

**ORAL HEALTH STATUS OF INSTITUTIONALISED
STREET CHILDREN IN A PLACE OF SAFETY
IN MOSHI, TANZANIA**

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KEYWORDS

Street children

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Oral hygiene

Periodontal diseases

Dental fluorosis

Malocclusion

Preventive knowledge

Oral health practice towards oral hygiene

Causes of dental caries

Prevention of dental caries

Causes of periodontal diseases

Prevention of periodontal diseases

Dental visits



ABSTRACT

AIM: The aim of the study was to analyze the oral health status (dental caries, periodontal conditions, fluorosis and malocclusion) of institutionalised street children at Amani and Mkombozi street children homes in Moshi town, Tanzania. To assess the oral health knowledge, attitude and practice of street children. Caregivers' oral health knowledge on causes and prevention of oral diseases. **Design:** A cross-sectional survey of street children aged between 12 to 18 years was carried out based on the WHO guidelines. The street children were clinically examined and children responded to an interview schedule. Self-administered questionnaires were used to collect information from the caregivers. **Subjects:** One hundred street children aged between 12 to 18 years participated in the survey. Only boys were in the study group, as there are no girls of that age group found in both the homes. A total of 20 caregivers were included in this study. **Outcome measures:** DMFT, CPI, Fluorosis and Malocclusion were recorded. The oral health knowledge, attitude and practice were ascertained. Caregivers knowledge on causes and prevention of oral diseases was ascertained. **Results:** The mean DMFT was 0.64, 87% of the subjects had periodontal conditions, bleeding gums 36%, calculus 37% and 14% had pocket 4-5 mm. Children's teeth were affected by fluorosis in 42% of the sample, with 20% severe, 11% moderate and 11% mild category. Identifiable malocclusion appeared in 34% of the children in this sample, ranging from 12% definite malocclusion, 17% had severe malocclusion and 5% very severe where treatment is mandatory. There is a remarkable improvement in oral hygiene habits and reduction in frequency of consumption of sugary items in the childrens homes compared to while they were on

the streets. Regular dental visits are negligible (5%) and mostly carried out for emergency care. Overall the level of oral health knowledge particularly preventive knowledge was lacking in these street children. Caregivers have good knowledge on causes and prevention of dental caries and periodontal conditions. **Conclusion:** Results from this study concludes that the F component was negligible and treatment need for street children is mainly fillings. Fifty one percent of the street children had poor standard of oral hygiene as assessed by CPI. The CPI findings indicate a clear need to improve oral hygiene care among these children. This study observed a high prevalence of dental fluorosis (42%) in the street children; significantly more children with fluorosis came from the rural areas ($p < 0.05$). Orthodontic treatment need in this study is mandatory for only 5% of the street children. Oral health knowledge particularly preventive knowledge, was lacking in this study group of children, dental visits were negligible. **Recommendations:** On-site services designed to increase access to the residents may be tailored for these street children, mobile and portable clinics are the most cost-effective alternative. Educating the caregivers on preventive, promotional aspect may improve the oral health in these street children.

Keywords: Street children, oral health knowledge, oral hygiene practice, oral diseases.

DECLARATION

I declare that “Oral health status of institutionalised street children in a place of safety in Moshi, Tanzania” the dissertation I am herewith submitting for the Degree MSc (In Dental Public Health) at the University of Western Cape is my own work and has not previously been submitted for any other degree at any other University, and that all the sources I have used or quoted have been indicated and acknowledged as complete references.



Sravanam Venkateswara Rao

A handwritten signature in blue ink, appearing to read "S. Venkateswara Rao".

Signature.....

Date.....15 February 2008.....

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My sincere thanks to the following people who assisted me; especially

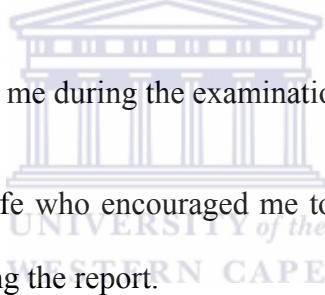
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Last, but not least, my wife who encouraged me to do this programme, my children who helped me in preparing the report.



DEDICATION

I sincerely dedicate this thesis to my wife who stood by me throughout and also to the street children in Tanzania and in Africa.



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CHAPTER ONE

1. Introduction

1.1 Background Information

Despite vast improvements in global oral health, problems still persist in many communities and populations around the world, particularly among the under privileged in both developed and developing countries (Petersen, 2004). The distribution and severity of oral diseases vary in different parts of the world and within the same country or region (Petersen, 2004). Over the past decade, several countries in Africa have experienced changing patterns of oral health (Sheiham, 1984; Baelum and Fejerskov, 1986; Fejerskov et al, 1994). However, the incidence of dental caries is predicted to increase in many developing countries in Africa, particularly as a result of growing consumption of sugars and inadequate exposure to fluorides (Petersen, 2004).

The significant role of socio-behavioral and environmental factors in oral disease and health is demonstrated in a large number of epidemiological surveys (World Health Organization, 2003 a). These lifestyle factors also significantly impact on oral health, and oral diseases qualify as major public health problems owing to their high prevalence and incidence in all regions of the world (Petersen, 2004).

Dental caries and periodontal diseases have historically been considered the most important global oral health burden (Petersen and Razanamihaja, 1996). Other oral health problems include malocclusion and dental fluorosis (Akpata, 2004). Oral health is integral to general health and essential for well being. Good oral health allows us to speak, smile, kiss, touch, smell, taste, chew and swallow. Oral diseases

restrict activities in school, at work and home causing a lot of schoolwork hours to be lost each year (Mosha, 2005; Petersen, 2004; World Health Organization 2003a). The psychological impact of these diseases often diminishes quality of life (Mosha, 1994). In modern society, the most important role of teeth is to enhance appearance. Facial appearance is very important in determining an individual's integration into society. Teeth also play an important role in speech and communication. Children and adults reported impaired social functioning due to oral disease, such as avoiding laughing or smiling due to poor perceived appearance of teeth (Chen, et al 1997). Throughout the world, children frequently reported apprehension about meeting others because of the appearance of their teeth or that others made jokes about their teeth (Kelly, 2000).

In many developing countries access to oral health services are limited and teeth are often left untreated or extracted (Petersen, 2004). In Tanzania 80% of the population is affected by periodontal diseases. Dental caries affects 25-55% of the general population, while 30% of school children are affected by caries (Ministry of Health Tanzania, 1994). In Tanzania 90% of the caries remain untreated (MOH Tanzania, 1994). There is also high prevalence of (90-95%) of endemic fluorosis in regions with high fluoride levels (Mosha, 1994). The population (37 million people) in Tanzania is served by public oral health care provided by a limited number of dentists or dental assistants, either in hospitals or dispensaries. Those vulnerable in the society are carrying the burden of disease and gap between the oralhealth of the rich and poor is wider (Mosha, 2006). Restorative care is offered also by the few private dentists available (Mosha, 2006; Petersen, 1998). Institutionalised former street children in Dar es Salaam have a poor knowledge on prevention of oral diseases (Kahabuka and Mbawalla, 2006). Furthermore, children living on the streets are

more likely to eat cariogenic foods and have poor oral hygiene practices (Kahabuka and Mbawalla, 2006).

In Tanzania information on the occurrence of oral diseases in street children is not available except for one study done on oral health knowledge and practice among institutionalised street children in Dare es Salaam, Tanzania (Kahabuka and Mbawalla, 2006).

Tanzania Policy on Dental Health Care Initiatives

The National Plan for Oral Health of Tanzania (1988-2002) places emphasis on primary health care, preventive approach and community involvement (MOH Tanzania, 1994).

The strategies include:

- Providing dental services to the rural population.
- Generating new and appropriate technology.
- Retaining dental staff for preventive work.

Much emphasis will be on health education, the role of primary school teachers and other non-dental health personnel in carrying out services to the community, (MOH Tanzania, 1994). However, the National Plan for Oral Health 1998-2002 has failed to address the special groups such as street children.

1.2 Country profile

Tanzania is an east African country bordering the Indian Ocean, between Kenya and Mozambique. The population of Tanzania is 37 million people. Life expectancy is 42 years. Kiswahili is the official language. Tanzania is one of the poorest countries in the world (Dent aid, 2000).

In Tanzania the population is served by a limited number of dentists and dental therapists, either from hospital or dispensaries. The care includes mainly emergency treatment (Petersen, 1998).

1.3 Street children

Street children are a worldwide problem in the developing and developed countries, where socio-economic problems prevail. Millions of children live on city streets around the world. They are there due to several reasons ranging from family dysfunction, poverty, booming population growth, physical and sexual abuse and parental exploitation (Dwelle, 1999). Other reasons considered of importance by the United Nations Children's Fund (UNICEF) include, wars, forced displacements and death of parents, disasters and the emergence the AIDS pandemic, which has so far contributed to an estimated 10-28 million AIDS orphans worldwide (Dwelle, 1999).

UNICEF (1987) regards street children as "those who have made the street their real homes".

Bond (1993) estimated the presence of 100 million children worldwide without homes. These children are geographically distributed with 40 million in Latin America, 25 million in Asia, 10 million in Africa, 25 million in Western cities and 2

million in United States (Dwelle, 1999). Boys predominate (71-97%), but girls often have more difficulties.

Street children situation in Africa

In Africa, the trend is almost the same with more than 80 million African children lacking access to healthy shelter and about 10 million children living in the street (Bond, 1993). Kenya had about 500,000 street children (Streetman, 1995) and there were about 60,000 in Nairobi city alone (Dwelle, 1999). Pretoria city had 9,000 black street children (Le Roux, 1993).

Street children situation in Tanzania

In Tanzania, the real magnitude of the problem is not well known, although most regional towns have reported the presence of such children. For example in 1994 it was estimated that there were about 5,000 street children in Tanzania, 40% of who resided in Dar es Salaam (Lugalla and Mbawambo, 1999). The Department of Social Welfare estimated the presence of about 15,000-20,000 such children scattered all over the country, while Moshi township had about 200-250 (Mc Alpine, 2000). There are 12 registered children homes in Kilimanjaro district, 3 of them for the street children (The Department of Social Welfare, Tanzania). In Dar es Salaam there are 24 registered children homes. There are several hundred unregistered institutions in Tanzania, exact number not known.

1.4 Literature review

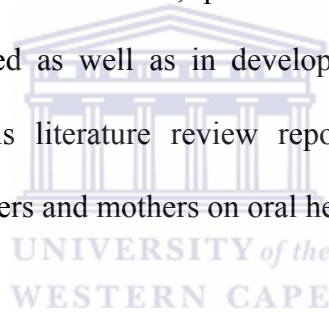
The literature was obtained via Google (Table 25) search (1980-2006), the World Health Organization Global Oral Data Bank (WHO GODB 2005) and authors name search. International articles on oral health from 1932 to 2006 were searched. Both

Tumaini University (Tanzania) library and the Western Cape (South Africa) University, library resources were used to assess the articles and abstracts. Tumaini University dissertations were also assessed.

Most of the oral health surveys in Tanzania have been sporadic and based on convenience samples (Table 22, see Appendix pg 120)

From these studies (Table 22) and few nation wide health surveys (Table23, see Appendix pg 121) it was possible to gain an insight into the country's oral health status.

This review reports on dental caries, periodontal disease, dental fluorosis, and malocclusion in developed as well as in developing countries and particularly in Tanzania. Secondly this literature review reports on knowledge, attitudes and practice of children, teachers and mothers on oral health.



1.4.1 Dental caries

Dental caries is one of the most prevalent diseases in the world (Lalloo et al, 1999). It is also one of the most prevalent infectious diseases in the world and a serious socio-medical problem (Beltran et al, 1999).

Etiology

The Latin word caries means rotteness. Dental caries is a destruction of the tooth tissue by microorganisms. It is now established that caries is a multifactor disease and results from a combination of four principal factors i.e. sucrose, bacteria (*Streptococcus mutans*), susceptible teeth and time (Newbrun, 1989).

Sucrose is the most widely used sugar and is considered as the most important factor in dental caries (Newbrun, 1989).

Global burden of caries

Since the mid 1970's reports from countries worldwide have shown that the prevalence of dental caries in children and adolescents has declined (Naylor, 1994).

The decline in dental caries in children in established market economies (EMEs) is well-documented. The EMEs include most of North America, Canada, Western Europe, Australia, New Zealand, and Japan. By the end of the 20th century, caries prevalence and incidence among 12 year olds in these regions had declined dramatically. Some of these changes are shown in Table 17. A review of caries levels in Europe between 1990 and 1995 showed "a general trend towards a further decline" (Marthaler et al, 1996; Naylor 1994).

The decrease in most developed countries can often be linked to an increase in the use of fluorides, oral health education and promotion (Petersen, 2004). In many instances, the changes in caries levels have been attributed to the use of fluorides in either toothpaste, fluoridation of water. Only a few reports tried to assess factors other than fluorides which are known to affect caries activity.

Studies in China (Fejerskov *et al.*, 1994; Wong *et al.*, 2001), India (Chawla *et al.*, 2000), Pakistan (Khan, 1992), Central America (Beltrán-Aguilar *et al.*, 1999), South America (Beltrán-Aguilar *et al.*, 1999), and Mexico (Beltrán-Aguilar *et al.*, 1999) indicative of a slower rate of caries development.

Studies of caries levels in Sub-Saharan Africa were systematically reviewed by Cleaton-Jones (2001). He reported no overall change in caries levels in 10 countries

in the region between 1988 and 1998. These studies reported caries levels in 10 of the 42 countries in the region. The mean DMFT score trend was relatively constant over time in the 11- to 13-year-old group. Analysis of the data indicates DMFT averages of 1.0 and 1.5 in the mid-1980s and even lower averages in later years, although the overall trend in the region is for no change.

Other longitudinal study done by Laloo et al (1999) and Fracken et al (1986) also revealed low dental caries prevalence in East Africa in relation to low consumption of refined sugar.

The data presented in table 17 (Appendix pg 117) are compiled from individual studies and reviews. The results are not always based on nationally representative samples: Some are based on regionally representative samples and others on local samples. These data should therefore be interpreted with the *proviso* that they reflect the best available data for the regions in question at this time. They do not reflect what is happening among relatively deprived groups (example street children) in populations or among ethnic minorities. However, in many cases, the trends in a region are supported by more than one study.

Tanzanian studies

The WHO Oral Health Data Bank (2005) and other surveys (Laloo et al, 1999; Mosha , 1994; Nithila et al, 1998) indicate that the dmft, DMFT (5-7 years, 12 years and 18 years age group) level in Tanzania is very low between 0.7 - 0.3 (Table 18).

Ruth (2006) conducted a study on children aged 12 year olds (n=367) in Kinondoni municipality, Tanzania, found prevalence of 33% from dental caries. Concluded that the prevalence of dental caries among 12 year olds in Kinondoni municipality, Dar es

Salaam is constant as it was 20 years ago (32-35%). She concluded that the relatively low prevalence of caries is associated with low consumption of refined sugars.

In this study Ruth (2006) did not measure the fluoride levels of drinking water which may have contribute to dental caries levels in this study. Children living in naturally fluoridated areas had significantly lower caries scores than children in non-fluoridated (Frencken et al, 1986). In this study inter examiner reproducibility was high (95-97%). Use of day light during examinations could have resulted in an underestimation of dental caries. Regarding validity, the sampling technique employed was random in this study.

Petersen and Omar (1998) conducted a study on school children aged 6 years (n=259) and 12 year olds(n=226) in Zanzibar, Tanzania found that 2.1 (6 years olds) dmft and 0.7 DMFT (12 year olds) and the prevalence was higher in urban than rural.

Further more, no effects were observed when consumption of sugary items were introduced as independent variable.

They concluded that the consumption of sugary items among Zanzibar children is relatively low and in agreement with previous observations among children of Tanzania (Normak and Mosha, 1989).

In this study inter examiner consistency of recording dental caries was sufficiently high (kappa higher than 0.85). Use of day light during examinations could have resulted in an underestimation of dental caries. In this study representative focal points of urban, peri-urban and rural areas were identified. All variables in relation to dental caries (oral health knowledge, attitude, oral health behavior of the children and mothers were tested, dental visits, daily use of brush, help from mother in daily tooth cleaning) were assessed and level of fluoride in the drinking water was analyzed. In the light of the high participation rates and the size of the sample the survey results

were considered relevant at national level. Petersen and Omer did not give the probable reasons for the observed difference of DMFT between rural and urban population.

Mosha (1994) found dental caries affected the primary dentition of one third to one fourth of the 5-6 year olds (n=6035) and mean dmft was less than 1.0. DMFT for 12 year olds was also low (< 1.5). The F component was negligible in all age groups. Treatment need was mainly simple fillings and extractions. He concluded that the oral health situation in Tanzania is better than that foreseen in the goals for oral health in Tanzania in the year 2002. Mosha did not given any reason for lower F component. The observed low F component may be due to lack of resources as it was observed by Petersen and Omer in Tanzania.

In this inter-examiner consistency of recording dental caries was considered sufficiently high. However, the use of daylight during examination of dental caries could have resulted in an underestimation of dental caries. In the light of the high participation rates and the size of the sample the survey results were considered relevant at national level. In this study Mosha (1994) did not measure other variable that could have attributed to lower caries prevalence, dental visits and socio-economic factors which could have contributed to the low prevalence of dental caries. However the results of the study are consistent with other studies done in Tanzania (Frencken et al, 1985; Kerosuo et al, 1986)

Kerosuo et al (1986) found that pupils in primary schools (n = 640), aged 12-18 year olds, two-thirds of the children examined were caries-free. Boys had significantly lower DMFT scores than girls, 0.7 and 1.2, respectively. He concluded that, there are no signs of an alarming caries problem in Dar es Salaam. Kerosuo et al in their study did not measure the difference in attitude and behaviors towards oral hygiene and

dietary habits (consumption of sugary items, dental visits, and brushing habits) between boys and girls which could have contributed to this phenomenon.

Bloch et al (1989) from their study in a rural community in Morogoro region, south-eastern Tanzania found relatively low prevalence of caries (n=346) in children aged from 1 year to 15 year olds. In permanent dentition 74.3% were caries free while DMF index averaged 0.43. Permanent dentition showed a constant increase in caries prevalence with age such that over half of 15 year old children had caries experience with a DMF index of 1.2. He concluded that this relatively low prevalence of caries is associated with low consumption of refined sugars. In this study Bloch et al did not measure the fluoride levels in drinking water and children's dental visits which could have contributed to lower DMF levels.

Frencken et al (1985) found geographic difference (urban and rural) for DMFT scores in Morongo district of Tanzania. DMFT scores of the 7 and 9 years old urban and rural children (n 763) were 0.27, 0.35 and 0.04, 0.23, respectively. The results of the study show that the child population higher caries prevalence in urban than in rural children.

In this study, intra-examiner reliability was assessed by duplicate examinations and found to be satisfactory ($\kappa = 0.96$).

A problem arising from this study might be that, Frencken et al, did not take into account some potentially confounding variables, permanent residence of the children and their place of birth. The children may well have lived in other areas and migrated to Urban area. Other limitations in these studies, difference between rural and urban children's attitude, behavior and practice towards oral hygiene, (frequency of consumption of sugary items, oral hygiene practices and their dental visits) which

could have contributed to the difference of dental caries. The use of daylight during examination of dental caries could have resulted in an underestimation of dental caries.

