EARLY CHILDHOOD CARIES AMONG 3-5 YEAR OLDS AND THEIR CAREGIVERS’ ORAL HEALTH KNOWLEDGE, ATTITUDE AND PRACTICE IN KIAMBAA DIVISION, KENYA

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This research thesis is submitted in partial fulfillment for the award of the degree of Master of Dental Surgery at the Department of Paediatric Dentistry and Orthodontics, School of Dental Sciences, University of Nairobi

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DECLARATION

I, Dr Nancy W. Njoroge, hereby declare that this thesis is my original work and has not been presented for a degree in any other University.

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To my husband Njoroge, for his tireless support and encouragement and to my children Wairimu and Njeri for their prayers and understanding.
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Above all I thank God whose grace and strength has sustained me throughout the course.
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<tr>
<td>ANC</td>
<td>Antenatal Clinic</td>
</tr>
<tr>
<td>BDS</td>
<td>Bachelor of Dental Surgery</td>
</tr>
<tr>
<td>dmft</td>
<td>decayed, missing, filled, teeth in the deciduous dentition</td>
</tr>
<tr>
<td>dt</td>
<td>decayed teeth</td>
</tr>
<tr>
<td>ECC</td>
<td>Early Childhood Caries</td>
</tr>
<tr>
<td>ft</td>
<td>Filled teeth</td>
</tr>
<tr>
<td>H&lt;sub&gt;A&lt;/sub&gt;</td>
<td>Alternate Hypothesis</td>
</tr>
<tr>
<td>H&lt;sub&gt;0&lt;/sub&gt;</td>
<td>Null Hypothesis</td>
</tr>
<tr>
<td>KAP</td>
<td>Knowledge, Attitude and Practice</td>
</tr>
<tr>
<td>KDDP</td>
<td>Kiambu District Development Plan</td>
</tr>
<tr>
<td>KNH</td>
<td>Kenyatta National Hospital</td>
</tr>
<tr>
<td>MCH/FP</td>
<td>Maternal and Child Health/ Family Planning</td>
</tr>
<tr>
<td>MDS</td>
<td>Master of Dental Surgery</td>
</tr>
<tr>
<td>MOE</td>
<td>Ministry of Education</td>
</tr>
<tr>
<td>MPH</td>
<td>Masters in Public Health</td>
</tr>
<tr>
<td>mt</td>
<td>missing teeth</td>
</tr>
<tr>
<td>NOHP&amp;SP</td>
<td>National Oral Health Policy and Strategic Plan</td>
</tr>
<tr>
<td>NOHS</td>
<td>National Oral Health Survey</td>
</tr>
<tr>
<td>SPSS</td>
<td>Statistical Package for Social Sciences</td>
</tr>
<tr>
<td>UoN</td>
<td>University of Nairobi</td>
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<td>WHO</td>
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ABSTRACT

INTRODUCTION: Early Childhood Caries (ECC) denotes any form of caries occurring in the primary dentition of children before 71 months of age. The prevalence of ECC appears to be on the increase among preschool children in Kenya. Change of diet from the traditional fibrous foods to western refined foods coupled with poor oral hygiene of the children may be part of the reason for the increase. Oral health knowledge and attitudes of caregivers may influence dietary habits and oral hygiene practices of their children.

OBJECTIVE: To determine the prevalence and patterns of ECC among 3-5 year olds and their caregivers’ oral health knowledge, attitude and practice in one division of Kiambu District, Kenya.

MATERIALS AND METHODS: This was a descriptive, cross-sectional study conducted among 3-5 year old children. A list of schools from the District Education office was used as the sampling frame. Stratified random sampling was used. The schools were categorized into private and public. A table of random numbers was used to select schools from each category until the sample size was obtained. A total of 343 children were enrolled in the study. An oral examination of the children was done under natural light using a dental probe and mirror. ECC experience was assessed using decayed, missing, filled teeth (dmft) index in accordance with World Health Organisation (WHO) criteria of 1997. Three hundred and forty three questionnaires were sent to the respective child’s caregiver. Information sought included caregivers oral health related knowledge, attitudes and practices.
DATA ANALYSIS: The data was analysed using SPSS 12.0.1 for Windows version. Descriptive analysis was used to report cross-sectional data. Univariate analyses were performed using chi-square statistics and one-way ANOVA.

RESULTS: Slightly over a half, 201 (59.5%) had dental caries. The mean dmft was $2.46 \pm 3.2$ SD with the greatest component (95%) being decayed teeth. Mandibular deciduous molars and maxillary incisors were the most frequently affected teeth. Majority (94.4%) of the children brushed at least once daily. Ninety five percent of the children used toothpaste. The caregivers' knowledge on causes and prevention of caries was high. Although 85% of caregivers reported that deciduous teeth were important, 57% preferred extraction of an asymptomatic carious deciduous tooth.

CONCLUSIONS: The prevalence of ECC was 59.5% while the dmft was $2.46 \pm 3.2$ with a mean decayed component of 2.36. Children from private pre-schools had a statistically higher prevalence of ECC compared to those from public preschools. Oral health knowledge among the caregivers was relatively high but the role of infant feeding practices on ECC was low.

RECOMMENDATIONS: Initiate oral health education programmes integrated with ANC, MCH/FP and School Health Education Programmes. Mobilise community oral health workers to perform regular dental check-ups of preschool children to enable prompt referral to the nearest dental health facility. Conduct further research to elicit factors influencing dental health seeking behaviour and dietary habits of the children.
CHAPTER 1

1. INTRODUCTION & LITERATURE REVIEW

1.1. INTRODUCTION

Caries is a biofilm-mediated acid demineralization of enamel or dentin. The disease of early childhood caries (ECC) is the presence of 1 or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe early childhood caries (S-ECC). From ages 3 through 5, 1 or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth, or a decayed, missing, or filled score of >4 (age 3), >5 (age 4), or >6 (age 5) surfaces constitutes S-ECC. The term Early Childhood Caries (ECC), was first suggested at a 1994 Centres for Disease Control and Prevention workshop. Early childhood caries has also been described as nursing caries, nursing bottle syndrome, night bottle mouth, and baby bottle tooth decay. Prior to the definition, there was no universally accepted criteria for the diagnosis of ECC and even those employed varied among epidemiological surveys.

Early Childhood Caries is a result of the interaction of cariogenic bacteria, fermentable carbohydrates and susceptible tooth surfaces within appropriate time. While several types of bacteria have been implicated in ECC, the streptococci group such as S. mutans, S. mitis and S. salivarius have been
thought to be the most important. Apart from their ability to produce acid, the
cariogenic properties of *S. mutans* depends also on its ability to form
extracellular glucans which favour plaque formation. In children the major
reservoir from which they acquire *S. mutans* is usually from their mother’s salivao.10 Milgrom et al.11 suggested that the acquisition of mutans streptococci in young children most likely takes place during a “window of infectivity” from 19 to 31 months of age. Early Childhood Caries has two variants: nursing caries and rampant caries. The difference between the two variants is the involvement of mandibular incisors in rampant caries as opposed to nursing caries.

Frequent consumption of foods containing fermentable carbohydrates such as juice, milk, and soda without good oral hygiene increases the risk of caries due to prolonged contact between the sugar in the food and the cariogenic bacteria on the surfaces of the susceptible teeth.12 Frequent bottle feeding at night and breast feeding on demand, have been associated with, but not consistently implicated in ECC. Other caries promotive factors reported include poor oral hygiene, presence of dental appliances and crowded teeth in a poorly maintained oral cavity. The tooth surfaces susceptible to plaque stagnation, such as occlusal pits and fissures, approximal and cervical regions, are most prone to caries.9

Consequences of ECC are both short and long term. Initially, the child may experience pain during feeding. Subsequent irreversible pulp damage may lead to premature loss of teeth which may predispose the child to the development of malocclusion in the succeeding permanent dentition. In addition, the child may be predisposed to an increased risk of developing caries in the permanent
and insufficient physical development especially in height and weight due to decreased dietary intake secondary to pain. Additionally the child suffers diminished oral health related quality of life.

Despite ECC being multi-factorial, it may be preventable. Ingestion of optimal fluorides during the calcification of the teeth decreases its incidence. Toothbrushing aids in the mechanical removal of plaque from the accessible areas and hence prevents development of dental caries. However, due to the physical and cognitive immaturity of the child at age 3-5 years, adequate plaque control can only be achieved with the help of the caregiver. Other preventive factors include proper nursing habits and reduction of cariogenic foods intake by the child.

Oral health knowledge, attitude and practice of the caregiver are likely to have an important role in influencing the development of healthy dental habits in the child. Despite the availability of oral health information from televisions, radios, newspapers and more recently from the internet, the caregiver may still have a low level of oral health knowledge, probably as a result of limited access to these resources.

