NUTRITIONAL STATUS OF CHILDREN AGED 3 – 5 YEARS WITH AND WITHOUT SEVERE EARLY CHILDHOOD CARIES IN NEW NYANZA PROVINCIAL GENERAL HOSPITAL, KISUMU, KENYA.

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DECLARATION

I, Dorah Catherine Wasunna, declare that this thesis is my original work and has not been presented for the award of a degree in any other university

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DEDICATION

This thesis is dedicated to all the children and their caregivers who participated in the study.

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ACRONYMS

BDS - Bachelor of Dental Surgery

CDC - Center for Disease Control and Prevention

dmft - decayed, missing, and filled teeth for primary teeth

ECC - Early Childhood Caries

EN - Dr. Edith Ngatia

FTT - Failure to Thrive

HAZ - Height for age

KNH - Kenyatta National Hospital

MM - Dr. Mary Masiga

MS - Mutans streptococci

NNPGH - New Nyanza Provincial General Hospital

PI - Principal investigator

S - ECC - Severe Early Childhood Caries

SD - Standard deviation

SPSS - Statistical Programme for Social Sciences

UON - University of Nairobi

WHO - World Health Organization

WAZ - Weight for age

WHZ - Weight for height

DEFINITION OF TERMS

Severe early childhood caries:

For the purposes of this study severe Early Childhood Caries was defined as decayed, missing or filled score of ≥ 4 (age 3), ≥ 5 (age 4), ≥ 6 (age 5).

Caries – free children

Children who were caries – free were defined as those whose teeth showed no evidence of dental caries, treated or untreated [1].

Caregiver:

Caregiver was defined as an individual such as a parent, aunt, uncle, grandparent, and guardian who attends to the needs of the child [2].

ABSTRACT

Background: Early childhood caries (ECC) is defined as the presence of one or more decayed, missing due to caries, or filled tooth surfaces in the deciduous dentition in children whose ages are from 71 months and below. However, in younger children aged 3 years, any sign of smooth surface caries is indicative of severe Early Childhood Caries (severe ECC). In the age group of 3 to 5 years, ECC is also considered once one or more carious, missing (due to caries), or filled smooth surfaces in the primary maxillary anterior teeth. Also a decayed, missing or filled score of ≥ 4 (age 3), ≥ 5 (age 4), ≥6 (age 5) constitutes severe ECC.

Some studies have shown that severe ECC affects growth and development of a child; while others have shown that there is no relationship between nutritional status and severe ECC. Currently there is scarce information regarding the nutritional status of children with severe ECC in Kenya.

Objective: To determine and compare the nutritional status of children aged 3 - 5 years with S - ECC with the nutritional status of 3 – 5 year old children who are caries - free.

Study area and Design: This was a comparative cross sectional study based at the Nyanza Provincial General Hospital in Kisumu, Western Kenya region.

Materials and methods:

Sampling and sample size: Purposive sampling was done to select the 196 children aged between 3 to 5 years for this study. There were eighty one children with severe ECC selected from amongst the patients who had sought dental

treatment at the dental clinic at the Nyanza Provincial General Hospital. However, 115 children who were caries free were selected from amongst the children attending the maternal child health clinic at NNPGH over a period of three months.

While Oral hygiene status was assessed using the plaque index of Löe and Silness (1964) , the WHO 1997 caries diagnosis criteria was used to assess dental caries experience. Dental caries was diagnosed when there was clinically detectable loss of tooth substance and when such loss had been treated with fillings or extraction. Nutritional status was assessed using anthropometric measurements and cut-offs of ±2 standard deviations (SD) were used to identify children at significant risk for either inadequate (<-2SD) or excessive (>+2SD) growth for the following indicators: weight-for-age (WAZ), height-for-age (HAZ), weight-for-height (WHZ).

Results: One hundred and ninety six children aged 3 – 5 years among whom 100 were males and 96 were females were recruited for the study. One hundred and forty eight children had fair oral hygiene status and thirty two had good oral hygiene status. Children with severe ECC had poor and fair oral hygiene status when compared to caries – free children. Pearson's chi square test showed that there was a statistically significant difference with a p – value of 0.027. The mean dmft of children with severe ECC was 7.5 (± 1.9 SD). Among males and females the mean dmft was 7.5 (±1.8SD) and 7.5 (±1.2SD) respectively.

The prevalence of underweight, wasting, and stunting among both groups of children was 14.3% 3.6%, and 2.6% respectively. Eleven males were underweight and seventeen females were underweight. Among children with severe ECC 14%, 4.9%, 2.5% were underweight, wasted and stunted respectively. 13.9%, 2.6%, 6.1% of caries - free children were underweight, wasted and stunted respectively.

Conclusion: There was no statistically significant difference in the nutritional status of children with severe ECC and caries – free children for Stunting (p=0.311), Underweight (p=0.859) and Wasting (p=0.451). However, children with Severe – ECC were 1.23 .times more likely to be underweight than caries – free children.

Recommendations: There is a need to create awareness on infant feeding practices and oral hygiene status for all children below 5 years of age. This may be done through maternal child health clinics. There is also a need to improve accessibility and availability of dental services and to provide nutritional support for all children below 5 years of age.

