

**UNTREATED DENTAL CARIES - MAGNITUDE, TREATMENT NEED
AND RESTORATIVE CARE DEMAND AMONG PATIENTS AGED 12
YEARS AND ABOVE ATTENDING PUBLIC DENTAL CLINICS IN
DAR ES SALAAM, TANZANIA**

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**MDent (Restorative Dentistry) Dissertation
Muhimbili University of Health and Allied Sciences
October 2013**

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AND RESTORATIVE CARE DEMAND AMONG PATIENTS AGED 12
YEARS AND ABOVE ATTENDING PUBLIC DENTAL CLINICS IN
DAR ES SALAAM, TANZANIA**

By

Martin Long'ida Chuva

**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 Sciences a dissertation entitled “**Untreated dental caries - magnitude, treatment need and restorative care demand among patients aged 12 years and above attending public dental clinics in Dar es Salaam, Tanzania**” 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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I, **Martin Long'ida Chuva**, declare 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 a similar or any other degree award.

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Date.....

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Dar es Salaam, April 2013 Martin Long'ida

DEDICATION

*This work is dedicated to
my beloved wife
Sofia Y. Mvungi and our daughter Grace*

ABSTRACT

Background

Literature shows that patients attending dental clinics in Tanzania have long-standing untreated carious lesions. Dental caries has been a major reason for attendance in dental clinics. The accumulation and persistence of dental caries suggest that the disease has either not received proper attention or has been going on un-addressed for long time. Various factors have been implicated to the accumulation and persistence of dental caries, hence the load of the untreated disease.

Dental caries experience levels in Tanzania is low with mean DMFT of 1.8 and 3.8 for age groups 20-29 years and 50-59 years, respectively; and below 1 for permanent dentition among 12 year olds. Despite the low experience levels, the reported high accumulation of untreated caries is a cause for concern.

Aim

The study aims to determine the magnitude of untreated dental caries, caries treatment needs and demand for restorative dental care among patients aged 12 years and above attending public dental clinics in Dar es Salaam, Tanzania.

Methodology

A cross-section study was conducted among patients aged 12 years and above who attended public dental clinics in Dar es Salaam between August and September 2012. A sample of 310 participants randomly selected was interviewed using a structured questionnaire. Clinical examination was performed by a calibrated examiner in which caries experience; severity, distribution and treatment needs were assessed and recorded using the WHO Basic Oral health Survey Methods criteria (WHO 1997). Informations obtained were recorded in a specially designed form. Data cleaning and analysis was done using Statistical Package for Social Sciences (SPSS) version 16 and statistical significance difference was assumed when p-value was less than 0.05.

Results

A total of 310 dental patients aged 13-76 years (mean age of 31.9 years) participated in the study with females being more than half (64.2%) of all participants.

Almost all participants (99.7%) reported to have experienced tooth decay with mean DMFT score of 6.6. The proportion of D component of DMFT (untreated dental caries) was found to be 62%. Dental caries were more in posterior teeth (88.8%) than other teeth. Dentinal caries were common in 62.7% of the carious teeth with majority of them (85.3%) being in posterior teeth. About 75% of the carious teeth needed restorative care (filling or endodontic care). Only 23.9% of participants demanded restorative dental care and demand varied significantly with education level ($p < 0.05$). The most cited reasons for not demanding restorative care were high cost for the service (28.6%), fear that pain will persist (26.5%) and not being aware of the service (23.1%)

Conclusion

In this study the amount of untreated dental caries was high. Posterior teeth were the most affected teeth and majority of the lesions in all teeth were located in dentine which means they needed simple filling. Demand for restorative care was low.

Recommendations

1. Community education on presence, importance, benefits and outcome of dental restorative care is required.
2. Atraumatic Restorative Treatment technique should be adopted in caries management and the focus should be to the strategic dentition.
3. Another large study that will include representative sample for Tanzania population is required for better estimate of the amount of untreated dental caries and treatment need in Tanzania at large.

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ACRONYM

| | |
|-----------|--|
| COHU | Central Oral Health Unit |
| MDent(RD) | Master of Dentistry in Restorative Dentistry |
| MNH | Muhimbili National Hospital |
| MUHAS | Muhimbili University of Health and Allied Sciences |
| MoH&SW | Ministry of Health and Social Welfare |
| WHO | World Health Organization |
| DMFT | Decayed Missing Filled Teeth |
| FT | Filled Teeth |
| DT | Decayed Teeth |
| MT | Missing Teeth |
| EDC | Early Dentinal Caries |
| MDC | Mid-Dentinal Caries |
| DDC | Deep Dentinal Caries |
| DS | Dental Status |
| CTN | Caries Treatment Need |
| HDC | Hospital Dental Clinic |
| SPSS | Statistical package for social sciences |
| RDO | Regional Dental Officer |
| ART | Atraumatic Restorative Treatment |
| SDV | Socio Demographic Variable |

INTRODUCTION AND LITERATURE REVIEW

Background

Literature shows that patients attending dental clinics in Tanzania have long-standing untreated carious lesions (van Palenstein and Nathoo, 1990; Mosha and Lema, 1991). In deed dental caries has been a major reason for attendance in clinics (van Palenstein and Nathoo, 1990). Accumulation and persistence of dental caries suggest that it has been going on unaddressed for long time. The evidence for accumulation and persistence of dental caries is shown in the dental literature (van Palenstein and Nathoo, 1990; Mosha and Scheutz, 1993; Kikwilu and Mandari, 2001; Petersen et al., 2005). As a result, most of the carious teeth end up being extracted as they are painful and unrestorable. Incidentally, treatment is directed, almost exclusively, towards the chief complaint leaving many carious teeth unattended to or even their treatment planned for because of lack of comprehensive care..

Lack of time and inadequacies in oral health delivery systems i.e. in terms of human resources and supplies, are probably the reasons for accumulation and persistence of dental caries. Financial restrictions, dissatisfaction from previous dental treatment, work commitments, lack of perceived need for urgent care, fear of dental treatment, lack of knowledge of disease condition and treatment possibilities are other factor positively related to accumulation and persistence of oral diseases and hence the load of untreated caries (Jaafar et al., 1992; Mosha and Scheutz, 1993; Heaton et al., 2004; Kikwilu et al., 2009). Poor access to care in terms of accessibility and availability can be thought to affect the use of oral health services i.e. restorative care also, and hence high level of untreated dental caries.



Fig 1. Untreated dental caries lesions

Figure 1 shows multiple carious teeth (black arrows) with the destruction of tooth hard tissues being at different levels. This is the situation for the majority of patients who visit dental clinics.

Dental caries experience in Tanzania is low with adult mean DMFT varying between 1.8 and 3.8 in the age between 20-29 and 50-59 respectively (Sarita et al. 2004), and below 1 for permanent dentition in children of 12 years (Frencken et al., 1986; Kikwilu and Mandari, 2001). Despite the low DMFT, however, there is high level of untreated caries in all age groups.

Studies have shown that over 90% of the carious lesions are located in the occlusal surfaces of posterior teeth (Manjiet al., 1986; Frencken et al., 1990; Frencken et al., 1996; Kikwilu and Mandari, 2001; Yee and Sheiham, 2002) and many of them within the dentine. This suggests that the lesions can be managed by simple restoration using easy to apply techniques like Atraumatic Restorative Treatment (ART) (Frencken et al., 1996). However, despite being easy to manage, most of the carious lesions go untreated (Manjiet al., 1986; Frencken et al., 1990; Moshia et al., 1994; Frencken et al., 1996; Kikwilu and Mandari, 2001; Mandari and Matee, 2006) until emergency services i.e. extraction is made available.



Fig 2. An abscess following long standing untreated dental caries involving 46

Figure 2 shows an abscess lateral to tooth number 46 (black arrow) which is the outcome of untreated dental caries. Patients with such condition usually presents with severe pain. As a result the offending tooth ends up being extracted.

The F-component of the DMFT-index in Tanzania is very low. Fillings have been found to be almost negligible in most of the studies of dental caries in Tanzania (Muya et al., 1984; Frencken et al., 1989; Frencken et al., 1990; Mosha et al., 1994; Kikwilu and Mandari, 2001; COHU, 2002; Sarita et al., 2004; Åström and Kida, 2007; Kikwilu et al., 2009). This negligible restorative care, the cause of which probably contributed heavily by the non-operational traditional restorative care system, has not only led to extraction of teeth that could have otherwise been saved but have also adds to the accumulation of untreated carious teeth among the population. The assumption goes further that the observed negligible restorative care and high level of untreated caries might have been caused by lack of patients demand for restorative service.