Thus from the foregoing, ECC is multi-factorial with far reaching consequences especially in developing countries. In Kenya for example, the government has identified children as a vulnerable group in the Kenya National Oral Health Policy and Strategic Plan: 2002-2012. The strategy identified for intervention includes the integration of oral health care services into the existing Maternal and Child Health/ Family Planning (MCH/FP) and Antenatal Care Clinics (ANC).
1.2. LITERATURE REVIEW

1.2.1. Epidemiology of ECC

Epidemiological studies on ECC around the world have produced varied results. In North America, studies in Canada by Peressini et al.\textsuperscript{19} have reported a prevalence rate of 52% among the 3-5-year-old children. Another study by Watson et al.\textsuperscript{20} in an inner city Latino community in Washington DC reported 53% of the 2-5 year-old children were caries free. In South East Asia, studies in Philippines have reported a prevalence rate ranging from 59% in 2-year-olds to 92% in 6-year-olds.\textsuperscript{21} From the Middle East, ECC prevalence of 73% and 62.7% was reported among preschool children in Saudi Arabia.\textsuperscript{22,23} In Poland Szatko et al.\textsuperscript{24} reported that a total of 43.8% of three-year-olds were caries-free. In Africa (Uganda), a study by Kiwanuka et al.\textsuperscript{25} reported mean dmft score of 1.7, 2.4 and 3.1 among 3-, 4- and 5-year-old children respectively. In Kenya, Masiga and Holt\textsuperscript{26} reported a mean dmft of 1.35 and 1.88 for 3- and 5-year-old children respectively and Ngatia et al.\textsuperscript{27} reported a mean dmft of 2.95 in 3- 5-year-old children with a prevalence rate of 63.5%.

When Developed and Developing countries are compared, the trend of ECC is varied. A study by Hugoson et al.\textsuperscript{28} in Sweden showed that the number of caries-free individuals increased in all age groups between 1973 and 1993. However, Milnes\textsuperscript{6} in his review on global studies of the epidemiology of caries in maxillary anterior primary teeth found the highest prevalence of ECC was in Africa and South-East Asia. In Kenya prevalence of ECC appears to have increased from 45% to 63.5%.\textsuperscript{26,27}
1.2.2. Risk Factors of ECC

Majority of the researchers have reported varied risk factors associated with ECC development. In a review of literature on risk factors for caries in deciduous dentition Harris et al. reported a total of 106 risk factors found to be significantly related to caries. These were grouped into demographic factors, dietary factors, factors related to breast and/or bottle feeding and factors related to oral hygiene habits. Other factors included those related to parental oral health and enamel hypoplasia (Table 1).

Table 1: Risk Factors Associated with ECC Development

<table>
<thead>
<tr>
<th>Socio-demographic factors</th>
<th>Dietary factors</th>
<th>Oral Hygiene</th>
<th>Breast/bottle feeding factors</th>
<th>Other Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender of Child (male)</td>
<td>High frequency, high sugar foods/day</td>
<td>Daily toothbrushing</td>
<td>Duration of breastfeeding</td>
<td>Level of water fluordate at home</td>
</tr>
<tr>
<td>Public rather than private school</td>
<td>High number of between meals sugary food/drink</td>
<td>Age brushing started</td>
<td>Mother’s dental attendance</td>
<td></td>
</tr>
<tr>
<td>Family income</td>
<td>Frequency consumption of sugary drinks</td>
<td>Visible plaque</td>
<td>Use of sugar/cereal in the bottle</td>
<td>Enamel hypoplasia</td>
</tr>
<tr>
<td>Father employed</td>
<td>Frequent consumption of carbonated drinks</td>
<td>Adults involved in brushing</td>
<td>Sub-optimal use of fluoride</td>
<td></td>
</tr>
<tr>
<td>Low parental education</td>
<td>Amount and frequency of sweet consumption</td>
<td>Lack of use of fluoride toothpaste</td>
<td>Use of sweetened comforter</td>
<td></td>
</tr>
<tr>
<td>Low maternal education</td>
<td>Ethnicity</td>
<td>High gingival score</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1.2.3. Patterns of ECC

In Uganda, Kiwanuka et al.\textsuperscript{25} reported that maxillary deciduous incisors were most frequently affected by caries followed by mandibular molars. Rajab and Hamdan\textsuperscript{74} in a study among 1-5 year old Jordanian children also reported that maxillary incisors had the highest caries experience followed by first mandibular molars whereas the mandibular canines had the lowest. In contrast, Wyne et al.\textsuperscript{23} in Saudi Arabia reported that mandibular first molars were the most frequently carious and the least affected were mandibular central incisors. Similarly, in Al-Karji, Saudi Arabia Paul\textsuperscript{75} reported that deciduous molars were the teeth which were most frequently carious, and caries among all teeth was always bilateral. In another related study among 2-5 year olds, Al Malik et al.\textsuperscript{22} reported that of those affected by caries, 26% had caries confined to posterior teeth, 6% had caries only in anterior teeth and 34% had rampant caries. Jose and King\textsuperscript{76} in India reported maxillary central incisors were most frequently affected by caries in children aged 8 to 48 months.

1.2.4. Oral Health Knowledge, Attitude and Education of Caregiver

Several studies have reported a relationship between oral health knowledge of caregivers and ECC experience in the child. In Poland Szatko et al.\textsuperscript{24} reported that the high level of caries among 3-year-old children was associated with low levels of oral health knowledge among their mothers. Similarly in a study among immigrant Latino children in America, Watson et al.\textsuperscript{20} reported that although 52% of the parents knew the purpose of fluorides, only 9% thought that brushing with toothpaste could prevent tooth decay. On the other hand, other studies have
reported a high level of oral health knowledge among caregivers, as reported by Chan et al.\textsuperscript{77} where only 7.5\% of parents/caregivers did not know the aetiological factors of dental caries and only 4.9\% did not know how it could be prevented.

Harris et al.\textsuperscript{29} in her systematic review of literature on risk factors for dental caries in young children found no studies had evaluated the impact of parental beliefs, attitudes about toothbrushing and sugar snacking on the presence of childhood caries. However, other studies have reported on other aspects of caregivers’ attitudes towards deciduous teeth. Chan et al.\textsuperscript{77} in Hong Kong reported that 67.7\% of parents/caregivers did not think carious primary teeth needed to be restored, while Watson et al.\textsuperscript{20} reported that 76\% of parents/caregivers thought baby teeth were important. Additionally among the mothers, 12.6\% did not know the oral condition of their child.\textsuperscript{77}

Other studies have reported an apparent relationship between education level of caregiver and ECC. Al Malik et al.\textsuperscript{22} reported that children of mothers with college education had lower prevalence and severity of caries. A study among 6-19 month-old Thai children reported that children of mothers/caregivers with a low level of education had higher intensity of ECC scores.\textsuperscript{78} In Jordan, Rajab and Hamdan\textsuperscript{74} reported that caries level among preschool children was significantly related to parents education level and awareness. Additionally, a study in Montreal, Canada among parents of children between nine months and three years reported that giving a bottle in bed was more often practiced by less educated mothers and that fluoride was given mainly by highly educated mothers.\textsuperscript{79} In contrast a study among urban Turkish children showed mothers’ education had no effect on level of ECC but a higher education level of fathers...
was associated with higher incidence of caries. A review on methods used for the prevention of ECC by Ismail, reported that education of mothers or caregivers on promotion of healthy dietary habits had a modest impact on the development of ECC.

1.2.5. ECC and Oral Health Practices

Several studies have reported a relationship between tooth brushing habit and ECC. A study by Paul reported that whereas 90% of the children had plaque present on their teeth, those who did not brush had both plaque and caries. In Uganda Kiwanuka et al. reported that 98% of the children examined brushed at least once daily and 99% used toothpaste. Scoring positively for plaque in the children was associated with higher odds for having a dmft greater than zero. In India, Jose and King reported significant correlations between carious lesions and cleaning of the child's mouth while in contrast, Olmez and Uzamris in Turkey reported no relationship between caries development and a brushing habit. Other studies by Chan et al. in Hong Kong reported that poor oral hygiene manifested by presence of visible plaque on the labial surface of at least two maxillary incisors were found to be associated with dental caries.

In Northern Phillipines, studies by Carino et al. have reported that majority (93%) of the children had tooth brushing practices but mostly unassisted by parents (58%). Additionally, children started brushing at an average age of 2 years and, among the 3-4 year olds children, a significant level of caries levels was noted for those who started brushing at a later age.
From the aforegoing, a conceptual framework of ECC was developed (Figure 1). ECC appears to be multifactorial in its aetiology. Education level of the caregiver can affect oral health related knowledge, attitude and practice which might in turn influence ECC.

Thus the aim of the present study was to determine ECC among 3-5 year olds and their caregivers' oral health knowledge, attitude and practice in Kiambaa Division, Kenya.

Figure 1: Conceptual Framework

1.3. Statement of the Problem

From the review of the literature, ECC appears to be on the increase in developing countries with multiple associated causative factors. Although several studies have evaluated the caregivers' oral health knowledge, few have reported
the relationship between caregivers’ oral health knowledge and ECC. Additionally, the attitude of the caregivers towards conservation of carious deciduous teeth appears to be negative. It appears that the majority of the preschool children in developing countries brush teeth without parental assistance despite their physical and cognitive immaturity, leading to ineffective brushing and hence caries predisposition.

Developing countries may lack financial and human resources to manage ECC effectively. In Kenya for example, the budget for oral health services was 0.0016% of the Ministry of Health total budgetary allocation. The dentist/population ratio in Kenya was 1:378,000 in the public sector against the WHO recommendation of 1:7,000. The limited financial and human resources may imply that comprehensive dental treatment for children affected by ECC may be largely unavailable.

1.4. Justification

There is limited information on ECC in Kenya especially among rural and peri-urban children. Previous studies have reported contradictory findings on the relationship between ECC and caregiver’s oral health knowledge, attitude and practice. The results obtained from this study will give baseline data for the study population. The information may be used by policymakers to formulate preventive strategies. This could lead to a reduction of the prevalence of ECC which would help alleviate pain and suffering resulting from untreated caries among children for whom comprehensive dental services are out of reach.
1.5. **Objectives of the Study**

1.5.1. Broad Objective

To determine prevalence and patterns of ECC among 3-5 year olds and their caregivers' oral health knowledge, attitude and practice in Kiambaa, Kenya.