1.0: Introduction and literature review

1.1: Introduction

Early childhood caries (ECC) is defined as the presence of one or more decayed (non-cavitated or cavitated lesions), those 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) [3].

From the age of 3 years through to 5 years, one 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), ≥6 (age 5) constitutes severe ECC[3].

ECC has been shown to affect disadvantaged groups in both developed and developing countries and even within a single country disparities by social standing exist, largely because of differences in diet, fluoride use and social empowerment. Disparities by social empowerment persists both because of lack of access to dental care and/ or utilization of dental care even when available[4].

Untreated caries and associated infections can cause pain, discomfort, reduced intake of foods because eating is painful [5].

The aim of this study was to determine and compare the nutritional status of children with S - ECC and children who are caries-free, so as aims to provide baseline information on nutritional status of children aged 3 – 5 years in a local community in Kisumu, Kenya.

1.2: Literature Review

The dentition of a 3 -5 year old is characterised by the presence of full complement of primary teeth and the eruption of the first permanent molars. The dentition is important for speech and mastication, promoting an aesthetic appearance, maintaining arch length and a healthy oral environment free of pain[6]. The dentition is also important for growth, development and nutritional status of a 3 – 5 year old.

1.2.1: Prevalence of Severe Early Childhood Caries

The prevalence of S - ECC varies from population to population. In developed countries the prevalence varies from 1-12%, while in developing countries and among disadvantaged populations (ethnic minorities) of the developed countries, the prevalence is as high as 70%[7.] A study among low income African American children aged between 0 – 5 years found the prevalence of S - ECC to be 27%[8]. In Europe, studies in England, Sweden and Finland have reported the prevalence of ECC in children aged 3 years to range from below 1% to 32%[9].

A study in South Africa among 5822 children aged 36 – 71 months found the prevalence of S - ECC to be 32%[10]. Literature on S -ECC in Kenya is scarce, however, a study carried out on the dietary patterns and dental caries among nursery school children in Nairobi found a prevalence of 63.5% among 3 – 5 years olds[11]. The prevalence of ECC among a peri-urban population of 3 - 5 year olds in Kiambaa division of Kenya was, however, found to have been 59.5%[12].

1.2.2: Aetiology of Severe Early Childhood Caries

1.2.2.1: Microbiologic factors

Severe ECC is an infectious disease and Streptococcus mutans (MS), Streptococcus sobrinus, Bifidobacteria dentium have all been associated with childhood caries [13, 14].

MS contribute to caries formation as a result of their increased ability to adhere to tooth surfaces, produce copious amounts of acid, survive and maintain metabolism at low pH conditions[15]. Colonization of a child's oral cavity with MS is generally as a result of transmission of these organisms from the child's primary caregiver and saliva is the principal vehicle by which transfer of MS may occur[16]. Studies have shown that MS strains isolated from mothers and their babies exhibit similar phenotypic profiles or chromosomal DNA patterns [17]. Factors influencing colonization include frequent sugar exposure in infants and habits that allow salivary transfer from mother to infant[18].

Preschool children with high (above 10^5) colonization levels of MS have greater caries prevalence and are at a much greater risk of developing new lesions than those children with low levels of MS[19].Studies also demonstrate a correlation between visible plaque on primary teeth and MS colonization[20]. A study carried out among 39 children aged 12 to 36 months found a positive correlation between baseline MS and plaque regrowth, suggesting that the presence of plaque on the anterior teeth of young children is related to MS colonization[21].

1.2.2.2: Dietary factors

Epidemiological studies show that dietary sugars, especially sucrose, are a factor affecting dental caries prevalence and progression[22]. The acid production from sucrose metabolism disrupts the balance of the microbial community, favoring the growth of MS and lactobacilli[23]. Sucrose is a unique cariogenic carbohydrate because it also serves as a substrate for extracellular glucan synthesis[24]. Glucan polymers are believed to enable MS to adhere firmly to teeth and inhibit the diffusion properties of plaque[25].

Bovine and human milk contain the carbohydrate lactose, which enhances the oral implantation of cariogenic bacteria and demineralises tooth enamel when acted upon by bacteria[26].Reports of caries in breastfed infants state that not only was the child breast fed on demand, but that in most cases the child slept with the mother so that nursing could continue during the night[27].

Fruit juices and carbonated beverages also contain fructose and are intrinsically acidic and these results in a significant increase in plaque pH[28]. A study carried out on the dietary patterns and dental caries among 304 nursery school children in Nairobi found that there was a high consumption of snacks both at home and at school[8].

1.2.2.3: Enamel Developmental Defects

Lack of enamel maturation or the presence of developmental structural defects in enamel may increase the caries risk. Such defects enhance plaque retention and increase MS colonization. In severe cases, the loss of enamel enables greater susceptibility to tooth demineralization. A strong correlation has been found between

the presence of enamel hypoplasia and high counts of MS [28]. Enamel defects in the primary dentition are mostly associated with pre-, peri-, or postnatal conditions such as low birth weight, and child or mother's malnutrition or illness.