Most of the studies on dental caries (Frencken et al,1985; Kerosuo et al, 1986; Mosha, 1994; Ruth 2006) in Tanzania were conducted at Dar es Salaam or Morogoro district which could have resulted in sampling bias. There was no single report on the finding of a proximal caries or root caries in primary teeth or permanent teeth. The results are always based on representative samples (school children) and others on local samples. They do not reflect what is happening among relatively deprived groups in populations (example street children) or among ethnic minorities.

Detection of tooth decay with radiographs, to detect caries not visible on visual or diagnosis of proximal caries assisted by using fiber-optic trans-illumination were not done in any of these studies in Tanzania, which could have given more specificity for these results. Petersen and Razanamihaza, (1996) found an escalating prevalence of dental caries, particularly, in those countries where preventive oral care programmes have not established. This trend is not found from the Tanzanian studies on dental caries. In many instances, the changes in caries levels in developed countries have been attributed to the use of fluorides toothpaste, water fluoridation and oral health promotion. In Tanzania water fluoridation was not introduced in those areas where natural fluoride levels were low in drinking water. Studies in Tanzania revealed the F component was negligible in all age groups no reason was given. We assume that it could be due to lack of resources or un-affordability of the community for dental treatment. From this review it is evident that the DMFT levels in Tanzania are within the National Oral Strategic Objective (Ministry of Health, Tanzania, 1994) of not more than 1. This relatively low prevalence of caries in Tanzania may be associated

with low consumption of refined sugars (Tanzania 4.8kg/per year/2002; WHO 2003 b). Sundin et al (1992) found a strong correlation between caries increment and the consumption of sweets. The relationship was strongest for those with poor oral hygiene (+0.51) compared with good oral hygiene (+0.11). Different fluoride exposure should also be considered in this respect.

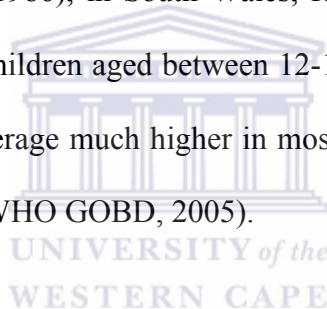
The decline in dental caries in children in established market economies. But in Tanzania (Dar es Salaam and Morogoro studies) it is constant as it was 20 years ago (32-35%). It implies that, the research, use of fluoride and oral health promotion in market economies brought a change in DMFT level. In Tanzania though the Government of Tanzania insists on health promotion and oral health education in primary school, it could not bring down any decrease in DMFT levels which need further research. Other issue of ethical importance is during last 24 years, researches are probing the cavities of teeth for examination of dental caries. From these research papers there is no evidence of restorations done for those children, after probing the teeth for dental examination. Additionally, probing is an invasive procedure that transmits cariogenic microorganisms to other teeth within the same oral cavity (Ekstrand et al, 1987).

1.4.2 Periodontal Status

Gingivitis and periodontitis are the two major forms of inflammatory diseases affecting the periodontium. Periodontal disease is usually chronic in nature and has a high prevalence in the entire world (American Academy of Periodontology, 1999). Their primary etiology is bacterial plaque, which can initiate destruction of the gingival tissues and periodontal attachment apparatus (AAP, 1999). Therefore, regular and constant thorough removal of plaque from margins of the gums on

lifetime basis is the chosen method for prevention of periodontal diseases including gingivitis (Higgins, 1985).

Detailed information on periodontal conditions is available from WHO GOBD 2005. The Community Periodontal Index of Treatment Need (CPITN), periodontal profiles have provided an insight into the magnitude of the periodontal disease problem on a world scale, its prevalence and severity, at least up to an age of around 60 years. In adolescents bleeding on probing, calculus and pocketing of 4 or 5 mm deep are the most frequently observed conditions (Dabora Pallos et al, 2005). De Almeida et al, (2002) in Portugal school children; Wang et al,(2002) in China; Bjarnson et al(1995), in Latvia; Addy et al (1986), in South Wales, found gingivitis and calculus were most frequent in school children aged between 12-15 year olds. It is evident that the level of calculus is on average much higher in most developing countries than in the industrialized countries (WHO GOBD, 2005).



Tables 19 (Appendix pg 119) and table20 (Appendix pg119) show the periodontal scores for some developed and developing countries. From table19 and 20 (Appendix pg 119) it is evident that bleeding calculus and periodontal pockets were present in all the groups, indicating that periodontal diseases affected all nations.

Timmerman and Van Der Weijden (2007) reviewed literature concerning risk factors for periodontitis. Several possible risk factors for the initiation and progression of periodontitis have been identified: age, gender, plaque, calculus, existing attachment loss. A consistent finding appears to be genetic predisposition for the development of the disease. In terms of microbiology, several micro-organisms have been identified. The results of the Java Project on natural development of periodontal disease clearly pinpoint *Actinobacillus actinimycetemcomitans* as being associated with the onset of

disease. The presence of sub gingival calculus was found to be associated with onset and dental plaque with progression of disease. Consistent with literature males are more susceptible to disease.

Björn Klinge, Anders Norlund (2005) conducted a systematic review to ascertain whether socio-economic conditions increase the risk of periodontal diseases for the period 1965–April 2004. Forty seven studies were analyzed regarding the outcome of the association between socio-economic variables and periodontal disease (cross-sectional survey or longitudinal case–control). They concluded that the socio-economic variables associated with periodontal diseases appear to be of less importance. As a local factor the presence of sub gingival calculus was found to be associated with the onset and dental plaque with the progression of disease

Periodontal Status in Tanzania

Ruth (2006) conducted a study on 12 year olds primary school children at Kinondoni municipality in Dar es Salaam, found 75% prevalence of gingivitis in this group of children. Boys had higher (77.5%) prevalence of gingivitis than girls (73.4%). In this study CPITN index was used to record periodontal conditions. The prevalence of gingivitis among the study group children is 75%. Ruth did not establish reason for high prevalence gingivitis in boys than girls. Boys had higher percentage of dental visits (71%) than girls (58%). Boys had higher percentage (37%) of teeth cleaning frequency than girls (35%). Intra-examiner reproducibility in this study was 95-97%.

Petersen and Omar (1998) conducted a study on school children (age 12 year olds) (n=226) in Zanzibar (Tanzania) observed 98 percent of the children (age 12 year olds) had maximum scores 1 or 2 and the mean number of 4.3 sextant with gingival bleeding and /or calculus. There was no difference between rural and urban children.

Validity and reliability were tested using previous methodology (Petersen, 1989) and found to be higher (Kappa higher than 0.85). In this study CPITN index was used to record periodontal conditions.

Petersen concluded that the standard oral hygiene and preventive knowledge is poor in this group of children which could have contributed to periodontal conditions and recommended tooth cleaning habits need to be improved.

In this study Petersen and Omer (1998) studied all factors in relation to periodontal conditions (brushing habits, knowledge of mothers on prevention and causes of oral diseases). Validity and reliability in this study were satisfactory.

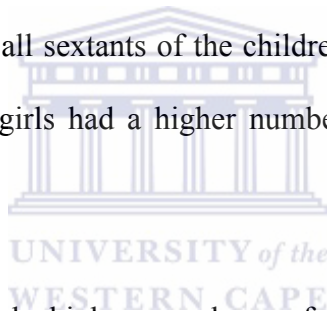
Mumghamba et al (1995) in assessing risk factors for periodontal diseases in Ilala, Tanzania, (n = 1764; 827 males and 937 females) reported that the most significant risk factors for periodontal diseases were age, sex, education and rural residence. Mumghamba et al (1996), in another study (n=647) found a high prevalence of (90%) periodontal disease among 12-18 year olds in Ukonga, Dar es Salaam, Tanzania. Mumghamba et al (1996) remarked that the estimated treatment needs in Tanzania beyond the capacity of the countries dental services. Cutres and colleagues (1987) have cautioned that the CPITN treatment need indicators should not be literally interpreted. The treatment indicators are only intended to serve as a guide regarding the quantity and complexity of periodontal care needed.

Mosha (1994) in a study among children (n=6035) aged between 5 to 18 years in Tanzania found most sextants in all age groups were affected by bleeding or calculus.

Lembariti et al (1988) conducted a study to assess the prevalence and severity of periodontal conditions among 809 adults age between 12-18 year olds in Morogoro District, Tanzania. The prevalence of plaque (99.6%), calculus (95, 7%) and

gingivitis (93.8%) among them was high. The mean number of teeth per person with pockets between 3.5 and 5.5 mm was 3.5 for the urban and 4.2 for the rural population. Pockets of more than 5.5 mm were found on average in 0.1 (urban) and 0.2 (rural) teeth per person. There were no statistically significant differences found in periodontal conditions between urban and rural adults. The study suggests that high prevalence of plaque, calculus and gingivitis at a young age.

Kerosuo et al (1986) found a high prevalence of periodontal problems among teenage school children (n=640) aged 12-18 year olds in Dar es Salaam, Tanzania. Ninety percent of children showed early signs of gingivitis and when assessed by the CPI showed that over 50% of all sextants of the children were affected. In the older age group (15–18 year olds) girls had a higher number of periodontal healthy sextants than boys



Frencken et al (1985) found a higher prevalence of gingivitis in rural (61%) compared to in urban (55%) Tanzanian children (n 763) aged between 7 to 9 years.

It has also been documented in the National Plan for Oral Health 1988-2002, that periodontal disease is the most common oral disease in Tanzania.

Studies from Tanzania found, several possible risk factors, for the initiation and progression of periodontitis have been identified: age, gender, plaque, calculus and males are more susceptible to disease.

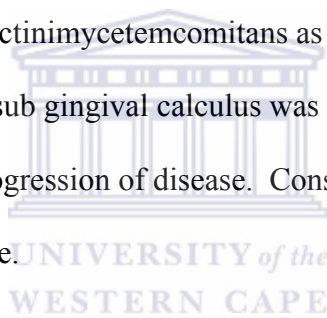
Gender as a risk factor for periodontitis: Ruth (2006); Mumghamba et al (1995); Kerosuo et al (1986) found from their studies, the boys had higher prevalence of gingivitis than girls. These is consistent finding in all national surveys in the USA that periodontal disease is more prevalent in males than in females (US Public Health

Service, 1965). Risk analyses of periodontitis in other populations are not unanimous about gender as a risk factor (Umeda et al, 1998). But, like in the USA, if a significant association is reported, males most often show a higher risk than females. Reasons for this have not been explored in detail, but are thought to be more a matter of differences in behavior than in genetic background (Position Paper of the American Academy of Periodontology 1996).

Rural residence as a risk factor for periodontitis: Frencken et al, 1985; Lembariti et al, 1988; Mumghamba et al, 1995 found, higher prevalence of gingivitis in rural compared to in urban, where as Petersen (1998) found no difference between rural and urban children in Zanzibar, Tanzania. Socio-economic status historically has been found to be related to gingivitis and poor oral hygiene (US Public Health Service 1979). This does not hold true for periodontitis (Miller et al 1987). Both in developing countries (Wertheimer et al 1967) and in industrialized countries (Grossi et al 1994) it was found that lower socio-economic status was not associated with severity of periodontitis. It is not clear how other factors like true genetic racial/ethnic influence and cultural factors confound in this multifaceted variable. Rural residence may be a confounding factor but may not be a risk factor.

Age, plaque, calculus, gingivitis as a risk factor for periodontitis: Mumghamba et al (1995); Kerosuo et al (1986) from their studies in Tanzania reported that the risk factors for periodontal diseases was age, plaque and gingivitis. In other studies done in US revealed that the prevalence and average severity of periodontitis, increased with age for groups of individuals until virtually all middle-aged people had the disease (Scherp 1964). Where as oral hygiene measures correlate well with gingivitis, many cross-sectional studies show a poor correlation between levels of plaque and supra-gingival calculus and periodontitis (Baelum et al 1986). Most studies have

found that periodontitis affects a significant number of individuals before the age of 20 years and affects the majority of the adult population after the age of 35–40 years (Scherp, 1964). While a large proportion of the population is susceptible to periodontitis, it appears that there is a small segment of the population that is susceptible to severe forms of periodontitis. As is apparent from all these studies, variables that have been suggested as possible risk factors for periodontal disease are not unanimously found to be so. The complex, multifaceted structure of these variables and their confounding influence on the multifactorial disease process of periodontitis may be the reason for the difficulty to assess the quality and quantity of the effects of these factors. Natural development of periodontal disease clearly pinpoints *Actinobacillus actinomycetemcomitans* as being associated with the onset of disease. The presence of sub gingival calculus was found to be associated with onset and dental plaque with progression of disease. Consistent with literature males are more susceptible to disease.



There are no studies done on genetic predisposition to periodontal disease in Tanzania. Timmerman and Van Der Weijden (2007) in their review found genetic predisposition for the development of periodontal disease.

Age sex and plaque are confounding factors but may not be the risk factors.

Last two decades the prevalence of periodontal conditions stands at the same higher-level in Tanzania (80%-90% prevalence). From these studies it is evident that there is no difference from previous studies done from two decades on periodontal conditions, though government of Tanzania insists on oral health promotion in primary schools. There is no clear literature from Tanzania on procedure and precautions like antibiotics, antiseptic mouth washes, the researchers advised to the children after,

probing gingiva with periodontal probe for gingival bleeding, sub gingival calculus and/or periodontal pockets. Periodontal destruction acknowledges relation ship between the microbial plaque and the inflammatory reaction of gingiva (Mosha 2006). However, the disease is considered to progress in relatively short episodes of rapid tissue destruction, sometimes followed by repair and mostly by prolonged periods of quiescence (Mosha 2006). By probing the gingiva the researchers created an inflammation on the tissue which may be quiescent from a prolonged period. There is no evidence in literature from Tanzania, whether they performed scaling for all these children or left the children without prophylaxis, which could lead to further progress of gingivitis. Further research need in this field.

WHO (2005) data confirm the high prevalence of periodontal problems in Tanzania.

1.4.3 Fluorosis

Laboratory research suggests that fluoride is most effective in caries prevention when a low level of fluoride is constantly maintained in the oral cavity (Denbesten, 1999). The decline in dental caries prevalence and incidence in the last two decades is considered to be largely due to the widespread use of fluoride (Petersen, 2004), however, the prevalence of dental fluorosis has increased simultaneously. The increase is in the mild and very mild forms of fluorosis, both in fluoridated and non-fluoridated areas. Multiple sources of fluoride intake have been identified. Four major risk factors have been consistently identified: use of fluoridated drinking water, fluoride supplements, fluoride dentifrice and infant formulas. In addition, some manufactured children's foods and drinks may also be important contributors to total daily fluoride intake (Denbesten, 1999). Dental fluorosis has been recognized since the turn of the century with high exposure to naturally occurring fluoride in drinking water. Dental fluorosis is a fluoride-induced disturbance in tooth formation, which

results in hypo-mineralized enamel with increased porosity (Fejerskov et al, 1990; Fejerskov et al, 1991). It is caused by excessive fluoride intake but only during the period of tooth development (Dean et al, 1942). The effect of fluoride on enamel crystal surfaces which could reflect changes in the nature and distribution of growth sites and/or in mineral-matrix interactions. These would be expected to affect crystal growth during maturation, resulting in the characteristic porous appearance of fluorotic lesions in mature teeth. The enamel of permanent teeth is affected by mottling and brownish discoloration and, in severe cases, pitting of the surface and chipping of the edges of teeth may occur (Fejerskov et al, 1990; Fejerskov et al, 1991).

Indices for dental fluorosis

The two most widely used indices in diagnosing dental fluorosis are Dean's index (Dean, 1934) and Thylstrup and Fejerskov's index (Thylstrup et al, 1991).

The dental fluorosis in East Africa

Fluorosis is endemic in at least 25 countries across the globe (UNICEF, 2005).

One study on school children (n=513) in Nairobi reported the association between fluoride levels in water and fluorosis (N'gang'a, 1993). The Thylstrup and Fejerskov's index (TFI) was used in dental assessment. Prevalence of fluorosis in 13-15 year olds in permanent dentition was 76%. No significant gender difference was observed in the prevalence or severity of dental fluorosis. The severity of fluorosis was higher in children drinking groundwater supplies (boreholes) compared with children drinking surface water.

A study done by Manji et al (1986) to assess fluorosis in Kenyan children (n= 317) aged 11-15 year-olds. Fluoride concentrations of all sources of drinking water among 3 areas (Area A1 and A2, Area B) were monitored, over one year period. The

prevalence of dental fluorosis was 93.8% of children in Area B (0.54-0.93 mg/l F), 91.2% in Area A2 (0.53-0.66 mg/l F) and 78.0% in Area A1 (0.10-0.46 mg/l F). From the lowest fluoride area to the highest fluoride area, the prevalence and severity of dental fluorosis increased (Manji et al, 1986). The most probable explanation for the observations by Manji et al (1986) is a positive association between annual maximum temperatures and total fluoride intake.

Wondwossen et al (2004) conducted a study in Ethiopia on dental fluorosis among 12-15 years- old children (n=306), selected from areas with moderate (0.3-2.2 mg/l), and high (10-14 mg/l) fluoride concentrations in the drinking water. The prevalence of dental fluorosis was 91.8% (moderate fluoride area) and 100% (high fluoride area).

Similar findings were observed in a study done in Uganda by Muller et al (1970). The study covered four districts in Ugandan (n=1366) and found that the severity of dental fluorosis increased with increasing fluoride concentration levels in drinking water.

In conclusion these studies have shown that fluorosis is endemic in areas across the Rift Valley and reported a positive association between fluoride levels in drinking water and severity and prevalence of fluorosis.

The prevalence of dental fluorosis in Tanzania

Awadia et al (2000) conducted an analytical cross-sectional retrospective study to compare the prevalence of dental fluorosis between, vegetarian and non-vegetarian children and adolescents, living in an area where dental fluorosis is endemic. Children (n = 165) aged 6-18 years, from five schools in Arusha town were examined. The children had a life-long exposure to drinking water with 3.6 mg /l F. The severity of dental fluorosis was assessed using the Thylstrup and Fejerskov Index (TFI). From

their study they found that, in the vegetarian group (n = 24), the prevalence of dental fluorosis (TFI score ≥ 1) was 67%, while 21% had severe fluorosis (TFI score ≥ 5). In the non-vegetarian group (n = 141) the prevalence of fluorosis and severe fluorosis was 95% and 35%, respectively. In bi-variant correlation analyses age, non-vegetarianism and a series of other factors related to childhood nutrition (meals per day, the use of home-made porridge, the use of fish, etc.) were significantly associated with the prevalence of dental fluorosis (TPF, $P < 0.05$).

Problems arising may include variation between dental assessments due to intra-examiner error and place of birth/traveling of the children included as they may not have always used the water source tested. However they observed significant satisfactory intra-examiner reproducibility after re-examinations of a proportion of children.

The study also observed that *magadi* consumption is not significant risk factor for dental fluorosis. In contrast, many studies have found that this is not the case. Random sample was not used in this study.