1.5.2. Specific Objectives

a) To determine prevalence of ECC among 3-5 year old children

b) To determine the patterns of ECC among 3-5 year old children

c) To evaluate caregivers knowledge on causes and prevention of dental caries

d) To evaluate caregivers attitude on importance of deciduous teeth

e) To determine oral hygiene practices of the child as reported by caregiver

1.6. **Hypotheses**

$H_A$: Caregivers oral health related knowledge, attitude and practice affects level of ECC in their children

$H_0$: Caregivers oral health related knowledge, attitude and practice does not affect level of ECC in their children

1.7. **Study Variables**

Socio demographic variables

- Age of child
- Relationship of child with
Independent variables

- Caregivers knowledge on causes and prevention of dental caries.
- Caregivers attitude on the options of management of a carious deciduous tooth.
- Oral hygiene practices of the child including tooth brushing, age of commencement of brushing, frequency of brushing, dentifrice and implement used, adult supervision of brushing.
- Caregiver's infant feeding practice including duration of breast and bottle feeding.

Dependent Variables

ECC:- prevalence and experience
CHAPTER 2

2. MATERIALS AND METHODS

2.1. Study Area

The study was conducted in Kiambaa Division, which is one of the five administrative divisions of Kiambu District in the Central Province of Kenya (Figure 2) with a total population of 188,055 persons.

Figure 2: Map of Kiambu District showing Kiambaa Division

Agriculture is the main economic activity; rainfall regimen is bimodal with the long rains between March-May and the short rains in October-November. Staple food crops grown include maize, beans, bananas and Irish potatoes. These are used for domestic consumption and for sale. Poultry and its products (eggs, meat)
supplement the demand for meat while the vegetables available include cabbages and kales. The cash crops grown are mainly coffee and tea with the majority being grown by small-scale farmers.

The agricultural sector is the main employer providing formal employment in the coffee and tea estates. The informal sector plays a vital role in economic development. Nutrition level is generally high but pockets of malnourished children are found in Kiambaa settled area with poverty and ignorance being the major causes.

The main sources of water include streams, rivers and boreholes. The classified roads are generally good and majority of the others are all weather but a few are impassable during long rains.

2.2. Preschool Education in Kiambaa

Kiambaa is divided into two education zones, namely Kihara and Karuri, with a total of 109 preschools. The division has the highest enrollment of children in Kiambu District with a total of 6,076 children out of which 3,172 are males and 2,904 are females. Preschool education caters for children aged between two and six years with a majority falling between the age of four and five years. Unlike the public primary schools which are free, preschools in Kiambaa are fee paying with a minority subsidized by religious organizations and/or local authorities.

2.3. Dental Health Services in Kiambaa

The public health facilities in Kiambaa consist of 2 hospitals, 4 health centers and 13 clinics. The two hospitals are Kiambu District Hospital and Tigoni
Hospital, both government sponsored institutions which offer dental treatment to both adults and children. The dental clinic at Kiambu District hospital is manned by 3 dental officers, 2 community oral health officers, 1 dental technologist and a nurse. Tigoni Hospital has 2 dental officers, 2 community oral health officers, and 1 dental technologist. In addition, a few private clinics and hospitals provide dental services in Kiambaa.

Pain due to pulpitis is the most common complaint of children attending dental clinics, with extractions being the main treatment modality. The government hospitals possibly lack adequate dental facilities and personnel to provide other services such as restorative procedures for the children. Dental treatment costs should not be a barrier as treatment is free for all children below 5 years in government health facilities.

2.4. Study Population

Three to five year old children, attending preschools in Kiambaa division and their respective caregivers were eligible for inclusion into the study. Children aged between 3 and 5 years were considered because they were easily accessible in the preschools.

2.5. Study Design

This was a descriptive cross-sectional study.

2.6. Inclusion and Exclusion Criteria

2.6.1. Inclusion

- caregivers of children aged 3-5 years who consented to the study
• children who assented

• children between 3-5 years

2.6.2. Exclusion

• caregivers who did not consent

• children who did not assent

• children below 3 years and above 6 years

2.7. Sampling Method

Kiambaa division had two education zones namely Kihara and Karuri with a total of 109 pre-schools. Stratified random sampling method was used to select the schools. A list from the Kiambu district education office was used as the sampling frame. Schools were categorized into public and private. A table of random numbers was used to select schools from each category until the sample size was obtained. All children aged 3-5 years and their caregivers were included in the study.

2.8. Sample Size Determination

A study in Kenya reported a caries prevalence of 63.5% among 3-5 year old urban children.\textsuperscript{27} Taking the proportion of children with dental caries in this age group to be 63.5% and using the formula, \( n = \frac{z^2pq}{\alpha^2} \)

where:

\( n = \) the desired sample (where population >10,000)

\( z = \) the standard normal deviate, usually set at 1.96 which corresponds to 95%
Confidence level.

\( p = \) proportion in target population estimated to have a particular characteristic.

\( q = 1 - p \)

\( \alpha = \) degree of accuracy desired, usually set at 0.05, the calculated sample size was

\[
n = \frac{1.96^2 \times 0.635 \times 0.365}{0.05^2} = 356
\]

Data obtained from the Kiambu district education offices listed preschool with approximately 3,997 children which is less than 10,000. Therefore using the formula

\[
f_n = \frac{n}{1+n/N}
\]

Where \( n_f \) = desired \( n \) for the same size less than ten thousand. The calculated sample size was

\[
f_n = \frac{356}{1+356/3997} = 327
\]

corrected \( n = 327 \)

The minimum sample size was therefore calculated to be 327 children.

In a study by Watson et al.\textsuperscript{20}, 9\% of the caregivers reported that brushing with toothpaste could prevent tooth decay. Therefore, taking the proportion of caregivers to be 9\%, the minimum sample size was 126.

\[
n = \frac{1.96^2 \times 0.09 \times 0.91}{0.05^2} = 126
\]

However, all the caregivers of the children recruited were included in the study.
2.9 Data Collection

2.9.1 Calibration

The principal investigator was calibrated by one of the supervisors. Kappa value was calculated to determine the level of agreement between the scores of the principal investigator and the calibrator. Kappa values before the study and in the field were 0.89 and 0.92 which showed good agreement. The clinical re-examination of every tenth child was done to determine the intra-examiner reproducibility, with a Kappa value of 0.95, which showed good agreement.

2.9.2 Caregivers Questionnaire

A pre-tested self-administered questionnaire (Appendix 1) was sent home to the caregivers through the preschool teachers and delivered by the respective child. The questionnaire was constructed in English based on similar tool. For appropriate analysis, the tool and the respective child's clinical form had similar identification numbers. The completed questionnaire was returned to the school with the consent information through the child within a week of receipt. The survey instrument included questions in the following areas; socio-demographics; knowledge on the causes and prevention of dental caries; child’s previous breast and/or bottle feeding habits; child’s current oral health practices and caregiver’s attitude toward retention of carious deciduous teeth.

2.9.3 Clinical examinations of children

Demographic data collected included child's date of birth, gender and type of school attended. The age of the child was recorded as their age at their last birthday and categorized as 3, 4 or 5 years.
A clinical examination was conducted to collect information on the prevalence and pattern of ECC in 3-5 year old children. The children recruited received a dental examination by the principal investigator assisted by one trained record clerk. The clinical examinations were carried out in a classroom next to a window under natural light using a sterile dental mirror and a probe as diagnostic aids. The child sat on an ordinary chair facing away from the examiner and reclining to rest his/her head on a cushion placed on the examiners lap. Cotton roll was used to remove plaque from the surfaces of the teeth to enhance visibility. Initially, one brave child was clinically examined acting as a model while the other children watched to alleviate dental fear and anxiety.

The clinical examination consisted of an assessment of decayed, missing and filled deciduous teeth using WHO guidelines. Lesions were recorded as present when a carious cavity was apparent on visual inspection. The dmft score for each child was calculated and recorded and teeth lost as a result of trauma or exfoliations were excluded. A tooth was considered missing due to caries if there was a history of extraction because of pain and/or the presence of a cavity prior to extraction.

Upon completion of the examination, each child was given a tube of toothpaste and toothbrush as a sign of appreciation for participation in the study. With the assistance of a teacher, other children were similarly examined.

2.9.4 Data Analysis and Presentation

The questionnaire and clinical forms were pre-coded. Data collected was entered into Statistical Package for Social Sciences (SPSS) version 12.0.1 for windows.
software. SPSS was used for data analysis. Descriptive analysis was used to describe cross-sectional data. Univariate analyses were performed using Chi square statistics and one-way ANOVA. A p value < 0.05 was considered statistically significant. The results were presented using bar graphs and tables.

2.9.5 Control of Errors and Biases

The study population was restricted to those meeting the inclusion criteria. Selection bias was minimized by randomly selecting the preschools using table of random numbers. Pre-testing of the questionnaire was done prior to commencement of the study. The principal investigator was calibrated by one of the supervisors and the assisting clerk was trained.

2.10 Ethical Consideration

Ethical approval to carry out the research was obtained from Kenyatta National Hospital (KNH) and University of Nairobi (UoN) Ethics and Research standards committee (Appendix IV). Written permission to conduct the study was obtained from the Ministry of Education, District Education offices and the respective schools authorities.

