara moja au mbili kwa wiki
- o Mara 3-4 kwa wiki
- o Kila siku au karibu kila siku

12) Ulikuwa na tatizo gani hasa la kinywa lililokupa taabu kuweza kuwa katika hali ya **kawaida ya mhemko bila kukereka**?

Hali	**Ndiyo**	**Hapana**
Maumivu ya Jino		
Jino linalolegea		
Jipu la ufizi		
Harufu mbaya		
Fizi zinazotoa damu		
Ganzi kwenye meno		

Jingine, (taja) _____

13) Katika kipindi cha miezi sita iliyopita ni mara ngapi umekuwa na tatizo katika mdomo wako na meno linakupa taabu ya **kufanya kazi kubwa au majukumu ya kijamii**

- o Sijapata tatizo
- o Chini ya mara moja kwa mwezi
- o Mara moja au mbili kwa mwezi
- o Mara moja au mbili kwa wiki
- o Mara 3-4 kwa wiki
- o Kila siku au karibu kila siku

14) Ulikuwa na tatizo gani hasa la kinywa lililokupa taabu kuweza kufanya **kazi kubwa na majukumu ya kijamii**?

Hali	**Ndiyo**	**Hapana**
Maumivu ya jino		
Jino linalolegea		
Jipu la ufizi		
Harufu mbaya		
Fizi zinazotoa damu		
Ganzi kwenye meno		

Jingine, (taja)_____

15) Katika kipindi cha miezi sita iliyopita ni mara ngapi umekuwa na tatizo katika mdomo wako na meno lililokupa taabu katika **kufurahia pamoja na watu wengine**

- o Sijapata tatizo
- o Chini ya mara moja kwa mwezi
- o Mara moja au mbili kwa mwezi
- o Mara moja au mbili kwa wiki
- o Mara 3-4 kwa wiki
- o Kila siku au karibu kila siku

16) Ulikuwa na tatizo gani hasa la kinywa lililokupa taabu katika kuweza **kufurahia pamoja na watu wengine**.

Hali	**Ndiyo**	**Hapana**
Maumivu ya jino		
Jino linalolegea		
Jipu la ufizi		
Harufu mbaya		
Fizi zinazotoa damu		
Ganzi kwenye meno		

Jingine, (taja)_____

Appendix: V Clinical form

The Tooth Wear Index (TWI) and the occurrence of DH

MAXILLA	17	16	15	14	13	12	11	21	22	23	24	25	26	27
TWI-Depth (mm)														
DH														
MANDIBULA	47	46	45	44	43	42	41	31	32	33	34	35	36	37
TWI-Depth (mm)														
DH														

Key;

The Tooth Wear Index (TWI);

1. no change of contours;
2. minimal loss of contour;
3. less than 1 mm deep defect;
4. 1-2 mm deep defect;
5. more than 2 mm deep defect, or pulp exposure, or exposure of secondary dentine.

The occurrence of DH;

0 signified no discomfort/pain while

1 mild discomfort/pain

2 moderate discomforts/pain

3 severe pains only during application of stimulus

5 severe pains persisting after removal of stimulus

Appendix: VI: Ethical Clearances

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/2149 Date: 09/04/2024

MUHAS-REC-04-2024-2149
Gerad George Jubeck
School of Dentistry
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: RELATIONSHIP BETWEEN NON-CARIOUS CERVICAL LESIONS AND DENTINE HYPERSENSITIVITY AND THEIR IMPACTS ON ORAL HEALTHRELATED QUALITY OF LIFE AMONG ADULT PATIENTS MUHIMBILI DENTAL CLINICS IN DAR ES SALAAM, TANZANIA.

Reference is made to the above heading,

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 09/04/2024
EXPIRATION DATE OF APPROVAL: 09/04/2025

STUDY DESCRIPTION:
Purpose:

The aim of this Hospital-based analytical cross-sectional study is to determine the Relationship between non-carious cervical lesions and dentine hypersensitivity and their impacts on oral health-related quality of life among adult patients attending Muhimbili dental clinics in Dar es salaam.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2015363.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

9th April 24

Dr. Kasusu Nyamuryekung'e.

Chairperson, MUHAS Research and Ethics Committee

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research, Publications & Innovations
Box 65001

Appendix: VII: Introduction Letter

UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.366/2021 15th April, 2024

The Dean,
School of Dentistry,
Muhimbili University of Health and Allied Sciences,
P.O. Box 65014,
DAR ES SALAAM.

Re: INTRODUCTION LETTER OF GERALD GEORGE JUBECK

The bearer of this letter is Gerald George Jubeck (HD/MUH/T.366/2021), a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing Mdent. Restorative Dentistry

As part of his studies he intends to do a study titled: **"Relationship Between Non-Carious Cervical Lesions and Dentine Hypersensitivity and Their Impacts on Oral Health related Quality of Life Among Adult Patients Muhimbili Dental Clinics in Dar es Salaam, Tanzania."**

The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

Mr. Sebe Mohamed
For: DIRECTOR, POSTGRADUATE STUDIES

c.c. Gerald George Jubeck

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz

UNITED REPUBLIC OF TANZANIA

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

OFFICE OF THE DIRECTOR – POSTGRADUATE STUDIES

In reply quote;
Ref. No. HD/MUH/T.366/2021 15th April, 2024

The Executive Director,
Muhimbili National Hospital,
P.O. Box 65000,
DAR ES SALAAM.

Re: INTRODUCTION LETTER OF GERALD GEORGE JUBECK

The bearer of this letter is Gerald George Jubeck (HD/MUH/T.366/2021), a student at Muhimbili University of Health and Allied Sciences (MUHAS) pursuing Mdent. Restorative Dentistry

As part of his studies he intends to do a study titled: **"Relationship Between Non-Carious Cervical Lesions and Dentine Hypersensitivity and Their Impacts on Oral Health related Quality of Life Among Adult Patients Muhimbili Dental Clinics in Dar es Salaam, Tanzania."** he is being supervised by Dr. Gobless Mandari from MUHAS and Dr. Lilian Mkony from MNH.

The research has been approved by the Chairman of University Senate.

Kindly provide him the necessary assistance to facilitate the conduct of his research.

We thank you for your cooperation.

Mr. Sebe Mohamed
For: DIRECTOR, POSTGRADUATE STUDIES

c.c. Gerald George Jubeck

9 United Nations Road; Upanga West; P.O. Box 65001, Dar Es Salaam: Tel. G/Line: +255-22-2150302/6; Ext. 1015; Direct Line:+255-22-2151378;Telefax:+255-22-2150465;E-mail:dpgs@muhas.ac.tz;Web:https://www.muhas.ac.tz