Tanzania aims for a coordinated oral health plan in order to ensure basic services for all citizens. One of the goals is to restore broken-down dentitions by providing simple restorations in health centres and regional and consultant hospitals (COHU, 2002). Apparently

this goal cannot be achieved through the traditional approach in restorative dentistry which emphasizes the necessity of a total repair of the dentition in order to maintain complete dental arches. For example if the mean number of decayed teeth (DT) for adults in Tanzania is 0.64 (Mosha et al, 1994) this would imply 22.4 million carious teeth for the approximately 35 million people aged 12 years and over. This would require 11.2 million man-hours of dentists to restore these teeth taking 30 minutes per tooth. If the average working hours per dentist per year is 1400 hours, Tanzania would need 8000 dentist to restore all carious teeth in one year using 12 tons of alloy and about 23 tons of mercury considering that on average an amalgam filling requires 0.6 grams of alloy and 1.2 grams of mercury. Even with the ART technique this would require unrealistic investment in human resource. Such resource is unthinkable even in the most developed countries.

However since it has been established that molars constitute a far greater proportion of the carious teeth the restorative burden can be reduced greatly by application of modern concepts of occlusion in which the dentition is categorised into strategic (anterior and premolar) and non-strategic (molar) parts. Research has shown that a dentition comprising intact anterior and premolar regions and at least one pair of occluding molars can satisfactorily support oral functional demands including chewing, aesthetic and oral comfort (Witter et al., 1999; Sarita et al., 2004; Kanno and Carlsson 2006). These should therefore receive the priority care focusing on quality rather than quantity and the goal to avail restorative care for the entire population. However, implementation of this strategy requires a thorough knowledge of profile of dental caries especially for the dental high risk groups.

LITERATURE REVIEW

Despite of great improvements in the oral health of populations in several countries, global oral health problems still persist (Petersen et al., 2003). Dental caries has been a major health problem in both developed and developing countries as most of the carious lesions go untreated.

In developed countries dental caries affects 60–90% of school-aged children and the vast majority of adults (Petersen et al., 2005). In Italy, Campus et al., (2007) assessed changing caries trends among 12-year old Sardinian children from 1989 to 2004. In this study, caries prevalence and mean DMFT index were noted to decrease from 90% to 36% and from 4.3 to 0.8, respectively. However the untreated caries was reported to have increased from 44% to 62%. In Romania, Petersen and Tanase, (1997), found untreated caries to be 64% in 18-24 years old when assessing oral health status of industrial population. Gorbatova et al., (2011) reported a very high prevalence (91.8%) and a mean DMFT of 4.92 in a study assessing dental caries experience among 15-year-old adolescents in north-west Russia. The study reported further that 53% of the carious teeth were untreated.

In developing countries the levels of dental caries were low until recent years but caries prevalence rates and experience are now tending to increase (Petersen and Kaka 1999, Petersen et al., 2005). Changes in life style that exposes one to sugar containing foods and inadequate self care practices are reasons behind the observed scenario. Yee (1999) reported that in most developing low income countries the prevalence of dental caries is 80% and that over 90% of caries were untreated. In line with Yee's report Adegbebo et al., (2000), in a National survey of dental caries prevalence and treatment needs in Gambia showed that more than half of the subjects had caries with mean DMFT of 2.3, 2.8, and 6.6 in 12-year-olds, 15-year-olds and 35-44-year-olds, respectively. In this study, while the mean filled teeth (FT) was zero in all ages; unmet treatment need (DT/DMFT) was 90-100% in subjects below 25 years.

In South Africa, despite low caries severity by WHO standards, untreated caries levels in all age groups are high. In a study conducted among 12- and 15-year-old South African children reported a decrease in caries prevalence and DMFT scores and an increase in unmet treatment

needs from 70.5% (1982) to 75.2% (1999/2002). In this study more than 70% of caries in 6-, 12- and 15-year-old children were untreated (van Wyk and van Wyk, 2010).

An earlier study assessing caries status and treatment needs, South African National Children's Oral Health Survey had more than 80% of untreated carious teeth among children (van Wyk et al., 2004). In Nigeria, Adekoya et al., (2006), found 77.2% of the carious teeth untreated among 12-year-old suburban Nigerian school children. However, the caries prevalence and the mean DMFT were low (13.9% and 0.14, respectively). Khalifa et al (2012) in Sudan reported a mean DMFT of 7.4 SD 62 in their survey of oral health in a Sudanese population. The study further reported that untreated caries was 87%. In Tanzania, studies on dental caries status have cited presence of high level of untreated caries. Kikwilu and Mandari (2001) reported a caries prevalence of 24%, mean DM-T of 0.41, and 90% untreated carious teeth among primary school children in Morogoro Municipality. Another study conducted in Kilwa among 10-19 years old urban and rural school children reported a caries prevalence of 17.4% and 20.8% and mean DMFT scores of 0.37 and 0.32, respectively, with a substantial proportion of students suffering from untreated caries (Mashoto et al., 2009). Most of the studies in Tanzania were based on child population in school settings. As such there is little information about the needs and demands for treatment of dental caries for patients attending dental clinics.

Epidemiological studies on tooth type and surfaces affected by dental caries show that molars accounts for over 90% and occlusal surfaces are the most common sites. A study in Zanzibar and Pemba found molars to be the most frequently missing teeth and also the teeth most frequently affected by dental caries in all age groups (Baelum and Fejerskov, 1986). In Zimbabwe, Chironga and Manji (1989) reported caries to occur mostly on occlusal surfaces and molars being the most affected teeth in their study on dental caries in 12-year-old urban and rural children in Zimbabwe. Kikwilu and Mandari (2001) in their study at Morogoro Municipality found 97% of lesions being in pits and fissure of molars. In Uganda, a study assessing pattern of dental caries in Mulago dental school clinic reported molars to be the most affected teeth (75.3%) and occlusal surface the most site of occurrence (68.8%). (Kutesa et al 2005)

Studies conducted in different countries have shown treatment need for carious teeth to be either preventive services, conservation/restoration (filling and pulp care) or extraction in which conservation accounted for the greatest need though extraction was the main treatment offered (Mosha et al., 1994; Adegbembo et al., 1995; Frencken et al., 1999; Adegbembo et al., 2000; van Wyk et al., 2004; Duraiswamy et al., 2008; Grewal et al., 2011).

In Tanzania the main reason for people to seek for dental care (87%) is pain (mainly due to caries) that has become intolerable after a period of wait and see (Paleinstein & Nattoo, 1990). Extraction is the most common mode of treatment provided (Paleinstein & Nattoo, 1990; Matee and Simon 2000). Restorative and rehabilitative dental treatment is limited by finances, shortage of professionals deficiencies in equipment as well as restricted supply of materials.

Against this background and despite the non-compromising economy, Tanzania aims for a coordinated oral health plan in order to ensure basic services for all citizens and not just few in the more easily reached areas. One of the goals is to restore broken down dentition by providing simple restorations at dental clinics in district, regional and consultant hospitals (COHU, 2002).

It is however not known how much restorative work will be required to rehabilitate the dentition affected by dental caries. So the aim of this study is to determine the magnitude, treatment need for untreated dental caries and restorative care demand among patients attending public dental clinics in Dar es Salaam, Tanzania. Having such information will enable The Ministry of Health to plan for and increase the level of restorative care.

PROBLEM STATEMENT

Tanzania aims for coordinated oral health plan in order to ensure basic services for all citizens. One of the goals is to restore broken down dentitions (cariou teeth) by providing simple restorations in district, regional and referral hospitals. However, the magnitude of untreated dental caries and its restorative treatment needs is not known. Such information is an essential component in planning and provision of oral health services. A need to determine the magnitude of untreated dental caries, the restorative treatment needs and demands among different population groups in the Tanzania is apparent.

JUSTIFICATION OF THE STUDY

This study will provide base line data on the magnitude of untreated dental caries, and the restorative dental care requirements for patients attending dental clinics in Tanzania.

This study is done as a partial fulfilment of the requirements for the degree of Masters of Dentistry (Restorative Dentistry) of Muhimbili University of Health and Allied Sciences.

OBJECTIVES

Broad Objectives

To determine the magnitude of untreated dental caries, caries treatment needs and demand for restorative dental care among patients aged 12 years and above attending public dental clinics in Dar es Salaam, Tanzania.

Specific Objectives

1. To determine demographic pattern (age, sex, level of education) of patients attending public dental clinics in Dar es Salaam.
2. To determine dental caries experience (DMFT) among patients aged 12 years and above attending public dental clinics in Dar es Salaam according to age, sex and level of education.
3. To assess the extent of caries (tissue destruction) among patients aged 12 years and above attending public dental clinics in Dar es Salaam by tooth type.
4. To determine caries treatment needs among patients aged 12 years and above attending public dental clinics in Dar es Salaam according to age, sex, level of education and tooth type.
5. To assess demand for restorative (conservative) caries treatment among patients aged 12 years and above attending public dental clinics in Dar es Salaam according to age, sex and level of education.