Consent was obtained from the caregivers before clinical examination of their children. All eligible children were given an equal opportunity to participate in the study. Children requiring specialized dental treatment were referred to the UoN Dental Hospital for further management.
2.11 Limitations of the Study

Out of the 343 children recruited into the study, five (1.5%) children were not clinically examined due to lack of cooperation. Lack of bite-wing radiographs may have led to underreporting of proximal caries. Moisture control was inadequate and may have led to poor visibility of the carious lesions. Literacy levels among the caregivers may have affected the response rate of the self administered questionnaire.

The disparity in socioeconomic status of the caregivers may have influenced dietary and oral hygiene habits of their children and hence the ECC predisposition.
CHAPTER 3

3. RESULTS

3.1. Socio-demographic Characteristics

3.1.1. Children in the Study

Three hundred and thirty eight children were clinically examined out of whom 169 (50.3%) were males and 167 (49.7%) were female. The age range was 3-5 years with a mode of 5 years (Figure 3), and the mean age was 4.61±0.58 SD. The mean age for the males was 4.65 ± 0.548 SD while that of the females was 4.57± 0.615 SD. There was no statistically significant difference between age of the male and female children (p=0.394, $X^2= 1.864$). About two-thirds or 222 (65.7%) of the children were from private preschools while the rest, 114 (34.3%) children were from public preschools.

Figure 3: Age and sex distribution of children (n=336)
3.1.2. Caregivers of the Children in the Study

Out of a total of 343 questionnaires sent to the respective caregivers, 229 (66.8%) were returned. Of these 188 (84%) were female while 36 (16%) were male. The age of the caregiver ranged from 17-65 years with a mean of 31.66+8.2 years (Figure 4). Majority of the caregivers were married 182 (83.1%) while 37 (16.9%) were single parents. About three-quarters 167 (74.6%) of the respondents were the mothers of the children and the rest were fathers 32 (14.3%), aunts 16 (7.1%), and grandparents 7 (3.1%).

Figure 4 : Age and sex distribution of the caregivers (n=206)

With respect to their level of education, 100 (45%) and 64 (28.4%) of the caregivers had attained secondary and primary education respectively. Only 5 (2.6%) did not have formal education. Two-thirds 148 (67.3%) of the caregivers were engaged in some form of economic activity. With respect to employment 90 (40.9%) were employed in the informal sector, 58 (26.4%) were employed in the
formal sector, a quarter 61 (27.7%) were homemakers and 11 (5%) were unemployed.

Majority of the University graduate caregivers were employed whereas those with no education were primarily homemakers or unemployed (Figure 5). Caregivers with a secondary education and below were mainly in self employment. None of the University graduates were homemakers.

Figure 5: Education and employment status of caregivers (n=225)

3.2. Early Childhood Caries

Slightly over half 201 (59.5%) of the children had dental caries. The prevalence of caries increased with age being 7%, 55% and 63% in the 3, 4 and 5 year old children respectively. The prevalence of caries was higher among the boys (64.5%) compared to the girls 5.4% (Figure 6). However, there was no
statistically significant difference between caries prevalence and gender of the child \( (p=0.060, \chi^2=3.55) \).

The prevalence of caries was 66.2% and 47.4% in private and public preschools respectively \( (P=0.001, \chi^2=12.22) \). The children from private preschools had a statistically higher prevalence of dental caries compared to those from public preschools.

Figure 6: Prevalence of caries by age and gender of child \( (n=336) \)

The prevalence of caries varied with gender of primary caregiver (Table 2). Children with a male and female caregiver had a caries prevalence of 72.2% and 63.3% respectively and the difference was not statistically significant \( (F=1.05, p=0.307) \).

About three-quarters (71.9%) of children with a father caregiver had caries compared to a mother caregiver (64.1%). Children with an aunt and grandparent as a caregiver had a prevalence of 75% and 14.3% respectively. However, the
difference was not statistically significant \( (F = 0.138, p=0.711) \). Children whose caregivers were single parents had a higher caries prevalence (67.6%) compared with those of married caregivers (64.3%) and the difference was not statistically significant \( (F = 0.144, p=0.705) \).

The prevalence of ECC increased with level of education of caregiver. Children whose caregivers had no education had a caries prevalence of 40% compared to university graduates (76.9%). Among those with primary and secondary level of education, the prevalence was 59.4% and 66% respectively. However the difference was not statistically significant \( (F = 0.477, p=0.490) \).

With regard to employment status, 54.1% of children whose caregivers were homemakers had caries. Children of caregivers in the formal and informal sectors had a prevalence of 69% and 66.7% respectively. Children whose caregivers were unemployed had a high caries prevalence of 81.2%. The difference was not statistically significant \( (F = 0.716, p=0.114) \).
Table 2: Prevalence of ECC by demographic characteristics of caregiver

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>(n %)</th>
<th>Caries (%) Prevalence</th>
<th>F</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>21</td>
<td>(10.4)</td>
<td>(61.9)</td>
<td>2.514</td>
<td>0.114</td>
</tr>
<tr>
<td>25-29</td>
<td>70</td>
<td>(35.8)</td>
<td>(62.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-35</td>
<td>48</td>
<td>(24.9)</td>
<td>(81.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;35</td>
<td>62</td>
<td>(31.8)</td>
<td>(59.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender of caregiver</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>36</td>
<td>(19.1)</td>
<td>(72.2)</td>
<td>1.050</td>
<td>0.307</td>
</tr>
<tr>
<td>Female</td>
<td>188</td>
<td>(80.9)</td>
<td>(63.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relationship With child</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother</td>
<td>167</td>
<td>(75.0)</td>
<td>(64.1)</td>
<td>0.138</td>
<td>0.711</td>
</tr>
<tr>
<td>Father</td>
<td>32</td>
<td>(17.1)</td>
<td>(71.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aunty</td>
<td>16</td>
<td>(7.4)</td>
<td>(75.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grandparent</td>
<td>7</td>
<td>(3.1)</td>
<td>(14.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>2</td>
<td>(0.4)</td>
<td>(100.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>182</td>
<td>(81.7)</td>
<td>(64.3)</td>
<td>0.144</td>
<td>0.705</td>
</tr>
<tr>
<td>Single</td>
<td>37</td>
<td>(18.3)</td>
<td>(67.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>5</td>
<td>(2.6)</td>
<td>(40.0)</td>
<td>0.477</td>
<td>0.490</td>
</tr>
<tr>
<td>Primary</td>
<td>64</td>
<td>(28.4)</td>
<td>(59.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>100</td>
<td>(45.0)</td>
<td>(66.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College</td>
<td>42</td>
<td>(18.3)</td>
<td>(69.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>13</td>
<td>(5.7)</td>
<td>(76.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>58</td>
<td>(26.4)</td>
<td>(69.0)</td>
<td>0.716</td>
<td>0.114</td>
</tr>
<tr>
<td>Self employed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homemaker</td>
<td>90</td>
<td>(40.9)</td>
<td>(66.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>61</td>
<td>(27.7)</td>
<td>(54.1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The overall mean decayed, missing and filled teeth (dmft) was 2.46±3.21 SD. The mean number of decayed teeth was 2.36±3.12 SD, while the missing teeth and filled teeth was 0.08±0.41 SD and 0.02±0.19 SD respectively. The level of ECC seemed to rise with increasing age of child. The dmft at 3, 4 and 5 years was 1.35±2.29 SD, 2.31±3.43 SD, and 2.61±3.17 SD respectively. ECC was higher among boys compared to girls. The overall dmft for the boys was
2.63±3.42 SD. Among the 3, 4 and 5 year old boys the dmft was 0.83±1.17 SD, 2.51±3.98 SD, and 2.78±3.24 SD respectively. For girls, the overall dmft was 2.29±2.99 SD and 1.64±2.73 SD, 2.12±2.83 SD, and 2.43±3.11SD among the 3, 4 and 5 year olds respectively (Table 3).

Table 3: Caries experience by gender and age of child (n=336)

<table>
<thead>
<tr>
<th>age in years</th>
<th>Gender of child</th>
<th>N</th>
<th>decayed (d) mean</th>
<th>missing (m) mean</th>
<th>filled (f) mean</th>
<th>dmft</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 Male</td>
<td>6</td>
<td>0.83</td>
<td>0.00</td>
<td>0.00</td>
<td>0.83</td>
<td>1.35</td>
<td>1.17</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>1.64</td>
<td>0.00</td>
<td>0.00</td>
<td>1.64</td>
<td>1.35</td>
<td>2.73</td>
</tr>
<tr>
<td>Sub-total</td>
<td>17</td>
<td>1.35</td>
<td>0.00</td>
<td>0.00</td>
<td>1.35</td>
<td>2.29</td>
<td></td>
</tr>
<tr>
<td>4 Male</td>
<td>47</td>
<td>2.43</td>
<td>0.04</td>
<td>0.04</td>
<td>2.51</td>
<td>2.31</td>
<td>3.98</td>
</tr>
<tr>
<td>Female</td>
<td>49</td>
<td>2.06</td>
<td>0.02</td>
<td>0.04</td>
<td>2.12</td>
<td>2.83</td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td>96</td>
<td>2.24</td>
<td>0.03</td>
<td>0.04</td>
<td>2.31</td>
<td>3.43</td>
<td></td>
</tr>
<tr>
<td>5 Male</td>
<td>116</td>
<td>2.68</td>
<td>0.09</td>
<td>0.00</td>
<td>2.78</td>
<td>2.61</td>
<td>3.24</td>
</tr>
<tr>
<td>Female</td>
<td>107</td>
<td>2.29</td>
<td>0.12</td>
<td>0.02</td>
<td>2.43</td>
<td>3.11</td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td>223</td>
<td>2.49</td>
<td>0.11</td>
<td>0.01</td>
<td>2.61</td>
<td>3.17</td>
<td></td>
</tr>
<tr>
<td>3-5 Male</td>
<td>169</td>
<td>2.54</td>
<td>0.08</td>
<td>0.01</td>
<td>2.63</td>
<td>2.99</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>167</td>
<td>2.18</td>
<td>0.08</td>
<td>0.02</td>
<td>2.29</td>
<td>3.42</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>336</td>
<td>2.36</td>
<td>0.08</td>
<td>0.02</td>
<td>2.46</td>
<td>3.21</td>
<td></td>
</tr>
</tbody>
</table>

