

**PREVALENCE, AWARENESS AND PREDISPOSING
FACTORS OF DENTINE HYPERSENSITIVITY AMONG
ADULT PATIENTS IN DAR ES SALAAM**

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**PREVALENCE, AWARENESS AND PREDISPOSING
FACTORS OF DENTINE HYPERSENSITIVITY AMONG
ADULT PATIENTS IN DAR ES SALAAM**

By

Alex A. Minja, DDS

A dissertation Submitted in (partial) Fulfilment of the Requirements for the Degree
of Master of Dentistry (Restorative Dentistry) of
Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences
October 2013

CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Science a dissertation entitled “*Prevalence, awareness and predisposing factors of dentine hypersensitivity among adult patients in Dar es salaam*” in (partial) fulfilment of the requirements for the degree of Master of Dentistry (Restorative Dentistry) of Muhimbili University of Health and Allied Sciences.

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Date: _____

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Date.....

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Acknowledgement

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Abstract

Background: Dentine hypersensitivity (DH) has been defined as short or transient sharp pain of a rapid onset that arises from exposed dentine due to enamel loss and or denudation of cementum. Data on prevalence of DH in Tanzania is lacking however worldwide prevalence ranges from 3% to 57%.

Aim: To determine prevalence, level of awareness and predisposing factors of dentine hypersensitivity among adult patients who attended for dental treatment in Dar es salaam, Tanzania.

Method: This hospital based cross-sectional study was conducted between July and September 2012 that involved 323 adults aged 18 years and above who attended public dental clinics in Dar es Salaam. Upon consented to participate, Sample were conveniently selected and self administered structured questionnaires were used to gather subject's socio-demographic particulars and information related to DH from participants. Using a mouth mirror and WHO recommended probe the dentition and periodontal status was assessed and recorded. Tactile stimulus test was used during clinical examination to assess level of sensitivity of the respondents.

Result: The male to female ratio of the 323 participants was approximately one (1:1.1) with age range of 18-72 years. Level of awareness on DH was 88.2%. About two thirds (63.2%) of respondents, self reported to have suffered from DH. Of the predisposing practices, cigarette smoking was found to be statistically significantly related to DH ($p=0.007$). The prevalence of clinically diagnosed DH was 46.4% and higher among males (52.7%) and age group 50-79 years (63.5%). Oral conditions diagnosed during clinical examination, namely, attrition, abrasion, erosion, gingival recession, periodontal pockets and plaque accumulation were statistically significantly ($p\leq 0.05$) related with DH. Of the participants with dentine hypersensitivity, those who visited the dentist were 54 (43.5%) and most (59.5%) did not take any action. Multivariate analysis confirm tooth abrasion, attrition and gingival recession to be the most important predictors of DH occurrence

Conclusion: Respondent's level of awareness and prevalence of clinically diagnosed DH was relatively high whereas tooth attrition, abrasion and gingival recession were observed to be the most important predictors for the development of DH.

Recommendation

- Similar studies should be conducted in other regions so as to establish the current status and data bank for DH in Tanzania.
- Preventive measures of DH need to be encouraged so as to maintain quality of life.
- Early diagnosis and treatment of DH should be emphasized so as to reduce suffering and the burden of rehabilitation cost.

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List of abbreviations

| | |
|-----------|--|
| DH | Dentine hypersensitivity |
| CDH | Cervical dentine hypersensitivity |
| DMFT | Decay, Missing, Filled tooth |
| MDent | Master of Dentistry |
| MNH | Muhimbili National Hospital |
| MoH&SW | Ministry of Health and Social Welfare |
| MUHAS | Muhimbili University of Health and Allied Sciences |
| NCCL | Non- carious cervical lesion |
| PSI | Pound per Square Inch |
| Rest.Dent | Restorative Dentistry |
| SPSS | Statistical Package for the Social Sciences |
| VRS | Verbal Rating Scale |
| WHO | World Health Organization |

Introduction

Background

Dentine hypersensitivity (DH) has been defined as short or transient sharp pain of a rapid onset that arises from exposed dentine (Andy, 2002). It usually occurs in response to stimuli typically thermal, evaporative, tactile, osmotic or chemical and cannot be ascribed to any other dental defects or pathology (Andy, 2002; CAB, 2003). Different terms are applied in reference to the disorder including not only dentinal hypersensitivity but also dentine sensitivity, cervical dentine hypersensitivity or cervical sensitivity or hypersensitivity (Andy, 2002). It is a very common unpleasant condition that can cause considerable suffering to patients and limiting their daily habits such as the possibility of eating/drinking different kinds of foods and drinks (Rösing et al. 2009; Parolia et al. 2010). Dentine is a calcified tissue of the body usually covered by enamel on the crown and cementum on the root surface. It is composed by weight of about 70% hydroxyapatite, 20% being organic material and 10% water (Jones, 2011). Each tooth contains millions of dentinal tubules, which are microscopic tubular structures that radiate outward from the pulp. These dentinal tubules are about 0.5–2.0 μm in diameter and are connected to the pulp by a plasma-like biological fluid. Each tubule contains a cytoplasm cell process called a Tomes' fibre and an odontoblast that communicates with the pulp (Chu et al. 2011). Depending on the depth, approximately 30,000 tubules can be found in 1 mm^2 in a cross-section of dentin (Chu et al. 2011; Jones, 2011).

There are two types of nerve fibres within the pulpodentin complex, myelinated ($A\beta$ and $A\delta$) and unmyelinated (C-fibres) sensory nerves. The ($A\beta$ and $A\delta$) fibres are responsible for the sensation of dentin hypersensitivity, perceived as pain in response to all stimuli and C-fibres associated with dull type of pain in chronic pulpalgia (Ngassapa, 1996; Chu et al. 2011). Dentin is normally sensitive to external stimuli since it has structural and functional relationships with the dental pulp (Rösing et al. 2009). However, dentine hypersensitivity is observed when the dentinal tubules of a vital tooth are exposed and subjected to mechanical, chemical and/or thermal stimuli (Rösing et al. 2009). Dentinal hypersensitivity is different from dentinal and pulpal pain, in that, the patient's ability to locate the site of pain is very good (Sandhu et al. 2010).

Mechanism of dentine hypersensitivity

Many theories have been proposed to explain the mechanisms of dentine hypersensitivity (DH). The first hypothesis was the “*dentinal receptor mechanism theory*” which suggests that DH is caused by the direct stimulation of sensory nerve endings in dentine. On the basis of microscopic and experimental data, it seems unlikely that neural cells exist in the sensory portion of the outer dentine (Irvine JH, 1988) this theory is not well accepted.

The second theory is “*odontoblast transducer mechanism*” proposed by Rapp (Rapp et al 1968) suggested that odontoblasts act as receptor cells, mediating changes in the membrane potential of the odontoblasts via synaptic junctions with nerves. This could result in the sensation of pain from the nerve endings located in the pulpodentinal border; however, evidence for the odontoblast transducer mechanism theory is generally lacking and inconclusive (West NX 2008)

The third theory which is the most widely accepted to explain mechanism of dentin hypersensitivity is the “*hydrodynamic theory*” proposed by Brännström and Astron (Brännström et al. 1964), the theory associate pain in dentine hypersensitivity and movement of fluid in the dentinal tubules that, changes in the flow of the fluid present in the dentinal tubules can trigger receptors present on nerves endings located at the pulpal aspect thereby eliciting a pain response. Moreover from animal experiments a mechano-receptor response is suggested thus, the pressure change across dentine distorts the pain receptors at the pulp dentine border. The study done on the interactions between neural and hydrodynamic mechanisms in dentine and pulp which performed in vivo revealed that the response of the pulpal nerves was proportional to the pressure and therefore the rate of fluid flow (Matthews and Vongsava 1994). Interestingly stimuli such as cold, which cause fluid flow away from the pulp produce more rapid and greater pulp nerve responses than those, such as heat, which cause an inward flow (Matthews and Vongsava 1994), this certainly would explain the rapid and severe response to cold stimuli compared to the slow dull response to heat.

Literature review

Prevalence of dentine hypersensitivity

Worldwide more than 40% of adults are affected by DH (Chu et al. 2010) and it has been estimated that up to 30% of adults in United State are affected (Chu et al. 2011, Rees et al. 2003). The study done in University Clinic in Brazil (Fischer et al. 1992) reported the prevalence of 25% of self-reported DH, and 17% were confirmed after clinical examination. In African countries, only limited studies on DH are available moreover, there is no available published data on the prevalence of DH in Tanzania. Most of the study findings demonstrate great variation of reported prevalence of DH which ranges from 3 to 57% (Martínez-Ricarte et al. 2008; Dababneh et al. 1999). The most affected patient's ranges in age from 20 to 50 years, with the peak incidence between 30 to 40 years then incidence tend to declines with age (Chu et al. 2011; Udoye, 2006; Dababneh et al.1999; Ketterl, 1983).

Awareness of dentine hypersensitivity

The awareness of dentine hypersensitivity among general public is not widespread (Pol et al. 2011; Chrysanthakopoulo et al. 2011). It has been reported that, only few proportion of the participants (Ye et al. 2012; Azodo et al. 2011) who suffering from DH were visiting the dentist for treatment of the condition, which signify insufficient awareness about the condition but also many patients do kept from revealing their sensitivity during routine dental visits (Pol, et al. 2011) and only 11.4% among those who visited the dentist because of DH (Azodo et al. 2011). Another study conducted among municipal employees of Mysore city India reported very high (100%) awareness on dental diseases in upper socioeconomic status (SES) and nil (0%) in the low SES (Shekar et al. 2011).