MATERIALS AND METHODS

Study Design

This descriptive cross sectional study was conducted between August-September 2012.

Study area

The study was conducted in four public dental clinics (Sinza, Mnazi Mmoja, Temeke and Muhimbili National Hospital) in Dar es Salaam.

Study population and participants

The study included patients aged 12 years and above who attended public dental clinics in Dar es Salaam during the study period.

Sample size and sampling method

Sampling was conducted in two stages. The first stage involved selection of dental clinics from the three municipalities (Kinondoni, Ilala and Temeke). A list of all public dental clinics in each municipality was obtained and from every list one dental clinic was selected by lottery. The clinics included *Mwananyamala*, ***Sinza*** and *Magomeni* in Kinondoni municipality, *Chanika*, *Amana*, *Kitunda* and ***Mnazi Mmoja***, in Ilala municipality, *Kigamboni*, *Vijibweni*, ***Temeke*** and *Mbagala Rangi Tatu* in Temeke municipality. Muhimbili dental clinic was included for having large number of patients and also because the observation that led to this study was made at the Muhimbili National Hospital dental clinic. Therefore four dental clinics out of the twelve public dental clinics in Dar es Salaam were included in the study. The second stage involved selection of study participants in which every second patient who attended the selected dental clinics for treatment was recruited for the study.

Sample size was computed from the formula below:

$$n = \frac{z^2 P (1-P)}{e^2} + 10\% \text{ of } n$$

Where, n = sample size

z = 95% confidence interval (1.96)

P= estimated proportion of people with dental caries in Tanzania (P= 24% or 0.24)
(Kikwilu and Mandari 2001)

e = desired precision (marginal error = 0.05)

Calculation

$$n = \frac{1.96^2 \times 0.24 \times 0.76}{0.05^2} = 280.3 + (10\% \text{ of } 280.3) = \underline{309} \text{ participants}$$

Selection and inclusion-exclusion criteria for study participants

A total of 310 participants who met the inclusion criteria were enrolled into the study. The recruitment flow chart is summarized in figure 3.

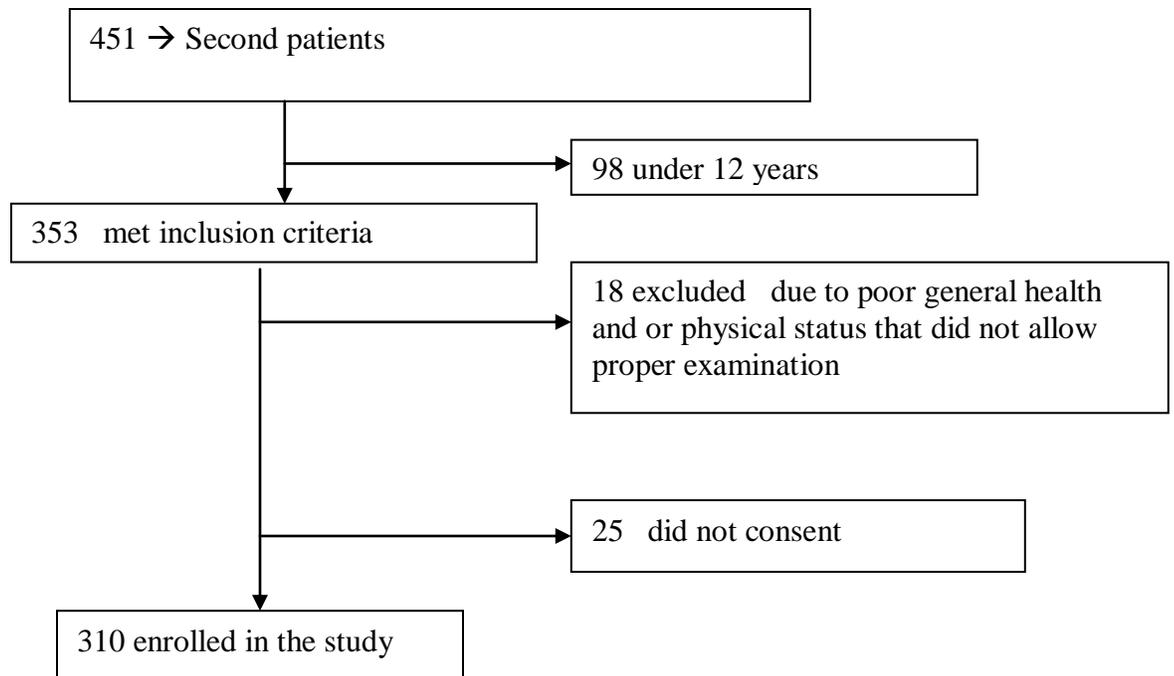


Fig 3. Recruitment flow chart.

Inclusion criteria

All patients aged 12 years and above who attended the selected dental clinics during the study period.

Exclusion criteria

Patients with poor general health - very sick and frail elderly.

Ethical issues

Ethical clearance was granted by the Ethical Clearance Committee of the Muhimbili University of Health and Allied Sciences. Permission to conduct this study was obtained from the administration of respective municipal councils and Muhimbili National Hospital. Participants were requested to consent by writing before taking part in the study (Appendix 1). Parents/guardians signed on behalf of assenting participants aged below 18 years. Participants were also informed that completing or not completing the questionnaire, agreeing or not agreeing to be examined had no influence on the treatment sought, and Informations obtained were only used for the study.

Data collection

Data were collected through interview and clinical examination.

Interview

After consent, each participant was interviewed using a structured questionnaire by the principal investigator in an isolated area and unaccompanied. Responses were recorded in the questionnaires form (Appendix 2). The questionnaire inquired socio-demographic particulars of participants and contained 17 questions: four assessing dental caries experience, two assessing perceived dental caries treatment needs, three assessing awareness of restorative dental care, four assessing demand for restorative dental care and four assess provision of restorative dental care in terms of service availability, accessibility and mode of treatment.

Pre-testing the Questionnaire

A pilot study was conducted to 30 patients at Muhimbili dental clinic to assess the validity and reliability of the questionnaire. Questions in questionnaire were found to be able to assess what was intended to assess and there were repeatability of the responses when the questionnaire were re-administered.

Clinical examination

Clinical examination was conducted by the principal investigator with subject seated on a dental chair. Artificial light (overhead light) was the source of illumination. Each tooth was air-dried using an air-blower followed with visual and tactile examination for dental caries and the findings recorded in a clinical survey form (Appendix 3). Dental mirror and dental explorer (with caution) were used for this purpose. Dental caries status and treatment need were assessed by using WHO Basic Oral Health Survey Methods Criteria (WHO 1997).

Tooth status assessment criteria

Tooth status was assessed and recorded using WHO Basic Oral Health Survey Methods Criteria (WHO 1997).

| <u>Score</u> | <u>Tooth status</u> |
|--------------|---|
| 0 | Sound (not carious) |
| 1 | Enamel caries – Decayed |
| 2 | Dentine caries – Decayed |
| 3 | Caries pulp exposure – Decayed |
| 4 | Root caries – Decayed |
| 5 | Filled with decay (2° caries) – Decayed |
| 6 | Filled with no decay – Filled |
| 7 | Fissure sealant – Sealed |
| 8 | Missing as a result of caries – Missing |
| 9 | Missing for reasons other than caries |
| 10 | Un-erupted tooth |

- 11 Bridge abutment, special crown or veneer/implant
- 12 Trauma (Fracture)
- 13 Not recorded

Caries treatment needs assessment criteria

Caries treatment need was determined using WHO Basic Oral Health Survey Methods Criteria (WHO 1997) modified, and ART criteria (Frencken et al., 1996).

Score Treatment need

- 0 None, no treatment (sound tooth, filled tooth with no decay)
- 1 Prophylaxis (preventive, caries- arresting care) when caries is confined in enamel
- 2 ART, when caries is confined in dentine and conservatively accessible and manageable with hand instrument only.
- 3 Conventional/Drill (CRT), when caries is in enamel and/or dentine and accessible to hand instruments and drill.
- 4 Endodontic treatment (RCT), when there is caries pulp exposure for all teeth except third molar
- 5 Extraction, when a tooth can not be saved by any of the means in our setting.
- 6 Not Applicable, when a tooth is absent

Reliability

Intra examiner consistency on clinical findings was based on the clinical scores from 31 randomly selected participants (10% of all participants). Measures of agreement of the various scores for each tooth were compared and reported using Kappa statistics. Kappa value ranged from 0.721 - 1.00

Data Management and Analysis

The data were analyzed using SPSS software for Windows version 16. The collected data were recorded, counted, cleaned and cross-tabulation was done and the obtained information was processed using Chi-square test to compare proportions for possible association. A p-value = 0.05 was used as a cut-off level for significance.