3.3. Pattern of ECC

Forty percent of the children in the study were caries free. Of the 60% with carious lesions, the number of cavities ranged from 1 to 19. Thirty-two percent had one to three lesions, 16% had 4 to 6 lesions, 8% had 7 to 9 lesions while only 4% of the children had more than 10 lesions (Figure 7).
Additionally, the distribution of carious lesions was different for both arches. The deciduous teeth in the maxillary arch were more frequently affected by caries than the teeth in the mandibular arch. However, overall mandibular deciduous molars were the most affected by caries 319 (40%) followed by the maxillary deciduous molars 202 (25%) and maxillary incisors 198 (25%). The least affected teeth by caries were the maxillary deciduous canines 17 (2%) (Figure 8). Overall frequency of caries attack by tooth type was deciduous molars 521 (65.7%), incisors 225(28.4%) and canines 47 (5.9%).
The distribution of caries by tooth type varied with age of the child. Caries involvement of deciduous maxillary incisors decreased with age, 44%, 28% and 28% in the 3-, 4- and 5- year old children respectively. However, caries involvement of the deciduous molars increased with age, 57%, 65% and 66% in the same age groups respectively. There was no caries of the deciduous canines among the 3 year olds. Less than 10% of the deciduous canines were carious in both the 4-and 5 year old children (Figure 9).
3.4. Caregivers Oral Health Related Knowledge

Oral health related knowledge on the causes of caries was generally good amongst the caregivers. Majority of the caregivers 220 (96.1%) reported that consumption of sugary foods causes tooth decay. Similarly, 205 (89.5%) reported that lack of brushing causes caries. Almost three-quarters of the caregivers 163 (71.2%) reported that eating sugary snacks between meals caused caries. However, knowledge on the effect of the type of infant feeding practices on caries development was low. About a quarter of the caregivers 57 (24.9%) reported bottle feeding at night caused caries. Only 26 (11.4%) of the caregivers reported that breastfeeding on demand caused caries (Table 4).
Table 4: Caregivers knowledge on causes of dental caries (n=229)

<table>
<thead>
<tr>
<th>Perceived cause of caries</th>
<th>yes n (%)</th>
<th>no n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sugary foods causes decay</td>
<td>220 (96.1)</td>
<td>9 (3.9)</td>
</tr>
<tr>
<td>Lack of brushing causes decay</td>
<td>205 (89.5)</td>
<td>24 (10.5)</td>
</tr>
<tr>
<td>Sugary snacks between meals</td>
<td>163 (71.2)</td>
<td>66 (28.8)</td>
</tr>
<tr>
<td>Bottle feeding at night</td>
<td>57 (24.9)</td>
<td>172 (75.1)</td>
</tr>
<tr>
<td>Breastfeeding on demand causes decay</td>
<td>26 (11.4)</td>
<td>203 (88.6)</td>
</tr>
</tbody>
</table>

Caregiver’s knowledge on prevention of caries was also high. Brushing teeth daily was reported to prevent caries by 216 (94.3%) of the caregivers. Additionally, majority of the caregivers 201 (87.8%) also reported that brushing with toothpaste prevented caries. Similarly, most of the caregivers 212 (92.6%) reported that caries could be prevented by limiting the amount of sugary foods consumed. Additionally, three-quarters 67 (72.9%) of the caregivers reported that reducing snacks consumed in between meals could prevent caries. However, the role of infant feeding practices on caries prevention was low. Breastfeeding at specific times was reported to prevent caries by 51 (22.3%) of the caregivers. Additionally, giving child a bottle of water at night was reported to prevent caries by only 74 (32.3%) of the caregiver (Table 5).
Table 5: Caregivers knowledge on prevention of dental caries (n=229)

<table>
<thead>
<tr>
<th>Preventive Measures</th>
<th>yes</th>
<th>%</th>
<th>no</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brushing teeth daily</td>
<td>216</td>
<td>(94.3)</td>
<td>13</td>
<td>(5.7)</td>
</tr>
<tr>
<td>Limit intake of sugary foods</td>
<td>212</td>
<td>(92.6)</td>
<td>17</td>
<td>(7.4)</td>
</tr>
<tr>
<td>Brushing with toothpaste</td>
<td>201</td>
<td>(87.8)</td>
<td>28</td>
<td>(12.2)</td>
</tr>
<tr>
<td>Reducing snacks between meals</td>
<td>167</td>
<td>(72.9)</td>
<td>62</td>
<td>(27.1)</td>
</tr>
<tr>
<td>Breastfeeding at specific times</td>
<td>51</td>
<td>(22.3)</td>
<td>178</td>
<td>(77.7)</td>
</tr>
<tr>
<td>Bottle of water at night</td>
<td>74</td>
<td>(32.3)</td>
<td>155</td>
<td>(67.7)</td>
</tr>
</tbody>
</table>

3.5 Attitude of Caregiver

Majority of the caregivers 194 (84.7%) reported that deciduous teeth were important. However, slightly over half of the caregivers 130 (56.8%) reported that they preferred extraction of a carious deciduous tooth while 72 (31.4%) preferred the tooth cleaned and filled. A few of the caregivers, 11 (4.1%) preferred the tooth left alone.

On dental health seeking behavior, majority of the caregivers 202 (88.2%) reported that children should visit a dentist every 6 months for dental checkup.

Slightly more than a quarter of the caregivers 65 (28.4%) reported that caries is passed from the deciduous to the permanent teeth while 25 (10.9%) reported that decay could be inherited from mother (Table 6).
Table 6: Caries prevalence and attitude of caregiver (n=229)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Response</th>
<th>n</th>
<th>(%)</th>
<th>(% Caries)</th>
<th>χ²</th>
<th>pvalue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deciduous teeth are not important</td>
<td>True</td>
<td>35</td>
<td>(15.3)</td>
<td>(62.8)</td>
<td>2.06</td>
<td>0.151</td>
</tr>
<tr>
<td></td>
<td>False</td>
<td>194</td>
<td>(84.7)</td>
<td>(75.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental treatment preferred for decayed deciduous tooth</td>
<td>Remove</td>
<td>130</td>
<td>(56.8)</td>
<td>(62.7)</td>
<td>2.72</td>
<td>0.605</td>
</tr>
<tr>
<td></td>
<td>leave it alone</td>
<td>11</td>
<td>(4.8)</td>
<td>(72.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clean and fill</td>
<td>72</td>
<td>(31.4)</td>
<td>(69.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>8</td>
<td>(3.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Don't know</td>
<td>8</td>
<td>(3.5)</td>
<td>(42.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Children should visit dentist every 6 months</td>
<td>True</td>
<td>202</td>
<td>(88.2)</td>
<td>(65.2)</td>
<td>0.13</td>
<td>0.131</td>
</tr>
<tr>
<td></td>
<td>False</td>
<td>27</td>
<td>(11.8)</td>
<td>(61.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decayed deciduous teeth can affect permanent teeth</td>
<td>True</td>
<td>65</td>
<td>(28.4)</td>
<td>(57.8)</td>
<td>1.88</td>
<td>0.170</td>
</tr>
<tr>
<td></td>
<td>False</td>
<td>164</td>
<td>(71.6)</td>
<td>(67.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tooth decay is inherited</td>
<td>True</td>
<td>25</td>
<td>(10.9)</td>
<td>(69.6)</td>
<td>0.26</td>
<td>0.609</td>
</tr>
<tr>
<td></td>
<td>False</td>
<td>204</td>
<td>(89.1)</td>
<td>(64.2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.6 Oral Hygiene Practices of the Child

3.6.1 Infant Feeding Practices

Majority of the caregivers 223 (97.8%) reported breastfeeding between 1-48 months with a mean duration of 19±7.7 SD months. Slightly less than a half of the caregivers 101 (44.5%) reported that the child had been bottle-fed and the mean duration was 5±8.6 SD months (Table 7).
Table 7: Caries prevalence and infant feeding practice (n=229)

<table>
<thead>
<tr>
<th>Practice</th>
<th>N%</th>
<th>Presence of caries %</th>
<th>Statistical test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>( \chi^2 )</td>
</tr>
<tr>
<td>Duration of Breastfeeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• &lt;6 months</td>
<td>(2.4)</td>
<td>(60.0)</td>
<td>0.139</td>
</tr>
<tr>
<td>• 6-12 months</td>
<td>(18.2)</td>
<td>(71.1)</td>
<td></td>
</tr>
<tr>
<td>• 13-24 months</td>
<td>(72.7)</td>
<td>(61.2)</td>
<td></td>
</tr>
<tr>
<td>• 25-36 months</td>
<td>(6.7)</td>
<td>(85.7)</td>
<td></td>
</tr>
<tr>
<td>Bottle feeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Yes</td>
<td>(45.5)</td>
<td>(64.0)</td>
<td>0.081</td>
</tr>
<tr>
<td>• No</td>
<td>(54.5)</td>
<td>(65.8)</td>
<td></td>
</tr>
<tr>
<td>Duration of bottle feeding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 1-12 months</td>
<td>(67.5)</td>
<td>(69.2)</td>
<td>1.298</td>
</tr>
<tr>
<td>• 13-36 months</td>
<td>(32.5)</td>
<td>(56.0)</td>
<td></td>
</tr>
</tbody>
</table>

3.6.2 Oral Hygiene Practices of the child

Almost all the caregivers reported that their children brushed teeth 219 (95.6%). Of the children who brushed, 68 (31.2%) brushed more than once a day, 137 (63.3%) brushed once daily while 13 (5.6%) brushed less than once a day. Majority of the caregivers reported that their children used a toothbrush 209 (95.4%) while 7 (3.2%) used a ‘mswaki’. Almost all the caregivers reported that their children used toothpaste to brush 209 (95.4%).