Predisposing factors

a) Gingival recession

One of the common clinical event and perhaps the most important factor related to the occurrence of cervical dentin hypersensitivity is gingival recession. From the study done UK demonstrate close relations between DH and gingival recession of which, 93% of the sensitivity teeth had closely associated with buccal gingival recession and majority were in

range of 1-3 mm (periodontal pocket depth) (Rees et al. 2004). Another Study finding show that buccal gingival recession was found in majority (87%) of sensitive teeth in the range of 1-3mm (Gurpreet et al. 2011).

b) Periodontal disease

It has been shown that, patients with periodontal diseases are at particularly high risk of developing DH (Dababneh et al.1999). Reported prevalence of dentine hypersensitivity to individual with periodontal disease ranges between 60% and 95% (Martínez-Ricarte et al. 2008; Dababneh et al.1999). The study conducted in UK, reported that patients who had periodontal disease had more gingival recession regardless of whether they smoked or not (Rees et al. 2004)

c) Cigarette smoking

Relationship between smoking and DH has been reported from several epidemiological findings that suggesting increased evidence points smoking to be indirectly related with DH. From the reported findings, majority of the subject with sensitive teeth were also smokers (Irwin, 1997; Afolabi et al. 2010). Other findings reported that tendencies of greater number of sensitive teeth were found from patients with periodontal disease who also smokes. However, some of documented findings could not establish any existed relationship between smoking and DH (Bahsi et al. 2012; Tengrungsun et al. 2012).

d) Tooth wear

Dentinal exposure may be secondary to loss of enamel or periodontal tissue (gingival recession). Enamel loss or dental wear is due to attrition, abrasion and erosion, and although dental erosion is the most important single factor to be taken into account, increased dentine wear and tubular aperture (Martínez-Ricarte et al. 2008). It has been reported that tooth wear is multifactorial in nature and many factors contributed to its initiation and progression (Walters, 2005; Addy et al. 2002; Martinez-Ricarte et al. 2008). It has been reported that attrition, abrasion, erosion and abfraction being related with DH Other tooth wear processes notably attrition and acid erosion cause loss of enamel and can expose dentine (Addy, 2005).

e) Tooth brush

Tooth brushing with or without toothpaste appears to cause minimal wear to enamel (in the absence of acids), circumstantial evidence implicates tooth brushing with gingival recession and exposure of dentine (Addy, 2005). However, positive association between hard toothbrush or excessive brushing force and occurrence of DH was reported earlier by several studies (Bamise et al. 2010; Liu et al. 1998; Tan et al. 2009). Gingival recession due to incorrect or aggressive Toothbrushing mostly occurs on buccal surfaces and frequently encountered to subjects with a high standard of oral hygiene (Cassiano et al. 2009; Khocht, 1995),

Pattern of dentine hypersensitivity

Most of the epidemiological findings describe pain due to DH a preferential order of pain distribution according to the type of teeth involved. The highest incidence of dentin hypersensitivity has been reported on the buccal cervical zone of permanent teeth in which premolars is the most affected tooth (Bahsi et al. 2012; Pong et al. 2009; Kahua et al. 1999; Lil et al. 1998;) followed by canine (Lin et al. 2011; Tan et al. 2009; Udoye et al. 2006) and the least affected is molar (Rees, 2005; Azodo et al. 2011; Martínez-Ricarte et al.2008)

Management of dentine hypersensitivity

Effective treatment must be preceded by proper diagnosis established after the exclusion of any other possible causes of dentine hypersensitivity pain (Dababneh, 1999). Currently Several methods and materials, such as varnishes, liners, restorative materials, dentinal adhesives, dentifrices and mouthwashes are used to reduce or prevent dentine hypersensitivity (Dababneh, 1999; Porto et al. 2009). Desensitizing toothpastes provide relief from dentin hypersensitivity symptoms in two main ways: First, they interrupt the neural response to pain stimuli by the penetration of potassium ions through the tubules to the A-fibres of the nerves, thereby decreasing the excitability of these nerves. Second, they occlude open tubules to block the hydrodynamic mechanism (Chu, 2010; Porto et al. 2009; Rösing et al. 2009), however, it often takes four to eight weeks for effective treatment of pain relief.

In Tanzania, desensitizing dentifrices are available in the market; however the awareness of the use is questionable. For patients presenting with teeth wear as predisposing factors of DH, treatments alternatives varies depends on the expertises, equipments and materials. The use of tooth coloured adhesive restorative material like Composite and Glass Ionomer Cements has been commonly applied as a treatment options for restoring missing dentine and relief from sensitivity pain by blocking the opened dentinal tubules.

Problem statement

Dentinal hypersensitivity is among the common clinical findings that cause considerable suffering to a patient (Azodo et al. 2011). Despite being the commonest cause of pain/discomfort to many adult patients, many people with dentine hypersensitivity do not specifically seek treatment for this problem but may only mention it at a routine dental visit (Azodo et al. 2011; Chu et al. 2011). We are not sure about the level of awareness in Tanzania, and it could be obtained via media or when visiting the dental clinic.

During treatment in the dental clinic the number of patients presenting with dentine hypersensitivity seems to be increasing. Regular dental check-up by dental clinicians should be used as a strategy for early diagnosis of the condition thereby reducing suffering and the burden of rehabilitation cost.

Reviews from the available literatures on DH worldwide demonstrate a great variation in its prevalent figures (Martínez-Ricarte et al. 2008; Dababneh et al. 1999). Research on DH in African countries is limited and no studies have been reported in Tanzania hence the need to establish the current status of this condition in Tanzania.

Conceptual framework for dentine Hypersensitivity

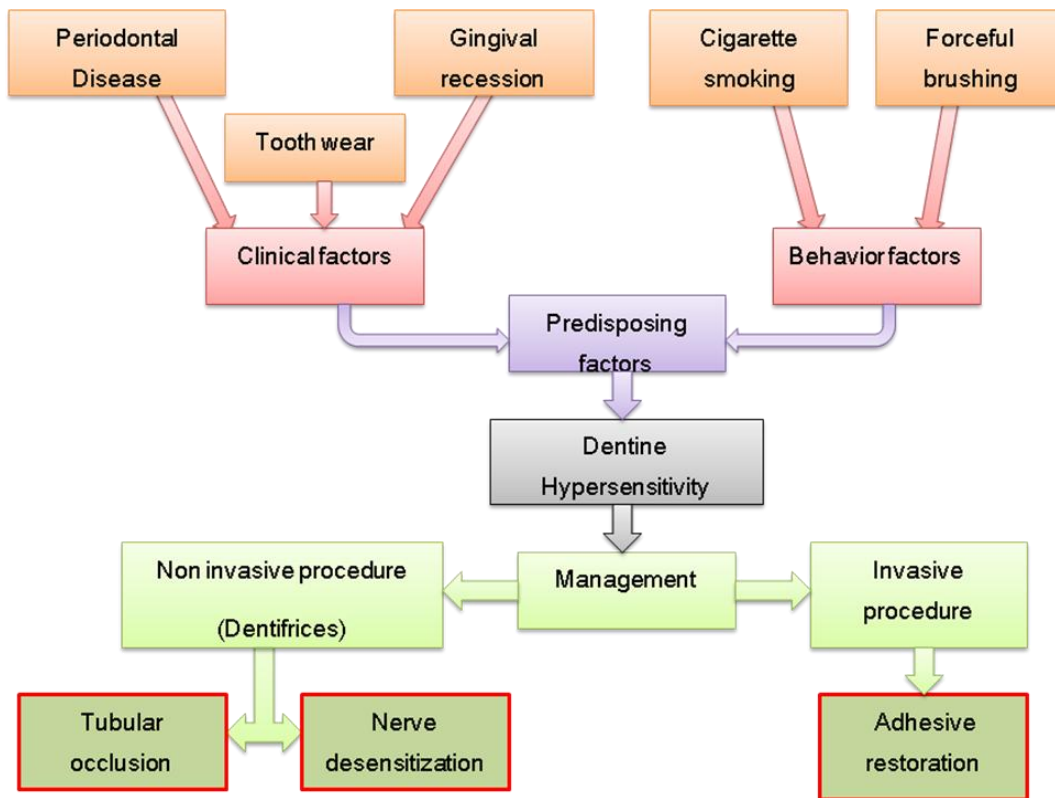


Figure 1 Conceptual framework for dentine Hypersensitivity

Rationale of the study

Determining the prevalence, level of awareness and predisposing factors of dentine hypersensitivity among adult patient attending dental clinics in Dar Es Salaam will enable the researchers to relate these findings with those obtained following a clinical examination hence quantifying the extent of the problem. The current status of DH of the population can thus be compared to studies done in other countries.

The study will establish the current status of DH and if it is a significant dental health problem in the population. Findings of this study will be used to create knowledge and awareness of dentine hypersensitivity amongst the community and to assist the government during preventive programs and treatment planning of DH within the implementation of oral health care delivery in general. Also awareness on the importance of early diagnosis and regular dental check-up may assist in reduce the burden of DH and henceforth reduce suffering and the burden of rehabilitation cost.

Moreover it will highlight of the problem of DH in Dar es Salaam and in turn will help in planning and conducting similar studies in other regions of Tanzania so as to establish national status of the problem.

Objectives

Broad Objective

To determine level of awareness, prevalence and predisposing factors of dentine hypersensitivity among adult patients attending dental treatment in Dar es salaam, Tanzania

Specific objectives

1. To determine level of awareness on dentine hypersensitivity among adult patients attending dental treatment in Dar Es Salaam
2. To determine the prevalence of self reported dentine hypersensitivity among adult patients attending dental treatment in Dar Es Salaam by age and sex
3. To determine behavioural factors predisposing to dentine hypersensitivity among adult patients attending dental treatment in Dar Es Salaam by age and sex
4. To clinically assess the prevalence and pattern of teeth affected by dentine hypersensitivity among adult patients attending dental treatment in Dar Es Salaam by age and sex
5. To assess clinical factors predisposing to dentinal hypersensitivity among adult patients attending dental treatment in Dar Es Salaam by age and sex

Material and Methods

Study area

Dar es salaam is one of the rapid developing cities of Tanzania with a population of 3.207 million (2009) people (Tanzania Demographics Profile, 2012) and the city has three municipals namely Ilala, Kinondoni and Temeke, each having one public district hospital, and several health centres. The study was conducted in the public dental clinics in each of the districts, namely, Temeke Hospital, Mnazi Mmoja and Magomeni Health Centre. Also included in the study was the Muhimbili National hospital (MNH), a referral hospital in Dar es Salaam which receives patients from all the three municipal including referral cases from all over the country.

Study Design and Study Period

A hospital based cross sectional study was conducted between July and September 2012

Study population and sampling method

Convenient sampling method was used to select adults aged 18 years and above who attended for dental treatment at any of the selected public dental clinics in Dar es Salaam during the time of study.

Sample size determination

Sample size calculation was based on proportion (p) of the dentine hypersensitivity which was set to be 50% because there was no available prior estimated proportion of dentine hypersensitivity in Tanzania as no pilot study was conducted. Standard deviates (z) for 95% confidence interval is 1.96 and Margin of error (ϵ) =5% (0.05)

From the formula
$$n = \frac{Z^2 P (1-P)}{\epsilon^2}$$

$$384 = \frac{1.962^2 \times 0.50 (1-0.50)}{0.05^2}$$

The calculated sample size was 384.

Ethical Issues

Muhimbili University of Health and Allied Sciences granted ethical clearance (Appendix IV) while permission to conduct the research in respective dental clinics was obtained from the respective municipal councils or Administrative Authorities of the sampled hospitals. The consent form (Appendix III) contains information that helped the participant to understand his/her role, they had the right to decide whether to participate or opt not to participate or stop participating at any time with no repercussion.