RESULTS

Demographic pattern of the study participants

A total of 310 dental patients aged 13-76 years (mean age of 31.9 years) participated in the study with females being more than half (64.2%) of all participants (Table 1). Majority of the participants (73.9%) were in the age group 18-40 years. Almost all participants (97.4%) had formal education with majority (46.5%) reported to have primary education.

Table 1. Distribution of the study participants according to socio-demographic variables and selected dental clinics. Percentages in parenthesis. N=310

| Socio-demographic variables | Dental Clinics | | | | Total |
|-----------------------------|----------------|-----------|-----------|-------------|-------|
| | MNH | Temeke | Sinza | Mnazi-mmoja | |
| Sex | | | | | |
| Male | 21 (18.9) | 29 (26.1) | 23 (20.7) | 38 (34.3) | 111 |
| Female | 55 (27.6) | 45 (22.6) | 57 (28.6) | 42 (21.2) | 199 |
| Age groups (yrs) | | | | | |
| 13-17 | 1 (6.1) | 5 (31.3) | 6 (35.3) | 5 (31.3) | 17 |
| 18-40 | 52 (22.7) | 54 (23.6) | 68 (29.7) | 55 (24.0) | 229 |
| 41-76 | 23 (35.9) | 15 (23.4) | 6 (9.4) | 20 (31.3) | 64 |
| Education | | | | | |
| None | 0 (0.0) | 2 (25.0) | 3 (37.5) | 3 (37.5) | 8 |
| Primary | 25 (17.4) | 30 (20.8) | 46 (31.9) | 43 (29.9) | 144 |
| Secondary | 18 (23.7) | 18 (23.7) | 19 (25.0) | 21 (27.6) | 76 |
| College | 19 (28.8) | 23 (34.8) | 12 (18.2) | 12 (18.2) | 66 |
| University | 14 (87.5) | 1 (6.3) | 0 (0.0) | 1 (6.3) | 16 |

Caries experience

The mean number of present teeth was 29.2 SD 2.9 while the mean number sound teeth were 25.0 SD 4.5 (Table 2). Almost all participants (99.7%) reported to have experienced tooth decay with a mean DMFT of 6.6 SD 4.7 for all age groups. Females demonstrated higher mean DMFT value than males (7.5 SD 3.7 and 5.3 SD 4.5 respectively) ($p=0.007$). DMFT showed a tendency to increase with age, with adults aged 41+ recording a highest value of 9.1 SD 4.7. The mean decayed component (DT) was 4.1 SD 2.7 and was observed more often in females (4.5 SD 2.9) than males ((3.5 SD 1.2). This represents the amount of untreated dental caries which was 62.1% of the mean DMFT score. The mean DT differences by age and level of education were not statistically significant. Mean missing teeth was 2.3 SD 2.9 and were significantly more in female(2.7 SD 3.3)than male (1.6 SD 2.1) and increased with age from 0.4 SD 1.0 in 13-17 years to 1.8 SD 2.1 in 18-40 years and 4.8 SD 4.3 in 41+ years. Overall the mean Filled component was very low 0.2 SD 0.9 (3%).

Table 2: Mean number of examined teeth; mean sound, decayed, missing and filled teeth, and mean DMFT scores by age, sex and level of education. N= 310

| | Base | Total teeth examined | | Sound (ST) | | Decayed (DT) | | Missing (MT) | | Filled (FT) | | DMFT | |
|------------------------|------|----------------------|-----|------------|-----|--------------|-----|--------------|-----|-------------|-----|------|-----|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| Sex | | | | | | | | | | | | | |
| male | 111 | 30.1 | 2.1 | 26.4 | 3.6 | 3.5 | 2.3 | 1.6 | 2.1 | 0.2 | 0.7 | 5.3 | 3.7 |
| female | 199 | 28.9 | 3.2 | 24.2 | 4.9 | 4.5 | 2.9 | 2.7 | 3.3 | 0.3 | 1.0 | 7.5 | 4.5 |
| Total | 310 | 29.4 | 2.9 | 25.0 | 4.5 | 4.1 | 2.7 | 2.3 | 2.9 | 0.2 | 0.9 | 6.6 | 4.7 |
| Age group | | | | | | | | | | | | | |
| 13-17 | 17 | 29.4 | 1.9 | 25.4 | 3.3 | 3.9 | 2.8 | 0.4 | 1.0 | 0.1 | 0.2 | 4.4 | 3.4 |
| 18-40 | 229 | 30.0 | 2.2 | 25.6 | 4.0 | 4.2 | 2.8 | 1.8 | 2.1 | 0.2 | 0.9 | 6.2 | 4.2 |
| 41+ | 64 | 27.0 | 4.2 | 22.6 | 5.7 | 4.0 | 2.7 | 4.8 | 4.3 | 0.3 | 0.9 | 9.1 | 5.7 |
| Total | 310 | 29.4 | 2.9 | 25.0 | 4.5 | 4.1 | 2.7 | 2.3 | 2.9 | 0.2 | 0.9 | 6.6 | 4.7 |
| Education level | | | | | | | | | | | | | |
| None | 8 | 29.7 | 4.8 | 26.6 | 4.0 | 3.1 | 2.5 | 2.3 | 4.8 | 0.0 | 0.0 | 5.4 | 4.0 |
| Primary | 144 | 29.2 | 3.0 | 29.0 | 4.6 | 4.0 | 2.7 | 2.4 | 3.1 | 0.2 | 0.8 | 6.6 | 4.7 |
| Secondary | 76 | 29.6 | 2.6 | 24.8 | 4.4 | 4.6 | 3.0 | 2.1 | 2.6 | 0.1 | 0.5 | 6.8 | 4.5 |
| College | 66 | 29.3 | 2.9 | 25.0 | 4.8 | 4.0 | 2.7 | 2.4 | 2.9 | 0.3 | 1.0 | 6.7 | 4.9 |
| University | 16 | 29.7 | 3.7 | 24.6 | 4.7 | 4.0 | 2.5 | 2.3 | 3.7 | 1.1 | 2.2 | 7.4 | 4.7 |
| Total | 310 | 29.4 | 2.9 | 25.0 | 4.5 | 4.1 | 2.7 | 2.3 | 2.9 | 0.2 | 0.9 | 6.6 | 4.7 |

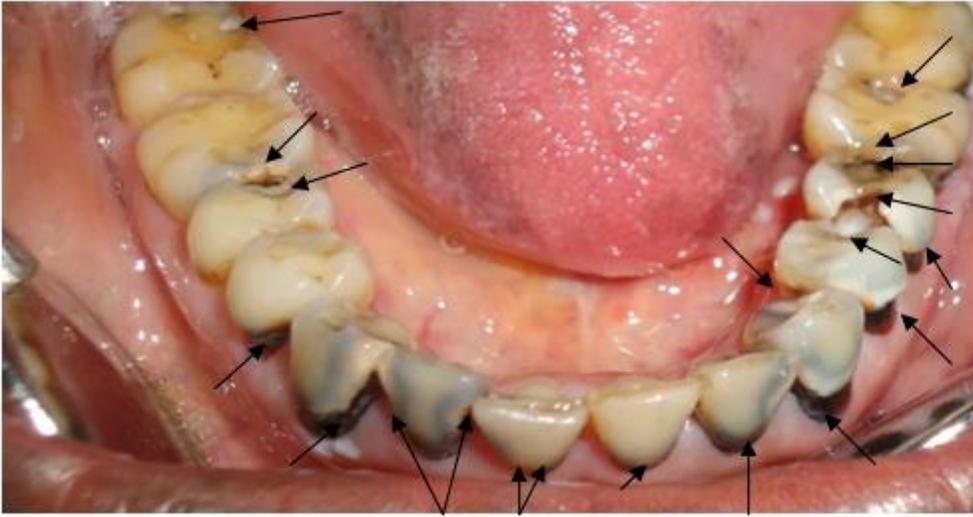


Fig 4. A photograph from one of the examined patient showing multiple untreated dental caries lesions (black arrows)

Pattern and extent of dental caries

Out of the 9817 permanent teeth examined, 1281 (13%) were found to be carious with 924 (72.1%) involving molars, 214 (16.7%) premolars, 120 (9.4%) incisors and 23 (1.8%) canines (Fig. 5).