1.2.2.4: Role of Saliva

Salivary flow rate, buffering capacity, antimicrobial activity, microorganism aggregation and clearance from the oral cavity, immune surveillance, and calcium phosphate binding proteins all interact to inhibit or reverse demineralization of exposed tooth surfaces[27]. Saliva acts as a protective factor against the development of ECC by providing the main defense system for the host. Low saliva rate, therefore, enhances the development of ECC. Saliva buffers plaque acids through activation of carbonic acid bicarbonate and phosphate protein systems. It also mediates antimicrobial activity by selectively allowing colonization of bacteria on the tooth surface and through activation of several antimicrobial system (lactoferri, lyzozyme and peroxidase enzymes) [28].

Buffering capacity and antimicrobial properties as well as clearance of food are closely related to saliva flow rates. The antibacterial factors against cariogenic bacteria are provided by salivary secretory immunoglobulin(s-IgA), lyzozyme, peroxidase, and lactoferrin present in saliva [3].

1.2.2.5: Socio-demographic factors

Socio-demographic and economic factors such as parental levels of education, number of children, household crowding, (number of persons and number of rooms), family income have been shown to be important determinants of dental caries. Many studies have shown a relationship between ECC and socio-demographic and

economic backgrounds with children from the lower socio-demographic classes having a higher experience of dental caries[29]. A systematic review on caries experience as a predictor of dental caries concluded that there is fairly strong evidence for an inverse association between socio-economic and demographic status and the prevalence of ECC[30].

A study on the social and behavior determinants of ECC found the prevalence to have been higher among children born to single parent families and those with younger mothers[31]. Another study on caries and its association with infant feeding and oral health related behavior in 3 – 4 year old Brazilian children found that dental caries, rampant caries, and incisor caries were all prevalent amongst children whose mothers were either illiterate or had less than 4 years of education[32].

A study in Abu Dhabi among preschool children found that children from rural areas tended to have been more prone to caries than children from urban areas. This study also found that children having parents of high educational status tended to have less dental caries in the older age groups[33]. A study in Kenya found that although not statistically significant, caries was more prevalent and severe among children of single parent families and of families having an unemployed father [34].

1.2.3: Consequences of S - ECC

With the development of dental caries, the child experiences pain, chewing difficulty, psychological trauma and premature tooth extraction. Dental pain is the immediate most common consequence of untreated caries and children with dental pain have their daily activities affected, such as eating, sleeping and playing. In addition, such pain can impair school performance and contribute to absenteeism from school[3].

Early deciduous tooth loss should be avoided, since these teeth are very important for an adequate development and growth of the maxillary arches, correct organization of the occlusion and, chewing and speech function. Premature loss of deciduous teeth in the upper anterior region may result in abnormal swallowing and production of speech sounds, delay or acceleration of permanent tooth eruption, eating difficulty and development of probable orthodontic problems, as well as psychological disorders[35]. A study on the effect of nursing bottle on oral health found a loss in vertical dimension in 63.3% of the children with extensive carious lesions in the upper incisors[36].Early loss of posterior teeth (deciduous molars) leads to chewing difficulty, in addition to possibility of loss of space for the permanent tooth[37, 38].

1.2.4: Nutritional status and Severe Early Childhood Caries

Nutritional status is the balance between the intake of food and nutrients by an individual and the utilization of these nutrients in the process of growth, development and health maintenance compared with a reference data of comparable age group that gives an indicator of the nutritional status. WHO global database on child growth and malnutrition indicates that 35.8% of preschool children in developing countries are underweight, 42.7% are stunted and 9.2% are wasted[39]. The Kenya Demographic and Health Survey (KDHS) 2008 – 2009 found that 35%, 7% and 16% of children under the age of six years were stunted, wasted and underweight respectively[40].

Studies on nutritional status and dental caries have yielded variable results. A retrospective study was carried out in the United States of America to describe the body mass index of two hundred and ninety three children aged two to five years with severe ECC receiving dental treatment under general anesthesia. In this study

the weight groups were assigned using current CDC body mass index for age and gender definitions. Results showed that the distribution of subjects by percentiles was: underweight 11%; normal weight 67%; at risk of overweight 9%; overweight 11%. This study concluded that significantly, more children in the sample were underweight than in the reference population[41].

A review of the possible effects of dental caries on failure to thrive (FTT) showed that in otherwise healthy children, severe dental decay could contribute to FTT[42]. A study on the effect of rampant caries on height and weight showed that three-year-olds with nursing caries with at least one pulpally involved tooth weighed about 1 kg less than control children without nursing caries. Seven point one percent of children with caries weighed less than 80% of ideal weight compared to 1.7% of the comparison group. They were significantly lighter and shorter than controls without caries. The mean weight of children with caries was between the 25th and 50th percentiles compared to controls that were between the 50th and 75th percentiles. Seven percent of cases and 0.7% of controls weighed less than the 20th percentile[43].