Sampling procedure

Data collection was carried out between July and September 2012 and involved four dental clinics in Dar es Salaam. One public dental clinic from each municipality of Dar es salaam was conveniently selected. Muhimbili National Hospital being a referral hospital that receives patients from all the three municipal in Dar es Salaam including referral cases from all over the country was also included in the study making a total of four public dental clinics. At each selected hospital, the study was introduced to the subjects waiting for dental treatment at the day of data collection and those who agreed to participate were given consent forms.

Inclusion criteria

All adult patients aged 18 years and above who attended for dental treatment at the selected hospitals during the time of study and who consented were included in the study

Exclusion criteria:

All patients who were mentally challenged, very ill and those who were under anti-inflammatory or analgesics drugs during the time of data collection were excluded from the study as they may not be able to differentiate pain related to DH. During assessment of participants' dentition decay teeth, restored teeth, teeth with orthodontic or involved in prosthodontic appliances were excluded from being assessed for DH as they may interfere/mask the expected outcome of the sensitivity stimulus test. A total of 169 (32.9%) subjects were excluded from the study as shown in Fig 1.

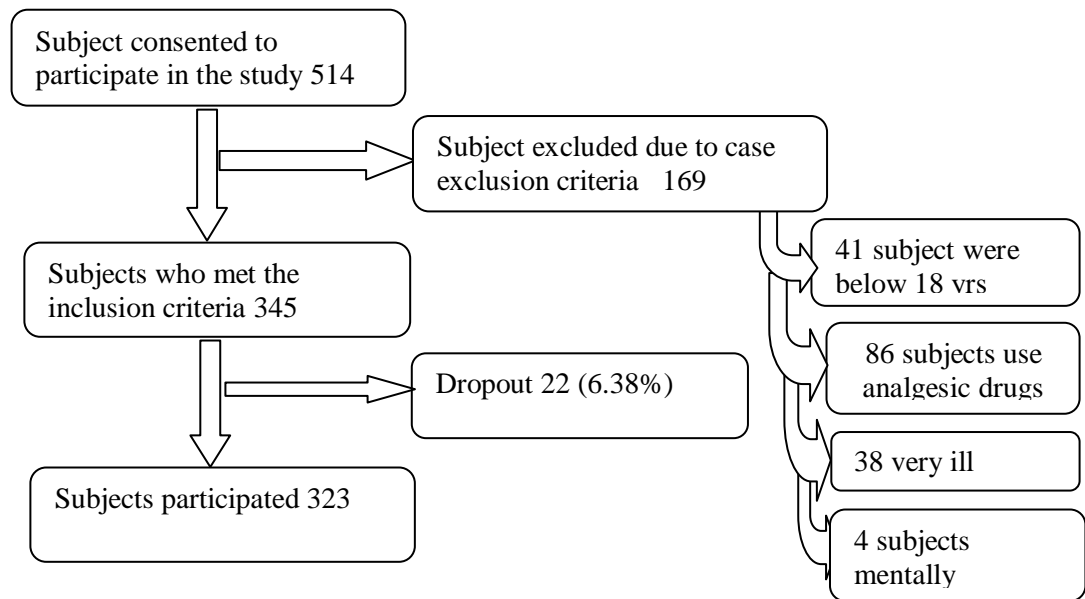


Figure 2: Summary depicting the employed sampling procedure.

Data collection tool

Questionnaire

A self administered structured questionnaire (Appendix I) was administered to the 345 participants who fulfilled the inclusion criteria. The questionnaire was divided into four main parts; socio-demographic information, level of awareness of DH, history of DH experiences and practices predisposing to DH

With regard to socio-demographic information; age, sex, education background and occupation status of the respondents were gathered. The second part comprised a total of twenty five questions. Subject's level of awareness on DH was assessed in five different categories that include level of awareness on DH experiences (question 1 to 5), predisposing factors (question 6 to 11), aggravating factors (question 12 to 17), what to do when experience DH (question 18 to 20) and awareness on preventive measures of DH (question 21 to 25). All awareness questions had dichotomous response (yes, no) were given equal weight and each correct score worth one mark.

All subjects who scored fifty percent or greater of the total marks in each particular category were considered to have an acceptable level of awareness on that specific category. The overall awareness of dentine hypersensitivity was computed through summing all five categories and of the total (25 marks) respondents who scored 13 marks or above while were considered to have an acceptable level of awareness on dentine hypersensitivity and those who scored less than 13 marks were regarded as not having acceptable level of awareness on DH. The third part was made up of four questions (question 26 to 29) which aimed at recalling subjects past experiences on DH. The questions helped to establish subject experiences of the problem, recalling time of episode and type of treatment preferred following the attack. The questions number 26 and 28 were dichotomised with yes/no responses while question number 27 and 29 are multiple answers questions that require the respondents to choose the most correct response.

The last part of the questionnaire was made up of six questions (question 31 to 36) designed to explore information about harmful behavioural practices that could have predisposing subjects from getting DH which include; smoking behaviour, tooth brushing practices and information on previous periodontal therapy experienced as it can predispose to DH. All questions in this section require the respondents to choose the most correct answerers except for question number 35 which is dichotomised with yes/no response. Responses of this question will be used to assess whether harmful practices could predisposing the subject from getting DH.

Clinical examination

Following the completion of the questionnaire, respondents were requested to proceed to the dental clinic for clinical examination while those who did not complete the clinical examination were considered as dropout. The examination was carried out by the same examiner in the dental chair with an overhead light for better illumination using a mouth mirror and WHO recommended probe (figure 3). The dentition and periodontal status was assessed and the findings were recorded in the clinical record form (Appendix III). Sensitivity test was performed to determine the sensitivity status

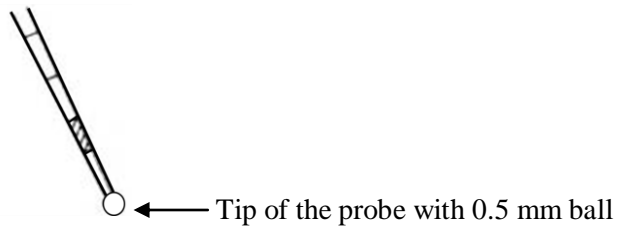


Figure 3: Recommended WHO Probe

i. Dentition assessment

Assessment was done in all permanent teeth except for third molars in accordance to criteria recommended by the World Health Organization (WHO, 1997) using the DMFT index for permanent teeth. Assumption is that every subject has 28 examinable teeth and last molar was excluded due to delay eruption and high prevalence of impaction. Prior to examination, a cotton gauze was used to gently dry the tooth was following which all surfaces of the tooth was thoroughly examined and the findings were recorded in the clinical record form (Appendix II). The observed Dentition conditions were coded and included decay =1, missing =2, filled teeth=3, trauma=4 and removable or fixed prosthesis =5 while sound tooth were given a code=0.

ii. Tooth wear assessment

Tooth wear was assessed in sequence from tooth 17 to 47, using a dental mirror and probe. Changes of the surface characteristics of the tooth that include occlusal, buccal cervical and lingual or palatal surfaces of the tooth was assessed in accordance with the modified criteria by Gandara and Truelove, 1999 (clinical record form Appendix II) and findings were recorded in the clinical record form. Absence of tooth wear was coded as 0, while attrition, abrasion, erosion and abfraction were coded as 1, 2, 3 and 4 respectively.



Figure 4: Severe tooth attrition on occlusal surface of one of the respondents.



Figure 5: Cervical tooth erosion as observed from one of the respondents.

iii. Periodontal status

Periodontal status was assessed in four respective indices that are used for estimating severity of periodontal disease namely; gingival recession, periodontal pocket, calculus and plaque score.

- Gingival recession

In order to estimate the apical-coronal width of recession, linear measurements of gingival recession was obtained from the cemento-enamel junction up to the edge of free gingival margin by using WHO recommended probe. Mid-facial/buccal and mid-lingual/palatal surfaces of all permanent teeth were measured except for the third molars. Gingival

recession was reported when the apical coronal width of recession was measured from one or above millimetres while less than one millimetre were considered as normal or absence of gingival recession. In the clinical record form, gingival recession was coded as one while absence of recession was coded as zero (0)

- **Periodontal pocket**

Estimating the apical coronal width of the periodontal pocket was done using WHO probe with 0.5 mm ball end and mirror. With gentle probing force (5 grams) the probe was inserted into the pocket on the mid-buccal/facial and mid-lingual/palatal surface of the tooth and the measurements were recorded in the clinical record form. When pocket depth measured three or less than three millimetres, it was considered as normal (no periodontal pocket) while measurements that ranging between 4 and 5 was considered as mild pocket and measurement that exciding 5 millimetres, considered as severe pocket which coded as 0, 1 and 2 respectively.

- **Calculus and plaque score**

Supra and subgingival plaque and calculus was assessed by using WHO probe through walking strokes while probing on the surface of the tooth from supra to sub-gingival area on both buccal and palatal/lingual surfaces of the tooth. By using tactile sensation, catchment or resistance during probing indicate presence of calculus whereas physical appearances of soft deposits on the surfaces of the tooth while probing indicate presence of plaque. The findings were recorded in the clinical record form by using numerical code whereby absence of calculus or plaque was coded as zero (0) while presence of supra and/or subgingival calculus or plaque was coded as one (1)

- **Sensitivity test**

Tactile stimulus test was performed to assess sensitivity status of tooth. By using WHO recommended probe, scrubbing on the surfaces of the tooth was done and patient's responses were recorded in the clinical record. In order to keep the initial intensity of the stimulus as low as possible, the initial scrubbing probing force of the probe was kept low (equivalent to 5 gram force) followed by gradual escalation to the threshold level (not

exciding 20 gram force) for the minimum stimulus capable of eliciting pain. Respondents were instructed to describe the extent of the pain/discomfort experienced while probing by using verbal rating scale (VRS) in five numerical codes from 0 to 4. Zero signify no discomfort/pain while 1, 2, 3 and 4 stand for mild discomfort/pain, moderate discomforts/pain, severe pain only during application of stimulus and severe pain persisting after removal of stimulus respectively. Responded who score 0 code, was considered as not sensitive while those who responded to 1, 2, 3 or 4 was considered to have tooth sensitivity or positive sensitivity test result. For avoiding false positive sensitivity test results, all teeth with the following conditions were excluded; dental pathology which can cause pain similar to cervical/dentinal hypersensitivity (dental caries) or fracture, presence of restorations that may interfered with the evaluation or was a possible cause of pain, Root canal treated tooth, Presence of any form of fixed or removable prosthesis (crowns, posts, bridgework, abutments) or orthodontic appliances which may interfered with the evaluation

Reliability

Intra examiner consistency on clinical findings was based on the clinical scores from 32 randomly selected participants (approximately 10% of all participants). Measures of agreement of the various scores for each tooth were compared and reported using Kappa statistics. Results of intra-examiner reproducibility for different variables ranged from kappa 0.705 to 0.934.