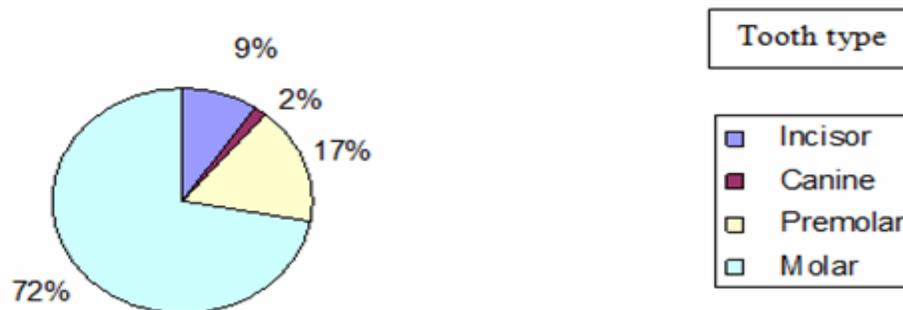


Fig 5. Dental caries pattern by tooth type

Table 3 shows the extent of caries (hard tissue specific destruction) in the four tooth types. Of the three levels of dental caries lesions, (enamel, dentinal and pulp caries exposure) , dentinal caries was the most common (62.7%). Majority of the dentinal lesions (85.3%) were found in the posterior teeth. Caries pulp exposure was observed in 26.9% of all carious teeth with 14.7% diagnosed as irreparable (non-restorable). Canine was the least affected tooth.

Table 3. The extent of caries lesions by tooth type N=1281

| Tooth type | Extent of caries lesions | | | | Total |
|------------|--------------------------|------------|----------------------|----------------|-------|
| | Enamel | Dentine | Caries pulp exposure | | |
| | | | Restorable | Non-restorable | |
| Incisor | 9 (7.5) | 102 (85.0) | 7 (5.8) | 2 (1.7) | 120 |
| Canine | 5 (21.7) | 16 (69.6) | 2 (8.7) | 0 (0.0) | 23 |
| Premolar | 17 (7.9) | 131 (61.2) | 38 (17.7) | 28 (13.1) | 214 |
| Molar | 102 (11.0) | 554 (60.0) | 109 (11.8) | 159 (17.2) | 924 |

Dental caries treatment needs

Table 4 shows the distribution of carious teeth according to caries treatment needs, SDV (sex, age, education), and tooth type. More than half (62.7%) of the treatment need was fillings. By sex, the need for fillings were greater than need for any other treatment and slightly more so among females (63%) than males (62%). By age, the need for fillings was slightly more among adolescents (67.7%) than among other age categories. However, the observed differences were not statistically significant. In all tooth types and education levels, fillings significantly accounted for the greater need than other restorative treatment modalities $p < 0.0001$. Need for extraction was relatively high among older adults (19.4%) than other age groups. The results in table 4 shows also that when restorative treatment options are to be done on anteriors, premolars and 1st molar (limited to this level leaving aside 2nd and 3rd molars, i.e. “functional dentition”), fillings and endodontic works may be reduced by 48.8% and 32% respectively.

Table 4. Distribution of the carious teeth according to caries treatment need, SDV and Tooth Type. N=1281. Percentages in parenthesis

| SES | Caries Treatment Need | | | | Total | |
|--|-----------------------|------------|-------------|------------|-------|-------------------------------------|
| | Prophylaxis | Filling | Endodontics | Extraction | | |
| Sex | | | | | | |
| M | 50 (12.9) | 240 (62.0) | 57 (14.7) | 40 (10.4) | 387 | $X^2=0.01, Df=1,$ $P= 0.9203$ |
| F | 83 (9.3) | 563 (63.0) | 99 (11.0) | 149 (16.7) | 894 | |
| Age group | | | | | | |
| 13-17 | 3 (4.6) | 45 (67.7) | 15 (23.1) | 3 (4.6) | 66 | $X^2= 5.23, Df= 2 ,$ $P= 0.0732$ |
| 18-40 | 112 (11.7) | 596 (62.3) | 113 (11.8) | 136 (14.2) | 957 | |
| 41+ | 18 (7) | 162 (62.8) | 28 (10.8) | 50 (19.4) | 258 | |
| Education level | | | | | | |
| None | 0 (0.0) | 15 (62.5) | 5 (20.8) | 4 (16.7) | 24 | $X^2=70.25, Df=12$ $P<0.0001$ |
| Primary | 41 (7.1) | 349 (60.2) | 78 (13.4) | 112 (19.3) | 580 | |
| Secondary | 43 (12.2) | 220 (62.7) | 43 (12.2) | 45 (12.9) | 351 | |
| College | 27 (10.4) | 183 (70.4) | 25 (9.6) | 25 (9.6) | 260 | |
| University | 22 (33.3) | 36 (54.5) | 5 (7.6) | 3 (4.6) | 66 | |
| Tooth type | | | | | | |
| Incisors | 9 (7.5) | 102 (85.0) | 7 (5.8) | 2 (1.7) | 120 | $X^2=63.95, Df=12$ $P<0.0001$ |
| Canines | 5 (21.7) | 16 (69.6) | 2 (8.7) | 0 (0) | 23 | |
| Premolars | 17 (7.9) | 131 (61.2) | 38 (17.8) | 28 (13.1) | 214 | |
| Molars | 102 (11.0) | 554 (60.0) | 109 (11.8) | 159 (17.2) | 924 | |
| (1 st , 2 nd & 3 rd) | | | | | | |
| 1 st Molar only | 22 (8.0) | 153 (55.2) | 59 (21.3) | 43 (15.5) | 277 | |

Demand for restorative dental care

Out of the 310 study participants, 251 (81%) reported to have visited a dentist previously with 23.9% of the participants requesting restorative dental care. More females than males (25.3% and 21.2%, respectively) requested for the service, the difference being not significant. Demand for restorative care significantly varied with education level. Those with university education showed the highest level of demand (56.3%) (Table 5).

Table 5: Participants demand for restorative care according to sex, education level and age group. Percentages in parenthesis. N= 251

| Socio-demographic variable | Demand | | Total | Statistics |
|----------------------------|-----------|--------------|-------|---------------------------------------|
| | Demanded | Not demanded | | |
| Sex | | | | |
| M | 18 (21.2) | 67 (78.8) | 85 | |
| F | 42 (25.3) | 124 (74.7) | 166 | $\chi^2=0.32$, $Df=1$, $P= 0.5716$ |
| Education level | | | | |
| None | 0 (0.0) | 6 (100) | 6 | |
| Primary | 15 (13.2) | 99 (86.8) | 114 | |
| Secondary | 16 (26.7) | 44 (73.3) | 60 | |
| College | 20 (36.4) | 35 (63.6) | 55 | |
| University | 9 (56.3) | 7 (43.7) | 16 | $\chi^2=23.27$, $Df=4$, $P= 0.0001$ |
| Age group (yrs) | | | | |
| 13-17 | 2 (20.0) | 8 (80.0) | 10 | |
| 18-40 | 41 (22.8) | 139 (77.2) | 180 | |
| 41+ | 17 (27.9) | 44 (72.1) | 61 | $\chi^2=0.74$, $Df=2$, $P= 0.6907$ |

The main reasons for not demanding restorative dental treatment were: “costs” 28.6%; “concern that pain will persist after treatment” 26.5%; and “not being aware of the service” 23.1%.

(Table 6)

Table 6: Reasons for not demanding restorative care. N= 325

| Reasons | n | % |
|---|----------|----------|
| • Restorative treatment is too expensive | 93 | 28.6 |
| • Concern r that pain will persist | 86 | 26.5 |
| • Was not aware of such service | 75 | 23.1 |
| • The dental clinic does not offer restorative dental care | 27 | 8.3 |
| • Tooth was not painful | 19 | 5.8 |
| • Was not advised (by the dentist) to seek restorative care | 16 | 4.9 |
| • Too busy with other issues | 9 | 2.8 |

DISCUSSION

This study is a hospital based so its findings can not be generalised to Tanzania general population. In this study more than half of the participants were females (64.2%). The observed large percentages of females' attendance to dental clinics can be accounted by two reasons. Firstly, the fact that females usually cares about their health more than males (Kutesa et al 2005) and so most of them do seek treatment unlike males. Secondly, it's believed that females consume sugar containing foods/products more than males (Blay et al., 2000; Okullo et al., 2003) and so more caries attack that calls for more dental visits. Similar findings were also found in other studies (Kutesa et al 2005 (54%), Matee et al (2006) (62.6%), Upadhyaya and Humagain 2009 (52.2%)). Majority (73.9%) of the participants were in age group 18-40 which is a young adult age. Characteristically this age group like consuming sugar containing products that predispose them to tooth decay and hence more dental visit than other age groups.

Clinical examination revealed almost all participants to have experienced tooth decay (99.7%) with mean DMFT of 6.6 SD 4.7. The observed high prevalence and high mean DMFT may be due to the fact that this study was hospital based and the examined participants came to hospital for dental problems i.e. tooth decay. A study by Khalifa et al (2012) in Sudan also reported a high mean DMFT 7.4 SD 6.2 and this may be due to the fact that both are hospital based studies. However most of other African studies reported lower mean DMFT scores and this could be due to differences in study area and study population (Adegbembo et al., 2000, Adekoya et al., 2006, Mashoto et al 2009). In present study, DMFT showed an increasing tendency with increase in age, adult (41+) scoring the highest value (9.1). This can be explained by the reason that old ages in their course of life have been challenged by caries more times than young ages. As a result old ages may end up with more decayed, missing and filled teeth than young ones. This finding agrees with those of Sarita et al., 2004, Adegbembo et al., 2000 where DMFT increased with age.