Further evidence of the effect of dental caries on growth comes from studies of 'catch-up growth' following comprehensive dental treatment, which indicated that the previous oral condition compromised nutritional intake. A study on the effect of dental rehabilitation on the body weight of children with early childhood caries showed that prior to dental rehabilitation, test subjects' percentile weight categories were significantly less than the comparison group. The weight categories of children with early childhood caries were compared with caries-free patients before and after comprehensive dental treatment under general anaesthesia. Percentile weight

categories of caries children were significantly less than controls. Of the children with ECC, 13.7% weighed less than 80% of their ideal weight.

Following therapeutic dental treatment the children with ECC had significantly increased growth velocities. After treatment there was no difference in age adjusted weights between the ECC and control groups. Children in the treated group had growth velocities in the 75th percentile at the end of the observation period, 'thereby propelling them from age-adjusted weights between the 25th and 50th percentiles to between the 50th and 75th percentiles. All the children showed an immediate increase in weight, shifting them to higher percentile categories with increased six-month increments of growth after carious teeth had been restored. At the end of the study, none of the children were considered to have faltering growth[5].

A cross-sectional study was carried out to assess whether there was an association between dental caries, and nutritional status in 1,018 preschool urban Brazilian children aged 12 to 59 months. In this study the dental caries prevalence and severity were measured using decayed, missing and filled surfaces index. The World Health Organization child growth reference was used to evaluate nutritional status. This study found that underweight children were 5.58 times more likely to have had S - ECC than children of normal height/weight. This study also found that children whose mothers had less than 8 years of education and were from lower-income families had higher prevalence of dental caries[44].

Other studies have found no statistically significant relationship in the body mass index for age and caries prevalence [45]. A comparative study on the nutritional status and dental caries among a large sample of four and five year old South African children, however, found no significant association between the prevalence of

caries and stunting or wasting but an association was found between decayed, missing and filled surfaces and wasting[46].

1.2.5: Prevention of S -ECC

The prevention of ECC should be focused on educational programs to alter children's feeding practices and to reduce levels of mutans streptococcus infection[47]. Primary prevention must begin in the pre and peri-natal period and should consist of advice on maximizing the nutrition of pregnant women during the last trimester of pregnancy and of infants during the first year of life when the enamel is undergoing maturation[48]. A randomized controlled trial on provision of anticipatory guidance to nulliparous women (women expecting their first child) involving receiving of oral health promotion information during pregnancy, and when the child reached 6 and 12 months of age showed that the incidence of S - ECC in the test group was 1.7% and 9.6% in the control group. Hence, an oral health promotion programme based on repeated round of anticipatory guidance initiated during the mother's pregnancy was successful in reducing the incidence of S - ECC[49].

Fluoride is also important in the prevention of S - ECC. The mineral content of dental hard tissue is an impure form of hydroxyl apatite. Flouride has a strong affinity for apatite, because of its small ionic and strongly electronegative character. When incorporated into the crystalline lattice, fluoride ions replace hydroxyl ions to form flouroapatite that is more stable than hydroxyapatite .Since the rate at which carious lesions progress is dependent on the rate at which the apatite crystals dissolve, this dissolution rate can be reduced by fluoride. The mainstay in caries prevention and remineralization is frequent exposure to low levels of fluoride. The role of systemic fluorides appears to be limited and the effect of fluoride is mainly topical[50].

The current guidelines on prevention of S - ECC by the American Academy of Paediatric Dentistry emphasises on reducing the parent's/sibling(s)' MS levels to decrease transmission of cariogenic bacteria, minimising saliva-sharing activities (eg, sharing utensils) to decrease the transmission of cariogenic bacteria, and implementing oral hygiene measures no later than the time of eruption of the first primary tooth. These guidelines also recommend that tooth brushing should be performed for children by a parent twice daily, using a soft toothbrush of age-appropriate size. In children considered at moderate or high caries risk under the age of 2, a 'smear' of fluoridated toothpaste should be used. In all children ages 2 to 5, a 'pea-size' amount should be used. Establishing a dental home within 6 months of eruption of the first tooth and no later than 12 months of age to conduct a caries risk assessment and provide parental education including anticipatory guidance for prevention of oral diseases is also essential to preventing ECC. High frequency consumption of liquids and/or solid foods containing sugar in particular: sugar-containing beverages (eg, juices, soft drinks, sweetened tea, milk with sugar added) in a baby bottle or no-spill training cup should be avoided. Infants should not be put to sleep with a bottle filled with milk or liquids containing sugars and Ad libitum breast-feeding should be avoided after the first primary tooth begins to erupt and other dietary carbohydrates are introduced. Parents are also encouraged to have infants drink from a cup as they approach their first birthday and Infants should be weaned from the bottle between 12 to 18 months of age[3].

1.3: PROBLEM STATEMENT

Severe ECC is an aggressive form of dental caries that affects the deciduous dentition and is more prevalent in children from lower socio-economic classes. These children frequently have painful abscesses and reduced ability to sleep or eat, which can lead to poor quality of life [51, 52, 53]. The extensive restorative therapy needed usually requires general anaesthesia [14].

From the literature reviewed S - ECC affects growth and development with children affected weighing significantly lighter and usually shorter than those without caries and that following therapeutic dental treatment of children with S - ECC there was an immediate increase in weight shifting them to higher growth percentiles[5]. Therefore, not only does S - ECC have an impact on the oral health of the child but also on the general health of the child.