Data Management and Analysis

Data analysis was done using SPSS version 16. Questions on awareness were compiled and dichotomized following which frequency distributions and summative indices were analysed. Data coding, counting and frequency distribution of variables related to the predisposing behaviour (smoking, tooth brushing methods and type of brush preferred) and clinical factors (periodontal condition, tooth wear and previous periodontal therapy) related to the occurrence of DH was performed. Bivariate analysis was done and results with p-value of equal or less than 0.05 was considered statistically significant. Multivariate analysis was performed to confirm findings of bivariate analysis after taking care of the confounding factors of DH.

Dissemination of results

This study is submitted as partial fulfilment for the Masters degree of Dentistry in Restorative Dentistry (MDent, Rest.Dent) of the Muhimbili University of Health and Allied Sciences. However the results will be presented at scientific forum and published in scientific journals.

Results

Questionnaire results

I. Socio-Demographic characteristics of the study population

A total of 514 subjects were recruited in this study out of them, 323 participated with a response rate was 93.62%. Table 1 shows the distribution of participants according to socio-demographic characteristics. The male to female ratio was approximately one (1:1.1) and age range between 18 and 72 years. There were more of the participants with secondary level education and were those who had attended the Mnazi Mmoja Health Centre. Magomeni Health centre had the least number of participants.

Table 1: Distribution of study participants by socio-demographic characteristics

| Socio-demographic variables | | |
|--------------------------------|-----|-------|
| Sex | n | (%) |
| Male | 152 | 47.1 |
| Female | 171 | 52.9 |
| Educational level | | |
| Primary education | 110 | 34.1 |
| Secondary education | 118 | 36.5 |
| Collage / University education | 95 | 29.4 |
| Hospital attended | | |
| Muhimbili National Hospital | 96 | 29.7 |
| Mnazi Mmoja Health Centre | 115 | 35.6 |
| Temeke Hospital | 60 | 18.6 |
| Magomeni Health Centre | 52 | 16.1 |
| Age group | | |
| 18 to 29 yrs | 125 | 38.7 |
| 30 to 49 yrs | 146 | 45.2 |
| 50 to 72 yrs | 52 | 16.1 |

II. Awareness on dentine hypersensitivity

The result shows that, most of the respondent reported to have acceptable level of awareness on all five categories of DH with overall awareness of 88.2%. However about one third of the respondents did not have acceptable level of awareness on predisposing and aggravating factors of DH

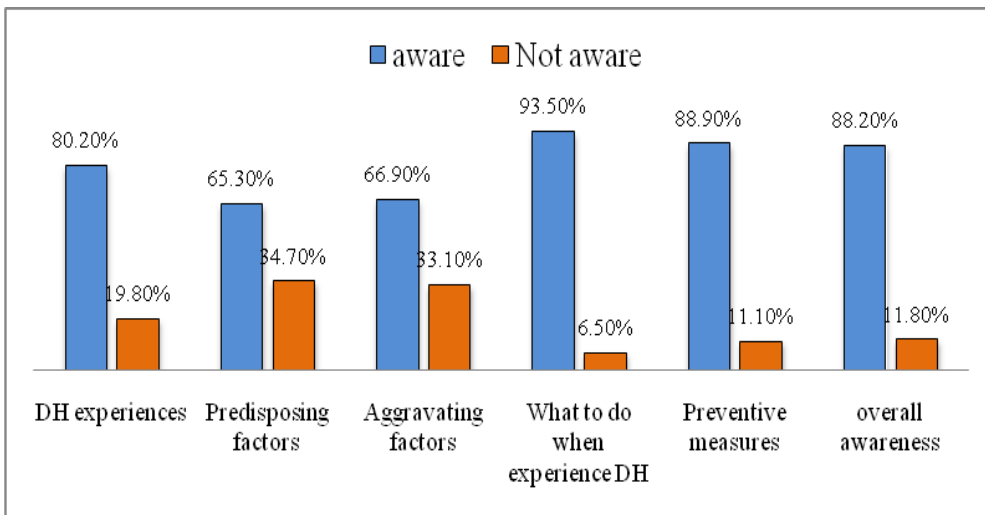


Figure 6: Distribution of participant according to level of awareness on dentine hypersensitivity

III. Distribution of self reported DH of the respondents by age and sex

The prevalence of self reported dentine hypersensitivity among all 323 respondents was 63.2%. There was no statistical significant differences observed between self reported DH and gender or age, however the lowest age group (18 to 29 years) had the least experienced (59.2%) self reported DH as compare to other age groups.

Table 2: Distribution of self reported DH of respondents by sex and age

| Self reported DH | | | | | | | |
|------------------|-----------|----------------|---------------|---------|-------|---------|-------|
| Sex | Sensitive | | Not sensitive | | Total | p-value | |
| Male | 96 | (63.2%) | 56 | (36.8%) | 152 | (100%) | |
| Female | 108 | (63.2%) | 63 | (36.8%) | 171 | (100%) | 0.968 |
| Age group | | | | | | | |
| 18 to 29 yrs | 74 | (59.2%) | 51 | (40.8%) | 125 | (100%) | |
| 30 to 49 yrs | 96 | (65.8%) | 50 | (34.2%) | 146 | (100%) | |
| 50 to 72 yrs | 34 | (65.4%) | 18 | (34.6%) | 52 | (100%) | 0.503 |
| Total | 204 | (63.2%) | 119 | (36.8%) | 323 | (100%) | |

Clinical findings

I. Distribution of clinically diagnosed DH of respondents by age and sex

The prevalence of clinically diagnosed DH is 46.4%. DH was found to be more predominant among male (52.0%) participants however there was no statistical significant difference between males and females. Majority (63.5%) of respondents within the highest age group of 50 to 72 yrs (n= 52) were clinically diagnosed with DH. There was a statistical significant increase of clinically diagnosed DH and age groups of the respondents.

Table 3: Distribution of clinically diagnosed DH of respondents by age and sex

| Clinically diagnosed DH | | | | | | |
|-------------------------|--------|---------|---------|---------|------------|---------|
| Age group | Absent | | Present | | Total | p-value |
| 18 to 39 yrs | 77 | (61.6%) | 48 | (38.4%) | 125 (100%) | 0.009 |
| 30 to 49 yrs | 77 | (52.7%) | 69 | (47.3%) | 146 (100%) | |
| 50 to 72 yrs | 19 | (36.5%) | 33 | (63.5%) | 52 (100%) | |
| Sex | | | | | | |
| Male | 73 | (48.0%) | 79 | (52.0%) | 152 (100%) | 0.06 |
| Female | 100 | (58.5%) | 71 | (41.5%) | 171 (100%) | |
| Total | 173 | (53.6%) | 150 | (46.4%) | 323 (100%) | |

This relationship between DH and age of the respondents is demonstrated in Figure 7.

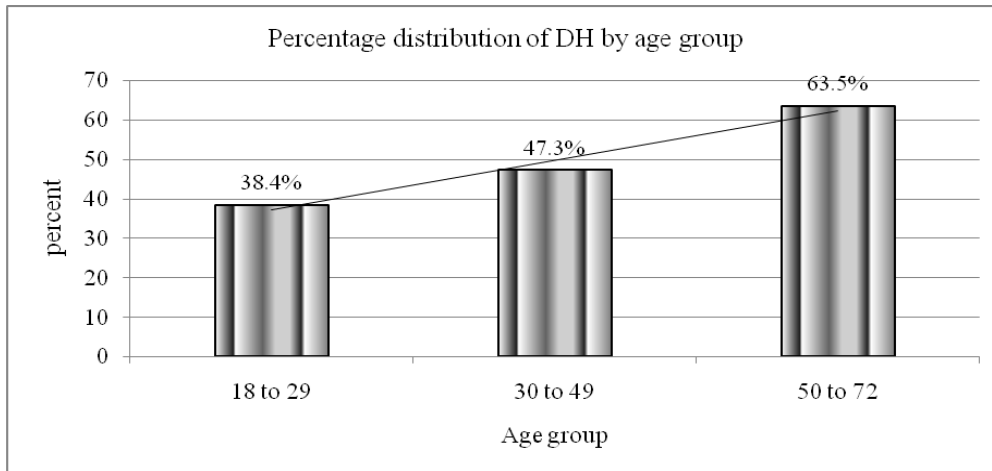


Figure 7: Relationship between clinically diagnosed DH and respondent's age

II. Assessment of clinical factors in relation to dentine hypersensitivity

a) Tooth wear

Majority of the respondents with tooth wear [attrition (69.3%), abrasion (85.1%) and erosion (68.4%) were also clinically diagnosed with DH.

The prevalence of clinically diagnosed DH was statistically significantly higher in subjects with and tooth wear (attrition, abrasion and erosion) however there was no statistical significant difference observed among respondents with abfraction.

Table 4: Distribution of clinically diagnosed DH of respondents by tooth wear

| | | Dentine hypersensitivity | | | | | |
|------------|-----|--------------------------|--|-------------|--|--------------|---------|
| Attrition | | Not sensitive | | Sensitive | | Total | P-value |
| Absent | 146 | (62.1%) | | 89 (37.9%) | | 235 (100.0%) | |
| Present | 27 | (30.7%) | | 61 (69.3%) | | 88 (100.0%) | < 0.001 |
| Abrasion | | | | | | | |
| Absent | 162 | (65.1%) | | 87 (34.9%) | | 249 (100.0%) | |
| Present | 11 | (14.9%) | | 63 (85.1%) | | 74 (100.0%) | < 0.001 |
| Erosion | | | | | | | |
| Absent | 167 | (54.9%) | | 137 (45.1%) | | 304 (100.0%) | |
| Present | 6 | (31.6%) | | 13 (68.4%) | | 19 (100.0%) | 0.04 |
| Abfraction | | | | | | | |
| Absent | 170 | (53.8%) | | 146 (46.2%) | | 316 (100.0%) | |
| Present | 3 | (42.9%) | | 4 (57.1%) | | 7 (100.0%) | 0.566 |
| Total | 173 | (53.6%) | | 150 (46.4%) | | 323 (100.0%) | |

b) Periodontal condition

A statistical significant difference was seen between clinically diagnosed and respondents who were found to have plaque accumulated on the surfaces of their teeth, gingival recession and periodontal pockets. However their calculus status was not significantly related with DH.