The observed high proportion of D component of DMFT (untreated dental caries) in this study (62%) can be explained by the reasons that patients usually have no habits of going for check

up regularly, they just visit on emergency bases when in pain. The mode of management (treatment oriented approach) in which the focus is only on chief complaint leaving other problems including carious teeth unattended or even planned for treatment may be an alternative explanation for high untreated caries. Barriers to restorative care (Kikwilu et al., 2009) may also be a reason for piling up of these carious teeth which in turn lead to high proportion of D component of the DMFT. High level of untreated caries was also observed in Europe by Petersen and Tanase, (1997) 64%, Campus et al., (2007) 62% and Gorbatova et al., (2011) 53%, similarly van Wyk van Wyk, (2010) 70% and Khalifa et al (2012) 87% in Africa and Duraiswamy et al., (2008) 72% in Asia. The observed mean missing teeth of 2.3 SD 2.9 (35%) in this study indicates that extraction is the most common treatment offered to carious teeth in our setting. Khalifa et al (2012) in Sudan reported mean missing teeth of 3.6 SD 4.9 which is slightly higher than that observed in the current study. The mean Filled component was very low (0.2 SD 0.9) (3%) giving an indication that fillings are not provided either due to inadequacies in oral health delivery system or due to lack of patient demand for restorative care.. Khalifa et al (2012) reported similar finding where mean Filled component was observed to be negligible (0.2%). Similar finding of negligible filled component were also found by Muya et al., 1984; Frencken et al., 1989; Frencken et al., 1990; Mosha et al., 1994; Kikwilu and Mandari, 2001; COHU, 2002; Sarita et al., 2004; Åstrøm and Kida, 2007. More than half (62.7%) of the carious teeth had their lesion located in dentine. Posterior teeth were found to be the most affected teeth (88.8%), in which molars and premolars were affected in 72.1% and 16.7% respectively. This observation may be due to the fact that the anatomy of the occlusal surfaces of posterior teeth contains pits and fissures which are known to harbour food stuffs (including sugar containing ones). So it is not surprising that posterior teeth are highly challenged by caries than other teeth. This finding agrees with those of Manji et al., 1986; Baelum and Fejerskov, 1986; Chironga and Manji, 1989; Kikwilu and Mandari, 2001 in which posterior teeth were mostly affected (>90%) and most of the lesions were in dentine.

The observation that caries were more in posterior teeth located within dentine and mostly in occlusal surface suggests that these lesions could have been managed by simple restoration

using easy to apply techniques like Atraumatic Restorative Treatment (ART) or simple surgical methods.

The observed 62.7% filling treatment need was due to the fact that most carious lesions were located in dentine and dentinal lesions need filling. Generally restorative treatment need was 74.9% (filling and endodontic treatment need) which means if the restorative service was to be provided, about 75% of the carious teeth would have been saved from extraction.

This finding agrees with those reported by Mosha et al., 1994; Adegbembo et al., 1995; Frencken et al., 1999; Adegbembo et al., 2000; van Wyk et al., 2004; Duraiswamy et al., 2008 where there were more restorative treatment need than extraction but disagree with that of Kumar et al., 2010 in which there were more extraction treatment need than restorative treatment need.

In the present study, extraction was seen to be relatively high in molars (17.2%) and in older adult age group (19.4%). This can be accounted by the fact that molars were the most affected teeth, and if the third molar was involved with pulp being exposed, the treatment thought to be of choice was extraction which might have also played role in elevating the extraction proportion. On the other hand, old adults have persistently stayed with their carious teeth unattended, this result in gross damage that calls for extraction and hence relatively high extraction proportion. Patients do not usually go for dental check-ups as it has been observed by Kikwilu et al., (2009), as a result gross damage occurs making extraction inevitable.

Just small proportional of participants (23.9%) demanded restorative care in their previous dental visit. This may be accounted by presence of a number of barriers that preclude patients from requesting restorative services (Kikwilu et al., (2009). However, for those who requested restorative care, demand varied significantly with education level, university showing the highest level of demand (56.3%). Most likely being educated is a factor for someone finding it important to restore a tooth rather than extracting it. Neither age nor sex showed significance difference in demand for restorative care, so the observed differences were just by chance.

Seven reasons have been mentioned by participants to affect their demand for restorative care. Among the reasons mentioned, high cost for restorative care, fear that pain will persist and not being aware of the service were mentioned most. High cost for restorative care was the most

frequently mentioned reason. The cost for one permanent filling in public dental clinics in Dar es Salaam ranges from 10,000/- to 20,000/- depending on type of filling material used. For a mere Tanzanian person such a cost for a filling might be too much and prevent him/her from demanding restorative service. High cost for the service as a reason that prevents patients from demanding and using service was also found by other researchers (Jaafar et al., 1992; Wakiaga et al., 1996; Kikwilu et al., 2009). The reason given by participants that they fear that pain will persist following restorative care may be explained by the presence of some wrong beliefs and misinformation in societies regarding restorative care. There is a common misconception that once a tooth is decayed, to get rid of pain, the tooth has to be removed otherwise if it is restored pain will persist (van Palenstein and Nathoo, 1990; Jaafar et al., 1992). Participants not being aware of the restorative service may probably be accounted by lack of education on restorative care (Kikwilu et al., 2009). Education on presence, importance, benefits and outcome of restorative care is not given to patients and with that patients are either not aware of the service or relies on wrong beliefs and wrong information on restorative care that preclude them from demanding the service.

The reason given that visited dental clinic does not offer restorative dental care, may be explained by the fact that there are few dental clinics that offer restorative care. Furthermore, inadequacies in oral health delivery system may also be behind the cited reason. Such finding was also observed by other researchers (Naidu et al., 2003; Kikwilu et al., 2009). A reason that participants did not demand restorative care because tooth was not painful can be accounted by the fact that dental patients usually do not seek treatment until they are in pain (van Palenstein and Nathoo, 1990). Some participants pointed out that they were not advised (by the dentist) to seek restorative care as a reason for them not demand restorative care. This might be due to lack of patient comprehensive care in which dental practitioners addresses only patient chief complaints to relief pain leaving other non painful carious teeth unattended or planned for treatment (Kikwilu et al., 2009).

The last reason mentioned was being busy with other issues (lack of time). This can be explained by the fact that dental problems in daily life are seen insignificant and with that one can continue with other business until pain drive him/her to seek restorative care.

As from the present study results, almost 62% of the carious teeth from patients attending Dar es Salaam public dental clinics were untreated. A number of reasons have been shown to be behind this observation. However, taking care of all untreated caries (62%) will require patients' comprehensive care and adequate oral health delivery system i.e. increasing human resources in terms of number and adequate skills, improving and increasing equipment, materials & supplies. The government through the Ministry of health is aiming at providing simple restorative care to all Tanzanians in need (COHU 2002). With financial restriction as it is in most developing countries it may take several years before achieving the goal. A quick workable solution may be adopting Atraumatic Restorative Treatment (ART) which simply use hand instruments, not relying on presence of power and done even by short term trained personnel instead of relying solely on conventional technique which depends on presence of power, modern equipment and highly trained personnel. Along side with ART, management of carious teeth should be focused on functional dentition. The effort for treating carious teeth restoratively should be directed to all the anteriors, premolars and the first molar. Scientifically it has been proven that a person with dentition limited to the first molar or even at the second premolars orally function as equally the same as the one with complete dentition (32 teeth) (Witter et al., 1999; Sarita et al., 2004; Kanno and Carlsson 2006). If the focus will only be to strategic dentition, the amount of teeth to be managed, material & supplies to be used and manpower for treating carious teeth will be reduced to the extent that even with the inadequacies and shortages in oral health delivery system, the untreated caries may possibly be managed restoratively with great success. In the present study if the focus will only be to the strategic dentition (anteriors – 1st molar), there will be about forty nine percent (48.8%) and 32% reduction in filling and endodontic treatment work respectively.

CONCLUSION

In this study the amount of untreated dental caries was high. Posterior teeth were the most affected teeth and majority of the lesions in all teeth were located in dentine which needed filling treatment. Demand for restorative care was low with high cost for the service, fear that pain will persist following tooth filling and not being aware of the service being the most reasons given for not demanding restorative care.

Recommendations

1. Community education on presence, importance, benefits and outcome of dental restorative care is required so as to raise awareness, to alleviate misconception and increase demand for the service.
2. Atraumatic Restorative Treatment technique should be adopted in caries management and the focus should be to the functional dentition (strategic dentition).
3. Another large study that will include representative sample for Tanzania population is required for better estimate of the amount of untreated dental caries and treatment need in Tanzania at large.