Yoder et al (1998) examined (using TFI) two hundred eighty-four Tanzanian children ages 9 to 19 (mean 14.0 \pm SD 1.69), to identify risk factors for dental fluorosis that cannot be explained by drinking water fluoride concentration alone, who were lifetime residents at differing altitudes (Chanika, 100 m; Rundugai, 840 m; and Kibosho, 1,463 m; Sites 1, 2, and 3 respectively) were examined for dental fluorosis and caries. They were interviewed about their food habits, environmental characteristics and use of a fluoride-containing food tenderizer known locally as *magadi*. Meal, urine, water and *magadi* samples supplied by the participants were analyzed for fluoride content. Urine samples were also analyzed for creatinine

concentration. Four *magadi* samples from Sites 1 and 3 were analyzed for complete element composition. Of the 13 water samples from Site 2, 10 contained \geq 4 mg/L F, ranging from 1.26 to 12.36 mg/L with a mean \pm -SD of 5.72 \pm -4.71 mg/L. Sites 1 and 3 had negligible water fluoride of 0.05 \pm -0.05 and 0.18 \pm -0.32 mg/L respectively. Mean TFI fluorosis scores (range 0-9) for Site 2 were high: 4.44 \pm -1.68. In Sites 1 and 3, which both had negligible water fluoride, fluorosis scores varied dramatically: Site 1 mean maximum TFI was 0.01 \pm -0.07 and Site 3 TFI was 4.39 \pm -1.52. Urinary fluoride values were 0.52 \pm -0.70, 4.34 \pm -7.62, and 1.43 \pm -1.80 mg/L F at Sites 1, 2, and 3, respectively. Mean urinary fluoride values at Site 3 were within the normal urinary fluoride, reference value range in spite of pervasive severe pitting fluorosis. Meal and *magadi* analyses revealed widely varied fluoride concentrations. Concentrations ranged from 0.01 to 22.04 mg/L F for meals and from 189 to 83211 mg/L F for *magadi*. Complete element analysis revealed the presence of aluminum, iron, magnesium, manganese, strontium and titanium in four *magadi* samples. There were much higher concentrations of these elements in samples from Site 3, which was at the highest altitude and had severe enamel disturbances in spite of negligible water fluoride concentration. An analysis of covariance model supported the research hypothesis that the three communities differed significantly in mean fluorosis scores ($P < 0.0001$). Controlling for urinary fluoride concentration and urinary fluoride: urinary creatinine ratio, location appeared to be significantly affected fluorosis severity. Urinary fluoride: urinary creatinine ratio had a stronger correlation than urinary fluoride concentration with mean TFI fluorosis scores ($r = 0.43$ vs $r = 0.25$). In conclusion the severity of enamel disturbances at Site 3 (1463 m) was not consistent with the low fluoride concentration in drinking water, and was more severe than would be expected from the subjects' normal urinary fluoride values. Location,

fluoride in *magadi*, other elements found in *magadi*, and malnutrition are variables which may be contributing to the severity of dental enamel disturbances occurring in Site 3. Altitude was a variable which differentiated the locations.

It has been reported that fluorosis is aggravated by hypobaric hypoxia in populations exposed to high-altitudes (Irigoyen et al 1995). Mottling unrelated to fluoride exposure has been suggested to be due to malnutrition, metabolic disorders, exposure to certain dietary trace elements, and widespread introduction of tea drinking among children at very early ages (Cutress and Suckling 1990). At high altitudes iodine deficiency and goiter occurrence is much more severe. Zhao et al, (1998) found iodine deficiency potentiates the toxic effects of fluoride

Thus, fluoride balance and tissue concentrations and the risk of fluorosis are increased by factors such as residence at high altitude.

Limitations of the study may include sampling, as a random sample was not selected. However all of the sample were born and raised in the areas of study. In terms of examination error, intra-examiner reproducibility scores were satisfactory.

Mosha (1984) conducted an oral health survey on children (n=2026) aged between 5 to 19 years in urban areas of Arusha and Moshi in Northern Tanzania. Deans index (DI) was used to diagnose dental fluorosis among respondents. Most children exhibited fluorotic changes in the permanent dentition to a degree, which seemed cosmetically unpleasant.

Use of specific dietary substances

Awadia et al (1999) compared two communities, in Kibosho and Moshi with similar drinking water fluoride concentrations. A cross-sectional study of 143 children aged

10-14 years was carried out to identify factors associated with the severity of dental fluorosis in 2 areas Moshi (n = 63), Kibosho(n=80) with fluoride (F) concentrations < 0.4 mg F/L in the drinking water. Dental fluorosis was recorded under field conditions using the Thylstrup and Fejerskov index (TFI). The prevalence of dental fluorosis in Moshi (TFI score \geq 1) was 60% and (TFI score \geq 5) it was 10%. The corresponding values in Kibosho were 100% and 34%, respectively. In Moshi and Kibosho, 65% and 97% of children, respectively, used *magadi*- a fluoride-containing food tenderizer. In Moshi, the risk of having TFI score \geq 2 was significantly higher among users of *magadi*. *Kiburu* a traditional homemade weaning food (porridge) cooked with *magadi*, was used only in Kibosho. Users of *kiburu* (36%) were at significantly higher risk (OR = 3) of developing fluorosis at severity TFI \geq 4 than the users of *lishe*-another type of weaning food. All children in Moshi and 64% in Kibosho used *lishe*, which is cooked without *magadi*. *Magadi* and *kiburu* were significant risk factors. Thus, it seems that the unexpectedly high prevalence of dental fluorosis and the observed differences in fluorosis prevalence and severity may be partly explained by F exposure from *magadi*.

Awadia et al did not consider altitude within this study which may have contributed to the explanation of the surprisingly high fluorosis levels. In terms of dental assessment error, intra-examiner reproducibility was measured and found to be acceptable. Van Palenstein et al (1997) in their study on 12 to 17 years-old Tanzanian children found severe fluorosis in areas where *magadi* was used.

In conclusion the main associated factors affecting fluorosis in East Africa include high fluoride content in drinking water, *magadi* and altitude, as potential risk factors.

1.4.4 Malocclusion

Malocclusions of teeth are significant variations from the normal range of growth and morphology. In contrast to disease and pathological lesions, malocclusion may be the result of a combination of minor variations from the normal; each abnormality is too mild to be classed but their combination summates to produce a clinical problem (Moyers, 1988). Furthermore, malocclusion has a large impact on individuals and society in terms of discomfort, social and functional limitations (Sheiham, 1984; 1993).

According to Helm (1997) the aim of epidemiologic studies on malocclusion is to describe and analyze the prevalence and distribution of malocclusion in various populations, the ultimate goal being to identify the etiology.

Epidemiology of Malocclusion

Abundant epidemiologic data relating to malocclusion have been compiled over last century, but the epidemiology has been lingering at the descriptive stage. The present knowledge of the epidemiology for occlusal anomalies includes the following: general agreement exists that malocclusion has a multifactorial etiology and that the two basic categories are generic and environmental (Buden, 1994); environmental factors include digital and dummy-sucking habits, trauma, dental diseases leading to tooth loss and food quality, the latter influencing the degree of attrition of the teeth (Ng'ang'a, 1991). There are several methods, both qualitative and quantitative that can be used to evaluate, describe and classify malocclusion (Tang and Wei, 1993).

The provision of orthodontic treatment has been justified on the grounds of potentially improving dental aesthetics, dental health, occlusal functioning, and

psychosocial adjustment. Occlusal aims include the creation of the six keys of ideal occlusion as presented by Andrews (1972)

Epidemiology of Malocclusion defined by Dental Aesthetic Index (DAI) and Occlusal Index of Summers in Africa.

Otuyemi et al (1999) investigated the distribution, prevalence and severity of malocclusion and treatment need amongst randomly selected (n=703) rural and urban Nigerian children, aged 12-18 years (mean age 14.0 ±1.8) using the DAI. They also assessed whether malocclusion was affected by age, gender and socio-economic background. Seventy four percent of the children had a dental appearance that required no orthodontic treatment. Over 13 per cent fell into the group where treatment for malocclusion was considered to be 'elective', 9.2 % of the population had severe to handicapping malocclusion where treatment was 'highly desirable' or 'mandatory'. There were no statistically significant difference in DAI scores between age groups, gender and socio-economic background.

Van Wyk et al (1985) found that urban children from the Eersterust Township of Pretoria, South Africa, 56% had good occlusions or slight malocclusion and 44% per cent required minor to definite orthodontic treatment using the Occlusal Index of Summers.

Malocclusion in Tanzania

Rwakatema, (2006) conducted a study to assess the malocclusion, two hundred and eighty nine randomly selected primary school children (153 males and 136 females aged 12-15 years) in Moshi northern Tanzania using Bjork's criteria. Found the overall prevalence of malocclusion was 97.6%. Angle's Class II and III malocclusion

occurred in 6.9% and 11% of the sample respectively. Crowding was encountered very frequently in both jaws, especially in the lower anterior segments. Anterior open bite occurred in 6.2% and the deep bite in 10.7% of the sample. There was no significant gender difference in either the overall prevalence of malocclusion or in the occurrence of the different occlusal traits. He concluded it was noteworthy that some of the malocclusion traits recorded were relatively minor deviations from the normal occlusion. Hence the high prevalence of malocclusion did not necessarily imply a heavy burden of need and demand for orthodontic treatment.

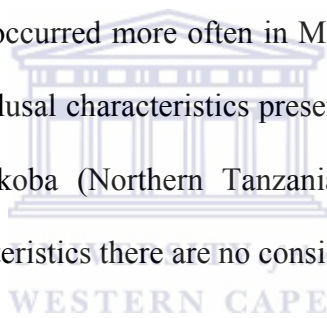
Mugonzibwa et al (2004) from their study in assessing the opinions of Tanzanian children on dental attractiveness and their perceptions of orthodontic treatment need in relation to their own dental attractiveness as measured by the aesthetic component (AC) of the index of orthodontic treatment need (IOTN). In a random sample of 386 school children (48% boys, 52% girls), aged 9 to 18 years, the subjective need was assessed by using a pre-structured questionnaire, and attractiveness was scored by using 18 intra-oral frontal photographs. Orthodontic treatment need was measured with the IOTN, and 11% of the children definitely needed orthodontic treatment (grades 8-10 of the AC with 4-5 of the dental health component [DHC]). The AC indicated that 11% of the children needed orthodontic treatment, whereas the DHC indicated 22%. Although 38% of the children said they needed treatment, 33% and 31% were unhappy with the arrangement and the appearance of their teeth, respectively. Most children (85%) recognized well-aligned teeth as important for overall facial appearance. Photographs showing severe deviations including crowding were regarded as the most unattractive, with older children tending to dislike them the most ($P < .0005$). This suggests that, from the children's point of view, grades 8-10 of

the AC and 4-5 of the DHC could be given the first priority when considering an orthodontic treatment policy in Tanzania.

Mugonzibwa et al (1992) undertook a study (n= 643) on Tanzanian children from urban district of Ilala, Dar es Salaam, they found the aesthetic treatment need (AC grade 8-10) and dental health component (DHC grades 4-5) occurred in 5-15% and 16-36% of the studied children, respectively. The need measured by DHC increased significantly with age. While about 3-19 % of the children had distal occlusion (Angle's class 2), medial molar occlusion (Angle's 3) was rare, occurring in 1-3% of the children. The most prevalent severe occlusal feature placing the children in the great need category was cross bite.

Mugonzibwa (1990) from their study to investigate the frequency of occlusal and space characteristics in (Bukoba and Moshi), two towns in North-Western and Eastern parts of Tanzania (n=547). The entire sample consisted of 47% boys and 53% girls. Angle's and Foster's classifications were used in the study. Sagittal, vertical and transversal occlusion variables were included in the classification. Most of the children had Angle's class I in both townships. No child had distal occlusion in Bukoba but 8% of the school children had Angle's class III which was present in only 5% of the Moshi children. The most prevalent occlusal anomalies in both populations were large overjet and deep bite (greater than or equal to 3.5 mm), the prevalence of which was significantly higher in Moshi. Open bite also occurred more often in Moshi girls than Bukoba girls. No child had scissors bite in Moshi. Open bite and scissors bite in Bukoba girls and cross-bite in Moshi girls were rare. Diastema mediale prevailed mostly in the maxilla in the whole sample. About one fifth of the whole sample had crowding. The results suggest that different occlusal and space characteristics are present in Bukoba and Moshi children.

Mugonzibwa et al (1992) from his study in Ilala, Dar es Salaam found 3-19 % of the children had distal occlusion (Angle's class 2), medial molar occlusion (Angle's 3) was rare, occurring in 1-3% of the children where as Rwakatema (2006) from his study in Moshi found 11% of the sample had Angle's III malocclusion and class II occurred in 6.9%. Mugonzibwa et al (1992) found the most prevalent severe occlusal feature placing the children in the great need category was cross bite. Rwakatema (2006) in Moshi found crowding was very frequently in both jaws, especially in the lower anterior segments. Mugonzibwa (1990) from his previous study in Moshi found open bite also occurred more often in Moshi girls. cross-bite in Moshi girls were rare, prevalent occlusal anomalies in Moshi populations were large overjet and deep bite Open bite also occurred more often in Moshi girls. From these studies it is evident that different occlusal characteristics present in same Moshi children. When compared to Moshi, Bukoba (Northern Tanzania) and Dar es Salaam different occlusal and space characteristics there are no consistent findings in these studies.



Treatment categorizations using the Dental Health Component and the Aesthetic Component can be contradictory, with one component suggesting treatment and the other suggesting no treatment. The hierarchical structure of Dental Health Component requires a separate protocol when only study models are available.

The IOTN indices have been validated against UK dental opinion (Richmond et al., 1995) and thus may not be representative. The ICON has relatively lower predictive accuracy for the treatment outcome than for treatment need judgments. This is due to the much lower level of inter-examiner agreement in decisions of treatment acceptability (Richmond and Daniels, 1998).

Mugonzibwa et al (2004). From their study in assessing the opinions of Tanzanian children on dental attractiveness and their perceptions of orthodontic treatment need in relation to their own dental attractiveness, 38% of the children said they needed treatment, 33% and 31% were unhappy with the arrangement and the appearance of their teeth, respectively. Most research suggests that patients seek treatment principally for aesthetic improvements (McKiernen et al, 1992) and that the principle benefits perceived by patients post-treatment are related to aesthetics (Albino et a., 1994).

Psychological aspects have also been cited as justification for treatment, but patient perceptions of their malocclusion are frequently disproportionate to the objective signs of the malocclusion (Shaw et al, 1975). Many younger patients are brought for treatment by parents who may be seeking the treatment for reasons other than the child's malocclusion (Pratelli et a., 1998) though the children may well reflect their parents perceived concerns (Lewit and Virolainen, 1968).

1.4.5 Oral health Knowledge, Practice and Attitude

In many countries, a considerable number of children have limited knowledge of the causes and prevention of the most common oral diseases (Petersen 2006; Zhu et al, 2003; Petersen and Kaka 1999; Petersen and Omar, 1998). Similarly, mothers' oral health knowledge is generally poor and schoolteachers' oral health knowledge, while better than that of the mothers, remains unsatisfactory (Petersen, 2006; Rajab et al, 2002; Al-Tamimi and Petersen and Omar 1998; Petersen and Razanamihaja, 1996). It is evident that cultural beliefs play an important role in the perception of the causes of dental decay and gum disease. Only a small proportion of children, parents and

schoolteachers are aware of the harmful effects of hidden sugars and sugary drinks (Petersen and Kaka1999; Petersen and Omar, 1998; Al-Tamimi and Petersen, 1998). Moreover, while many parents recognize the importance of tooth brushing in general, some do not know how to prevent tooth decay and gum disease and the role of fluoride in the prevention of dental decay is poorly understood. In many countries, less than half of mothers have received oral health advice from dentists (Rajab et al, 2002; Petersen and Omar, 1998).

As part of oral hygiene routine self-care, children should clean their teeth and gums every day. However, in many countries the proportion of children who brush their teeth every day is still unsatisfactory (Jassem-Al-Ansari et al 2003; Rajab et al, 2002; Petersen and Omar, 1998; Al-Tamimi and Petersen, 1998). A small proportion of children do not clean their teeth at all (Zhu, 2003). Some may not have access to a toothbrush (Mishra, 2003). The use of traditional cleaning aids such as '*Miswaki*'-a traditional chewing stick, is common in some communities (Vigild et al 1999; Al-Tamimi and Petersen1998).

Professional care is an important component for attaining and maintaining optimal oral health, however, a significant proportion of children have no access to dental care, particularly among children in developing countries (Petersen, 2006; Wang et al, 2002; Petersen and Omar, 1998). Many children have not visited a dentist before starting school.

In some countries, a significant proportion of school children have never visited the dentist. For example, in Tanzania, over 75 % of 12 year-old children have never been to the dentist (Petersen, 2004). Consequently, few receive preventive oral care. Many children go to see the dentist when in pain, an experience that may have a lasting effect through life and prove to be detrimental to oral health (Petersen, 2004).

Early dental visiting experience enables children to develop a good rapport and relationship with the dental team, so that preventive measures can be implemented before oral disease begins. Parents also play an important role in shaping the positive attitudes and influencing good oral health behaviors at home. With regular reinforcement and encouragement at home and in schools, these healthy behaviors are more likely to continue into adulthood, becoming life-long habits. Healthy behaviors and lifestyles developed at a young age are more sustainable (Petersen, 2004).

Oral hygiene practices can easily be adopted and incorporated into daily routines such as eating and cooking. Hence, daily tooth brushing with fluoridated toothpaste is a habit that should be encouraged to become a norm early in life. Good dietary patterns should also be fostered at a young age, particularly in preventing children from developing a habit of eating too much sugar (Currie et al, 2000; WHO, 2003 b).

Promotion of health in the settings where people live, work, learn and play is clearly the most creative and cost-effective way of improving oral health and, in turn, the quality of life (WHO, 2003a). Sporod et al (1996) concluded that there is clear evidence that oral health education is effective in bringing about changes in people's knowledge and improve their oral health.

According to Ministry of Health Tanzania all primary teachers within walking distance of health centres and district hospitals where oral health personnel are stationed will have to attend at least one seminar on oral health education. Teachers are in a better position in communicating with school children concerning oral health, as they have continuous contact with pupils in the classroom (Sheiham, 1993).

Kahabuka and Mbawalla (2006) conducted a survey on oral health knowledge and practices among Dar es Salaam institutionalised former street children aged 7-16 years. They found that most former street children are aware of the causes of dental

caries and bleeding gums but have poor knowledge on prevention of the two diseases. Furthermore, children living on the streets are more likely to eat cariogenic foods and have poor oral hygiene practices (Kahabuka and Mbawalla, 2006).

Zhu et al (2003) conducted a survey of oral health behavior, knowledge and attitude of school children and adolescents in China and found that 44.4% of the respondents brushed their teeth at least twice a day but only 17% used fluoridated toothpaste. Subjects who saw a dentist during the previous 12 months or two years were 31.3% and 35.3% for 12-year-olds and 22.5% and 20.2% for 18-year-olds, respectively. Nearly, one-third (29%) of 12 year-olds and 40.5% of 18-year-olds would visit a dentist in case of signs of caries but only when in pain. Nearly half of the participants (47.2%) had never received any oral health care instruction. Significant variations in oral health practices were found according to province and regular dental care habits were more frequent in urban than in rural areas. The risk of dental caries was high in the case of frequent consumption of sweets and dental caries risk was low for participants who used fluoridated toothpaste.