Table 5: Distribution of clinically diagnosed DH of respondents by periodontal status

| Clinically diagnosed DH | | | | | | |
|-------------------------|---------------|----------------|----------------|----------------|------------|-----------------|
| Plaque | Absence of DH | | Presence of DH | | Total | P-value |
| Absent | 90 | (61.2%) | 57 | (38.8%) | 147 | (100.0%) |
| Present | 83 | (47.2%) | 93 | (52.8%) | 176 | (100.0%) |
| | | | | | | 0.012 |
| Calculus | | | | | | |
| Absent | 90 | (57.7%) | 66 | (42.3%) | 156 | (100.0%) |
| Present | 83 | (49.7%) | 84 | (50.3%) | 167 | (100.0%) |
| | | | | | | 0.150 |
| Gingival recession | | | | | | |
| Absent | 129 | (74.6%) | 44 | (25.4%) | 173 | (100.0%) |
| Present | 44 | (29.3%) | 106 | (70.7%) | 150 | (100.0%) |
| | | | | | | 0.000 |
| Periodontal pocket | | | | | | |
| Absent | 147 | (57.2%) | 110 | (42.8%) | 257 | (100.0%) |
| Present | 26 | (39.4%) | 40 | (60.6%) | 66 | (100.0 %) |
| | | | | | | 0.01 |
| Total | 173 | (53.4%) | 150 | (46.4%) | 323 | (100.0%) |

III. Behavioural factor that are predisposing to dentine hypersensitivity

a) Tooth brushing practised

Table 6 below shows type of tooth brush and brushing methods practiced by respondents. Of the 323, 52.3% of respondents preferred to use a tooth brush with medium hard bristles and the circular method of tooth brushing (40.6%) whereas ‘to and fro’ (horizontal) brushing method (31.0%) followed.

Table 6: Distribution of the participants by type of tooth brush and brushing methods used

| Hardness of tooth brushing bristle | Frequency | Percentage |
|------------------------------------|-----------|------------|
| Brush with hard bristle | 42 | 13.0 |
| Brush with medium hard bristle | 169 | 52.3 |
| Brush with soft bristle | 112 | 34.7 |
| Methods of brushing | | |
| Horizontal movement (To and fro) | 100 | 31.0 |
| Vertical Movement (Up & down) | 72 | 22.3 |
| Circular movement | 131 | 40.6 |
| Combination | 20 | 6.1 |

Table 7 below shows the Distribution of clinically diagnosed DH of the respondents by type of tooth brush and brushing methods. There was no statistical significant difference observed between type of toothbrush (hard bristles, medium hard bristles and soft bristles) and clinically diagnosed DH. The tooth brushing method also had no statistical significant relationship with clinically diagnosed DH.

Table 7: Distribution of clinically diagnosed DH of the respondents by type of tooth brush and brushing methods

| Type of tooth brush | Clinically diagnosed DH | | | p-value |
|-------------------------------|-------------------------|--------------------|---------------------|---------|
| | Absent of DH | Presence of DH | Total | |
| Hard bristle | 22 (52.4%) | 20 (47.6%) | 42 (100.0%) | 0.894 |
| Medium hard bristle | 89 (52.7%) | 80 (47.3%) | 169 (100.0%) | |
| Soft bristle | 62 (55.4%) | 50 (44.6%) | 112 (100.0%) | |
| Tooth brushing Methods | | | | |
| To and fro | 53 (53.0%) | 47 (47.0%) | 100 (100.0%) | 0.636 |
| Up and down | 37 (51.4%) | 35 (48.6%) | 72 (100.0%) | |
| Circular | 75 (57.3%) | 56 (42.7%) | 131 (100.0%) | |
| Combination | 8 (40.0%) | 12 (60.0%) | 20 (100.0%) | |
| Total | 173 (53.6%) | 150 (46.4%) | 323 (100.0%) | |

b) Smoking behaviour

Of the 323 respondents, 21 subjects were active smokers while 21 quit smoking sometime ago. Majority (n=15; 71.4%) of the respondents who are active smokers were found to have DH as compared to those who never smoked cigarette (n=281; 43.1%) or those who quit smoking as shown in Table 8. This difference was statistically significant.

There was a statistical significant difference observed between the number of cigarettes smoked per day and clinically diagnosed DH.

Table 8: Distribution of clinically diagnosed DH of the respondents and their smoking behaviour

| Clinically diagnosed DH | | | | |
|------------------------------------|---------------|----------------|------------|---------|
| Smoking status | Absence of DH | Presence of DH | Total | p-value |
| I am smoking | 6 (28.6%) | 15 (71.4%) | 21 (100%) | 0.007 |
| I left smoking | 7 (33.3%) | 14 (66.7%) | 21 (100%) | |
| Never smoke | 160 (56.9%) | 121 (43.1%) | 281 (100%) | |
| Number of cigarette smoked per day | | | | |
| Never smoked | 160 (56.9%) | 121 (43.1%) | 280 (100%) | 0.006 |
| Less than ten | 8 (28.6%) | 20 (71.4%) | 28 (100%) | |
| More than ten | 5 (35.7%) | 9 (64.3%) | 14 (100%) | |
| Total | 173 (53.6%) | 150 (46.4%) | 323 (100%) | |

Shown in figure 8 is relationship between clinically diagnosed DH and smoking behaviour of the respondents. The trend demonstrate that there is a linear increase of DH with smoking behaviour of the respondents

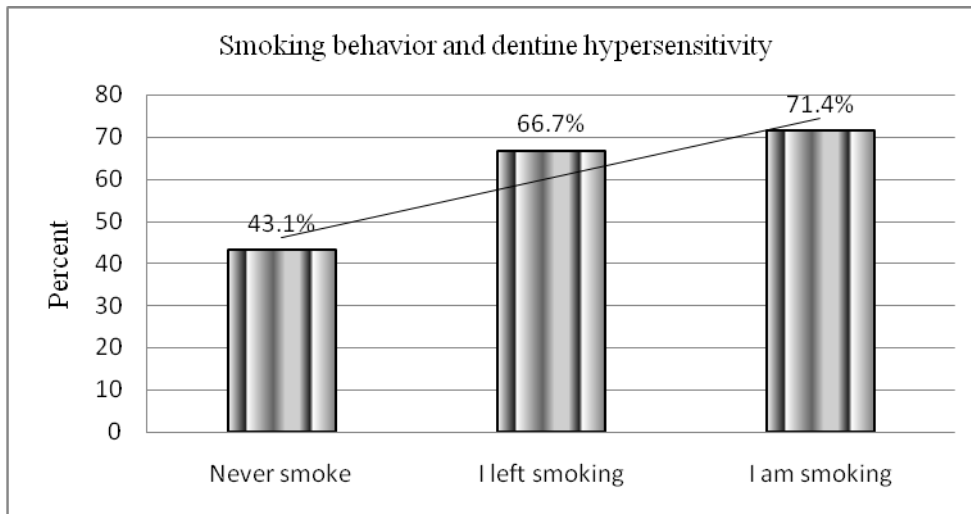


Figure 8: Relationship between clinically diagnosed DH and smoking behaviour of the respondents

IV. Previous History of periodontal therapy

Among all respondents, 51 reported a history of undergoing periodontal therapy. Nearly half [25 (49%)] of the respondents who had the history of periodontal therapy were also clinically diagnosed with DH, however there was no statistical significant difference between the two groups ($p=0.687$) as shown in Table 9.

Table 9: Distribution of respondents with clinically diagnosed DH by history of previous periodontal therapy

| Previous Periodontal Therapy | Clinically diagnosed DH | | Total | p-value |
|------------------------------|-------------------------|----------------|--------------|---------|
| | Absence of DH | Presence of DH | | |
| No | 147 (54.0%) | 125 (46.0%) | 272 (100.0%) | 0.687 |
| Yes | 26 (51.0%) | 25 (49.0%) | 51 (100.0%) | |
| Total | 160 (56.9%) | 121 (43.1%) | 323 (100.0%) | |

V. Pattern of teeth affected by dentinal hypersensitivity

Figure 9 below shown frequency distribution of teeth types in both the upper and lower jaws by clinically diagnosed for DH. Of the 9044 teeth examined, 672teeth were excluded due to exclusion criteria whereas 736 teeth were found missing and five hundred and twenty eight (6.9%) of the 7636 sound teeth were diagnosed with DH. In upper jaw, first premolar were most affected (26.9%), followed by canine (22.9%) and second premolar (19.6%) while in the lower jaw, the most affected tooth type was first premolar (24.2%) followed by second premolars (23.1%), and first molar (18.1%).

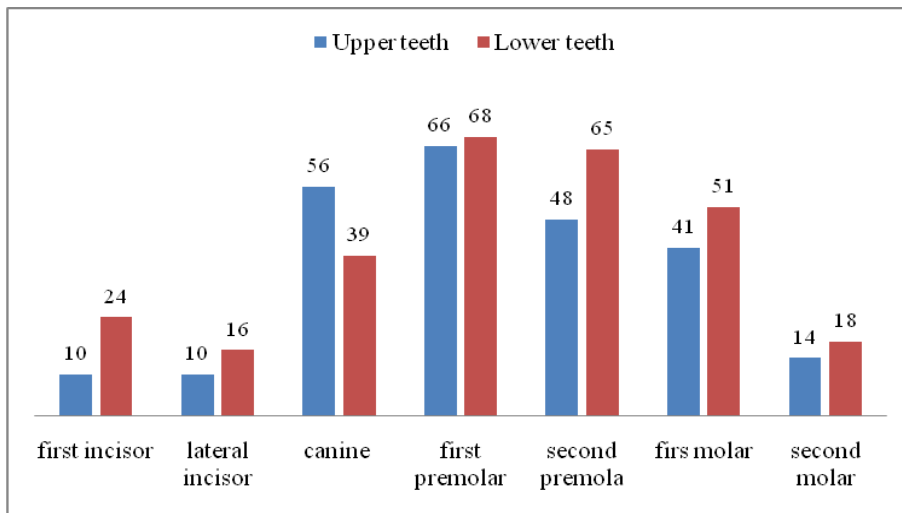


Figure 9: Frequency distribution of teeth type affected by DH

Multivariate analysis

Variables with statistically significant relationship with occurrence of DH during bivariate analysis that included age of respondents, tooth wear (attrition, abrasion & erosion), periodontal condition (presence of plaque, gingival recession & periodontal pocket) and smoking behaviour were confirmed by multivariate analysis to take care of the confounding effects. Multivariate analysis indicate that attrition (OR 3.971, CI 2.076-7.598), abrasion (OR 10.249, CI 4.674-22.475) and gingival recession (OR 7.305, CI 3.885-13.733) were the most important predictors for the occurrence of DH as shown in Table 10. The effects of other variables (tooth erosion, presence of plaque, periodontal pocket and smoking behaviour) in multivariate analysis were not statistically significant.