Slightly less than a half of the caregivers reported assisting their child to brush 105 (47.9%) while 80 (36.5%) reported that the children brushed their own teeth.
unassisted. A few of the caregivers brushed their child's teeth 34 (15.5%).
Almost all the caregivers reported brushing their own teeth 220 (96.1%). Only 3
(1.3%) of the caregivers reported not brushing their own teeth (Table 8).

Table 8: Prevalence of ECC and oral hygiene practices of the child (n=229)

<table>
<thead>
<tr>
<th>Practice</th>
<th>N%</th>
<th>Prevalence of caries %</th>
<th>Statistical test</th>
<th>$\chi^2$</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person cleaning child</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Child</td>
<td>(36.4)</td>
<td>(59.5)</td>
<td></td>
<td>4.216</td>
<td>0.121</td>
</tr>
<tr>
<td>• Caregiver</td>
<td>(15.7)</td>
<td>(79.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Child with assistance</td>
<td>(47.9)</td>
<td>(63.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency of tooth brushing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• &lt;once daily</td>
<td>(5.6)</td>
<td>(50.0)</td>
<td></td>
<td>3.134</td>
<td>0.209</td>
</tr>
<tr>
<td>• once daily</td>
<td>(63.3)</td>
<td>(68.4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• &gt;once daily</td>
<td>(31.2)</td>
<td>(58.2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commencement of brushing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 12- 24 months</td>
<td>(37.8)</td>
<td>(73.7)</td>
<td></td>
<td>4.599</td>
<td>0.204</td>
</tr>
<tr>
<td>• 25- 36 months</td>
<td>(41.8)</td>
<td>(60.7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 37 – 48 months</td>
<td>(15.9)</td>
<td>(56.3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• &gt;48 months</td>
<td>(4.5)</td>
<td>(55.6)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. DISCUSSION

4.1. Overview of Study Methods and Socio-demographic Characteristics of the Study Population

The broad objective of the current study was to determine the prevalence and patterns of ECC among 3-5 year old preschool children in Kiambaa Division and their caregiver's oral health knowledge, attitude and practice (KAP). The design adopted was a descriptive cross-sectional study. The major advantage of descriptive studies is the relative ease with which they can be conducted. Additionally, they are relatively inexpensive to perform. The 3-5 year age bracket was chosen by the investigator in accordance with the definition of ECC. Additionally, children between 3-5 years were more likely to have been enrolled in preschools hence easily accessible to the investigator.

A test-retest approach was used to test for reliability and a Cohen’s Kappa of 0.89, 0.92 (inter-examiner) and an average of 0.95 (intra-examiner) was obtained for dental caries which represents good agreement. In spite of obtaining acceptable reliability for caries in the current study, the possibility of under-reporting cannot be ruled out. The present study was conducted under field conditions and without x-rays it was impossible to detect approximal non-cavitated carious lesions. For purposes of compatibility, the rules for field surveys established by WHO were observed during the present study.

The reliance on self reports to assess oral health-related knowledge, attitude and practice and the ability to recall past events may have influenced the validity of
the caregivers’ answers in the present study. This may have been especially pronounced in caregivers of the older children who may have forgotten certain aspects such as the duration of breastfeeding. The response rate for the caregiver’s questionnaire was 66.8%. Non-response bias may have occurred in the present study. It is possible that parents or caregivers of children with healthy teeth may have had a lack of interest or motivation to participate as they saw no relevance to their child. Social desirability indicates the respondents’ tendency to represent a favorable image of himself /herself. Thus, there is a possibility that socially desired and undesired attitudes and practices may have been over- and underestimated in the present study.

A total of 343 children and their caregivers were recruited to participate in the study from 8 randomly selected pre-schools. Five children were excluded from the study due to lack of cooperation. Of the children examined 169(50.3%) were boys and 167(49.7%) were girls which gave a ratio of boys to girls as approximately 1:1. Ngatia et al.\textsuperscript{27} reported a similar ratio of boys to girls among 3-5 year olds in Nairobi. The same ratio is reflected in the total number of boys (28,780) and girls (28,365) in the 3-5 year old age bracket in Kiambu district.\textsuperscript{82}

The age distribution was skewed towards the 5 year olds. Of the children examined 17 (5%), 96(29%), and 223(66%) were 3-, 4-, and 5- year olds respectively. Ngatia et al.\textsuperscript{27} reported a similar distribution among 3-5 year old children in Nairobi. The higher number of 5 year olds maybe related to the the prerequisite for pre-unit education for admission into primary school. About two-thirds 222(65.9%) of the children attended private preschools and 114(34.3%) were from public preschools. The higher number of children in private fee paying
preschools compared to public subsidized preschools could be due to the fact that the preschool education is not funded by the government.

Of the 343 questionnaires sent out to the respective caregivers, 229 (66.8%) were returned. Of the respondents, 188 (84%) were female while 36 (16%) were male. The gender distribution of caregivers in the current study may reflect socio-cultural differences where the females are the main caregivers.

The education level in the study area was relatively high. Forty five percent and 28.4% of caregivers had attained secondary and primary education respectively. This correlates with KDDP where adult literacy was reported as 94% and 91% for the males and females respectively. However, only two-thirds of the caregivers were engaged in some form of employment. Forty one percent were self-employed while 26% were salaried employees. A few caregivers (5%) were unemployed. Wage and self employment were reported to contribute 63% and 19% respectively in Kiambu District.

4.2. Prevalence of ECC

The prevalence of caries in the study population was 59.5%. Ngatia et al. reported caries prevalence of 63.5% among 3-5 year olds in Nairobi. The lower prevalence in the current study may reflect differences in the study settings. The present study was done in a peri-urban area while Ngatia's was in an urban setting. Thus the peri-urban setting of the current study may imply less availability of cariogenic snacks to the study population.

In Uganda, Kiwanuka et al. reported ECC prevalence of 64% among 3-5 year olds in Nakawa, a peri-urban location. The results in the current study are lower
than the Kiwanuka study and may be due to regional differences in sugar availability and consumption. In the Middle East, caries prevalence among preschool children was reported to range between 62% and 73%. This is higher compared to the current study and may possibly imply cultural differences in sugar consumption. However, the prevalence of ECC in the current study is still higher compared to the developed countries. In Canada, a prevalence of 52% was reported among 3-5 year old children. The lower prevalence may be due to lower sugar consumption and possibly increased oral health awareness among caregivers in developed countries. Additionally, better oral health care systems and optimal fluoride use may also contribute to the lower prevalence.

There was a difference in the caries prevalence among the different age groups. The prevalence of caries in the present study was 47%, 55% and 63% for the 3, 4 and 5 year olds respectively. This compares closely with the study by Ngatia et al. where 52% and 68% of the 3 and 5 year olds had caries, respectively. In Uganda, Kiwanuka et al. reported a caries prevalence of 45%, 59% and 65% in 3, 4 and 5 year olds respectively. Similar findings have been reported in Philippines with caries prevalence of 51%, 53% and 69% among 3, 4 and 5 year olds respectively. The higher caries prevalence with increasing age of child may result from the increased time of exposure of the primary dentition to cariogenic foods. Thus increasing age of child seemed to be a risk factor of caries development in primary dentition. The oral health goals for the year 2000 recommended that 50% of the 5-6 year olds should be caries free. The caries prevalence of the 5 year olds in the current study was above that recommended by WHO.
The type of school attended by the child affected the caries level. The current study reported a significant difference in caries prevalence in children attending private and public preschools being 63.4% and 46.6% respectively. Children who attended private fee paying preschools in the current study possibly had higher socio-economic status. This implies that children from more affluent households with greater disposable income were more affected by caries possibly because their parents could afford to purchase cariogenic snacks more often. The pattern of caries being higher in children of high socio-economic status in this study group conforms to that reported in developing countries. However, in contrast, the prevalence of caries among 2-5 year old preschool children in Jeddah Saudi Arabia was reported to be higher (77%) in those attending public schools compared to those in private schools (71%). This pattern observed more in developed countries may imply that parents of children in private schools are more aware of the harmful effects of cariogenic snacks and thus limit their consumption. Additionally, their children possibly observe more stringent and regular oral hygiene practices leading to reduced caries predisposition.

Dental caries experience was assessed using the dmft index which is universally employed to measure caries. The mean dmft in the current study was 2.4±3.21SD with the decayed component contributing 95% of the score. Ngatia et al. reported a dmft of 2.9 among urban 3-5 year old children and the decayed component contributed 96% of the score. The caries experience in the current study is lower than previously reported in Nairobi. This could result from differences in consumption of cariogenic snacks which may be more prevalent among urban school children.
Other studies in Africa have reported similar findings in caries experience. In Uganda and South Africa, studies have reported mean dmft values of 2.6 and 2.9 respectively among 3-5 year old children.\textsuperscript{25,38} Additionally, studies among 3-7 year old Tanzanian children reported mean dmft value of 2.7.\textsuperscript{46} Thus the caries experience in the current study seemed comparable to that reported in other African countries and may reflect similar dietary patterns.