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APPENDICES**Appendix 1a: Informed Consent Form (English version)****MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES****DIRECTORATE OF RESEARCH AND PUBLICATIONS, MUHAS
INFORMED CONSENT FORM**ID. No. Clinic **Consent to Participate in a Study**

Greetings! My name is Dr Martin Long'ida; I am working on this research with the objective of determining the magnitude of untreated caries among patients aged 12 years and above attending public dental clinics in Dar Es Salaam, 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 at determining the magnitude of untreated dental caries, assessing awareness on restorative dental care, demand for restorative dental care, dental caries experience, dental caries restorative treatment needs, and service provision.

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 first be interviewed in order to answer a series of questions in the questionnaire prepared for the study. Secondly, a dentist will perform a brief examination of your mouth. The examiner will provide you with a summary of the findings offer advice and refer for suitable treatment.

Confidentiality

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.

Risks

We do not expect that any harm will happen to you because of participating in this study. Some questions could potentially make you feel uncomfortable. You may refuse to answer any particular question and may stop the interview at anytime.

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

If you agree to participate in this study, you will be advised on what to do (management) with accordance to the examination findings so as to prevent further damage to your oral tissues. The information you provide will help to assess awareness on restorative care, assess demand for restorative care determine the load of restorative dental care and assess dental caries restorative treatment needs in patients attending dental clinics in Dar es Salaam.

The result of the study will give information that will enable creation of awareness on restorative dental care and also will enable oral health planners to plan for oral health services as per need and reduce or possibly eliminate the problem of untreated caries.

Who to Contact

If you ever have questions about this study, you should contact the Principal Investigator, Dr Martin Long'ida of Muhimbili University of Health and Allied Sciences, P. O. Box 65001, Dar es Salaam. 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 2152489 Dar es Salaam or Supervisors of this study Dr. Godbless. J. Mandari (Tel: 0754817424) and Dr. P.T.N Sarita (Tel: 0784632228)

Signature:

Do you agree?

Participant agrees Participant does NOT 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 1b: Informed Consent Form (Kiswahili version)**CHUO KIKUU CHA SAYANSI ZA AFYA MUHIMBILI****KURUGENZI YA TAFITI NA UCHAPISHAJI FOMU YA RIDHAA**Namba ya usaili Namba ya Kiliniki **Ridhaa ya kushiriki kwenye utafiti**

Hujambo! Ninaitwa Dr. Martin Long'ida, nashughulika kwenye utafiti huu wenye lengo la kutathmini ukubwa wa tatizo la meno yaliyotoboka ambayo hayajatibiwa kwa wagonjwa wanaohudhuria kliniki za meno jijini Dar es salaam.

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 uelewa na uhitaji wa huduma ya uzibaji meno, ukubwa/uzito wa tatizo la huduma ya kuziba meno yaliyooza, aina ya tiba ya uzibaji wa meno na huduma inayohitajika kwa wagonjwa wanaohudhuria kliniki za meno jijini 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 huduma ya meno ndani ya taifa hili baadaye.

Jinsi ya kushiriki

Ukikubali kushiriki katika utafiti huu, kwanza utasailiwa ili kuweza kujibu maswali toka kwenye dodoso lililoandaliwa kwa ajili ya utafiti huu. Pili mganga wa meno atafanya uchunguzi mfupi wa kinywa chako kisha atakufahamisha kuhusu afya yako ya kinywa na/ama kukupatia ushauri wa kitaalam na kukuelekeza mahali sahihi pa kupatiwa matibabu.

Usiri

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

Faida

Kwa kushiriki kwako utapata ushauri wa nini cha kufanya kulingana na matatizo yatakayoonekana baada ya uchunguzi ili kuepusha madhara zaidi ikiwa matatizo hayo hayatahudumiwa. Taarifa utakazotoa zitatuwezesha kufahamu mwenendo wa magonjwa ya meno, uelewa wa wananchi kuhusu huduma ya uzibaji meno, ukubwa wa tatizo la huduma ya kuziba meno yaliyooza na namna ya kukabiliana na tatizo hili jijini Dar es salaam.

Matokeo ya utafiti huu yanaweza kutoa taarifa zitakazosaidia katika kuelimisha uma kuhusu huduma hii ya uzibaji meno na pia kuwasaidia watunga sera (wataalam wa mipango) kupanga huduma kufuatana na uhitaji ili kupunguza na hatimaye kuondoa tatizo la mlundikano wa meno yanayohitaji kuzibwa ndani ya taifa.

Athari na kukitokea madhara

Hutegemewi kupata madhara yoyote kutokana na ushiriki wako katika utafiti huu. Hata hivyo, baadhi ya maswali yanaweza yasikupendeze, ikiwa hivyo na ikibidi unaweza kukataa kujibu swali lolote la aina hiyo.

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, walakukosa huduma uliyotarajia.

Nani wa kuwasiliana naye

Kama una maswali kuhusiana na utafiti huu, wasiliana na mkuu wa utafiti huu, Dr. Martin Long'ida wa Chuo Kikuu cha Afya na Sayansi ya Tiba Muhimbili, S. L. P. 65001, Dar es Salaam. 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 2152489 Dar es Salaam au wasimamizi wa utafiti huu Dr. Godbless. J. Mandari (Simu: 0754817424) au Dr. P.T.N Sarita (Simu: 0784632228)

Sahihi:

Je mshiriki amekubali? Mshiriki amekubali Mshiriki hajakubali

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 2a Questionnaire (English Version)

**QUESTIONNAIRE ON UNTREATED DENTAL CARIES - MAGNITUDE,
TREATMENT NEED AND RESTORATIVE CARE DEMAND AMONG PATIENTS
AGED 12 YEARS AND ABOVE ATTENDING PUBLIC DENTAL CLINICS IN DAR
ES SALAAM, TANZANIA**

REG No. **MUN** **HD-CLN** **ED** **OCP:** _____ **DATE**

day month year

NAME _____ **AGE** (yrs) **SEX** 1= *male*, 2= *female*

1. You have experienced tooth ache/cavity due to tooth decay (no 1, yes 2)
2. At present how many decayed (untreated) teeth do you have (count)
3. For how long have you stayed with the decayed tooth/teeth week (s)
4. The following are treatment options for a carious tooth
 - a. Restoration (filling) (no 1, yes 2)
 - b. Extraction (no 1, yes 2)
 - c. Others (Specify).....
5. How many of your teeth received the following treatment due to tooth decay?
 - a. Restoration (filling) (count)
 - b. Extraction (count)
6. The following are benefits of restoration (filling) of decayed tooth:

- a. There won't be pain any more (no 1, yes 2)
- b. Patient will be able to chew properly (no 1, yes 2)
- c. Pronunciation of words will be improved (no 1, yes 2)
- d. Aesthetics appearance will be maintained (no 1, yes 2)
7. Does restoration (filling) work? (NA 0, no 1, yes 2)
8. Do you feel that you require the following treatment for your decayed tooth/teeth?
- a. Restoration (filling) only (no 1, yes 2)
- b. Extraction only (no 1, yes 2)
- c. Both restoration and extraction (no 1, yes 2)
- d. Others (Specify):
- e. NA (does not require any treatment)
9. If you had a carious tooth which of the following treatment options would go for?
- a. Do nothing/wait and see (no 1, yes 2)
- b. Restoration (filling) (no 1, yes 2)
- c. Extraction (no 1, yes 2)
10. Have you ever visited a dentist? (no 1, yes 2)
11. Have you ever requested for a restoration (filling) of your carious tooth?(no1, yes 2)
12. If yes, was the treatment you requested for provided? (no 1, yes 2)
13. If no, what made you not request restorative care? 1....., 2....., 3, 4.....
14. Dental clinics "providing restorative care" where you live
- a. Are government owned (public) (no 1, yes 2)
- b. Private owned (no 1, yes 2)
- c. Not available (no 1, yes 2)
15. The closest dental clinic providing "restorative care"
- a. Is located km. from where I live

b. Transport cost is TShs. (to and fro)

16. You failed to get “restorative dental treatment” to your carious tooth because

- a. The dental clinic visited does not offer restorative care (no 1, yes 2)
- b. The clinic is too far (no 1, yes 2)
- c. Restorative care in that clinic is too expensive (no 1, yes 2)

17. After examining your mouth and teeth, the dentist,

- a) Pointed out to nature of you the problems (no 1, yes 2)
- b) Informed you that you had other carious teeth (no 1, yes 2)
- c) Gave you an appointment for the other carious teeth (no 1, yes 2)
- d) Told you to seek treatment for other carious teeth (no 1, yes 2)

Appendix 2b Questionnaire/Dodoso (Kiswahili Version)