Table 10: Adjusted Odds ratio (OR) and 95% Confidence interval (CI) for dentine hypersensitivity according to predisposing factors

| Predictors | Sig. | Odds Ratio (OR) | 95% C.I. | |
|--------------------|---------|-----------------|----------|--------|
| | | | Lower | Upper |
| Age | 0.212 | 0.678 | 0.369 | 1.248 |
| Attrition | 0.000** | 3.971 | 2.076 | 7.598 |
| Abrasion | 0.000** | 10.249 | 4.674 | 22.475 |
| Erosion | 0.445 | 1.640 | 0.461 | 5.833 |
| Plaque | 0.302 | 1.352 | 0.762 | 2.399 |
| Gingival Recession | 0.000** | 7.305 | 3.885 | 13.733 |
| Periodontal Pocket | 0.339 | 0.691 | 0.324 | 1.474 |
| Smoking behaviour | 0.131 | 1.968 | 0.818 | 4.736 |

Multiple logistic regressions * $p \leq 0.05$, ** $p \leq 0.001$, ns = Not statistically significant

Discussion

This hospital-based cross-sectional study was conducted to determine the prevalence, level of awareness and predisposing factors of DH. It aimed at collecting useful information that could be used to provide an insight on the magnitude of the problem in Dar es Salaam as well as to provide baseline data of DH. The Convenient sampling method was employed in this study. The limitations and advantages of using convenient sampling method were all considered and effort was made to reduce the effect of the expected outcome. Since this is a Hospital based study and patients who are coming for dental treatments are fewer as compare to other medical conditions and some of them do presenting with unbearable toothache, It was found to be difficult to conduct probability sampling which sometimes require prior access to the list of name of the population to be sampled for randomization. However, the possibilities of reducing bias and confounding factors were done which include pair matching on gender during sampling procedure and logistic regression was conducted for ruling out confounding factors of DH. Moreover selected Hospitals were those most easily accessible by majority of the residents with well distributed geographically throughout Dar es Salaam, and also served as a mixture of urban (Ilala) and semi-urban population (Kinondoni and Temeke). Likewise Dar es Salaam is among the highly populated Cities in Tanzania with about 3.207 million people according to Tanzania Demographics Profile 2012. The selected samples were gender balanced with male-female ratio of approximately one (1:1.1). Furthermore, equal educational level representations among respondents were achieved (primary, secondary and college/university). Mnazi Mmoja Health Centre contributed more (35.6%) of the attendee as compare to other hospitals probably because it is city centred and easy accessible by most of the residence.

During clinical examination, assessment of permanent dentition was based on the criteria recommended by World Health Organisation (WHO, 1997) using DMFT index for permanent teeth. Moreover periodontal assessment was carried out by using WHO recommended William probe. Assessment of surface characteristics of the tooth in with tooth wear was done and recorded in accordance with the modified criteria by Gandara (Gandara and Truelove, 1999).

Majority of the respondents were found to have acceptable level of awareness with the overall awareness on DH of 88.2%. The high level of awareness reported in this study could have been contributed by over exaggerations during filling questionnaires. However, these findings are not in agreement with the previous studies, which reported insufficient awareness among public on DH as a reason why they don't seek medical attention for DH (Ye et al. 2012) and only few of the suffered group visited the dentist for management of the problem. Moreover it has been reported that women tend to have to suffer DH more than man because women tend to have greater awareness on dental diseases than men (Rees et al. 2004, Ocharadson et al. 1987)

The prevalence of self reported DH is 63.2% with no gender preponderance. These finding were in agreement with studies done in Nigeria that reported the prevalence of self reported DH of 61% (Afolabi et al. 2010). However it is comparatively low as compared to 68.4% reported among university students in Nigeria (Bamise et al. 2010) and 84% among patient attending the Periodontal Specialist Clinic. (Chabanski et al. 1996) Moreover the results were relatively higher than findings from the studies conducted with the same methodology (Clak et al. 2012; Ye et al. 2011; Oderinu et al. 2011; Azodo et al. 2011; Rong et al. 2010; Gillam et al. 1999; Tan et al. 2009; Irwin and McCusker 1997). The variation observed among documented finding with very high prevalence of self reported DH as could be due to exaggerations by the respondents during filling of the questionnaire, failure to differentiate pain caused by DH to that caused by other dental condition like dental caries, questionnaire error and cumulative effects of the of DH reported by patients as life time experienced.

The prevalence of clinically diagnosed DH was 46.4% which is relatively high as compare to most of the reported findings documented to be within the range of 3% to 57 (Martínez-Ricarte et al. 2008; Dababneh et al. 1999). The high variation in prevalent figures could have contributed by the use of different methods of diagnosing DH. Since DH manifests as a sharp acute pain arising from exposed dentine typically in response to mechanical, chemical, thermal or osmotic stimuli, in this study, tactile stimulus test was the diagnostic method used. There are some studies uses tactile stimulus test as diagnostic method (Lui et al. 1998) whereas air blast from triple air syringe as a single diagnostic method (chrysanthakopoulos et al. 2011; Ye et al. 2011; Taani and Awartani 2001;) and

combination of air blast and tactile stimulus test as diagnostic method also used by some of the studies (Bahsi et al. 2012; Bamise et al. 2008;). The use of different methods of diagnosing DH could bring about the large variation of prevalent figure due to different sensitivity and specificity of diagnosing the methods used. These results are in agreement with the findings of the study done in General Dental Clinic in Saudi Arabia (Taani and Awartani, 2002) that reported the prevalence of 42.4%. But it was relatively low as compared to 67.7% (Rees et al. 2002), 60.3% in a study conducted in Periodontal Specialist Clinic, Saudi Arabia (Taani and Awartani, 2002) and another study done in Dental Hospital Population (52.6%), (Taani and Awartani 2001). However it was found to be comparatively higher than the findings obtained from other studies conducted using the same methodology (Tangrungsom et al. 2012; Bahsi et al. 2012; Lin et al. 2011; Ye et al. 2011; Tan et al. 2009; Rong et al. 2009; Liu et al. 1998; Bamise et al. 2007; Udoye, 2006; Rees, 2005; Chrysanthakopoulos, 2001; Fischer et al. 1992). It has been noted in most of the reported studies that, prevalence of self reported DH is higher than the clinically determined figure. The most probable reason to explain that could be due to respondents wrote false answers (exaggeration) during filling the questionnaire in a way that will impress the researcher or making them look more smarter and not being ignorant to the subject but also the nature of the information collected from the respondent, there is a possibility for respondents to mistakenly report discomfort or pain due to other dental conditions like dental caries thinking of being sensitivity while it is not.

The prevalence of the clinically diagnosed DH was found to be more common in male than female. Only few studies reported similar findings of male predominance in clinically diagnosed DH (Liu et al. 1998; Kehua et al. 2009; Bamise et al. 2007). However, results from a study conducted on patients referred to Periodontal Department of Specialist Postgraduate Clinic in UK reported no significant gender preponderance on DH prevalence (Chabanski et al. 1996). Most of the reported prevalence of clinically diagnosed DH were in contrary to the findings of this study for they reported a high preponderance to female than male (Tangrungsom et al. 2012; Bahsi et al. 2012; Ye et al. 2011; Azodo et al. 2011; Afolabi et al. 2010; Rong et al. 2010; Udoye, 2006; James et al. 2003; Taani and Awartani 2001; Chrysanthakopoulos, 2001; Dababneh et al. 1999). The possible reason for this is not

clear, but it could be related to women being conscious on self care but also it could be related to them having better overall oral hygiene awareness and dental clinic attendance (Tangrungsun et al. 2012). The highest prevalence of clinically diagnosed DH was noted among the highest age group (50 to 72 yrs) which is similar to other studies (Rong et al. 2010; Kehua et al. 2009; Liu et al. 1998) with peak prevalence of 63.5%. Other studies have also reported the relationship between prevalence of DH and age group of the respondents, indicated the age group ranging between 40 and 50 were mostly affected by DH (Bahsi et al. 2012; Ye et al. 2011; Chrysanthakopoulos, 2011; Rees et al. 2005). Although it has been documented that cervical dentine exposure increases with age and the peak prevalence reached at around 40 and 50 years age group, followed by decline with age (Rees et al. 2003). The probable reason for this drop in dentine hypersensitivity after the fifth decade may be related to the changes that occur in the dentine-pulp complex with increase in age, particularly dentinal sclerosis and the laying down of secondary or tertiary dentine (Bahsi et al. 2012)

More than two third (69%) of the respondents who smoke cigarette were also diagnosed with DH and it was found to be statistically significantly ($p=0.007$). Moreover, these results were further analysed by Multivariate analysis to rule out other variables (confounders) that could have contributed to the development of DH and the results indicating that, there is no association between cigarette smoking and occurrence of DH, These findings were in agreement with the studies that reported no significant differences in prevalence of DH among those who smoking and non smokers (Bahsi et al. 2012; Tengrungsun et al. 2012). However, some studies with contrary findings reported to have established associated between smoking and occurrence of DH (Afolabi et al. 2010; Irwin ET al. 1997; Rees et al. 2005). Moreover, some researchers go more far and establish a link that associates cigarette smoking and presence of supragingival plaque and calculus as a key factor for development of localised and generalised recession and finally DH (Lafzi et al. 2009; Banihashemrad et al. 2008). The mechanism on how smoking causes gingival recession could possibly be due to the alteration of the immune response and topical changes such as decreasing gingival circulation (Banihashemrad et al. 2008). With the increased gingival recession, the exposed cementum is liable to abrasion and finally will lead to development of DH.

Tooth brushing is among the predisposing factors that reported to have contributed to development of DH. Finding of this study indicating that, more than two third of all respondents reported to preferred tooth brush with hard and medium hard bristle while only 34.7% preferred soft bristles. The relationship between tooth brushing practices and the occurrence of DH were not statistically significant. Similar findings were reported in Turkey (Colak et al. 2012). However, positive association between hard toothbrush or excessive brushing force and occurrence of DH was reported earlier by several studies (Bamise et al. 2010; Liu et al. 1998; Tan et al. 2009). Gingival recession due to incorrect or aggressive Toothbrushing mostly occurs on buccal surfaces and frequently encountered to subjects with a high standard of oral hygiene (Cassiano et al. 2009; Khocht, 1995). The possible explanation could either be due to excessive scrubbing at the cervical areas but also recession increases with increasing brushing frequency for the good intension of achieving optimal oral health. Majority (70.7%) of the respondents with gingival recession were also diagnosed with DH and it was significantly related with it ($p < 0.001$). Basically the exposure of the root surface due to gingival recession increases the risk of damaging to the cementum which is less strong as compare to enamel. These findings were in consistency with the study conducted in a private practice population in Australia (Amarasena et al. 2011) and another study on the National Survey on DH conducted in Chinese urban (Rong et al. 2009). Moreover, even high prevalent figures of DH among patient with gingival recession have been reported (Bahsi et al. 2012; Chrysanthakopoulos, 2011; Ye et al. 2011; Ye et al. 2009). When multivariate analysis conducted, it qualifies the results by demonstrates strong association between gingival recession and occurrence of DH as it is shown on table 10 above.