Petersen and Omar (1998) conducted a survey on oral health behavior, knowledge and attitude at Zanzibar school children, mothers and schoolteachers. Fifty nine percent of the mothers knew about the etiologic factors of dental caries. Knowledge about the potential effect of hidden sugar was lower than (for sweets 81%, candy 74%) plain sugar. Knowledge about fluoride and prevention of dental diseases was low, one quarter of the mothers did not know about prevention. The level of knowledge was diffuse with respect to prevention of gingival problems. The consumption of sugary items among Zanzibar children is relatively low (Petersen and Omar, 1998). About half the children and mothers performed daily cleaning by use of traditional chewing stick 47%. Both children and mothers seeking professional care was

infrequent and mostly due to presence of symptoms or pain (Petersen and Omar, 1998). Dental visits within past year were 16% children and 12% mothers.

Tewari and Goyal (1991) conducted a survey on oral health behavior, knowledge and attitude towards oral health of rural communities in Haryana (India) and found that use of a stick was more prevalent (56% in adult community & 49% students) than tooth brush (35% adult community and 34% students). Thirty seven percent of the total community had the knowledge of a brush being the best oral hygiene measure. Twenty five percent of the communities using a brush were brushing only once a day. The knowledge of the community regarding the role of fluorides in prevention of dental caries was completely lacking, 1.8% of the community was using fluoride dentifrice, and 35-45 percent of the community was taking sweet foods/drinks etc, four times a day.



Normak and Mosha (1983) from their study on the relationship between habits and dental health among rural Tanzanian children found that the amount of plaque, calculus, and gingivitis showed no relation to brushing, if it was performed once a week. The effect of using chewing sticks or plastic toothbrushes was identical. Children eating cakes, biscuits and/or sweets at least three times a day seemed to have more caries [DMFT = 1.5].

In conclusion in developing countries and in Africa regular dental visits are negligible except for relief of pain. Regular brushing using tooth paste and is infrequent. Preventive knowledge is lacking in school children and mothers. The knowledge of the community regarding the role of fluorides in prevention of dental caries was completely lacking. Knowledge about the potential effect of hidden sugar was lower in the community and school children.

Disadvantaged children and oral health

Winter (1995) observed a high need for preventive and restorative dental therapy for homeless in Boston. Sullivan and Stephens (1997) reported a high (90%) prevalence of gingivitis, 50% had sub/supra gingival calculus and 5% pocketing measuring 4-5 mm in children (n=247) aged 12-15 year olds residing in a Romanian orphanage.

Miller (1988) reported that 36% of children had dental problems according to homeless family surveys. Wright (1991) observed 28% of street children had visible caries.

Distribution of Oral Health Services in Tanzania

According to MOH Tanzania (2002), dental services in the country are not adequately accessible to the whole population and particularly in the rural areas. Few dentists (n= 82) are confined in towns while 75% of Tanzanians live in rural areas (Census Tanzania, 2002).

MOH Tanzania (2002) has placed much emphasis upon the principles of primary health care, preventive approach and community involvement. It is particularly important to make dental services available to the rural population by generating new appropriate technology and re-training dental personnel on preventive work. Moreover, much emphasis should be put on health education and role of primary school teachers and other health personnel in carrying out services to the community (MOH Tanzania, 2002).

Oral health services in developing countries

Oral health services are unevenly distributed in many developing countries. The bulk of the services are concentrated in major cities, leaving the rural areas unattended

(Petersen and Omar, 1998). Insufficient resources and the inadequate number of trained manpower have not been able to meet this challenge. In many developing countries there is at most one dentist for 100,000 populations (Lankinen et al., 1994).

1.5 Statement of the problem

Wright (1991), winter (1995) and Sullivan and Stephens (1997) indicated that normative need for dental treatment among an institutionalised group is higher. These children are most vulnerable to general and oral health problems and little access to health information and services (Bond, 1993).

In Tanzania there exists little or no information about the oral health status of institutionalised street children particularly in Northern Tanzania. Only one study was conducted on oral health knowledge and practice among street children in Dar es Salaam by Kahabuka and Mbawalla (2006). In this study they observed poor knowledge on prevention of dental caries and gingivitis in institutionalised street children in Dar es Salaam. Hence there is a need for this study on oral health status of insitutionalised street children in Moshi, Northern Tanzania.

1.6 Justification of study

Findings from this study may also identify factors, which contribute to dental caries, periodontal diseases and fluorosis and malocclusion among street children at Mkombozi and Amani centers in Moshi, Tanzania. It may also be possible to design training modules that can be used in health education and promotion for street children. Furthermore, the study recommendations may help in planning strategies in improving the oral health status of street children at Mkombozi and Amani homes and

across Tanzania. This study may aid in inclusion of the needs of street children in the National Plan for Oral Health in Tanzania



CHAPTER TWO

2 Aim and objectives

2.1 Aim

To analyze the oral health status (dental caries, periodontal conditions, fluorosis and malocclusion) and to assess knowledge, attitude and practice among institutionalised street children aged 12-18 year-olds in Moshi municipality, Kilimanjaro, Tanzania

2.2 Objectives

- (a) To determine dental caries, periodontal, fluorosis and malocclusion status among street children aged 12-18-year-olds in Moshi Municipality.
- (b) To assess knowledge on causes and prevention of dental caries and periodontal diseases among street children aged 12-18-year-olds in Moshi Municipality.
- (c) To explore the attitudes and practice towards oral hygiene among street children aged 12-18-year-olds in Moshi Municipality.
- (d) To assess the knowledge on causes and prevention of dental caries and periodontal diseases among caregivers of street children in Moshi Municipality.

CHAPTER THREE

3.0 Methodology

3.1 Study Design

A descriptive cross-sectional study on street children between the ages of 12 years to 18 years was carried out based on the WHO Oral Health Survey Basic Methods (1997).

3.2 Study area

The study was conducted in Mkombozi and Amani children homes within Moshi Municipality, Kilimanjaro region, Northern Tanzania.

Mkombozi Street Children home

Mkombozi (meaning "liberator, emancipator" in Swahili) works to stem the tide of Tanzania's street children through housing, education, research, advocacy, and outreach. Initially established in 1997 as a live-in residential centre and safe haven for street children today, Mkombozi is one of the leading child-focussed agencies in northern Tanzania, working with over 1,000 vulnerable children and families annually in Kilimanjaro and Arusha Regions. The number of full-time street children far exceeds the capacity of residential care centres. For example, in Moshi there are currently three residential care centres with a combined capacity of 170 children, but there are 169 full-time children on the streets and 170 children already in care. Additionally, given the increase of female street children in both towns (currently totalling 52 in Moshi and 145 in Arusha), lack of care services specifically for girls is now also an urgent issue (Mkombozi information centre 2006).

Amani Children's home

Amani Children's home is a small non-governmental, not-profit organization that runs a residential home for orphans and street-children on the base of Mt. Kilimanjaro, Tanzania. It started in the year 2001. The number of children at Amani usually varies between 50 and 60 children at any given time (Amani information centre 2006).

Geographical area of Moshi

Moshi is a small but typically vibrant Tanzanian town with an urban population of 150,000 and rural population of 402,400 (Population census Tanzania, 2002). It is the regional capital of the Kilimanjaro region.

3.3 Study population

1. Street children aged 12-18- year olds.
2. Caregivers of street children.

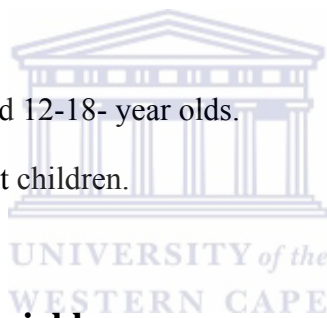
3.4 Study variable

3.4.1 Independent variables

- Demographic characteristics (residence, age, sex)
- Oral health knowledge, attitude and practice among street children.
- Oral health knowledge, among caregivers.

3.4.2 Dependent variable

- Oral health status of street children (DMFT scores, CPI scores, Fluorosis and Malocclusion status)



3.5 Selection of sample size

All street children aged between 12-18 year-olds (40 in Amani and 60 in Mkombozi children's homes) were included as a purposeful sample giving a total number of 100 eligible respondents. The 100 respondents fulfilled the age-group inclusion criteria of the study. In both Amani and Mkombozi homes only boys were found and therefore included in the study. Efforts were made to have girls but it was not possible as street girls are quickly absorbed by the community, to work as domestic workers (Hillary, 1998). The selection was based on personal records of the children at Amani and Mkombozi children homes. In the absence of birth certificates, accurate ages of eligible respondents were validated by the presence of second molars for 12- year-olds and third molars for above 18- year-olds, respectively. In this study a convenient sample of 20 caregivers were included.

3.5.1 Inclusion criteria

- Street children aged 12-18- years of age.
- Street children who were present in the home on the day of examinations and interviews.
- Those who were willing to participate.

3.5.2 Exclusion criteria

- Children who are not willing to participate.
- Children below 12 years or above 18 years of age.

3.6 Data collection technique

3.6.1 Data collection tools

Two trained dental nurses together with the principal investigator collected the data from 11-10-2006 to 19-11-2006. The collection of information for the study was achieved using a questionnaire (appendix F pg 101) and an intra oral clinical examination of the respondents. A questionnaire was developed (August 2006) consisting of open-ended six questions and closed-ended twenty three questions, on oral health knowledge and practice on oral health (nutritional habits, tooth brushing habits and use of dental services), which could be associated with dental caries and periodontal diseases among institutionalised (Amani and Mkombozi) street children aged between 12-18 years in Moshi municipality. The first part of the questionnaire included items of demographic characteristics. The second part of the questionnaire focused on oral hygiene, knowledge on causes and prevention of oral diseases, and dietary habits. The questionnaire was developed by the researcher adapting some questions from previously tested instruments through various studies in the past (Ruth 2006 Varenne et al 2006; Petersen and Kaka1999; Petersen and Omar 1998) but was modified to suit the objectives of this study. Self-administered questionnaires (appendix G pg 110) were administered to caregivers both open-ended (eight questions) and close ended (twenty three questions). The dental nurses (research assistants) supervised the completion of a questionnaire to ensure confidentiality and control of information bias. The respondents used Kiswahili language for an easy understanding, and questions were read loud by the examiner giving time for children to answer the questionnaire and ask questions. The questionnaires were anonymous so as to avoid bias.

All completed questionnaires were reviewed immediately for missing data before the participant was asked to leave the room. Oral examination was conducted soon after filling in the questionnaire.

3.6.2 Pilot study

Prior to the actual survey, the research assistants were adequately trained to ensure quality of data collection. Two days sessions were conducted on filling in and validating the data collection instrument by the principal researcher. The questionnaire was translated into Kiswahili and tested in the field (September 2006). During piloting the quality of the interviewers were closely monitored and deficits corrected. Ten children were pre-tested (September 2006) to obtain information for improving the survey, assessing its feasibility and the adequacy of the measurement instrument. Changes were made after the pre-test, to strengthen the data collection tool (September 2006). Validated and the reliability of the items were tested in previous methodological studies (Petersen, 1989).

3.7.1 Clinical Examinations

Oral clinical examinations were carried out under natural light at Amani children home as they are not having transport to bring their children to KCMC. The caregivers from Mkombozi children home brought the children to K.C.M.C in their transport. Mkombozi street children were examined at KCMC dental clinic (using dental chair and dental light) using plane dental mirrors and dental probe. Special WHO periodontal probes were used for examining gingival conditions. During the intra oral examinations dental caries experience, periodontal status, fluorosis and malocclusion was determined using DMFT, CPI, Dean's fluorosis Index and Dental

Aesthetics Index, respectively (WHO Oral Health Surveys Basic Methods, 1997). Fluorosis was assessed, limiting to mild, moderate and severe categories only. Oral screening was conducted using a mirror and probe. When examining (Oral) the children, universal precaution on infection control, was maintained all the time to avoid cross infection. Privacy was maintained at all time during oral examination

Dental health status and need for dental treatment was recorded using the modified WHO criteria for epidemiological studies (WHO, 1997).

Oral health condition was recorded after examining each child. Children, who needed dental treatment, were treated at KCMC clinic. Children were also given oral hygiene instructions by the researcher and the assistants.

3.7.2 Dental caries

Caries was recorded as present when there was a visible breakdown of enamel resulting to cavitations, or a softened floor of wall on either the pit or fissure or on one of the smooth tooth surfaces. If the tip of the explorer (Dental probe) could enter the lesion the tooth was diagnosed as caries, otherwise the tooth was regarded as sound.

3.7.3 Oral hygiene

Oral hygiene status was measured by Community Periodontal Index (WHO, 1997). Special 0.5 mm ball-ended probes with color markers at 3.5 and 5.5mm were used for these measurements.

A score of 0 (periodontal healthy – code H), 1 (gingival bleeding – code B), 2 (calculus at any supra- or sub-gingival site – code C), 3 (pocket of 4-5mm – code P1), or 4 (pocket of 6 mm or more –code P2) was obtained for each dentate sextant, or an X (excluded) was recorded for excluded sextants. P1 and P2 were measured on above

15 (sixteen years and above) years-old children. Upper jaw right molar (tooth no 16), anterior right central incisor (tooth no 11) left upper first molar (tooth no 26) on lower jaw right molar (tooth no 46) lower left anterior central incisor (tooth no 31) and lower left first molar (tooth no 36), in each sextant were examined, and subsequently the most severe CPI condition observed was recorded as a sextant score. Sextants were defined by tooth position in the maxillary or mandibular arches, with molars and premolars making up four posterior sextants and canines and incisors making up two anterior sextants. Sextants were excluded (code X) when there were no teeth present or only one remaining tooth that could be probed. A CPI periodontal probe was used to measure the pocket depth (i.e. the distance from gingival crest to the base of the pocket) and to detect sub gingival calculus and/ or bleeding. Prevalence of periodontal disease was defined based on the percentage of the highest score of all subjects. Periodontal disease severity was scored for each sextant and was considered separately (not cumulatively) by counting the number of sextants of dentate persons. Periodontal treatment needs were expressed as percentage of subjects categorized by one of the four options: TN 0 = no treatment required (code H), TN 1 = oral hygiene instruction (code B+C+P1+P2), TN 2 = dental scaling and oral hygiene instruction (code C+P1+P2), TN 3 = complex treatment, dental scaling and oral hygiene instruction (code P2). In addition, for TN 2 and TN 3, the number of sextants requiring treatment was reported as an average for all dentate subjects.

3.7.4 Fluorosis

Fluorosis was assessed through clinical examination, using WHO guidelines (WHO, 1997). Fluorosis was diagnosed limiting it to mild, moderate, severe fluorosis (Dean's index). The WHO recommended the use of Dean's index for assessing fluorosis and the recording is made on the teeth that are most affected. If white

opacity of the enamel of the teeth is more extensive, but covers less than 50% of the tooth surface was regarded as mild fluorosis and given a code 3. When enamel surfaces of the teeth showed marked wear and brown stain is frequently a disfiguring feature it was coded as moderate fluorosis and given a code 4. When enamel surfaces were badly affected and hypoplasia is so marked that the general form of the tooth may be affected, or pitted or worn area were evident then it was regarded as severe fluorosis and given a code 5.

3.7.5 Malocclusion

Malocclusion was assessed through clinical examination, using WHO guidelines (WHO, 1997). DAI score of 25 and below represent normal or minor malocclusion with no treatment needed or slight treatment need. DAI scores of 26 to 30 represent definite malocclusion with a treatment option considered elective. DAI score of 31 to 35 represent severe malocclusion with treatment indicated as highly desirable. DAI score of 36 and higher represent very severe or handicapping malocclusion with treatment considered mandatory.

3.8 Calibration

Training and calibration for examination for dental caries, periodontal conditions, fluorosis and malocclusion were conducted in the dental department at KCMC, Moshi by the researcher. The continuous calibration of the examiner was done each day of the survey, by examining 10% of the participants twice by the same examiner to assess the intra-examiner variation. Intra-examiner reliability was tested by means of the weighted Kappa statistics. The weighted Kappa statistics for the CPI scores ranged from 0.75 to 0.85, for dental caries (DMFT) was 0.92, for fluorosis (Dean's

fluorosis index) 0.72 and for malocclusion 0.68. The assigning of the subjects for re-examination was done by one of the recorders without the knowledge of the examiner.

3.9 Data Analysis

The data from the examination and questionnaires was statistically analyzed using the SPSS package version 10. Data was summarized using frequency distributions, cross tabulations, and charts. Relationships were tested using non-parametric tests (Spearman rank correlation test at 5% level of significance). The strength of associations was tested using Odds Ratio at 95% confidence level.

3.10 Ethical considerations

Consent to conduct the study was obtained from the Regional Director, Department of community services and social Welfare Moshi, and from the Directors of the place of safety in Moshi (Amani Children's home and Makombozi children's home). Ethical approval for the study was obtained from the Research Committee, University of the Western Cape and from Ethical Clearance Committee, Tumaini University, Tanzania (Ethical clearance number 100, Proposal number 126). Informed consent was obtained after the potential participants, caregivers and Directors of Amani and Mkombozi centres were informed about the study objectives. Rights of participants to withdraw from the study at any time without being penalized were also explained. In addition, confidentiality was maintained at all times and the data was collected and presented anonymously. This was achieved by using coded numbers rather than subject's names. Interviews and intra-oral examinations were conducted in privacy and universal infection control methods were maintained all the time during oral examinations. Those who need fillings and scaling were done at the clinic free of charge.

CHAPTER FOUR

4.0 Results

The results will be presented following the specific objectives of the study. The tables referred to can be found within the text.

4.1 Demographic Characteristics of Street children

Table 1 reflects the demographic characteristics of street children.

Majority (76%) of the children were in the age group between 12-14 years.

Table 1 Demographic characteristics of respondents (n=100)

Variable	Attribute	No n	Percent %
Age (years)	12-14	76	76
	15-18	24	24
Area of residence	Rural	49	49
	Urban	51	51

4.2 Prevalence of Dental caries

Table 2 reflects the prevalence of dental caries.

A higher (50%) percent of children in the 15-18 year age group had experienced caries compared to the 12- 14 year age group children ($p < 0.05$).

Table 2 Number and percentage of street children aged 12-18 year-olds with caries experience and caries free

Age group	N	Caries experience		Caries free	
		n	%	n	%
12-14	76	14	(18.4%)	62	(81.6%)
15-18	24	12	(50%)	12	(50%)
12-18	100	26	(26%)	74	(74%)

Table 3 reflects distribution of the mean DMFT in street children. A higher (0.33) mean decayed component and missing (0.06) component was seen in the 15 -18 years age group than 12-14 years age group. Generally the mean DMFT for the total group was below the WHO recommended level.

Table 3 Distribution of the mean DMFT in street children

Age group	N	D	M	F	DMFT (SD)
12-18	100	0.55	0.07	0.02	0.64 (0.24)
12-14	76	0.22	0.01	0.01	0.24 (0.10)
15-18	24	0.33	0.06	0.01	0.4 (0.14)

4.3 Prevalence of Periodontal conditions

Table 4 reflects prevalence of periodontal conditions

Out of 100 children examined 13% had healthy periodontal status, 36% had bleeding gums, 37% had calculus and 14% had pockets 4-5 mm.

Table 4 Prevalence of persons affected

Age	No of dentate Persons	% Persons coded			
		H	B	C	P1
12-18	100	13	36	37	14

Table 5 reflects the mean number of sextants affected per person with gingival bleeding, calculus and/or pockets. Sextants were predominantly affected by bleeding and calculus, pocketing of 4-5mm was rare.

Table 5 Mean number of sextants affected per person

Age	No of dentate Persons	Mean number of sextants coded			
		H	B	C	P1
12-18	100	1.56	2.08	1.88	0.47

Table 6 reflects the treatment need in street children.