1.4: JUSTIFICATION

Currently there is scarce information on the nutritional status of children with S - ECC in Kenya. This study therefore aims to provide baseline information on the nutritional status of children aged 3 – 5 years with S – ECC in NNPGH, Kisumu, Kenya. The results generated from this study may provide information for planning and formulation of policies that integrate oral health programmes into maternal child health programmes.

1.5: STUDY OBJECTIVES

1.5.1: Broad objective

To determine and compare the nutritional status of children aged 3 - 5 years with S - ECC and the nutritional status of 3 – 5 year old children who are caries - free.

1.5.2: Specific objectives

1. To identify children aged 3 – 5 with S - ECC.
2. To determine the nutritional status of children aged 3 - 5 years with S ECC.
3. To determine the nutritional status of 3 – 5 year old children who are caries - free
4. To compare the nutritional status of children aged 3 - 5 years with S -ECC and those who are caries – free.

1.6: NULL HYPOTHESIS

There is no difference in the nutritional status of children aged 3-5 years with S - ECC when compared to who are caries – free in NNPGH.

1.7: STUDY VARIABLES

Table 1.1: Study variables

Variable	Measurement
Socio- demographic variables	
Age of child	Number of years since birth
Gender	male or female
Employment status of caregiver	Formal and Informal
Level of education of caregiver	Highest level of education attained
Independent variables	
Severe ECC	decayed, missing, filled teeth
Dependent variable	
Stunting	Height for age
Underweight	Weight for age
Wasting	Weight for height
Confounding variables	
Oral hygiene status	Scores from Oral Hygiene Index
Dietary and weaning practices	Mode of feeding, duration of feeding and feeding on demand

CHAPTER TWO

2.0: Materials and methods

2.1: Study area

This study was carried out at the New Nyanza Provincial General Hospital (NNPGH) located in Kisumu, the third largest city in Kenya. NNPGH is a public referral hospital and serves a catchment with a population in three provinces namely Nyanza, Western and Rift Valley.

2.2: Study design

This was a comparative cross – sectional study.

2.3: Study population

The study population consisted of children aged 3 - 5 years attending the dental clinic and Maternal Child at NNPGH

2.3.1: Inclusion criteria

- Children aged 3 - 5 years.
- Children whose caregiver's consented to the study

2.3.2: Exclusion criteria

- Children with craniofacial anomalies.
- Children with debilitating systemic illnesses

2.4: Sample size determination

Sample size was calculated using the formula [54].

$$n = \frac{\{Z_{1-\alpha/2}\sqrt{[2P(1-P)]} + Z_{1-\beta}\sqrt{[P_1(1-P_1)+P_2(1-P_2)]}\}^2}{(P_1-P_2)^2}$$

Where;

α = Type I error (0.05)

β = Type II error (0.10)

At 95% confidence, $Z_{1-\alpha/2} = 1.96$

At 90% power, $Z_{1-\beta} = 1.28$

P_1= Assumed proportion of malnutrition among caries free children (50%).

P_2= Estimated proportion of malnutrition among children with Severe - ECC (75%).

$$P = \frac{P_1 + P_2}{2}$$

n=77

Therefore the minimum sample size required for the children with Severe - ECC was 77. A total number of 81 children with Severe ECC and an unmatched number of 115 caries – free children were recruited for the study.

2.5: Sampling Procedure

Selection of children with S - ECC

S – ECC was defined as decayed, missing or filled score of ≥ 4 (age 3), ≥ 5 (age 4), ≥ 6 (age 5). Purposive sampling was done whereby every child aged 3-5 years attending the dental clinic at NNPGH was examined and only children presenting with S - ECC were selected for the study until the required sample size was obtained.

Selection of caries - free children

Purposive sampling was done whereby every child aged 3 - 5 years attending the maternal child health clinic at NNPGH was examined and only children who were caries – free were selected for the study until the required sample size was obtained. The children with S – ECC and those who were caries free were not matched for age and gender.

2.6: Calibration of principal investigator (PI)

The PI was calibrated by 2 supervisors. A Paediatric Dentist (MM) on charting the caries status and oral hygiene status using the dmft index and Löe and Silness index respectively, and a Nutritionist (EN) on the nutrition assessment. The Cohen Kappa agreement for dmft was 0.9(Very good) (n=8) and oral hygiene status was 0.8(Good) (n=8) while that for nutrition assessment was 0.89(Very good) (n=8). During data collection, every tenth child was re-examined and the intra-examiner Cohen Kappa agreement for dmft and oral hygiene status was 0.89(Very good) (n=10) and that for nutritional assessment was 0.88(Very good) (n=10).

2.7: Data collection instruments

Data collection was done over a period of 2 months. A semi-structured questionnaire (Appendix I) was administered to the caregiver in a face to face interview with the PI. Information was collected on socio-demographic background of the children including the age, gender, and the caregivers level of education, occupation and area of residence. Oral examination of the children was carried using sterilised instruments.