Poor oral hygiene may cause periodontal pocket or attachment loss indirectly by allowing the development of periodontal disease (Isabel et al 2009). Large proportions (60.6%) of the respondents with periodontal pocket were also diagnosed with DH and it was found to be statistically significant ($p = 0.01$). However, after confirming with multivariate analysis the results indicating no association between periodontal pocket and DH which implies that, there are unknown variable that could have act together with periodontal pocket to bring about DH. Similar studies have been reporting the same findings (Kehua et al. 2009;

Rong et al. 2009; Taani and Awartani 2002; Rees et al. 2002; Liu et al. 1998). The mechanism on how periodontal disease causes DH is not clearly known however some studies suggested the possibility of acid secreted by bacteria on the smear layer could act to opening the dentinal tubules and allow movements of fluid (Addy, 2008).

Tooth wear is among the commonest factor reported to be associated with the occurrence of DH. From the bivariate analysis results, among the 88 respondents who were clinically diagnosed to have tooth attrition, 61 (69%) were also diagnosed with DH while 85.4% of the 74 respondents with abrasion and 68.4% of 19 with erosion were also diagnosed with DH and of statistical significant related with it. Similar association were confirmed by multivariate analysis, that respondents with attrition and abrasion were two and five more likely respectively to develop DH. Abfraction on the other hand was not significantly related with DH. These reported findings were in agreement with the study conducted in Nigeria which reported attrition, abrasion, erosion and abfraction being related with DH, while findings for abfraction were in contrary with the findings and it was no significant related with DH.

Of the 323 respondents, only 51 (15.8%) reported to have undergone periodontal therapy which include removal of remnants (9.3%), periodontal surgery (5%) and polishing (1.5%). The relationship between DH and previous history of periodontal therapy was not statistic significant, however, it was found to be in agreement with the study done by Irwin who reported no significant relationship between DH and previous periodontal therapy (Irwin et al. 1997). Contrary to these findings, a high prevalence of DH among respondents with the history of previous periodontal therapy has been reported (Taani and Awartani 2002; Chabanski, 1996). The possible explanation could be periodontal treatments that involve scaling and root planning increase the chance of developing DH since it involves the remove of the cementum layer from the root surface (Cassiano et al 2009; Dababneh et al 1999).

With regard to distribution and pattern of teeth affected by DH, first premolar was the most frequently susceptible tooth type for both upper and lower jaws followed by second premolar and first molar for lower jaw while canine and second premolar was the next affected tooth on the upper jaw respectively. These could be due to the anatomical

protuberance found on the buccal surfaces of premolar and canine teeth as compared to incisor and molars. These findings were in agreement with the previous documented studies_(Fischer et al. 1992; Orchardson and Collin 1987; Addy et al. 1987). Other studies reported contrary findings of lower incisors and first molars being the most frequently affected by DH especially for those with periodontal diseases (Rees et al. 2004).

Conclusion

Respondent's level of awareness and prevalence of clinically diagnosed DH was relatively high whereas tooth attrition, abrasion and gingival recession were observed to be the most important predictors for the development of DH.

Recommendation

- Similar studies should be conducted in other regions so as to establish the current status and data bank for DH in Tanzania.
- Preventive measures of DH need to be encouraged so as to maintain quality of life.
- Early diagnosis and treatment of DH should be emphasized so as to reduce suffering and the burden of rehabilitation cost.

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PART 3: PAST DENTINE HYPERSENSITIVITY EXPERIENCES

Choose the most correct answer and put tick (✓) on the space provided.

26. Have you ever experienced tooth hypersensitivity Yes No

If the answer is NO go to question No. 30 below

27. if yes, When was the last experience?

- a. One day ago
- b. One week ago
- c. One month ago
- d. First six month
- e. One year or more

28. Did you seek treatment for tooth sensitivity? Yes No

29. What type of treatment did you seek?

- a. Self care dentifrices
- b. Hospital based treatment
- c. Local remedies

PART 4: PREDISPOSING BEHAVIOURS

Choose the most correct answer and put tick (✓) on the space provided

30. Smoking behaviour;

- a. I'm smoking
- b. I left smoking
- c. Never smoked

31. If ever smoked, how many cigarette per day?

- a. Less than 10
- b. More than 10

32. What characteristics of tooth brush do you prefer more?

- a. Brush with hard bristle
- b. Medium hard bristle
- c. Soft bristle

33. What methods of tooth brushing do you mostly practised?

- a. To and fro
- b. Circular
- c. Up and down

34. Have you ever treated for periodontal disease before? Yes No

35. What type of periodontal treatment did you received?

- a. Remnants were removed from my teeth
- b. I had surgery performed
- c. They used a brush to polish

Appendix I (b): Questionnaire (Swahili version)

DODOSO LA UTAFITI WA TATIZO LA MENO KUFA GANZI

SEHEMU YA 1: TAARIFA ZA KIJAMII NA KIDEMOGRAFIA

- a) Namba ya mgonjwa [_____] b) Tarehe ___/___/2012
 c) Jina la Hospitali _____
 d) Umri (mwaka wa kuzaliwa) 19 __ __ e) Jinsia: Mume [_] Mke [_]
 f) Kazi _____
 g) Kiwango cha elimu a. Sijasoma kabisa [_] b. Elimu ya msingi [_]
 c. Elimu ya sekondari [_] d. Chuo/Chuo kikuu [_]

SEHEMU YA 2: UELEWA JUU YA TATIZO LA MENO KUFA GANZI

Weka alama ya vema (✓) kama jibu ni ndiyo na alama (X) kama jibu ni hapana mbele ya swali

| A: Uelewa wa watu juu ya tatizo la meno kufa ganzi | |
|--|--|
| 1. | Umeshawahi kusikia tatizo la meno kufa ganzi? |
| 2. | Meno kufa ganzi huwa na maumivu makali yanayodumu kwa muda mfupi? |
| 3. | Meno kufa ganzi huwa na maumivu makali yanayodumu kwa muda mrefu bila kuisha? |
| 4. | Maumivu ya Meno kufa ganzi huanza baada ya kuwa na kitu kinachosababisha |
| 5. | Maumivu ya Meno kufa ganzi huanza yenyewe bila ya kuwa na kitu kinachosababisha? |
| B: Vitu vinavyoweza kupelekea meno yako kupata tatizo la kufa ganzi | |
| 6. | Kusukutua meno kwa kutumia mswaki mgumu |
| 7. | Kusukutua meno kwa kutumia mswaki mlaini |
| 8. | Kusukutua meno kwa kutumia vitu kama mkaa au majivu |
| 9. | Kula chakula kupita kiasi |
| 10. | Kuvuta sigara |
| 11. | Kutapika mara kwa mara |
| C: Vitu vifuatavyo vinaweza kuanzisha au kuchokoza maumivu ya meno kufa ganzi | |
| 12. | Kula au kunywa vyakula vitamu |
| 13. | Kula matunda mabichi (kama vile chungwa au embe bichi) |
| 14. | Kula au kunywa vyakula vya moto |
| 15. | Kunywa soda zenye gesi kama vila coca cola or pepsi cola |
| 16. | Wakati wa kupiga mswaki |
| 17. | Kula au kunywa vyakula vya baridi |
| D: Wakati unajisikia meno yamekufa ganzi, Je unafikiri unatakiwa kufanya nini? | |
| 18. | Kufuata matibabu ya meno |
| 19. | Kwenda kwa mganga wa kienyeji |
| 20. | Kujinunulia dawa kwenye duka la madawa |
| E: Ili kuzuiya tatizo la meno kufa ganzi kutokea, Je unatakiwa ufanye mambo yafuatayo:- | |
| 21. | Kutumia mswaki mgumu |
| 22. | Kutumia mswaki mlaini |
| 23. | Kusugua kuelekea mbele na nyuma |
| 24. | Kusugua kwa mzunguko |
| 25. | Kutumia mkaa au majivu kusugua meno |

SEHEMU YA 3: HISTORIA YA MATATIZO YA MENO KUFA GANZI

Chagua jibu lililo sahihi na weka alama ya Vema (✓) kwenye kisanduku mbele ya swali.

26. Umeshawahi kupata tatizo la meno kufa ganzi? Ndiyo Hapana

Kama jibu HAPANA, nenda swali namba 31. hapo chini

27. Kama jibu ni NDIYO; Mara ya mwisho kupata hilo tatizo ni lini?

- a. Siku moja iliyopita
- b. Wiki moja iliyopita
- c. Mwezi mmoja iliyopita
- d. Ndani ya miezi sita iliyopita
- e. Mwaka mmoja uliopita au zaidi

28. Ulipojisikia meno yamekufa ganzi ulitafuta matibabu? Ndiyo Hapana

29. Kama jibu ni **Ndiyo**; Je, ni aina gani ya matibabu ulitafuta?

- a. Kutumia dawa ya kupigia mswaki
- b. Kwenda hospitali
- c. Dawa asilia

SEHEMU YA 4: TABIA SABABISHI TATIZO LA MENO KUFA GANZI

Chagua jibu lililo sahihi na weka alama ya Vema (✓) kwenye kisanduku mbele ya swali.