The majority of children (51%) had periodontal conditions. Fifty one percent of the children need scaling and oral hygiene instruction. A mean number of 2 sextants need scaling in these street children

Table 6 Treatment needs

Age	No dentate Persons	% TN 0 (No treatment need)	% TN-1 (Oral hygiene Instructions)	% TN-2 (Scaling and Oral hygiene Instructions) (Mean no. of sextants)
12-18	100	13	36	51 (2.35)



4.4 Prevalence of fluorosis

Table 7 reflects the prevalence of fluorosis by degree of affliction. This table shows a high prevalence of dental fluorosis (42%) in street children. Out of the 42 children who had fluorosis 20% had severe fluorosis which was more prevalent in the children of rural origin. Significantly more children with fluorosis came from the rural areas ($p < 0.05$).

Table 7 Prevalence of fluorosis among street children

Fluorosis score	N 100 n (%)	Urban n (%)	Rural n (%)
0 (Normal)	58 (58%)	35 (69%)	23 (47%)
3 (Mild)	11 (11%)	3 (6%)	8 (16%)
4 (Moderate)	11 (11%)	5 (9%)	6 (13%)
5 (Severe)	20 (20%)	8 (16%)	12 (24%)
Total	100(100%)	51(100%)	49(100%)

4.5 Prevalence of Malocclusion

Table 8 reflects the state of malocclusion and treatment need.

The majority of children (66%) had no malocclusion with, 12% moderate, 17% severe and 5% having very severe malocclusion. In terms of the DAI findings as presented in table 8, for 5% of children orthodontic treatment would be mandatory, 17 % highly desirable and 12% elective.

Table 8 Prevalence of malocclusion and treatment need among street children according DAI scores.

DAI score ≤ 25 Normal occlusion (No Treatment)	DAI score 26-30 Definite Malocclusion (Elective Treatment)	DAI score 31-35 Severe Malocclusion (Treatment Highly Desirable)	DAI score ≥ 36 Very severe Malocclusion (Treatment Mandatory)
66%	12%	17%	5%

4.6.1 Knowledge on causes of dental caries and periodontal diseases in street children

Table 9 reflects the percentage of street children who responded on causes of dental caries and periodontal diseases. Most of the children are not aware of the causes of dental caries and periodontal diseases.

Table 9 The percentage of street children who reported the following variable as the cause of dental caries and periodontal diseases

Statement	Causes on dental caries	Causes on Periodontal diseases
N100	%	%
Improper cleaning of teeth/ Not brushing thoroughly	26	26
Sugary food/ Unhealthy food	26	26
Worms	15	15
Hereditary	5	5
Don't know	28	28
Illness	0	0
Others	0	0

4.6.2 Knowledge on prevention of dental caries and periodontal diseases in street children

Table 10 reflects the percentage of street children responded positively to the statement on dental diseases.

On prevention of gingival bleeding 26% of respondents agreed that tooth brushing prevents bleeding. On prevention of dental caries 26 % mentioned avoiding sugars and 26 % mentioned brushing. Twenty-eight percent of respondents agreed with the preventive effect of fluoride on tooth decay. Most (74%) of the children does know the knowledge on prevention of periodontal diseases and dental caries or preventive effect of fluoride on tooth decay.

Table 10 The percentage of street children who responded positively to statements on prevention of dental diseases

Statement	Children
Tooth brushing prevents bleeding gums	26%
Tooth brushing prevents tooth decay	26%
Avoiding consumption of sweets/ carbohydrate prevent tooth decay.	26%
Fluoride protects the teeth against decay	28%

4.6.3 Oral Hygiene Practices

Table 11 summarizes the dental care habits of street children.

Majority (83%) of children cleaned their teeth once a day using toothbrush and toothpaste. Only 5% have visited a dentist. For all variables the care habits were better in the street children's homes as compared to street life.

Table 11 Percentage of street children with reported dental care habits

Dental care habits	At children's home	While in the street
Teeth cleaning once a day	83%	33%
Teeth cleaning twice a day	0%	0%
Never clean teeth	6%	17%
Tooth cleaning once a week/some times	11%	48%
Brush and toothpaste	83%	31%
Use Brush with stick	9%	20%
Use Finger/other (ash)	3%	40%
Dental visit	5%	0%
Never been to dental visit	95%	100%

Fifty percent of children said that there is no need to visit the dentist if no problem is experienced and 28% said they were afraid of a dentist.

4.6.4 Consumption of sugary items

Table 12 summarizes the consumption of sugary items in street children.

While in the street life 55% of the children reported that they were consuming biscuits, sweets, cool drinks, ice cream, more than once every day, whereas in the children homes 11% of the children were consuming sweets once a day and 7% children were consuming ice cream once a day. Frequencies of consumption of sugary items by street children were more while they were in the street than in the children homes. Tea was consumed once a day in the home by most of the children (see table 12 page 61)



Table 12 Percentage of Street children distributed according to the reported frequency of consumption of sugary items

N100	Place	Once a day	More than Once a day	Once a week	Occasional	Never/ Seldom
Variable		%	%	%	%	%
Sweets/ Chocolates	On streets	15	55	16	11	3
	At- residence	11	0	31	53	5
Tea with Sugar	On streets	18	55	16	11	0
	At-residence	100	0	0	0	0
Biscuits	On streets	15	55	16	11	3
	At- residence	1	0	54	31	14
Ice cream	On streets	15	55	16	11	3
	At- residence	7	0	4	73	16
Chewing gum	On streets	15	55	16	11	3
	At- residence	1	0	54	31	14
Cool Drinks	On streets	15	55	16	11	3
	At- residence	0	0	56	43	1

4.6.5 Knowledge of street children on harmful effects of sugar items

The harmful effect of sugar was considered in terms of sweets /chocolates, ice cream, chewing gum, sweet drinks often indicated. More than 50% of the street children do not know the harmful effects of sugary items on natural teeth. Table 13 summarizes the knowledge of street children on sugary items.

Table 13 Percentages of Street children who identified that the following items can harm your natural teeth.

N=100	Children
Variables	%
Sweets/chocolates	46
Ice cream	46
Cool drink	46
Chewing gum with sugar	46
Biscuits	16
Milk with sugar	11
Tea with sugar	11

4.7. Demographic characteristics of caregivers

Majority (90%) of the caregivers came from urban areas. Seventy five percent of them are degree or diploma holders and 65% of them are male.

4.7.1 Knowledge of Caregivers on causes of dental caries and periodontal diseases

Table 14 summarizes the knowledge of caregivers on causes of dental caries and periodontal diseases. Everybody said that improper cleaning can lead to dental caries and periodontal diseases. Most caregivers also agreed that sugary food/ refined carbohydrates can lead to dental caries and periodontal disease.

Table 14 The percentage of caregivers who responded on causes of dental caries and periodontal diseases

Statement	Causes of dental caries	Causes of periodontal diseases
N100	%	%
Improper cleaning of teeth	100	100
Sugary food/ refined carbohydrate	95	95
Illness	20	20
Worms	15	15
Hereditary	15	15

4.7.2 Knowledge of Caregivers on prevention of dental caries and periodontal diseases

Table 15 reflects the knowledge of caregivers on prevention of dental caries and periodontal diseases.

All caregivers know that tooth brushing prevents dental caries and bleeding gums.

Other preventive measures mentioned were, avoiding sugar products (95%) and using fluoride (65%).

Table 15 The percentage of caregivers who responded positively to statements on prevention of dental caries and periodontal diseases.

Statement	Care takers
Regular tooth brushing prevents bleeding gums	100%
Regular tooth brushing prevents tooth decay	100%
Avoiding consumption of sugary food	95%
Fluoride prevents against tooth decay	65%

4.7.3 Knowledge of Caregivers on sugary items

Table 16 summarizes the knowledge of caregivers on sugary items. The majority of caregivers were able to identify harmful sugary items. The most identified sugary items were sweets, chocolates, chewing gums and ice cream.

Table 16 Percentages of caregivers who identified that the following items can harm your natural teeth

	Caregivers
Variables	%
Sweets/chocolates	100 %
Chewing gum with sugar	100%
Ice cream	100%
Cool drink	45%
Biscuits	30%
Tea with sugar	30%

CHAPTER FIVE

Discussion

In this chapter the study findings are discussed. Most of the findings are based on the quantitative data and will be compared with other studies done in other parts of the country and the world for plausibility or lack of similar findings to this study. The discussion will follow the same pattern as presented in the results.

5.1 Prevalence of dental caries

The 26% percent caries experience in this study is similar to that observed by Ruth (2006) with 27% caries experience among primary school children in Kinondoni Municipality. According to the National Oral Health Plan (MOH, 1994) the prevalence of dental caries by 1980's was 32-35%. The observation of 26% caries experience in these children is within the range of NOHP of Tanzania (1994).

The present observation of low mean DMFT 0.64 is similar to previous studies done in Tanzania [range: 0.3 DMFT to 0.7 DMFT] (Petersen and Ramzanamihaja, 1996; Mosha, 1994; Nithila et al, 1998; Frencken et al, 1986; Kerosuo et al, 1986). A more recent study by Ruth (2006) on primary school children aged 12 year-old in Kinondoni Municipality found a mean DMFT of 0.65.

In this study a higher (0.33) mean decayed component and missing (0.06) component was seen in the 15 -18 years age group when compared to 12-14 years group. Other studies done in Tanzania by Mosha (1994) and Frencken et al (1984) also observed higher mean decayed and missing components in older age groups (18 years) when compared to 12-year old children. The F-component was negligible in this study

group of street children. Frencken, et al (1984) and Mosha (1994) also observed negligible F-component in school children aged 12 years in Tanzania. Further this study observed that treatment need for street children is mainly fillings. In Tanzania 90% of the caries remain untreated (MOH Tanzania, 1994) and over 75% of 12 year-old school children have never been to the dentist (Petersen, 2003). In Tanzania the population is served by a limited number of dentists and dental therapists, either from hospitals or dispensaries. Restorative care is offered by the few and extremely expensive private dentists (Petersen and Omar 1998) which is not affordable by the unfortunate street children. In this study 95% of the street children never visited a dentist. Most of the street children had the misconception that there is no need to visit a dentist if there is no pain. This was also observed in a study in China (Zhu et al, 2003). In Tanzania also the frequent cause of dental visits has been noted as dental pain rather than preventive reasons (Mosha, 1994). As observed by other studies unmet need for fillings may be due to unavailability of (resources) dental services and un-affordability by the unfortunate street children or lack of oral health education in these children.

The National Oral Strategic Objective for Tanzania (MOH, 1994) stated that by 2002 all 12 year-old children should have an average DMFT of not more than 1.0. This study shows that the level of DMFT is within the level of The Tanzania MOH goal of DMFT 1.0. According to findings by Ruth (2006) there has been no significant change in the prevalence of dental caries among school children in the past three decades. No significant difference in DMFT was found in street children from previous studies done on school children. A probable explanation could be that children in developing countries are less exposed to dangerous eating habits (sugar items) compared to those in developed countries (Varenne et al, 2006). The incidence

of dental caries is predicted to increase in many developing countries in Africa, particularly as a result of growing consumption of sugars and inadequate exposure to fluorides (Petersen, 2004). In countries with an intake of sugar below 18 kg/person/year (equivalent to 50g/ person/d) experience of caries was consistently below DMFT 3 (WHO goal for 2000). The countries with sugar consumption in excess of 44 kg/person/year had significantly higher levels of caries (Moynihan and Petersen, 2004). In this study the low dental caries experience observed among street children may be due to lower sugar consumption in Tanzania.

5.2 Prevalence of Periodontal conditions

The WHO regards periodontal disease in approximately 50 percent of a population as moderate prevalence. The street children had higher (51 %) prevalence of periodontal conditions as assessed by the presence of gingival bleeding, calculus and pocketing. Supra/sub gingival calculus (37%) and pocketing (14%) measuring 4-5mm were the major problems among street children. This observation concurs with high percentage of periodontal conditions in studies done in other parts of Tanzania.

Frencken et al (1993) observed 80% gingivitis in school children aged 12 years. Petersen, et al (1998) observed in primary school children aged 12 years in Zanzibar (Tanzania Island) and found 98% had periodontal conditions with maximum scores 1 or 2. In a recent study done by Ruth (2006) the prevalence of gingivitis was found to be 75% among school children in Kinondoni, Dar- es- Salaam.

In this study bleeding gums and calculus were observed more among 12-14 years-old, while shallow pockets were more among 15-18 years old. Calculus was more

common among respondents coming from rural settings whereas pockets were more common among urbanites.

In this study the mean number of sextants with bleeding gums, calculus and pockets measuring 4mm-5mm was 4.4 sextants. Gingivitis and calculus, however dominated the CPI findings. The majority (98%) of primary school children (aged 12 years old) in Zanzibar had a mean number of 4.3 sextants with gingival bleeding or calculus (Petersen et al 1998). Mosha et al (1999) also observed no changes in prevalence of oral health status compared with previous studies among primary school children in Tanzania. Fifty one percent of street children has periodontal problems reflected in this study may be due to a lack of preventive knowledge and effective brushing practice. Fifty one percent of respondents are in need of professional care in terms of scaling. The rest needed instructions on oral hygiene. These findings are lower than previous studies done by Frencken et al 1993 (80%); Mosha 1994 (90%) and similar to Kerosuo et al 1996 (50%). The CPI findings indicate a clear need to improve oral hygiene care among these children.

5.3 Prevalence of Fluorosis

Fluorosis was present in 42% of respondents (11% mild, 11% moderate and 20% severe). The majority of affected children came from rural (62%) areas. The observed prevalence of fluorosis among street children is lower than that observed in previous studies done in Ethiopia (91.8%) Wondwossen et al (2004), Kenya (76%) Ng'ang'a (1993), (93%) Manji et al (1986) and Tanzania (98%) Van Palestein et al (1997). The African Rift Valley is known to have endemic fluorosis primarily due to the high fluoride content in water. (Wondwossen et al 2004; Ng'ang'a 1993; Manji et al 1986). Arusha and some parts of Kilimanjaro region are known for endemic

fluorosis. Use of *magadi* and fluorosis of teeth has also been well documented among communities in Kilimanjaro region (Awadia et al, 2000; Van Palenstein et al, 1997; Mabelya et al 1994).

Dental fluorosis, of esthetic concern, is an expensive condition to treat. If left untreated, it can cause embarrassment for school-aged children, resulting in psychological stress and damaged self-esteem. There is also mounting evidence that dental fluorosis in its more advanced stages can leave teeth more susceptible to cavities (Levy, 2003).

Street children originate from different regions; hence the risk factors associated with severe fluorosis is uncertain. The place of birth and the use of *magadi* during childhood among street children may be one of the attributes. Dean et al (1942) found excessive fluoride intake during the period of tooth development is a strong predictor of fluorosis. It is assumed that those children who came from Arusha region were exposed to the risk of high fluoride levels in drinking water and those from Kibosho were exposed to the risk of *magadi* in their diets during the period of tooth development.

There is need to educate the community on the causes of fluorosis, and to propose/facilitate strategies for addressing the issue, such as encouraging more rainwater harvesting, treating drinking water with alum, or using clay pots for storage of drinking water. The most appropriate method in rural East Africa is probably, filtration using bone char (Mjengera and Mkongo, 2002).

Access to safe drinking water is a millennium development target under the 'ensure environmental sustainability' goal. At the United Nations Millennium Summit (September 2000), eight Millennium Development Goals were agreed.

Subsequently, almost one hundred and ninety countries worldwide have signed up to them. Government, NGO's and communities need work together to achieve this goal, particularly in northern Tanzania where endemic fluorosis persists.

5.4 Prevalence of Malocclusion

The prevalence of malocclusion among street children in this study was observed to be 34 % (table 8). These findings concur with the studies done by Mugonzibwa (1992) in Tanzania with 36% prevalence and Otuyemi et al (1999) in Nigeria with 32.6% prevalence. The findings however are higher than studies by Abdulla and Rock (2001) in Malaysian children with 24 % prevalence. In treatment need assessment according to the DAI score 34% needed orthodontic treatment (12% need elective orthodontic treatment; 17% definite orthodontic treatment and 5 % treatment mandatory). Mugonzibwa et al (2000) in Tanzania observed that 22% of children need orthodontic treatment. The orthodontic treatment need was lower than the Van Wyk et al (1985) study in Pretoria where 44 % of children required orthodontic treatment, however in this study orthodontic treatment is mandatory for only 5% of the street children.

In modern society, the most important role of teeth is to enhance appearance. Facial appearance is very important in determining an individual's integration into society. Teeth also play an important role in speech and communication. The second International Collaborative Study of Oral Health Systems (ICSII) revealed that in all countries covered by the survey substantial numbers of children and adults reported impaired social functioning due to oral disease, such as avoiding laughing or smiling due to poor perceived appearance of teeth (Chen et al, 1997). Throughout the world, children frequently reported apprehension about meeting others because of the

appearance of their teeth or that others made jokes about their teeth (Kelly, 2000). At present there is no doubt that many street children with severe and handicapping malocclusion are not receiving any orthodontic treatment (Proffit, 2000).

5.5 Knowledge on causes and prevention of dental caries and periodontal diseases in street children

Three quarters (74%) of the street children had no knowledge on causes and prevention of dental caries and periodontal conditions. These findings are similar to previous studies among school children in Tanzania (Nyandini et al, 1994; Petersen and Omar, 1998). In a recent study Kahabuka and Mbawalla (2006) observed poor knowledge on prevention of dental caries and gingivitis in institutionalised former street children in Dar es Salaam.

According to Olivera et al (1999) street children don't have access to newspapers or radios while they are on the street, this could be the reason for the lack of knowledge in street children. This study observed a low knowledge on harmful effects of consumption of sugary items on natural teeth, which concurs with a study done by Petersen (2006) in Burkina-Faso. Petersen (2006) reported that 57% of school children were not aware that consumption of sugary products might cause tooth decay. Knowledge about fluoride and its preventive effect on dental caries was also lacking. Fifty two percent of the children believed that fluorides discolor their teeth. Similar gaps in knowledge about fluoride and its preventive effect on dental caries was also observed by Petersen et al (2006) in Burkina Faso, among school children aged 12 years.

5.6 Practice towards oral hygiene and consumption of sugary items in street children

There is a remarkable improvement on brushing habits among the street children while they are in the children's homes (83% brushing with fluoride) compared to being on the streets (33%). The frequency of consumption of sugary foods, (more than once a day) decreased from (55%) in the streets to (0%) while in the children's homes. The most probable explanation for the observed high percentage of tooth brushing among institutionalised street children is the free supply of toothbrushes and paste provided by the caregivers. These observations differ from other studies among school children in Zanzibar and Burkina Faso. Petersen and Omar (1998) found that 32% of children use toothpaste and brush in Zanzibar. Petersen et al (2006) in another study in Burkina Faso found that 58% of children are not brushing their teeth with toothpaste. A low frequency of dental visits was observed among street children. Street children had misconceptions that there is no need to visit a dentist without any dental problem. In this study 95% of street children never visited a dentist and 32% mentioned that they are afraid of dentist, however, most of the children expressed that they had experienced gum bleeding, bad breath and toothache. The most probable explanation for this observation may be the highly expensive oral health services.