DODOSO KUHUSU MENO YALIYOTOBOKA AMBAYO HAYAJATIBIWA: UKUBWA WA TATIZO, AINA STAHIKI YA MATIBABU YANAYOHITAJIKA NA UHITAJI WA MATIBABU YA KUZIBA MENO YALIYOTOBOKA KWA WAGONJWA WANAHUDHURIA KLINIKA ZA MENO ZA SERIKALI DAR ES SALAAM, TANZANIA

USAILI |__|__|__| MANISP |__| KLIN |__| ELIM |__| KAZI _____ TAR
|__|__|__|__|__|__|

siku mwezi mwaka

JINA _____ UMRI (miaka) |__|__| JINSI 1= me, 2= ke |__|

- 1 Umewahi kupata maumivu ya jino/shimo kwenye jino kutokana na kuoza kwa jino
(Hapana 1, ndiyo 2) [__]
- 2 Kwa sasa ni meno mangapi yaliyooza/yaliyotoboka uliyonayo (ambayo hayajazibwa)
(idadi/hesabu) [__]
- 3 Umekaa na jino/meno yaliyooza kwa muda gani (wiki) [__]
- 4 Zifuatazo ni namna ya kutibu jino lililotoboka
 - a. Kuziba (kujaza) (Hapana 1, ndiyo 2) [__]
 - b. Kung'oa (Hapana 1, ndiyo 2) [__]
 - c. Namna nyingine (Taja).....
- 5 Una meno mangapi ambayo yametibiwa kwa njia tajwa hapo chini baada ya kutoboka?
 - a. Kuziba (kujaza) idadi/hesabu [__]
 - b. Kung'oa idadi/hesabu [__]
- 6 Zifuatazo ni faida za kuziba (kujaza) meno yaliyotoboka
 - a. Hakutakuwa na maumivu tena (Hapana 1, ndiyo 2) [__]

- b. Mgonjwa ataweza kutafuna vizuri (Hapana 1, ndiyo 2)
- c. Maneno yatatamkwa vizuri (Hapana 1, ndiyo 2)
- d. Kutakuwa na muonekano mzuri (Hapana 1, ndiyo 2)
- 7 Kuziba (kujaza) jino kunasaidia? (Hapana 1, ndiyo 2)
- 8 Unahisi unahitaji matibabu yafuatayo kwa jino lako lililotoboka?
- a. Kuziba (kujaza) tu (Hapana 1, ndiyo 2)
- a. Kung'oa tu (Hapana 1, ndiyo 2)
- b. Vyote viwili kuziba (kujaza) na kung'oa (Hapana 1, ndiyo 2)
- c. Matibabu mengine (taja):
- d. Haiwezekani (Sihitaji tiba yoyote)
- 9 Ungekuwa na jino lililotoboka/lililooza ni tiba ipi kati ya zifuatazo ungeitaka/ungeifata/
ungeitafuta
- a. Sifanyi chochote/Nasubiri (Hapana 1, ndiyo 2)
- b. Kuziba (kujaza) (Hapana 1, ndiyo 2)
- c. Kung'oa (Hapana 1, ndiyo 2)
- 10 Ulishawahi kwenda kwa daktari wa meno? (Hapana 1, ndiyo 2)
- 11 Ulishawahi kumtaka akuzibe jino lako lililotoboka? (Hapana 1, ndiyo 2)
- 12 Kama jibu ni ndiyo ulipata huduma hiyo uliyoitaka? (Hapana 1, ndiyo 2)
- 13 Kama jibu ni hapana, nini kilikufanya usitake/usiombe kuziba jino lako lililotoboka?
1....., 2....., 3, 4.....
- 14 Kliniki ya meno “inayotoa huduma ya kuziba” unakokaa
- a. Inamilikiwa na serikali (Hapana 1, ndiyo 2)
- b. Ni ya mtu binafsi (Hapana 1, ndiyo 2)
- c. Hakuna kliniki (Hapana 1, ndiyo 2)

15 Kliniki ya meno iliyoko karibu sana “inayotoa huduma ya kuziba”

- c. Iko km. kutoka ninapokaa
- d. Gharama ya usafiri ni TShs. (kwenda na kurudi)

16 Ulishindwa kupata huduma ya kuziba jino lako lililooza/ toboka kwa sababu

- a. Kliniki ya meno niliyoenda haitoi huduma ya kuziba (Hapana 1, ndiyo 2) [__]
- b. Kliniki ya meno iko mbali (Hapana 1, ndiyo 2) [__]
- c. Huduma ya kuziba jino kwenye kliniki ile ni ghali mno (Hapana 1, ndiyo 2) [__]

17 Baada ya kukuangalia kinywani na meno, daktari wa meno ,

- a. Alikueleza aina ya tatizo lako (Hapana 1, ndiyo 2) [__]
- b. Alikuarifu kuwa una jino lingine lililooza/toboka (Hapana 1, ndiyo 2) [__]
- c. Alikuambia urudi kwa ajili ya kutibu meno mengine yaliyooza/toboka (Hapana 1, ndiyo 2) [__]
- d. Alikuambia ukayatibie meno mengine yaliyooza/toboka (Hapana 1, ndiyo 2)[__]

Appendix 3 Clinical Examination Form

Untreated dental caries -magnitude, treatment need and restorative care demand among patients aged 12 years and above attending publics dental clinics in Dar es Salaam, Tanzania..

REG No. MUN HDC ED OCP: _____ | | DATE

 day month year

NAME _____ AGE years SEX 1= male, 2= female

TOOTH STATUS AND TREATMENT NEED

Maxilla

| Tooth No. | 18 | 17 | 16 | 15 | 14 | 13 | 12 | 11 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 |
|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Tooth Sfs. | | | | | | | | | | | | | | | | |
| 1 Occlusal | | | | | | | | | | | | | | | | |
| 2 Mesial | | | | | | | | | | | | | | | | |
| 3 Lingual/palatal | | | | | | | | | | | | | | | | |
| 4 Distal | | | | | | | | | | | | | | | | |
| 5 Buccal/labial | | | | | | | | | | | | | | | | |
| Caries Treat. Need | | | | | | | | | | | | | | | | |

Mandible

| Tooth No. | 48 | 47 | 46 | 45 | 44 | 43 | 42 | 31 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 |
|---------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Tooth Sfs. | | | | | | | | | | | | | | | | |
| 1 Occlusal | | | | | | | | | | | | | | | | |
| 2 Mesial | | | | | | | | | | | | | | | | |
| 3 Lingual/palatal | | | | | | | | | | | | | | | | |
| 4 Distal | | | | | | | | | | | | | | | | |
| 5 Buccal/labial | | | | | | | | | | | | | | | | |
| Caries Treat. Need | | | | | | | | | | | | | | | | |

KEY: REG. NO = Patient's registration/identification number (001-310)

MUN = Municipality (1 Kinondoni, 2 Ilala, 3 Temeke)

HDC = Hospital Dental Clinic (1, 2, 3, 4, → will be known after sampling procedures)

ED = Education level (0 None, 1 Primary school, 2 Secondary school, 3 College, 4University)

OCUP = Occupation

Tooth Sfs. = Tooth surfaces (Occlusal (o), Mesial (m), Distal (d), Buccal/labial (b/lb),
Lingual/ Palatal (l/p))

Tooth No. = Tooth number (from 18-48)

Appendix 4: Tooth status and caries treatment needs assessment criteria

(Adopted and modified from WHO (1997) Criteria).

Tooth status assessment criteria -.

| <u>Score</u> | <u>Tooth status</u> |
|--------------|--|
| 0 | Sound (not carious) |
| 1 | Enamel caries – Decayed |
| 2 | Dentine caries – Decayed |
| 3 | Caries pulp exposure – Decayed |
| 4 | Root caries – Decayed |
| 5 | Filled with decay (2° caries) – Decayed |
| 6 | Filled with no decay – Filled |
| 7 | Fissure sealant – Sealed |
| 8 | Missing as a result of caries – Missing |
| 9 | Missing from any other reason |
| 10 | Un-erupted tooth (crown) |
| 11 | Bridge abutment, special crown or veneer/implant |
| 12 | Trauma (Fracture) |
| 13 | Not recorded |

Caries treatment needs assessment criteria.

| <u>Score</u> | <u>Treatment need</u> |
|--------------|---|
| 0 | None, no treatment (sound tooth, filled tooth with no decay) |
| 1 | Prophylaxis (preventive, caries- arresting care) when caries is confined in enamel |
| 2 | ART, when caries is confined in dentine and conservatively accessible and manageable with hand instrument only. |
| 3 | Conventional/Drill (CRT), when caries is in enamel and/or dentine and accessible to hand instruments and drill. |
| 4 | Endodontic treatment (RCT), when there is caries pulp exposure for all teeth except third molar |
| 5 | Extraction, when a tooth can not be saved by any of the means in our setting. |
| 6 | Not Applicable, when a tooth is absent |