2.7.1: Oral hygiene status:

Intraoral examination was carried using a dental mirrors and a Michigan O dental probe under natural light as the child sat on an ordinary chair facing the light .Oral hygiene status was assessed using the plaque index of Silness and Löe (1964). Plaque scores for each tooth was recorded from the distal, buccal, mesial, and lingual surfaces of six teeth (55, 51, 65, 75, 71, and 85).The plaque score for each individual was then determined by adding the scores for each tooth and dividing this by the number of teeth examined. The interpretation of the scores was such that individual scores of 0, 0.1 – 0.9, 1.0 – 1.9, and 2.0 – 3.0 was indicative of excellent, good, fair, and poor oral hygiene status respectively.

2.7.2: Dental caries assessment

Prior to dental caries diagnosis each tooth was dried using a piece of sterile gauze. WHO 1997 caries diagnosis criteria was used and dental caries was diagnosed when there was clinically detectable loss of tooth substance and when such loss had been treated with fillings or extraction. Radiographs were not taken for dental caries assessment due to financial constraints

2.7.3: Nutritional status:

The nutritional status was assessed using anthropometric measurements. The height of the children, erect and barefoot, was measured with a standard height board to the nearest 0.5cm, and weight was measured using a Salter scale to the nearest 0.1 kg. Three measurements for height and weight were taken and an average of each was recorded. Cut-offs $\pm$2 standard deviations (SD) were used to identify children at significant risk for either inadequate (<-2SD) or excessive (>+2SD) growth for the following indicators: weight-for-age (WAZ), height-for-weight (HAZ), weight-for-height (WHZ).

2.8: Data analysis and presentation

Data collected was coded and analyzed using SPSS version 17.0 (SPSS Inc, Chicago Illinois, USA) for windows and Microsoft office excel 2007. Nutritional data was analysed using Epi-Nutri programme of Epi-Info version 3.5.1.

Univariate analysis: Descriptive statistics such as proportions were used to summarize categorical variables while measures of central tendency such as mean, standard deviations and ranges were used to summarize continuous variables.

Bivariate Analysis: Pearson's Chi-square tests were used to test for the strength of association between categorical variables. All exposure variables were associated with the dependent variable to determine which ones had significant association. Odds Ratio (OR) and 95% Confidence Interval (CI) were used to estimate the strength of association between independent variables and the dependent variable. Statistical significance was set at $p \leq 0.05$.

2.9: Validity and reliability

The use of a standard examination and measurement procedure was employed for all participants. The questionnaire was pretested prior to data collection among the caregivers of children aged 3 – 5 years attending the dental clinic at NNPGH. Supervisors calibrated the investigator. A duplicate clinical examination was carried out on every 10^{th} child and Cohen's Kappa index was used to calculate intra-examiner reliability. .

2.10: Ethical considerations

Ethical approval was sought from the Ethics and Research Committee of the University of Nairobi and Kenyatta National Hospital, Kenya. Permission to conduct the study was sought from the Nyanza Provincial Medical Officer of Health and the Medical Superintendent of Nyanza Provincial Hospital. A written informed consent was obtained from each caregiver. Children who were classified as malnourished and / or having ECC or S - ECC were referred to the paediatric outpatient clinic and the dental clinic respectively for further management. Confidentiality of study participants and protection of their identity was strictly observed and participants shall not be identified in any reports on this study.

CHAPTER THREE

3.0 Results

3.1: Socio-demographic characteristics

A total of 196 children aged 3 – 5 years were recruited into the study. Eighty one children with S - ECC (41.3%) and 115(58.7%) who were caries - free. The mean age of the study children was 4.1 $\pm$ 0.6 ranging between 3 and 5 years with a high proportion of the children (62.2%) aged 4 years. There was a statistically significant difference in age distribution among children with Severe – ECC and children who were Caries - free (χ^2=28.36, df=2, p<0.001). Majority of the children with caries were aged 4 years (84.0%) compared to those who were caries – free (47.0%).Gender distribution was comparable with boys slightly more (51.0%) than girls (49.0%).

Table 3.1: Age and gender distribution of children with Severe - ECC and children who were caries – free

	Total (N=196)		**S - ECC (n=81)**		**Caries - free (n=115)**				
Variables	**n**	**%**	**n**	**%**	**n**	**%**	**χ^2**	**df**	**p≤0.05**
Age group									
3 years	69	35.2	13	16.0	56	48.7			
4 years	122	62.2	68	84.0	54	47.0	28.36	2.00	**<0.001***
5 years	5	2.6	0	0.0	5	4.3			
Sex of child									
Male	100	51.0	43	53.1	57	49.6	0.24	1.00	0.627
Female	96	49.0	38	46.9	58	50.4			

***** Pearson's Chi-square

Overall, 65(33.2%) and 131(66.8%) of the children resided in rural and urban areas respectively. There was a statistically significant difference in the place of residence between children with S – ECC and children who were caries - free (χ^2=13.36, df=1, p<0.001). Majority of the children with S -ECC resided in urban areas (81.5%) compared to children who were caries- free (56.5%). Similarly when the caregiver's level of education was considered it was found that there was a statistically significant difference between the two groups (χ^2=9.41, df=3, p=0.024). A higher proportion caregivers of the children with S - ECC had tertiary level of education (17.3%) when compared to children who were caries free (6.1%) (Table 3.2).