It is noteworthy that the decayed component of the dmft score contributed a large proportion in both the current and Ngatia et al.\textsuperscript{27} study. This implied that majority of the carious lesions were untreated. Lack of adequate and accessible dental facilities especially in the Government hospitals may be part of the reason. The high cost of dental treatment in private clinics may also limit access to services due to lack of affordability by majority of parents. Other factors may include low dental awareness and negative attitudes of the caregivers which translate to the higher rate of unmet dental treatment need observed in the study population.

Another finding in the current study was the gender disparity in caries experience being higher in boys (2.63±3.4SD) compared to the girls (2.29±3.0SD). This was also reported by Ngatia et al.\textsuperscript{27} where the dmft was 3.29 and 2.62 for the boys and girls respectively. The difference in caries experience between girls and boys might arise due to socio-cultural factors with the girls being more meticulous in personal hygiene and thus better oral health care. Additionally, the girls mature earlier and thus possibly attain a higher level of responsibility compared the boys.
The carious lesions were not evenly distributed by tooth type. The most frequently affected by caries were deciduous mandibular molars followed closely by maxillary incisors and maxillary molars. Additionally, caries involvement in all teeth was bilateral. Previous studies in Nairobi reported similar patterns with deciduous maxillary incisors, mandibular and maxillary molars being most affected by caries. \(^{27}\) In Saudi Arabia, Paul\(^{75}\) reported that the most commonly affected teeth with caries were mandibular first (61.2\%) and second molars (60\%) and the least affected were mandibular lateral incisors (7.7\%). The caries pattern in the study population especially the high percentage of carious maxillary incisors may be due to prolonged breastfeeding of the child. About 70\% of the children were breastfed for 13-24 months. This could point towards a nursing caries pattern. On the contrary, caries involvement of the deciduous molars seemed to increase with age of child and may be attributed to consumption of sticky cariogenic foods. The least affected teeth were the deciduous canines. The late eruption of the deciduous canine at age 18 months coupled with its position and morphology may result in reduced caries predisposition.

4.3. Oral Health Related Knowledge of the Caregivers

The level of oral health related knowledge among caregivers is likely to influence the development of dental health habits in their children from an early age. This is due to the ability of the children to model dental behaviours from their caregivers. Several studies have reported a relationship between the caregiver's level of education and ECC among their children. \(^{24},^{77}\). However, few studies
have explored the relationship if any between caregiver’s level of oral health related knowledge and ECC in their children.

In the present study, oral health knowledge was relatively high. Majority of the caregivers (96.1%) acknowledged that consumption of sugary foods caused caries. Other perceived causes of dental caries reported by caregivers were 'lack of brushing' (89.5%) and 'eating sugary snacks between meals' (71.2%).

Other studies that have evaluated the level of oral health knowledge among caregivers have reported different findings. In a Hong Kong study, 92.5% of parents/caregivers knew the aetiological factors of caries. The level of knowledge among caregivers in the current study was lower compared to the Hong Kong study and could be attributed to presence of oral health education programs. The relatively high level of oral health knowledge among caregivers in the present study may be due to availability of information through print media, radios and televisions. Other sources of information may be the marketing campaigns of companies manufacturing oral health care products through the mass media. The proximity of the study area to the capital city Nairobi makes it fairly accessible to these campaigns.

The role of infant feeding practices on caries initiation was unknown to the majority of the caregivers. The practice of 'breast feeding on demand' and 'bottle feeding at night' was reported to cause caries by 11.4% and 24.9% of the caregivers respectively. The practice of breastfeeding is encouraged by the Ministry of Health in the ANC and MCH/FP clinics but is possibly not accompanied by oral health education.
The knowledge on prevention of caries was also high among caregivers. The perceived means of prevention of dental caries reported in the present study include ‘brushing teeth daily’ (94.3%) and ‘limit intake of sugary foods’ (72.6%). Additionally, ‘brushing with toothpaste’ and ‘reducing snacks between meals’ was reported to prevent caries by 87.8% and 72.9% of caregivers respectively. Other studies have reported different findings.

In a Hong Kong study, 95.1% of parents/caregivers knew how caries could be prevented. Another study in Latin America reported that, although 52% of caregivers knew the purpose of fluorides, only 9% thought that brushing with toothpaste could prevent tooth decay. Despite good knowledge on prevention of caries in the current study, the role of infant feeding practices on caries prevention was unknown to the majority of the caregivers. The practice of ‘breastfeeding at specific times’ and ‘giving bottle of water at night’ was reported to prevent caries by 22.3% and 32.3% of caregivers respectively. This generally reflects a knowledge gap among the caregivers on the effect of infant feeding practice on caries prevention. Thus oral health education emphasizing the role of infant feeding practices on ECC is necessary among the caregivers in this study. The pattern of caries in the study population seemed to indicate a nursing caries pattern and thus implicated inappropriate infant feeding practices.

4.4. Attitude of Caregivers

Social scientists have studied the role of attitude on human behaviours in many aspects. However, Harris et al. on reviewing available literature on ECC found no studies that evaluated the impact of parental beliefs and attitudes about
toothbrushing and sugar snacking on the presence of ECC. In the present study, 84.7% of the caregivers agreed that deciduous dentition was important, yet 56.8% of the respondents opted for an extraction of a carious deciduous tooth. Only 31.4% of the respondents preferred a restoration. On the other hand, a study among immigrant Latino children reported that 76% of the parents thought that baby teeth were important.\textsuperscript{20} A study in Poland reported that 66% of the mothers agreed that milk teeth need not be looked after because they eventually fall of.\textsuperscript{24} The attitude of caregivers in the present study on the importance of deciduous dentition compares closely with the Watson study.\textsuperscript{20} However, the finding that over half of the respondents in the current study preferred extraction of a carious deciduous tooth may indicate otherwise. It is possible that the caregivers were not as keen on retaining the deciduous dentition until exfoliation or were not aware of restorative procedures to conserve them.

The practice of seeking dental services is likely to be influenced by the attitudes of the caregivers towards dental health. In the present study, 88.2% of the caregivers reported that children should visit the dentist every six months for checkup. Similarly, 90% of the Polish mothers reported the same.\textsuperscript{24} However, the high dental treatment need of the children in the present study tends to reflect a contradiction to this finding. Although majority of the caregivers agreed with the importance of regular dental checkups, the carious lesions in the children remained mostly untreated. The findings thus reflect a gap between what the caregivers knew and what they actually practiced. It is possible that social desirability may have influenced the nature of responses with the majority of the caregivers stating what they knew was right not what they practiced. However,
the present study did not elicit the reasons for not seeking dental services for the children.

4.5. Oral Health Practices

The practice of regular toothbrushing is important in the removal of plaque which plays a role in the initiation of caries. In the present study, majority of the caregivers (95.6%) reported that their children brushed their teeth. However, the frequency of brushing varied considerably. Sixty three percent and 31.2% of the children brushed once and twice daily respectively while 5.6% brushed irregularly. Similarly, Ngatia et al.²⁷ in Nairobi reported that 94.4% of the 3-5 year old children brushed their teeth with 59.5% brushing once daily. Despite this widespread practice of toothbrushing in the study children, the level of ECC was relatively high. This finding could be attributed to an inaccurate response regarding the frequency of brushing or an ineffective brushing practice. Additionally, the multifactorial aetiology of caries may imply that other factors such as sugar consumption were involved. The current study did not elicit the dietary habits of the study population.

Different implements can be used for mechanical plaque removal. In the present study, 95.4% of the children used a commercial toothbrush and toothpaste to clean their teeth. The findings were comparable to other studies. In a related study, Ngatia et al.²⁷ reported that toothbrush and toothpaste were used by 90% and 93% of the preschool children respectively. Similarly, in Uganda Kiwanuka et al.²⁵ reported toothpaste use in 99% of the 3-5 year old children. The widespread use of toothbrush and toothpaste in the study population may be attributed to the
marketing campaigns of local dentifrice manufacturing companies. The proximity of the study area to the capital city Nairobi implies improved accessibility. Additionally, advertisements of dentifrices in the print media, radio and television may also influence their use in the study population.

The assistance of the caregiver in brushing the child’s teeth is likely to improve plaque removal. Children at 3-5 years have poor manual dexterity due to physical and cognitive immaturity. Thus for children to achieve adequate plaque control, parental/caregiver assistance is necessary during brushing. In the present study, 47.9% of the caregivers reported assisting their children to brush teeth. Additionally, 36.4% of the children brushed without assistance while 15.7% had their teeth cleaned by the caregiver. In Nairobi, Ngatia et al.\textsuperscript{27} reported that 71% of the children received assistance from a parent or guardian to brush their teeth. The low level of caregivers' assistance in the present study may be attributed to either their unavailability to help or lack of awareness. Absence of the caregiver in the present study is reflected by the fact that two thirds of the caregivers (67%) were engaged in some form of employment.