30. Tabia ya Uvutaji wa sigara:-

- a. Ninavuta sigara
- b. Niliacha kuvuta sigara
- c. Sijawahi kuvuta sigara

31. Kama unavuta au umewahi kuvuta, Je unavuta sigara ngapi kwa siku?

- a. Chini ya sigara kumi (10)
- b. Zaidi ya sigara kumi (10)

32. Unapenda kutumia mswaki wa aina gani wakati wa kusukutua meno?

- a. Mswaki mgumu
- b. Mswaki mlaini kidogo
- c. Mswaki mlaini

33. Ni njia gani unayopenda kutumia wakati unapiga mswaki?

- a. Kusugua kuelekea mbele na nyuma
- b. Kusugua kuelekea juu na chini
- c. Kusugua kwa mzunguko

34. Umeshawahi kutibiwa ugonjwa wa fizi kutoa damu? Ndiyo Hapana

35. Ni aina gani ya matibabu ya magonjwa ya fizi kutoa damu ambayo ulipatiwa?

- a. Kutolewa ugaga au utandu mgumu kwenye meno
- b. Nilifanyiwa matibabu ya kusafisha meno na kutoa modoa/rangi
- c. Nilifanyiwa upasuaji mdogo wa kwenye fizi

Guide for filling clinical form

1. Dentition status guide

| DENTITION | DESCRIPTION | CODES | |
|-----------------------|---------------------------|--------------------|---|
| Status | Sound tooth | 0 | |
| | Decay | 1 | |
| | Missing tooth | 2 | |
| | Filled | Normal restoration | 3 |
| | | Root canal treated | 4 |
| | Trauma/Fracture crown | 5 | |
| | Prosthetic/crown | 6 | |
| Tooth wear assessment | Sound | 0 | |
| | Attrition | 1 | |
| | Abrasion | 2 | |
| | Erosion | 3 | |
| | Abfraction | 4 | |
| | Missing | 8 | |
| | Excluded or un-applicable | 88 | |

2. Periodontal status coding guide

| PERIODONTAL CONDITION | STATUS | DESCRIPTION | CODING |
|-----------------------|-------------------------------|--------------------------------|--------|
| Gingival recession | Absent | Less than 1mm | 0 |
| | Present | 1 or more than 1mm | 1 |
| | Missing | | 8 |
| Periodontal pocket | Normal | Pocket not exciding 3mm | 0 |
| | Mild pocket | Pocket ranging 4-5 mm | 1 |
| | Severe pocket | Pocket exciding 5 mm | 2 |
| | Missing | | 8 |
| Calculus score | Absent | | 0 |
| | Present (Supra & subgingival) | | 1 |
| | Missing | | 8 |
| Plaque score | Absent | | 0 |
| | Present | | 1 |
| | Missing | | 8 |

3. Sensitivity test coding

| PATIENT RESPONSES | RATING |
|--|--------|
| No discomfort | 0 |
| Mild discomfort | 1 |
| Moderate discomfort | 2 |
| Severe pain only during application of stimulus | 3 |
| Severe pain persisting after removal of stimulus | 4 |
| Missing | 8 |
| Excluded / non applicable | 88 |

4. Tooth wears classification and coding

| Score | Condition | Criteria |
|-------|------------|---|
| 0 | Absent | No change of surface characteristics |
| 1 | Attrition | Presence of occlusal and incisal facets and/or Generalized/matching wear on occluding or incisal contact with flatter back teeth and shorter front teeth and/or Enamel and dentin wear at the same rate |
| 2 | Abrasion | Smooth buccal surfaces with well defined margins that are wedged or V-shaped defects, with greater depth than width located in the cervical region normally free of plaque, |
| 3 | Erosion | Cupping of occlusal surfaces, (Incisal grooving)with dentin exposure and/or Presence of even, smooth surfaces, concavities, mainly cervically on labial surfaces, but also on lingual surfaces: much greater width than depth and/or Raised amalgam restorations and clean surfaces and/or Pits on cusps and incisal edge |
| 4 | Abfraction | |

Appendix III (a): Informed Consent Form (English version)

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES



DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS

INFORMED CONSENT FORM

Patient ID Number [][][]

Consent to Participate in a Study

Greetings! My name is Dr Alex A. Minja; I am working on this research with the objective of assessing prevalence, awareness, pattern and aetiological factors of dentine hypersensitivity among patients attending for treatment in Dar Es Salaam City, Tanzania

Purpose of the study

The study is conducted in partial fulfilment of the requirements for the degree of Master of Dentistry in Restorative of MUHAS. This study is aiming to establishing; prevalence, pattern, aetiological factors and awareness amongst adults attending dental clinics in Dar es Salaam. You are being asked to participate in this study because you have particular knowledge and experiences that may be important to the study. Kindly please be honest and true for betterment of the results that could lead to better intervention and recommendations for future.

What Participation Involves

If you agree to join the study, you will be interviewed in order to answer a series of questions in the questionnaire prepared for the study.

Confidentiality

I assure you that all the information collected from you will be kept confidential. Your name will not be written on any questionnaire or in any report/documents that might let someone identify you. Your name will not be linked with the research information in any way. All information collected on forms will be entered into computers with only the study identification number. Confidentiality will be observed and unauthorized persons will have no access to the data collected.

Right to Withdraw and Alternatives

Taking part in this study is completely voluntary. You can stop participating in this study at any time, even if you have already given your consent. Refusal to participate or withdrawal from the study will not involve penalty.

Benefits

The information you provide will help to establish prevalence and aetiological factors related to dentine hypersensitivity of Tanzanian population. This study will help to increase knowledge and awareness to dental clinician on dentinal hypersensitivity and assist government to establish/improving diagnostic procedures, management modalities and possibly its preventive measures

Who to Contact

If you ever have questions about this study, you should contact the **Principal Investigator, Dr Alex A. Minja** of Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam (Tel. 0713599209)

If you ever have questions about your rights as a participant, you may call

Prof. M Aboud, Chairperson of the Senate Research and Publications Committee,

P.O. Box 65001, Telephone: 255 22 2150302-6 Dar es Salaam,

Dr. L.C.Carneiro who is the supervisor of this study (Tel. 0713835140) and

Dr Severin A, who is Co-Supervisor (Tel. 0712427143)

Signature:

Do you agree?

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

Signature of participant

Signature of Research Assistant

Date of signed consent

Appendix III (b): Informed Consent Form (Kiswahili version)

CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI



KURUGENZI YA TAFITI NA UCHAPISHAJI

FOMU YA RIDHAA

Patient ID Number [][][]

Ridhaa ya kushiriki kwenye utafiti

Habari! Ninaitwa Dr Alex A. Minja, nashughulika kwenye utafiti huu wenye lengo la kutathmini ukubwa wa tatizo la meno kufa ganzi, visababishi pamoja na uelewawa watu juu ya tatizo hili kwa wagonjwa wanaotibiwa katika hospitali za meno za serikali na za watu binafsi hapa jiji la Dar es Salaam

Madhumuni ya Utafiti

Utafiti huu unafanyika katika kutimiza sehemu ya matakwa ya shahada ya uzamili ya matibabu ya kurekebisha na kuziba meno ya Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili. Utafiti unalenga kuchunguza kiasi cha watu (wake kwa waume) walioathirika, mtazamo wa watu juu ya hili tatizo na visababishi vya tatizo la meno kufa ganzi kati ya wagonjwa wanaotibiwa katika hospitali za meno za serikali na za watu binafsi hapa jiji la Dar es Salaam. Unaombwa kushiriki katika utafiti huu kutokana na upeo na ufahamu ulio nao ambavyo ni muhimu kwa utafiti huu. Tafadhali kuwa mkweli na muwazi kwa vile matokeo ya utafiti huu yanaweza yakatoa maamuzi na mapendekezo ya baadaye.

Jinsi ya kushiriki

Ukikubali kushiriki katika utafiti huu, utasailiwa ili kuweza kujibu maswali toka kwenye dodoso lililoandaliwa kwa ajili ya utafiti huu.

Usiri

Taarifa zote zitakazokusanywa kupitia dodoso zitaingizwa kwenye ngamizi kwa kutumia namba za utambulisho. Kutakuwa na usiri na hakuna mtu yeyote asiyehusika atakayepata taarifa zilizokusanywa.

Faida

Kama utakubali kushiriki kwenye utafiti huu taarifa utakazotoa zitatuwezesha kutupa mwanga zaidi juu ya kiasi cha watu (wake kwa waume) walioathirika na visababishi vya tatizo la meno kufa ganzi kwa jamii ya kitanzania. Matokeo ya utafiti huu yanaweza kutoa taarifa ambazo zitaweza kusaidi katika kuongeza uelewa na ufahamu kwa madaktari wa meno kuhusu kuwepo kwa tatizo la meno kufa ganzi na kuisaidia serikali katika kuimarisha huduma za ugunduzi wa hili tatizo, matibabu pamoja na huduma za kuzuia mapema kabla halijajitokeza.

Athari na kukitokea madhara

Hutegemewi kupata madhara yoyote kutokana na ushiriki wako katika utafiti huu. Baadhi ya maswali yanaweza yasikupendeze, unaweza kukataa kujibu swali lolote la aina hiyo na unaweza kuamua kusimamisha udahili wakati wowote.

Uhuru wa kushiriki na haki ya kujitoa

Kushiriki kwenye utafiti huu ni hiari. Unaweza kujitoa kwenye utafiti huu wakati wowote hata kama umeshajaza fomu ya ridhaa ya kushiriki utafiti huu. Kukataa kushiriki au kujitoa kwenye utafiti huu hakutaambatana na masharti yoyote.

Nani wa kuwasiliana naye

Kama una maswali kuhusiana na utafiti huu, wasiliana na Mtafiti mkuu wa utafiti huu,

Dr Alex A. Minja wa Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S. L. P. 65001, Dar es Salaam (Simu 0713599209)

Kama una swali kuhusu stahili zako kama mshiriki unaweza kumpigia simu **Prof. M Aboud**, Mwenyekiti wa kamati ya Utafiti na Uchapishaji, S.L.P 65001, Simu: 255 22 2150302-6 Dar es Salaam au msimamizi wa utafiti huu **Dr L.C. Carneiro** (Simu: 0713835140) au msimamizi msaidizi **Dr Severin A**, (Simu: 0712427143)

Sahihi:

Je umekubali?

Mimi nimesoma maelezo ya fomu hii.

Maswali yangu yamejibiwa. Nakubali kushiriki katika utafiti huu.

Sahihi ya mshiriki.....

Sahihi ya mtafiti msaidizi.....

Tarehe ya kutia sahihi ya idhini ya kushiriki.....

Appendix IV: Ethical Clearance form

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES DIRECTORATE OF POSTGRADUATE STUDIES

P.O. Box 65001
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Ref. No. MU/PGS/SAEC/Vol. VI/

5th July, 2012

Dr. Alex A. Minja,
M.Dent Restorative Dentistry,
MUHAS.

RE: APPROVAL OF ETHICAL CLEARANCE FOR A STUDY TITLED "EXPLORING DENTINE HYPERSENSITIVITY AMONG PATIENT ATTENDING DENTAL TREATMENT 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 Senate approved ethical clearance for the above-mentioned study.

Thus ethical clearance is granted and you may proceed with the planned study.

Please liaise with bursar's office to get your research fund.


Prof. Z. Premji

DIRECTOR, POSTGRADUATE STUDIES

/emm

- c.c. Vice Chancellor, MUHAS
- c.c. Deputy Vice Chancellor – ARC, MUHAS
- c.c. Dean, School of Dentistry - MUHAS