Table 3.2: Caregivers place of residence, level of education, and occupation

	Total (N=196)		**S - ECC (n=81)**		**Caries – free (n=115)**				
Variables	**n**	**%**	**N**	**%**	**n**	**%**	**χ^2**	**df**	**p≤0.05**
Place of residence									
Rural	65	33.2	15	18.5	50	43.5	13.36	1.0	**<0.001***
Urban	131	66.8	66	81.5	65	56.5			
Caregiver's level of education									
No formal education	4	2.0	0	0.0	4	3.5	9.41	3.00	**0.024***
Primary education	68	34.7	24	29.6	44	38.3			
Secondary education	103	52.6	43	53.1	60	52.2			
Higher education	21	10.7	14	17.3	7	6.1			
Caregiver's occupation									
Formal	43	21.9	14	17.3	29	25.2	1.75	1.00	0.186
Informal	153	78.1	67	82.7	86	74.8			

***Pearson's Chi – square

3.2: Caries experience of children with S - ECC

The mean dmft was found to be 7.5 (± 1.9 SD) ranging between 5 and 12 scores. When gender was considered the mean dmft for the males was 7.5±1.8 and for females (7.5±2.0), with no statistically significant difference found between the two groups (t=0.15, p=0.88). The mean dmft score for children aged 3 years was 6.9 ± 2.2, 4 years was 7.6 ± 1.9, and for 5 year olds was 7.2 ±1.2. There was no statistically significant differences found between the age groups (t=1.59, p=0.248) (Table 3.5).

Table 3.3: Distribution of decayed, missing, and filled teeth by age and gender

Variables	N	Mean dmft ± SD	Range
Overall	**81**	**7.5 ± 1.9**	**5 – 12**
Gender			
Male	43	7.5 ± 1.8	5 – 12
Female	38	7.5 ± 2.0	5 – 12
p value		0.880	
Age			
3 years	13	6.9 ± 2.2	5 – 12
4 years	60	7.6 ± 1.8	5 – 12
5 years	8	7.2 ±1.2	5 – 12
p value		0.248	

Overall the d component of the dmft contributed 92.3%. The missing and filled component of the dmft contributed 7.4% and 0.3% respectively. Fifty four , 41.5%, and 4% of children with S – ECC had teeth which were sound, decayed and missing on the upper arch respectively (Figure 3.1) . On the lower arch, 70.6%, 27.8% and

1.4% of the children had sound, decayed, and missing teeth respectively.

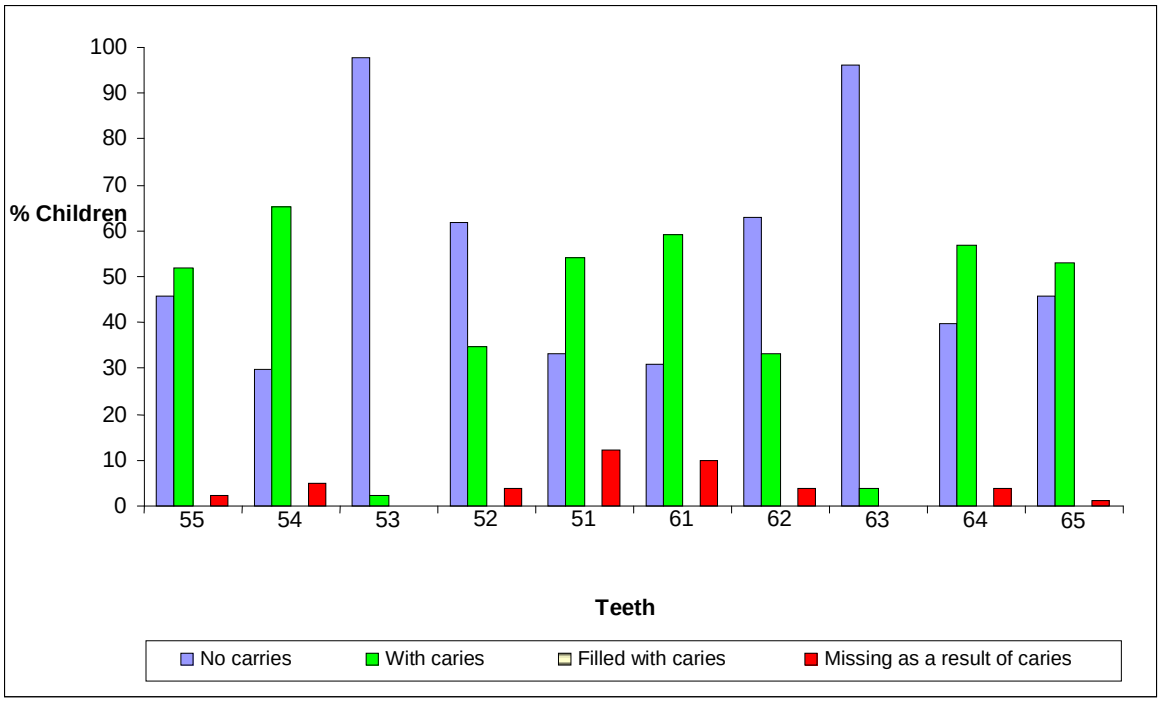

Figure 3.1: Distribution of decayed, missing, and filled teeth by tooth type in the upper arch