Professional care is an important component for attaining and maintaining optimal oral health (Wang 2002), however, a significant proportion of children have no access to dental care, particularly children in developing countries (Petersen 2003; Wang et al 2002 Petersen and Omar, 1998). Early dental visits enable children to develop a good rapport and relationship with the dental team, so that preventive measures can be implemented before oral disease begins (Petersen, 2003).

While on the streets more than half of the children consume sugary items more than once a day but in the institute the frequency of consumption of sugary items was low. Mosha et al (1994); Petersen and Omar (1998) found a relatively low consumption of sugary items among school children in Tanzania mainland. Petersen and Omar (1998) also observed low level of sugar consumption in 12 years-old school children in Zanzibar Island (Tanzania); Petersen and Kaka (1999) in republic of Niger; Petersen (2006) in Burkina Faso school children aged 12 years. The most probable explanation for this observation is that the presence of caregivers in the children's homes has an influence on consumption of surgery items.

5.7 Knowledge of caregivers on causes and prevention of dental caries and periodontal diseases

The Government of Tanzania, through its centre for oral health, strategically ensures that primary school teachers are enabled as potential alternative oral health education providers (MOH, 1994). According to MOH in Tanzania all primary teachers within walking distance of health centers and district hospitals where oral health personnel are stationed will have to attend at least one seminar on oral health education. Unfortunately the goal could not be attained by the year 2002. The most cost effective means of prevention of oral diseases is through oral health education. This has been advocated by World Health Assembly in the Primary Health Care Approach.

Most of the caregivers know about the causes of dental caries, periodontal diseases and potential effects of sugar. The etiologic role of sugar in dental caries was well accepted, particularly as regards the frequency of sugar consumption (Rugg-Gunn, 1984).

Most of the caregivers know about the prevention of dental caries, periodontal diseases and potential preventive effects of fluoride. More than half the caregivers know the need to brush teeth twice and those remaining know the need to brush at least once a day.

Teachers are, in a better position to communicate with school children on matters concerning oral health as they have continuous contact with pupils in the classroom (Sheiham, 1993; Sheiham, 1994). But this is not happening in the remote rural areas of Tanzania (Nyandindi et al, 1994). Report from previous study in Rungwe district (Mwangosi, 1998) revealed most of the primary school teachers had never seen any oral health hand book which was made for them and they are lacking enthusiasm in teaching on oral health promotion. This phenomenon provided evidence of the gap between what the policy states on school oral health promotion and what actually happens in the remote areas (Ruth, 2006).

But in this study seventy five percent of the caregivers agreed, that they should advise on proper oral hygiene and restrict sugary items. They responded positively towards prevention and health education of children. Most of the caregivers in this study responded positively on attending a proposed seminar and were willing to disseminate the information and knowledge to the community and street children.

CHAPTER SIX

6.1 Study limitations

The results of the study as a small sample size would conceal true associations between variables even if they do exist. In both Amani and Mkombozi homes only boys were found and were included in the study, gender balance may be a limitation in this study. The use of daylight during examination at Amani children home could have resulted in an under estimation of dental caries and fluorosis.

6.2 Conclusion

The present survey of street children aged 12-18 year-olds showed that the DMFT level was within the range of WHO global goal for 2000 and found negligible F component. (2) Fifty one percent of the street children had periodontal conditions and higher prevalence of fluorosis among street children. (3) Five percent of street children have very severe malocclusion where treatment is mandatory. (4) Low knowledge on causes and prevention of dental caries and periodontal diseases. (5) Dental visits were negligible and need to be increased. (6) Better oral hygiene habits and lower frequency of sugar consumption among street children in the homes than when they were on the streets. (7) This study found higher knowledge on causes and prevention of dental diseases among caregivers.

6.3 Recommendations

1) There is a need to include the oral health needs of institutionalised street children in the Tanzania National Oral Health Policy

2) A participatory approach on teaching behavioral change communication and information (BCCI) should be adopted in the street children homes in re-enforcing the positive behavior life style in the prevention of oral diseases among street children. This can be achieved through training of trainers' programmes and workshops need to be established in order to reinforce the skills and knowledge on oral health in caregivers.

3) As we plan long term preventive and promotive strategies for these children, there is an urgent need to address the present need for these children. On-site services for example, mobile and portable clinics are the most cost-effective alternative.

7. Reference

Abdullah, M.S and Rock, W.P. (2001). Assessment of orthodontic treatment need in Malaysian children using the IOTN and DAI indices. *Community. Dent Health Dec.*, **18** (4):242-8

Addy, M.; Griffiths, G; Drummer, P; Kingdom, A; Shaw, W.C. (1986). Prevalence of plaque, gingivitis and caries in 11-12-year-old children in South Wales. *The Community Dent Oral Epidemiology.*, April. **14**:115-8

Akpata, E.S. (2004). Oral health in Nigeria. *International Dental Journal.*, **54**: 361–366

Albino, J. E.; Lawrence, S. D; Tedesco, L. A. (1994) Psychological and social effects of orthodontic treatment, *Journal of Behavioral Medicine.*, **17**: 81–98

Al-Tamimi, S and Petersen, P.E. (1998). Oral health situation of schoolchildren, mothers and school teachers in Saudi-Arabia. *International Dental Journal.*, **48**:180-186

Amani street children home information centre (2006). Moshi, Tanzania.

www.amanikids.org

American Academy of Periodontology. (1999). The pathogenesis of periodontal diseases (position paper). *J Periodontal.*, **70**:457-470

Andrews, L. (1972). The six keys to normal occlusion, *American Journal of Orthodontics and Dentofacial Orthopaedics.*, **6**: 296–309

Awadia, A.K; Bjorvatn, K; Birkeland, J.M; Haugejorden, O. (2000). Weaning food and *magadi* associated with dental fluorosis in Northern Tanzania. *Acta Odontologica Scandinavica.*, **58** (1):1-7

Awadia,A.K; Haugejorden, O; Bjorvatn, K; Birkeland, J.M. (1999). Vegetarianism and dental fluorosis among children in a high fluoride area of northern Tanzania. *International Journal of Pediatric Dentistry.* **9**: 3-11.

Baelum, V; Fejerskov, O; Karring, T. (1986). Oral hygiene, gingivitis and periodontal breakdown in adult Tanzanians. *J Periodontal Res.*, **21**: 221–232.

Beltran-Aguilar, E.D. S; Estupinan-Day, S; Baez,R. (1999). Analysis of Prevalence and Trends of Dental Caries in the Americas between the 1970s and 1990s *International Dental Journal.*, **49**: 322-29.

Bjarnason, S; Berzina, S; Care, R; Mackevica, I. (1995). Oral health in Latvian 15-year-olds. *Euro. J Oral Sci* Oct., **103**(5):274-9.

Bloch, B; Malele, J; Tanner, M; De Savigny, D. (1989). Prevalence of dental caries among children in a rural Tanzanian community., **12**(2):47-53

Bond, L.S. (1993). The sad reality of Street the children. *Boletin De la officinal Panamerica.*,114(2): 105-1.

Björn Klinge and Anders Norlund. (2005). A socio-economic perspective on periodontal diseases: a systematic review. *Journal of Clinical Periodontology.*, **32** (s6): 314–325.

Buden, D and Holmes, A. (1994). The need for orthodontic treatment in the child population of United Kingdom. *Euro J Orthod.*, **16**: 395-399.

Centres for Disease Control and Prevention. (1994). Guidelines for school health programs to prevent tobacco use and addiction. *MMWR Morb Mortal Wkly Rep.*, **43** (RR-2): 1-18.

Census Tanzania 2002. Population and housing

Census.www.tanzania.go.tz/census/census/tables.htm

Chawla, H.S; Gauba, K; Goyal, A. (2000). Trend of dental caries in children of Chandigarh over the last sixteen years. *J Indian Soc Pedod Prev Dent.*, **18**(1):41–45.

Chen, M.; Andersen, R.M.; Barmes, D.E ; Leclercq, M.H.; Lyttle, S.C. (1997). Comparing Oral Health Systems. A Second International Collaborative Study: Geneva, World Health Organization. WHO/ ORH/ICS11/97.1

Cleaton-Jones, P.E and Fatti, L.P. (1999). Dental caries trends in Africa. *Community Dent Oral Epidemiology.*, **27**: 316-320.

Cleaton-Jones, P. (2001). Dental caries trends in 5 to 6 year-old and 11 to 13 year-old children in two UNICEF designated regions: Sub-Saharan Africa, and Middle East and North Africa, 1970–2000. *J Isr Dent Assoc.*, **18**(1):11– 21

Cutress, T.W; Suckling, G.W. (1990). Differential diagnosis of dental fluorosis. *J Dent Res.*, **69**(Spec Iss):714–720.

Currie, C., Hurrelmann, K., Settertobulte, W., Smith, R. (2000). Todd. J. (eds). Health and health behavior among Young people. Copenhagen: WHO Regional Office for Europe; WHO Policy Series: Health policy for children and adolescents. Issue 1, International Report.

Dabora Pallos, Jussara CIA Sanches, Loberto. (2005). Periodontal disease in a rural community in Minas Gerais, *Brazil. J. Oral Sci.*, January/March -Vol.4-Number 12.

- De Almeida, P. E., Petersen S. J., Andre and A., Toscano. (2003). Changing Oral Health Status of 6- and 12-Year-Old Schoolchildren in Portugal. *Community Dental Health.*, **20**: 211–216.
- Dean, H.T., Arnold, F.A., Elvove, E. (1942). Domestic water and dental caries. *Public Health Rep.*, **57**:1155-79.
- Dean, H.T. (1934). Classification of mottled enamel diagnosis. *J Amer Dent Assoc.* v. **21**, p. 1421-6.
- Denbesten, P.K. (1999). Biological mechanisms of dental fluorosis relevant to the use of fluoride supplements *Community. Dent Oral Epidemiology.*, **27**: 41-7.
- Dent aid (2000). www.dentaid.org
- Dwelle, T.L. (1999). The challenge of street. Paper presentation, Community Health, Evangelism Conference. Nairobi, Kenya.
- Ekstrand, K; Qvist, V; Thylstrup, A. (1987). Light microscope study of the effect of probing in occlusal surfaces. *Caries Res* July/Aug;**21**(4):368-374.
- Frencken, J.E., Truin, G.J., Koenig, K.G., Ruiken, R.M., Elvers, H.J. (1985). Prevalence of caries, plaque and gingivitis in an urban and rural Tanzanian child population. *Community Dent Oral Epidemiology.*, **14**:161-4.
- Frencken, J.E., Manji, F., Mosha, H. (1986). Dental caries prevalence amongst 12-year-old urban children in East Africa., *Community Dent Oral Epidemiology.*, **14**:94-8.
- Fejerskov, O., Thylstrup, A., Mosha, H.J. (1991). Post-eruptive changes in human dental fluorosis a histological and ultra structural study. *Proc Finn Dent Soc.*, v. **87**, n. 4, p. 607-19.
- Fejerskov, O., Manji, F., Baelum, V. (1994). Caries prevalence in Africa and People's Republic of China. *InternationalDental Journal.*, **44**: 425-433.

- Grossi SG, Zambon JJ, Ho AW et al. (1994). Assessment of risk for periodontal disease. Risk indicators for attachment loss. *J Periodontal*, **65**: 260–267.
- Helm, S. (1997). Epidemiology and Public Health Aspects of Malocclusion. *J Dent Res Special Issue*, **56**: 27-31.
- Irigoyen ,M .E and Nelly, M. L (1995). Community Dentistry and Oral Epidemiology,. **23** (4):243-245.
- Jassem Al-Ansari, Eino Honkala, & Sisko Honkala. (2003). Oral health knowledge and behavior among male health sciences college students in Kuwait. *Med Princ Pract*, **12**:260-5.
- Kahabuka, F.K& Mbawalla, H.S. (2006). Oral health knowledge and practice among Dar-es- Salaam Institutionalised former street children aged 7-16 years. *Int J dent Hyg*, Nov. **4** (4):174-8.
- Kappa Statistics. [wikipedia.org/wiki/Kappa statistics](http://wikipedia.org/wiki/Kappa_statistics)
- Kelly, M., Steele, J., Nuttall, N., Bradlock, G., Morris, J., Nunn, J. (2000.) Adult Dental Health Survey. Oral Health in the United Kingdom. London. The Stationery Office.
- Kerosuo, E., Kerosuo, H., Kallio, P., Nyandini, U. (1986). Oral health status among teenage schoolchildren in Dar es salaam, Tanzania. *Community Dent Oral Epidemiology*, **14**:338-40.
- Khan, A.A. (1992). Prevalence of dental caries in schoolchildren of Lahore, Pakistan (abstract). *Community Dent Oral Epidemiol*,. **20**:155.

- Lalloo, R., Hobdell, M.H., Mosha, H.J., Mboli, F., Tanda, A. (1999). Dental caries status of 5-7 year old children in three districts in Tanzania, Uganda and Mozambique. *Odontostomatol Trop.*, **87**: 46-48.
- Lankinen, K.S, Bergstroms Makela, P.H., Peltomaa, M. (1994). Health and Disease in Developing Countries. London and Oxford: Macmillan Education Ltd.:586
- Lembariti, B.S. (1983). Periodontal Disease in Rural and Urban population in Tanzania. M.Sc. Thesis. University of Dar es Salaam, Dar es Salaam.
- Lembariti, B. S; Frencken, J. E; T. Pilot. (1988).Prevalence and severity of periodontal conditions among adults in urban and rural Morogoro, Tanzania.Community Dentistry and Oral Epidemiology,. **16** (4): 240–243.
- Levy S. (2003). Fluoride Action Network. fluoridealert.org/dental-fluorosis
- Le Roux, J. (1993). The black child in crisis. *JL van Schaik.*, (Vol. I). Pretoria
- Lewit, D. W. and Virolainen, K. (1968) Conformity and independence in adolescents' motivation for orthodontic treatment, *Child Development*., 39: 1189–1200.
- Lugalla, J.P & Mbawambo, J.K. (1999). Street Children and life in Urban Tanzania, *International. Journal of Urban and Regional Research.*, Vol **23**: 329-346.
- Mabelya, L., van't Hof, M.A., Koenig, K.G., van Palenstein Helderma, W.H. (1994). Comparison of two indices of dental fluorosis in low, moderate and high fluorosis Tanzanian Populations. *Community Dent Oral Epidemiology.*, **22**:415-20.
- Manji, F and Fejerskov, O. (1990). Dental caries in developing countries in relation to the appropriate use of fluoride. *J Dent Res.*, **69**:733-41.

Manji, F., Baelum., V., Fejerskov, O. (1986). Enamel changes in two low-fluoride areas of Kenya. *Caries Research.*, **20** (4):371-80.

Marthaler TM, O'Mullane DM, Vrbic V. (1996). The prevalence of dental caries in Europe 1990–1995. *Caries Res.*, **30**:237–255.

Mc Alpine, K. (2000). Mkobozi centre for street children: Brochure, Moshi, Tanzania. pg 3.

McKiernen, E., McKiernen, F. and Jones, M. L. (1992) Psychological profiles and motivation of adults who seek orthodontic treatment, *International Journal of Adult Orthodontics and Orthognathic Surgery*, 7, 187–198.

Miller. (1988). Homeless family Surveys. *The American Academy of Pediatrics.*, Volume **81**, Issue5, pp.668-673.

Miller AJ, Brunelle JA, Carlos JP, Brown LJ, Loe H. (1987). Oral Health of United States Adults: National Findings: Bethesda, M.D. National Institute of Dental Research, NIH, publication no. 87–2868.

Ministry of Health, The United Republic of Tanzania (1994). The National Plan for oral health of Tanzania. Dar es Salaam, Tanzania: COHU and DANIDA.

Ministry of Health. (2002). The United Republic of Tanzania. The Policy guidelines for oral health care in Tanzania. Dar es Salaam, Tanzania: COHU and DANIDA.

Mishra, P. (2003). Nepal Country Report: School oral health promotion programe. In The 2nd Asian Conference of Oral Health Promotion for School Children. Prospectus for Our Future Generation. Ayutthaya, Thailand, February 2003. Pp25-38. Bangkok: Thammasat University

Mjengera, H., Mkongo, G. (2002). Appropriate Defluoridation Technology for Use in Fluorotic Areas in Tanzania 1. 3rdWaterNet/Warfsa Symposium 'Water Demand Management for Sustainable Development. Ministry of Water and Livestock Development. Dar Es Salaam, Tanzania.

Mkombozi Street children home information center (2006).Moshi, Tanzania
[www,mkombozi.org/publication/internal policy](http://www.mkombozi.org/publication/internal_policy).

Mosh H.J. (2006). Dentistry for the underprivileged. *Tanzania Dental Journal*,. Vol **13** :1: 23-29.

Mosha, H.J. (2005). Provision of oral health services in Tanzania. Implementation status *.Tanzania Dental Journal*,. **12**:1:30-34.

Mosha, H.J. (1994). Oral health status and treatment needs in different age groups in two regions of Tanzania. *Community Dent Oral Epidemiology*,. **22**: 307-310.

Mosha, H.J and Jorgen, L. (1983). Dental caries, oral hygiene, periodontal disease and dental fluorosis among school children in Northern Tanzania. Oral Health Surveys. *Odonto-Stomatol Tropical*,. **6**:149-56.

Moyers, R.E. (1988). Handbook of orthodontics, Fourth edition. Chicago.

Moynihan, P., Petersen, P.E. (2004). Public Health Nutrition. Volume 007 (01A): 201-226.

Mugonzibwa, E.A; Mumghamba, E; Rugarabamu, P; Kimaro, S. (1990). Occlusal and space characteristics among 12-year-old school children in Bukoba and Moshi Tanzania. *Afr Dent J*,. **4** (1-5):6-10.

Mugonzibwa, E.A. (1992). Variation in occlusal and space characteristics in a series of 6- to 18-year-olds, in Ilala district, Tanzania. *Afr Dent J*,. **6**:17–22.