4.6. Infant Feeding Practices

The influence of infant feeding practices on ECC remains a complex and somewhat controversial issue. Breast feeding of the child was reported by majority of the caregivers (97.8%) with a mean duration of 19± 7.7 SD months. This was comparable to a study in Nairobi which reported 96% of the children had been breastfed with a mean duration of 20.17 ± 10.39 SD months.\textsuperscript{27} The duration of breast feeding may be related to the availability of the mother.
Breast feeding duration beyond 24 months and breast feeding on demand have been implicated in ECC development. In the present study, about three-quarters (72.7%) of the children were breastfed for a period of 1 to 2 years. Additionally 18.2% of the children were breastfed for 6 to 12 months and 2.4% for less than six months. Only 6.7% were breastfed beyond 2 years. Of the children breastfed for more than two years, 85.7% had caries compared to those breastfed for less than six months (60%). This finding may be due to the fact that although maternal-breast milk contains caries protective elements such as maternal immunoglobulins and leucocytes, beyond 12 months, the caries protection offered from breastfeeding diminishes progressively with depletion of these elements. However, the present study did not elicit whether the breast feeding was on demand or at specific times.

On the other hand, the practice of bottle feeding the child was reported by 45.5% of caregivers with a mean duration of 5± 8.6 SD months. The results compare with those obtained by Ngatia et al. in Nairobi where 40.8% reported bottle feeding for a mean duration of 13.58± 12.4 SD months. In the current study, bottle feeding practice for more than one year was associated with lower ECC (56%) compared with no bottle feeding at all (65.8%). Conversely, other studies have reported that there was a significant trend for increasing prevalence and severity of ECC with increased duration of bottle feeding to 36 months of age compared with not bottle feeding at all. This difference may arise from the contents of the feeding bottle. However, the contents of the bottle and time given did not form part of the present study. Nonetheless, studies have reported that
the length of time for bottle contact, particularly at night is the most important determinant of ECC development.\textsuperscript{86}

4.7. CONCLUSIONS

1. The prevalence of ECC was 59.5%, while the dmft was 2.4±3.2 with a mean decayed component of 2.36.

2. ECC prevalence was 66.2% and 47.4% for private and public preschools respectively and the difference was statistically significant.

3. The mandibular deciduous molars and maxillary incisors were the most frequently carious teeth.

4. Oral health knowledge among the caregivers was relatively high but the role of infant feeding practices on ECC was low.

5. Despite a positive attitude toward deciduous dentition, 57% of the caregivers preferred extraction of a carious deciduous tooth.

6. Although over 90% of the children brushed at least once daily with toothbrush and toothpaste, less than half received assistance from their caregivers.

4.8. RECOMMENDATIONS

1. Initiate oral health education programmes integrated with ANC, MCH/FP and School Health Education Programmes to:
   
   - educate caregivers on the importance of the deciduous teeth conservation.
- educate caregivers on the role of infant feeding practices on the oral health of the child.

- educate and encourage caregivers to assist children during brushing to ensure effective brushing.

2. Mobilise community oral health officers to perform regular dental check-ups of preschool children and educate caregiver to enable prompt referral to the nearest dental health facility.

3. Conduct further research to elicit factors influencing dental health seeking behaviour and dietary habits of pre-school children in peri-urban and rural areas.
REFERENCES


Appendix I: Questionnaire

Dear Parent,

Please answer all questions. For the question with YES or NO please tick (√) only ONE. For the questions with choices, please tick only ONE box. For questions without choices, please write in the dash ( ) provided. Kindly give the completed form to the class teacher through your child by ..........

Date

Name of the school

Name of child

Demographic characteristics

The following questions relate to the person who takes care of this child (caregiver). For example mother, father, grandmother/father, auntie/uncle.

1. Sex of caregiver: Male _________________ Female _________________

2. Age of caregiver:

3. What is your relationship with the child?

□ mother

□ father

□ other (specify)
4. Marital status of caregiver (Tick one)

□ married

□ single

5. Number of children (brothers & sisters) in the child's family

6. Who is the primary caregiver (parenting) to the child?

□ mother

□ father

□ other (specify)

7. What is the highest level of school completed by the caregiver in 6? (Tick one)

□ primary education

□ secondary education

□ tertiary education (certificate or diploma)

□ tertiary education (university)

8. What is the employment status of the caregiver?

□ formal employment

□ self employed

□ home maker

□ others
9. The following are causes of tooth decay in children? Tick yes or no for each answer

- eating too much sugary foods [ ]
  Yes [ ] No [ ]

- lack of brushing [ ]
  Yes [ ] No [ ]

- breastfeeding on demand [ ]
  Yes [ ] No [ ]

- bottle feeding at night [ ]
  Yes [ ] No [ ]

- frequent snacking between meals [ ]
  Yes [ ] No [ ]

10. Tooth decay can be avoided by the following? Tick yes or no for each answer

- brushing teeth daily [ ]
  Yes [ ] No [ ]

- limiting the amount of sugary foods [ ]
  Yes [ ] No [ ]

- brushing with toothpaste [ ]
  Yes [ ] No [ ]

- reducing snacks eaten in between meals [ ]
  Yes [ ] No [ ]

- breast feeding at specific times [ ]
  Yes [ ] No [ ]

- giving the child a bottle of water at night instead of milk [ ]
  Yes [ ] No [ ]
Practice

11. Was the child breastfed?

□ no

□ yes If yes, for how long? _______ Months

□ Don't know

12. Was the child bottle-fed.

□ no

□ yes If yes, for how long? _______ Months

□ Don't know

13. Does the child brush his/her teeth?

□ no (now go to question 19)

□ yes (continue with question 14)

14. Who brushes the child’s teeth?

□ child

□ caregiver

□ child assisted by caregiver

15. At what age did you start cleaning the child’s teeth? _______ years
16. How often do you clean your child's teeth? (Tick one)

- more than once a day
- less than once a day
- once a day
- don't know

17. What is used to clean the child's teeth?

- a toothbrush
- a chewing stick (mswaki)
- something else (please specify)

18. Does your child use toothpaste to clean the teeth? (Tick one)

- yes
- no
- don't know

19. Do you brush your teeth?

- no
- yes
Attitude of caregiver

20. Why should children's teeth be cleaned? (Tick one)

☐ to prevent tooth decay

☐ to make them whiter

☐ to freshen breath

☐ I don't know

☐ Others (specify)

21. What would you prefer done to a baby tooth that has a hole? (Tick one)

☐ Remove the tooth

☐ Leave the tooth alone

☐ Clean and fill the tooth

☐ Other (specify)

☐ Don't know

22. Which of the following statements regarding children's teeth are true? (Tick the true statements only)

☐ milk teeth do not need to be looked after because they fall off any way

☐ tooth decay is passed on from milk teeth to permanent teeth

☐ tooth decay is passed on from mother to child

☐ children should visit a dentist regularly every six months
Appendix II: Data Collection Form

Examiner Name: _______________________________ Date: ____________

1. Name of child______________________________________________

2. Identification Number_______________________________________

3. Date of birth_____________________________________________

4. Sex (M=1, F=2)____________________________________________

5. dmft score______________________________________________

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d .........

m .........

f .........
Appendix III: Consent Information

My name is Dr. Nancy Njoroge. I am a postgraduate student at the Department of Paediatric Dentistry and Orthodontics, School of Dental Sciences, University of Nairobi. I’m carrying out a research in Kiambaa Division Nursery Schools. The aim of this research is to find out about holes in teeth (dental caries) among 3-5 year old children and your (caregiver) knowledge on teeth. I will check for holes in your child’s teeth and ask you some questions. I shall not remove any teeth nor cause any pain to the child. The check up will be free of charge. If your child is found to have holes in his/her teeth or any other problem in the mouth you will be advised where to seek help. The results will benefit your child by highlighting the problems to the Ministry of Health and the Ministry of Education.

Consent Form

I............................................................, as parent/guardian have read the above information and allowed my child ............................................................... to have his/her teeth checked

Signature of parent/guardian                          Date

--------------------------------------------------  -----------------------------

Signature of Investigator                          Date
Taarifa Ya Kutoa Idhini


Idhini

Mimi.....................................kama mzazi/mlezi nimesoma nakala hii na nimemruhusu mtoto wangu ....................... afanyiwe uchunguzi wa meno na nitafika/nitamtuma mtu wakati huo.

Sahihi ya mzazi/Mlezi Tarehe

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Sahihi ya mchunguzi Tarehe

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Appendix IV: Ethical Approval

Ref: KNH-ERC/01/3015

Dr. Nancy W. Njoroge  
Dept. of Paediatric Dentistry and Orthodontics  
Faculty of Dental Sciences  
University of Nairobi

Dear Dr. Njoroge

RESEARCH PROPOSAL: “PREVALENCE AND PATTERNS OF EARLY CHILDHOOD CARIES IN KENYAN RURAL CHILDREN AND THEIR CAREGIVER'S ORAL HEALTH KNOWLEDGE, ATTITUDE AND PRACTICES”

This is to inform you that the Kenyatta National Hospital Ethics and Research Committee has reviewed and approved revised version of your above cited research proposal for the period 22nd September 2005 - 21st September 2006. You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given.

On behalf of the Committee, I wish you fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of database that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely,

PROF A N GUANTAI  
SECRETARY, KNH-ERC

Cc: Prof. K.M.Bhatt, Chairperson, KNH-ERC  
The Deputy Director CS, KNH  
The Dean, Faculty of Dental Sciences, UON  
The Chairman, Dept. of Paediatric Dentistry and Orthodontics, UON  
The HOD, Medical Records, KNH  
Supervisors: Dr. A. Kemoli, Dept. of Paed. Dent. & Orthodontics, UON  
Dr. A. Hussein, Dept. of Paed. Dent. & Orthodontics, UON  
Dr. L.W. Gathece, Dept. of Periodontology, Community & Prevent. Dentistry, UON

Date: 22nd September 2005