- Mugonzibwa, E.A ; Kikwilu, E.N; Martin, A. Van 't Hof; Kuijpers-Jagtman, A.M. (2004). Perceptions of dental attractiveness and orthodontic treatment need among Tanzanian children,. **125**: 426-434.
- Muller, I.J., Pindborg, J.J., Gedalia, I., Roed-Petersen, B. (1970). The prevalence of dental fluorosis in the people of Uganda. *Arch. Oral. Biol.*, **15**: 213-225.
- Mumghamba, E.G., Markkanen, H.A., Honkala, E. (1995). Risk factors for periodontal diseases in Ilala, Tanzania. *J Clin Periodontal.*, May **22** (5): 347-54.
- Mumghamba, E.G., Markkanen, H.A., Honkala, E. (1996). Periodontal status and treatment needs in a rural area of Ukonga, *Tanzania In Dent J.*, **46**: 156-60.
- Mwangosi, IEA. (1998). Suitability of present and future Primary school Teachers as Oral Health educators in Tanzania. A study in Rungwe district, Mbeya. M.Phil. Thesis. University of Bergen, Bergen.
- Naylor, M.N. (1994). Second International Conference on Declining Caries. *Int Dent Journal.*, **44**:363-458.
- Newbrun, E. (1989). Current concept of caries etiology. In: *Cariology*. 3rd ed. Chicago: Quintessence; p.29.
- N'gang'a, P.M., Valderhaug, J. (1993). Prevalence and severity of dental fluorosis in primary schoolchildren in Nairobi, Kenya. *Community Dent Oral Epidemiology.*, **21**:15-8.
- Nithila, A., Bourgeois, D., Barmes., D.E., Murtomaa, H. (1998). WHO Global Oral Data Bank, 1986-96: an overview of oral health surveys at 12 years of age. *Bull World Health Organ.*, **76**: 237-244.
- Normark & Mosha, H.J. (1989). Relationship between habits and dental health among rural Tanzanian children. *Community Dentistry and Oral Epidemiology.*, **17**:317-321

- Nyandini, U.S., Palini-Palokas, T., Milan, A., Robinson, V., Kombe, N., Mwakasagule, S. (1994). Oral health knowledge, attitude, behavior and skills of children entering in urban and rural areas in Tanzania. *Public Health.*, **108**:35-41.
- Olivera, S.A., Chits, P.J., Halpen, A.C., Fine, J.A., Barhill, R.L., Berwick, W.M. (1999). Patient knowledge, awareness and delay in seeking medical attention. *Journal of Clinical Epidemiology.*, **52** (11): 1111-6.
- Otuyemi, O.D., Ogunyinka, A., Dosumu, O., Cons, N.C., Jenny, J. (1999). Malocclusion and orthodontic treatment need of secondary school students in Nigeria according to the dental aesthetic index (DAI). *Int Dent J.*, **49** (4):203-10.
- Petersen, P.E. (2006). Oral health behavior of children and adults in urban and rural areas of Burkina Faso, Africa. *International Journal.*, **56**: 61-70.
- Petersen, P.E. (1989). Guttman scale analysis of dental health knowledge and attitude. *Community Dentistry and Oral Epidemiology.*, **17**:170-172.
- Petersen, P.E. & Razanamihaja, N. (1996). Oral health status children and adults in Madagascar. *International Dental Journal.*, **46**: 41-47.
- Petersen, P.E. & Mzee Omar. (1998). Oral Health profile of school children, mothers and school teachers in Zanzibar. *Community Dental Health.*, **15**:256-262.
- Petersen, P.E. & Kaka, M. (1999). Oral health status of children and adults in, the Republic of Niger, Africa. *International Dent J.*, **49**: 159-164.
- Petersen, P.E. (2003). The World Oral Health Report 2003: continuous improvement of oral health in the 21st century - the approach of the WHO Global Oral Health Programme. *Community Dentistry and Oral Epidemiology* **31**: (Suppl. 1): 3-24.

Petersen, P.E. (2004). Challenges to improvement of oral health in the 21st century - the Approach of the WHO Global Oral Health Programme..Int Dent J.Dec; **54** (6Suppl 1):329-43.

Population census, Tanzania, (2002). Industry News; 11-Oct-2002 DRS
www.tzonline.org

Position Paper of the American Academy of Periodontology. (1996). Epidemiology of periodontal diseases. *J Periodontol.*, **67**: 935–945.

Pratelli, P; Gelbier, S; Gibbons, D. E. (1998) Parental perceptions and attitudes on orthodontic care, *British Journal of Orthodontics.*, **25**: 41–46

Proffit, W. R. (2000). Contemporary orthodontics. Third edition. St Louis: Mosby

Rajab L.D., Petersen, P.E., Bakaeen, G., Hamdan, M.A. (2002). Oral health behavior of schoolchildren and parents in Jordan. *Int J Pediatric Dent.*, **12**: 168-76.

Richmond, S; Shaw, W. C; O'Brien, K. D; Buchanan, I. B; Stephens, C. D; Andrews, M.; Roberts, C. T. (1995) The relationship between IOTN and the consensus opinion of a panel of 74 dentists, *British Dental Journal.*, **178**: 370–374.

Richmond, S and Daniels, C. (1998) International comparisons of professional perceptions in Orthodontics. Part 1: treatment need, *American Journal of Orthodontics and Dento-facial Orthopaedics.*, **113**: 180–185.

Ruth, R. S. (2006). Assessment of oral health status in 12 years old primary school children in Kinondoni Municipality. Dar-es- Salaam. Unpublished thesis Tumaini University

Rugg-Gunn, A.J. (1984). Sugar consumption and dental caries: a review of evidence. *Community dental Health.*, **1**:85-92.

- Rwakatema, D.S. (2006). Prevalence of malocclusion among 12-15-year-olds in Moshi, Tanzania, using Bjork's criteria. *East African Medical Journal*,. Vol. **83**(7): 372-379.
- Scherp, H.W. (1964). Current concepts in periodontal disease research: epidemiological contributions. *J Am Dent Assoc.*, **68**: 667–675.
- Sembene M, Kane AW, Bourgeois D. (1999). Caries prevalence in 12-year-old schoolchildren in Senegal in 1989 and 1994. *Int Dent J.*, **49**:73–7521.
- Shaw, W. C., Lewis, H. G. and Robertson, N. R. E. (1975) The perception of malocclusion, *British Dental Journal*,. **138**, 211–216.
- Sheiham, A. (1984). Changing trends in Dental caries. *International Journal of Epidemiology*,. **13**:142-147.
- Sheiham, A. (1993). Guest Editorial: The Berlin Declaration on Oral Health and Oral Health Services. *Quintessence Int.*, **24**:829-831.
- Sheiham, A. (1994). The future of preventive dentistry. *BMJ.*, **309**:214-215.
- Streetman, H.D. (1995). A case of education for street children in Nairobi, Kenya and implications for the future policy. Ann Arbor, Michigan UMI dissertation services,. (2), Viii131p. 7
- Sprod, A.J; Anderson, R; Treasure, E.T. (1996). Effective oral health promotion. Literature review. Health promotion Wales Technical report No. 20.
- Sundin, B; Granath, L; Birkhed, D. (1992). Variation of posterior approximal caries incidence with consumption of sweets with regard to other caries-related factors in 15–18-year-olds *Community Dentistry and Oral Epidemiology*,. **20** 76 – 80.

Sullivan, E.A.O and A.J. Stephens. (1997). The Oral and dental status of Children residing in a Romanian orphanage. *Int J Pediatric dent Mar.*, **10**:41-2.

Tang, E.L, Wei, S.H. (1993). Recording and measuring malocclusion: a review of the literature. *Am J Orthod Dentofacial Orthop.*, **103**:344–351.

Tewari, G. K and Goyal, A. (1991). Evaluation of existing status of knowledge, practice and attitude towards oral health of rural community in Haryana-India. *J Indian Soc Pedod Prev Dent Mar.*, **9** (1):21-30.

The National Plan for Oral health Tanzania 1988-2002

www.who.int/oral_health/media/en/orh_school

Timmerman, M.F and Van Der Weijden, G.A. (2006). Risk factors for periodontitis *Int J Dent Hygiene.*, **4**: 2–7 3

The Department of Social Welfare Tanzania. (2007). Telephone conversation on institutionalised children.

Umeda, M; Chen, C; Bakker, I; Contreras, A; Morrison, J.L; Slots, J. (1998).

Risk indicators for harboring periodontal pathogens. *J Periodontol.*, **69**: 111–118

US Public Health Service, National Center for Health Statistics (1979). Basic Data on Dental Health Examination Findings of Persons 1–75 years; United States, 1971–1974. DHEW publication no. (PHS) 79–1662, Series 11, No. 214. Washington, DC: Governement Printing Office.

United Nations Millennium Summit (September 2000), The eight Millennium Development Goals. <http://www.unescap.org/esid/hds/pubs/2450/2450MDGs>.

UNICEF (2005). Fluoride in water: An overview L:www.unicef.org/wes/fluoride.pdf
Date accessed 27.10.05.

- Van Palenstein; Helderma, W.H ; Mabelya, L; Van't Hof, M.A; Konig, K.G. (1997). Two types of intraoral distribution of fluorotic enamel. *Community Dentistry & Oral Epidemiology.*, **25**(3):251-5
- Van Wyk, P.J ; Du plessis, L.S; Summers, C..J ; Snyman, W.D. (1985). A system for identifying and scoring occlusal disorders. *Am J Orthod.*, **59**:552-67.
- Varenne, B; Petersen, P.E; Ouattara, S. (2006). Oral health behavior of old children in urban and rural areas of Burkina Faso, Africa. *Int dent J.*, **56**: 62-70.
- Vigild, M; Petersen, P.E ; Hadi, R. (1999). Oral health behavior of 12-year-old children in Kuwait. *Int J Paediatr Dent.*, **9**: 23-29.
- Wang, H.Y; Petersen, P.E; Bjan, J.Y; Zhang, B.X. (2002). The second national survey of oral health status of children and adults in China. *Int Dent J Aug.*, **52**(4):283-90.
- Wertheimer, F.W ; Brewster, R.H; White, C.L. (1967). Periodontal disease and nutrition in Trinidad. *J Periodontol* ,. **38**: 100–104.
- Winter. (1995). Oral health: An essential service for the homeless. *J public Health dent.*, **55**(1):8-9.
- World Health Organization Global Oral Data Bank (WHO GODB 1994): Geneva.
- World Health Organization (1997): *Oral Health Surveys, Basic Methods*, **4th** edn. Geneva.
- World Health Organization (2003a): The World Oral Health Report 2003: continuous improvement of oral health in the 21st century - the approach of the WHO Global Oral Health Programme. *Community Dentistry and Oral Epidemiology.*, **31** (Suppl. 1): 3-24.
- World Health Organization (2003b): Diet, Nutrition and the Prevention of chronic Diseases. Report of a Joint WHO/FAO Expert Consultation. WHO Technical Report Series 916. Cambridge University Press. *Public Health Nutrition.*, **7**: 245-250

- World Health Organization Global Oral Data Bank (WHO GODB 2005): Geneva.
- World Health Organization (2004): Guidelines for drinking-water quality (3rd ed.) Geneva, Switzerland. 2004. *Oral Epidemiology*, **6** :315-28.
- Wondwossen, F; Astrom, A..N ; Bjork, H..L K ; Bardsen, A. (2004). The relationship between dental caries and dental fluorosis in areas with moderate- and high- fluoride drinking water in Ethiopia. *Community Dent Oral Epidemiology*, **32**: 337-44.
- Wright, J.D. (1991). “Children in and of the Streets - Health, Social Policy, and the Homeless Young”, *AMJ Disabled child*,. **145** (5) 516-519.
- Yoder, K.M; Mabelya, L; Robison, V.A; Dunipace, A.J; Brizendine, E.J; Stookey, G.K. (1998). Severe dental fluorosis in Tanzanian population consuming water with negligible fluoride concentration. *Community Dentistry & Oral Epidemiology*, **26** (6):382-93.
- Zhao, W; Zhu, H; Yu, Z; Aoki, K; Misumi, J; Zhang, X. (1998). Long-term Effects of Various Iodine and Fluorine Doses on the Thyroid and Fluorosis in Mice. *Endocr Regul* ,. **32**(2):63-70.
- Zhu, L; Petersen, P.E; Wang, H.Y; Bain, J.Y; Zang, B.X. (2003). Oral health knowledge, attitudes and behavior of children and adolescents in China. *Int Dent J*, **53**:289-298

CONSENT FORM

Dear caregivers,

I am conducting a study on oral health status of street in Amani street children's home Moshi district. I would like to ask some question regarding oral health practices and conduct clinical examination for street children in your home. All the information will be recorded and kept with confidentiality. Nothing parenteral will be given to your child. You are free to refuse in participation in this study with out giving any explanations.



Do you agree and allow your child to participate in the study?

YES _____

NO _____

NAME OF THE CHILD: _____

NAME OF THE CARE

GIVER: _____

SIGNATURE _____

DATE: _____

CONSENT FORM

Dear caregivers,

I am conducting a study on oral health status of street in Mkombozi street children's home, Moshi district. I would like to ask some question regarding oral health practices and conduct clinical examination for street children in your home.

All the information will be recorded and kept with confidentiality. Nothing parenteral will be given to your child. You are free to refuse participation in the without giving any explanations.

Do you agree and allow your child to participate in the study?

YES _____ NO _____

NAME OF THE CHILD: _____

NAME OF THE CARE _____

GIVER: _____

SIGNATURE _____

DATE: _____



Appendix C

Request letter to “The Regional Director of Social Welfare”

Dr Sravanam.V.Rao

K.C.M.C

P.O. Box 3010

Moshi.

Tanzania

Date:

The Regional Director of Social Welfare

Ministry of social welfare

Moshi, Tanzania



Dear Sir,

Sub: - REQUEST TO CONDUCT A SURVEY ON ORAL HEALTH STATUS OF STREET CHILDREN AT MOSHI (AMANI CHILDREN HOME & MKOMBOZI STREET CHILDREN HOMES).

I, Dr Sravanam.V.Rao (the researcher), intend to conduct a survey on the oral health status of the street children, who are residing in Amani street children home and Mkombozi street children home. The study consists of two parts, a clinical examination and questionnaire for the children and self-administered questionnaire for the caregivers. Oral examinations will be carried out using WHO guidelines.

Informed consent will be obtained from each child who is participating in the study.

(Consent form attached).

The researcher preserves the right of the respondents by not using force or coercion and by giving full explanation about the study. The study will be careful when forming questions not to alarm respondents and privacy will be maintained. The researcher will assure the subject of confidentiality and this will be ensured by use of numbers rather than subject's names. When examining (Oral) the children, universal precaution on infection control, will be maintained all the time to avoid cross infection. Privacy will be maintained at all time during oral examination.

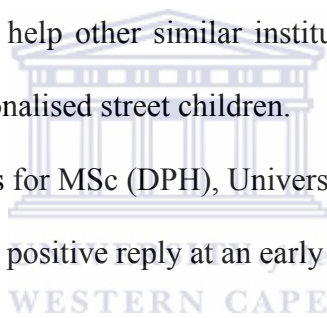
After examining the children, treatment will be given for those who needed treatment. Oral health education will be given to every child. We will also educate the caregivers on prevention of oral diseases and oral hygiene. The recommendations from this study may also help other similar institutions in Tanzania to improve the oral health of the institutionalised street children.

This will also be my thesis for MSc (DPH), University of the Western Cape.

May you kindly give me a positive reply at an early date?

Yours truly,

Dr S.V.Rao



Request letter to “The Director Mkobozi Street Children Home”

Dr Sravanam.V.Rao

K.C.M.C

P.O. Box 3010

Moshi.

Tanzania

Date:

The Director

Mkobozi street children home

Box: 9610

Moshi.

Tanzania



Dear madam/sir

Sub: REQUEST TO CONDUCT A SURVEY ON ORAL HEALTH STATUS OF
STREET CHILDREN IN MKOMBOZI STREET CHILDREN HOME, MOSHI

I, Dr Sravanam.V.Rao (the researcher) intend to conduct a survey on the oral health status of the children who are residing in your home (Mkobozi street children home).

The study consists of two parts, a clinical examination and interviews with street children in the institute and self-administered questionnaires for the caregivers.

Oral examinations will be carried out using the instruments, examination procedures and diagnostic criteria recommended by WHO.

Informed consent will be obtained from each child who is participating in the study (consent form attached).

The researcher preserves the right of the respondents by not using force or coercion and by giving full explanation about the study. The study will be careful when forming questions not to alarm respondents. The researcher will assure the subject of confidentiality and this will be ensured by use of numbers rather than subject's names. When examining (oral examination) the children, universal precaution on infection control, will be maintained all the time to avoid cross infection. Privacy will be maintained at all time during oral examination.

After examining the children, treatment will be given for those who needed treatment. Oral health education will be given to every child. We will also educate the caregivers on prevention of oral diseases and oral hygiene. The recommendations from this study may also help other similar institutions in Tanzania to improve the oral health of the institutionalised street children.

This will also be my thesis for MSc (DPH), University of the Western Cape.

May you kindly give me a positive reply at an early date?

Yours truly,

Dr S.V.Rao

Appendix E

Request letter to “The Director Amani Street Children Home”

Dr Sravanam.V.Rao

K.C.M.C

P.O. Box 3010

Moshi.

Tanzania

Date:.....

The Director

Amani Childrens Home

Moshi



SUB: - REQUEST TO CONDUCT A SURVEY ON ORAL HEALTH STATUS OF
STREET CHILDREN AT AMANI CHILDREN’S HOME, MOSHI.

I, Dr Sravanam.V.Rao (the researcher), intend to conduct a survey on the oral health status of the street children, who are residing in your home (Amani Children’s Home).

The study consists of two parts, a clinical examination and questionnaire for the children and self-administered questionnaire for the caregivers. Oral examinations will be carried out using (WHO) guidelines.

Informed consent will be obtained from each child who is participating in the study (consent form attached).

The researcher preserves the right of the respondents by not using force or coercion and by giving full explanation about the study. The study will be careful when

forming questions not to alarm respondents. The researcher will assure the subject of confidentiality and this will be ensured by use of numbers rather than subject's names. When examining (Oral) the children, universal precaution on infection control, will be maintained all the time to avoid cross infection. Privacy will be maintained at all time during oral examination.

After examining the children, treatment will be given for those who needed treatment. Oral health education will be given to every child. We will also educate the caregivers on prevention of oral diseases and oral hygiene. The recommendations from this study may also help other similar institutions in Tanzania to improve the oral health of the institutionalised street children.

This will also be my thesis for MSc (DPH), University of the Western Cape.

May you kindly give me a positive reply at an early date?

Yours truly,

Dr S.V.Rao



Questionnaire for street children

Questionnaire: English version

Questionnaire No.

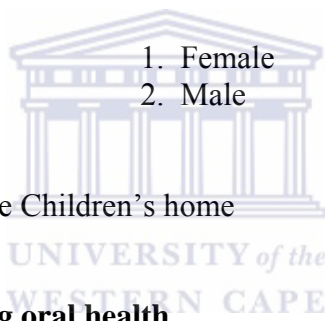
Names of Children home: -----

Date: -----

Section 1

Personal particulars

No	Question	Variable
1.	Age	<input type="text"/> <input type="text"/>
2.	Sex	<input type="text"/>
3.	Class	<input type="text"/>
4.	Duration at the Children's home	<input type="text"/>



Section 2

Questionnaire concerning oral health

5. Do you brush your teeth?

1. Yes.....

2. No.....

If yes to Q5

6. What item do you use to clean your teeth in the home?

1. Brush.....

2. Miswaki.....

3. Only finger.....

4. Char coal.....

5. I don't brush at all.....

7. What item were you using while you were in the streets?

- 1. Brush.....
- 2. Miswaki.....
- 3. Only finger.....
- 4. Char coal.....
- 5. I don't brush at all.....

8. What do you clean with in the home?

- 1. Tooth paste.....
- 2. Ashes.....
- 3. Salt.....
- 4. Char coal.....
- 5. I don't brush at all.....



9. What do you clean with while you were in streets?

- 1. Tooth paste.....
- 2. Ashes.....
- 3. Salt.....
- 4. Char coal.....
- 5. I don't brush at all.....

10. Do you use toothpaste with fluoride?

- 1. Yes
- 2. No

11. How often do you brush your teeth?

1. Once daily
2. Twice daily
3. Thrice daily
4. once a week
5. I don't brush my teeth

12. How often do you brush your teeth while you were in the streets?

1. Once daily
2. Twice daily
3. Thrice daily
4. Once a week
5. I don't brush my teeth

13. When normally do you brush your teeth?

1. Mornings
2. Evenings
3. Morning & evening before going to bed
4. Whenever I get time
5. I don't brush at all



14. Have you ever received oral health education?

1. Yes.....
2. No.....

If Yes to Q14

15. From who did you received health information?

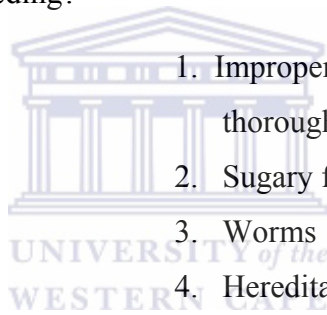
1. Teachers at school
2. Parents
3. Older siblings
4. Friends
5. Others

16. What causes dental caries?

(Tooth decay)

1. Improper cleaning of teeth/not brushing thoroughly
2. Sugar foods /Unhealthy food
3. Worms
4. Hereditary
4. I don't know
5. Illness
6. Others

17. What causes gum bleeding?



1. Improper cleaning of teeth/not brushing thoroughly
2. Sugary foods /Unhealthy food
3. Worms
4. Hereditary
5. I don't know
6. Illness
7. Others

8. How can you prevent dental decay/caries?

1. By rinsing with water
2. Restricting sugary food
3. Regular brushing
4. I don't know
5. Other

19. How can you prevent gum bleeding?

1. By avoiding kissing
2. Eating soft diet
3. By thorough tooth brushing with paste
4. I don't know
5. Others (explain)

.....
.....

20. What does fluoride do to our teeth?

1. Makes teeth discolor

YES	NO
<input type="checkbox"/>	<input type="checkbox"/>

2. Prevents tooth decay.

YES	NO
<input type="checkbox"/>	<input type="checkbox"/>

3. Make teeth stronger and healthier

YES	NO
<input type="checkbox"/>	<input type="checkbox"/>

4. Don't know

21. How many times do you eat the following snacks while in you are in the home?

Biscuits/Chocolates

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Sweets

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Soda or cool drink

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Ice cream



1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Tea with sugar

1. Once a day
2. Twice a day
3. Three times a day or more
4. Occasionally
5. I don't eat completely

Chewing gum with sugar

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

22. How many times do you were eating the following snacks while you were in the streets?

Biscuits/Chocolates

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Sweets/Chocolates

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Soda and Juice



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WESTERN CAPE

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Ice cream

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Tea with sugar

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Chewing gum with sugar

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

23. May you identify which the following items may harm your natural teeth?

1. Chewing gum with sugar.....
2. Ice cream.....
3. Tea/Coffee with sugar.....
4. Milk with sugar
5. Soda and Juice.....
6. Biscuits.....
7. Sweets/Chocolate/.....
Carbohydrate



24. Have you ever suffered from dental problem?

1. Yes
2. No

If yes to Q.24

26. Have you ever suffered with?

1. Tooth pain.....
2. Bleeding gums.....
3. Bad breathe.....
4. Others.....

27. How often do you visit Dentist?

1. In every 2 years
2. Once a year
3. After every 6 months
4. When I have a toothache
5. I don't go for check up

If No to Q 27

28. What reason for not to visiting a dentist?

1. Can not afford
2. No need when no pain
3. Dentist hurt
4. Afraid of dentist
5. I don't go for check up

If Yes to Q 27

29. What reason to visit a dentist?



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1. Tooth extraction.....
2. Tooth filling.....
3. Cleaning.....
4. Check up.....
5. Any other reason
specify.....

Questionnaire for caregivers

Questionnaire: English version

Questionnaire No.

Name of Children home: -----

Date: -----

Section 1

Personal particulars

No	Question	Variable
1.	Age	<input type="text"/> <input type="text"/>
2.	Sex	<input type="text"/>
3.	What is your profession?	<input type="text"/>
	1. Administrator	
	2. Teacher	<input type="text"/>
	3. Care taker	
	4. Nurse	
4.	Highest qualifications that you have attained?	
	1. Standard 7	
	2. O-level	
	3. A-level	<input type="text"/>
	4. Diploma	
	5. Cambridge	
	6. Degree	

Section 2

Questions concerning oral health

Oral hygiene practice

5. Do you brush your teeth?
1. Yes.....
4. No.....

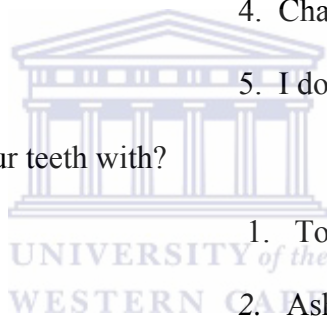
If yes to Q5

6. What item do you use to clean your teeth?
1. Brush.....
2. *Miswaki*.....
3. Only finger.....
4. Char coal.....
5. I don't brush at all.....

7. What do you clean your teeth with?
1. Tooth paste.....
2. Ashes.....
3. Salt.....
4. Char coal.....
5. I don't brush at all.....

8. Do you use toothpaste with fluoride?
1. Yes
2. No

9. How often do you brush your teeth?
1. Once daily
2. Twice daily
3. Thrice daily
4. Once a week
5. I don't brush my teeth

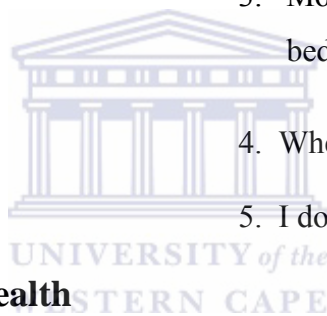


10. How often one should brush once teeth?

- 1. Once daily
- 2. Twice daily
- 3. Thrice daily
- 4. Once a week
- 5. I don't brush my teeth

11. When normally do you brush your teeth?

- 1. Mornings
- 2. Evenings
- 3. Morning & evening before going to bed
- 4. Whenever I get time
- 5. I don't brush at all



Knowledge on oral health

12. Have you ever received oral health education?

- 1. Yes.....
- 2. No.....

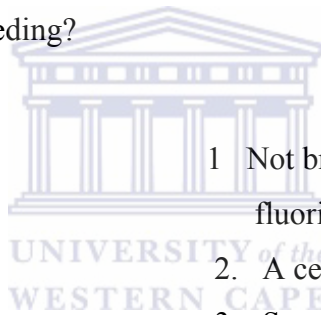
13. If Yes, from whom?

- 1. Teachers at school
- 2. Parents
- 3. Older siblings
- 4. Friends
- 5. Others

14. What causes dental caries (Tooth decay) ?

1. Not brushing teeth thoroughly with fluoride paste
2. A certain worm
3. Sugary food / sweets
4. Hereditary
5. I don't know
6. Ill health
7. Others

15. What causes gum bleeding?



1. Not brushing teeth thoroughly with fluoride paste
2. A certain worm
3. Sugary food / sweets
4. Hereditary
5. I don't know
6. Ill health
7. Others

16. How can you prevent dental caries?

1. By regular tooth brushing.....
2. By rinsing with water.....
3. Avoiding consumption of sugary food.....
4. By regular dental visits.....
5. I don't know -----
6. Other -----

17. How can you prevent gum bleeding?

- 1. By regular tooth brushing
- 2. Avoiding consumption of sugary food.....
- 3. By avoiding kissing.....
- 4. I don't know.....
- 5. Eating soft diet.....
- 6. Others (explain)

.....

18. What does fluoride do to our teeth?



1. Makes teeth discolor

YES NO

2. Prevents tooth decay. YES NO

3. Make teeth stranger and

Healthier

YES NO

4. Don't know.....

Practice of sugary items

19. How many times do you eat the
Following snacks?

Biscuits

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Sweets

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Soda or Cool drinks

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Ice cream

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Tea/Coffee with sugar

1. Once a day

2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

Chewing gum with sugar

1. Once a day
2. Twice a day
3. Three times a day and more
4. Occasionally
5. I don't eat completely

20. May you identify which the following
Items may harm your natural teeth?



1. Chewing gum with sugar.....
2. Ice cream.....
3. Tea/Coffee with sugar.....
4. Soda.....
5. Biscuits.....
6. Sweets/Chocolate/.....

21. Have you ever suffered from dental problem?

1. Yes
2. No

If yes to Q.21

22. Have you ever suffered with?

1. Tooth pain.....
2. Bleeding gums.....
3. Bad breathe.....
4. Others.....

23. How often do you Visit dentist

- 1. In every 2 years
- 2. Once a year
- 3. After every 6 months
- 4. When I have a toothache
- 5. I don't go for check up

If No to Q 23

24. What reason not to visit a dentist?
- 1. Can not afford
 - 2. No need when no pain
 - 3. Dentist hurt
 - 4. Afraid of dentist
 - 5. I don't go for check up

If yes to Q 23

25. Reason for dental visit?
- 1. Tooth extraction.....
 - 2. Tooth filling.....
 - 3. Cleaning.....
 - 4. Check up.....
 - 7. Medication for tooth pain.....
 - 8. Any other reason
specify.....



26. Where did you seek treatment?

- 1. Private clinic
- 2. Govt. clinic
- 3. Mission hospital
- 4. Any other.....

27. Do you advise children on oral health?

- 1. Yes
- 2. No

28. How often do you provide

1. Tooth paste?

- a). Once every month
- b). Once in two months
- c). Not regularly

2. Toothbrush

- a). Once every month
- b). Once in two months
- c). Not regularly

29. Do you provide sugary items to children?

- a). Sweets
- b). Chocolates
- c). Cool drinks
- d). Biscuits
- e). Tea with sugar

30. Would you attend a seminar on oral health?

- 1. Yes
- 2. No

31. Would you disseminate the information on oral health to community?

- 1. Yes
- 2. No

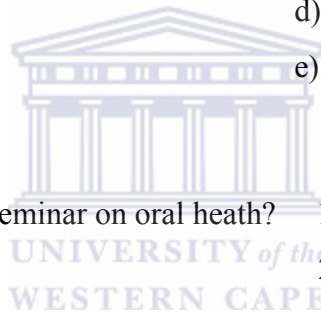


Table 17 Changes in Caries Levels in Different Global Regions

Region	Area	Age Group	Year	Mean DMFT	Year	Mean DMFT	Reference
EME	England and Wales	12	1973	4.8	1993	1.2	O'Brien, 1993
	Finland	12	1988	2.0	1991	1.2	Marthaler <i>et al.</i> , 1996
	USA	12	1986–87	1.8	1988–91	1.4	Beltrán-Aguilar <i>et al.</i> , 1999
Sub-Saharan Africa	Review of 45 papers meeting specified criteria		Review of studies from 10 countries between 1988 and 1998 show a decline in DMFT among urban and no change among rural 11- to 13-year-olds				Cleaton-Jones, 2001
	Tanzania	11	1983	1.0	1989	0.3	Fejerskov <i>et al.</i> , 1994
	Senegal	12	1989	1.5	1994	1.2	Sembene <i>et al.</i> , 1999
Middle Eastern Crescent (incl. North Africa)	Review of 25 papers meeting specified criteria		Review of studies from 10 countries between 1976 and 1994 show no change in mean DMFT.				Cleaton-Jones, 2001
	S. China	12	1982	2.1	1997	0.9	Wong <i>et al.</i> , 2001
Asia	India	15	1977	4.74	1985	1.4	Chawla <i>et al.</i> , 2000
Asia	Pakistan	12	1979	2.1	1991	0.9	Khan, 1992
Source: WHO Oral Health country/Area profile: Global Oral Data Bank 2005							

Table 18 DMFT and dmft scores status in Tanzania

Per Cent Affected; DMFT; Different Age groups							
Age Group	% affected	DMFT	D	M	F	Year	Source
12 years	n.a.	0.3	0.3	0.0	0.0	1994	1) WHO Oral Health Data Bank, 2005 2) Nithila et al, 1998
18 years	n.a.	0.7	0.48	0.22	0.03	1989-90	1) WHO Oral Health Data Bank, 2005 2) Mosha et al, 1994
Age	% affected	dmft	d	m	f	Year	Source
5-7 years	65	2.6	2.5	0.15	0.0	1997	1) WHO Oral Health Data Bank, 2005 2) Lalloo et al, 1999

TABLE 19 Periodontal conditions in developed countries

Country	Year	Number of dentate	Age	% of persons with highest score(CPITN)				
				0	1	2	3	4
				No disease	Bleeding on probing	Calculus	PP 4-5mm	PP 6mm
Germany	1991-92	198	15-19	7	11	11	62	9
Ireland	1984	2454	15-19	43	21	35	1	0
Italy	1989-91	234	15-19	39	10	48	3	0
Netherlands	1986	530	15-19	6	47	29	16	1
USA	1986	358	15-19	17	13	33	32	5
Canada	1989	187	15-19	17	36	42	5	0

Source: WHO GODB 1994.

Table 20 Periodontal conditions in African countries

Country	Year	No of dentate	Age	% of persons with highest periodontal score(CPITN)				
				0	1	2	3	4
				No Disease	Bleeding on probing	Calculus	PP 4-5 mm	PP \geq 6 mm
Tanzania	1989	135	15-19	18	19	62	1	0
Zaire	1985	245	16-19	1	1	96	2	0
Zimbabwe	1995	1407	15-19	23	21	47	8	1
Kenya	1984	1898	15	1	52	40	6	1
South Africa	1995	683	15-19	3	3	8	47	1

Source: WHO, 2005



Table 21 Number of street children treated and Oral hygiene instructions give

Treatment given	Oral hygiene instructions	Scaling done	Fillings done
Number of children	100	51	26

Table 22 Tanzania studies

Sporadic surveys	
Ruth (2006)	Assessment of oral health status in 12 years old primary school children in Kinondoni Municipality. Dar-es- Salaam
Kahabuka, F.K& Mbawalla, H.S. (2006)	Oral health knowledge and practice among Dar-es- Salaam. Institutionalised former street children aged 7-16 years.
Rwakatema, D.S. (2006)	Prevalence of malocclusion among 12-15-year-olds in Moshi
Mugonzibwa,(2000)	Perception of dental attractiveness and orthodontic treatment need among Tanzanian children
Mc Alpine, K. (2000)	Mkobozi centre for street children: Brochure, Moshi
Lugalla, J.P & Mbawambo, J.K. (1999)	Street Children and life in Urban Tanzania
Mumghamba, et al(1996)	Periodontal status and treatment needs in a rural area of Ukonga,
Mumghamba, et al,(1995)	Risk factors for periodontal diseases in Ilala, Tanzania.
Mugonzibwa, (1992)	Variation in occlusal and space characteristics in a series of 6- to 18-year-olds, in Ilala district, Tanzania
Kerosuo, et al (1986)	Oral health status among teenage schoolchildren in Dar es Salaam, Tanzania

Table 23 Tanzania Nation wide surveys

Mosh H.J. (2006)	Dentistry for the underprivileged
Mosha, H.J. (2005)	Provision of oral health services in Tanzania. Implementation status
Ministry of Health Tanzania, (2002)	The Policy guidelines for oral health care in Tanzania. Dar es Salaam, Tanzania:
Mjengera, H& Mkongo, G. (2002)	Appropriate Deflouridation Technology for Use in Fluorotic Areas in Tanzania
Awadia, et al (1999)	Vegetarianism and dental fluorosis among children in a high fluoride area of northern Tanzania
Awadia, et al(2000)	Weaning food and <i>magadi</i> associated with dental fluorosis in Northern Tanzania
Mwangosi, IEA. (1998).	Suitability of present and future Primary school Teachers as Oral Health educators in Tanzania.
Yoder et al,(1998)	Severe dental fluorosis in Tanzanian population consuming water with negligible fluoride concentration
Petersen and Omar (1998)	Oral Health profile of school children, mothers and school teachers in Zanzibar.
Van Palenstein et al (1997)	Two types of intra-oral distribution of fluorotic enamel.
Mosha, H.J (1994)	Oral health status and treatment needs in different age groups in two regions of Tanzania.
Nyandini(1994)	Oral health knowledge, attitude, behavior and skills of children entering in urban and rural areas in Tanzania
Mabeya, et al(1994)	Comparison of two indices of dental fluorosis in low, moderate and high fluorosis Tanzanian Populations
Normark & Mosha, H.J. (1989)	Relationship between habits and dental health among rural Tanzanian children.
Frencken et al. (1985)	Prevalence of caries, plaque and gingivitis in an urban and rural Tanzanian child population.
Baelum(1986)	Oral hygiene, gingivitis and periodontal breakdown in adult Tanzanians.
Lembariti,B.S (1983)	Periodontal Disease in Rural and Urban population in Tanzania.
Mosha, H.J and Jorgen, L (1983)	Dental caries, oral hygiene, periodontal disease and dental fluorosis among school children in Northern Tanzania

Table 24 African & East African studies

Varenne et al (2006)	Oral health behavior of old children in urban and rural areas of Burkina Faso, Africa.
Petersen, P.E. (2006)	Oral health behavior of children and adults in urban and rural areas of Burkina Faso, Africa
Wondwossen Et al,(2004)	The relationship between dental caries and dental fluorosis in areas with moderate- and high- fluoride drinking water in Ethiopia
Laloo et al (1999)	Dental caries status of 5-7 year old children in three districts in Tanzania, Uganda and Mozambique
Cleaton-Jones, P.E and Fatti, L.P. (1999)	Dental caries trends in Africa
Petersen, P.E &Kaka, M. (1999).	Oral health status of children and adults in, the Republic of Niger, Africa.
Dwelle, T.L.(1999).	The challenge of street. Paper presentation, Community Health, Evangelism Conference. Nairobi, Kenya.
Petersen, P.E. & Razanamihaja, N. (1996).	Oral health status of children and adults in Madagascar.
Streetman, H.D. (1995)	A case of education for street children in Nairobi, Kenya
N'gang'a, P.M., Valderhaug, J. (1993).	Prevalence and severity of dental fluorosis in primary Schoolchildren in Nairobi, Kenya.
Manji, et al (1986)	Enamel changes in two low fluoride areas of Kenya.
Frencken, et al (1986)	Dental caries prevalence amongst 12-year-old urban children in East Africa
Sheiham, A. (1984)	Changing trends in Dental caries

Summary of Google database literature.

Table 25

Dental caries			
Source	Source	Google	Google
Years/Database searched	1932-2006		
Search Terms	Results	Relevant/Articles abstract	Accessible results
Dental caries in Africa	146,000	19,500	4
Dental caries in East Africa	98,400	15,100	3
Dental caries in Tanzania	11,100	425	5
Periodontal conditions			
Periodontal conditions Human population in Africa.	83,600	13,400	2
Periodontal conditions in East Africa	62,800	11,400	2
Periodontal conditions in Tanzania	21,900	334	5
Dental fluorosis			
Dental fluorosis in Africa	34,100	514	2
Dental fluorosis in East Africa	33,500	453	2
Dental fluorosis in human population in Tanzania	26,000	185	7
Malocclusion			
Malocclusion in Human population in Africa	26,500	322	2
Dental Malocclusion in human population in East Africa	15,800	289	0
Malocclusion in Tanzania	680	109	4
Oral health knowledge			
Oral health knowledge of school children in Africa	832,000	462,000	5
Oral health knowledge of school children in Tanzania	179,000	422	2
Oral health and Oral health knowledge and practices among institutionalized street children in Africa	15	5	5
Petersen et al 1980-2006	29	12	5

Literature was also identified from searches conducted on the WHO website using the following terms World Health Organization Global Oral Data Bank (WHO GODB 2005). The World Health Report 2003. Oral Health Surveys, Basic Methods.

Information got from the Tumainy University dissertations. Library services and

UWC, (University of the Western Cape, S.A) library services. Remaining were searched by author's name.