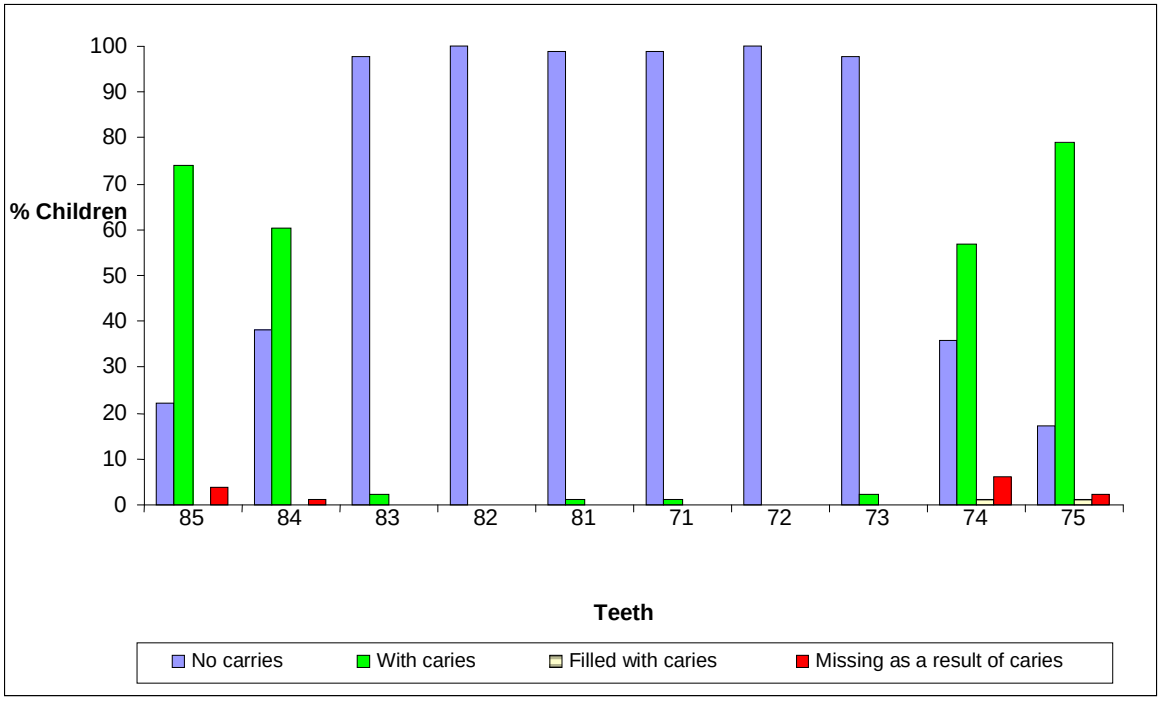

Figure 3.2: Distribution of decayed, missing, and filled teeth by tooth type in the lower arch

3.2.1: Oral hygiene status

Majority of the children had fair oral hygiene status 148 (75.5%).Among the children with severe ECC 64 (79.1%) and 22(19.0%) had fair and good oral hygiene status respectively. While 84(73.0%) and 22(19.1%) of children who were caries - free children had fair and good oral hygiene respectively. There was a statistically significant difference in the oral hygiene status of children with S - ECC and children who were caries - free (χ^2=9.18, p=0.027) as shown in table 3.4.

Table 3.4: Oral hygiene status of children with severe ECC and children who were caries - free

	Total (N=196)		S - ECC (n=81)		Caries-free (n=115)				
Variable	**N**	**%**	**n**	**%**	**n**	**%**	**χ^2**	**Df**	**p ≤0.05**
Oral hygiene status									
Excellent	6	3.1	0	0.0	6	5.2			
Good	32	16.3	10	12.3	22	19.1	9.18	3.0	**0.027***
Fair	148	75.5	64	79.0	84	73.0			
Poor	10	5.1	7	8.6	3	2.6			

*Pearson's Chi-square

3.3: Nutritional status, infant feeding and weaning practices

This section covers anthropometric assessment of nutritional status and infant feeding and weaning practices.

3.3.1: Infant feeding and weaning practices

Feeding practices reported include mode of feeding at birth, duration, beverage placed in the bottle and feeding on demand. Majority of the children, 125(63.8%) were breast fed exclusively. Overall most, 94(48%), of the children were breast fed or bottle fed for duration of 24 months or more. Among the children with severe ECC and children who were caries- free 55 (67.9%) and 70 (60.9%) were exclusively breast fed respectively. Forty two (51.9%) and 52(45.2%) of children with Severe ECC and children who were caries – free had been breast fed for 24 months or more. Milk was the most common beverage placed in the bottle for both groups of

children who had been bottle fed. Majority of the children with S – ECC were fed on demand (66.7%) compared to those who were caries - free (30.4%) and this was statistically significant (χ^2=25, p<0.001) (Table 3.5).

Table 3.5: Infant feeding and weaning practices of children with S –ECC and children who were caries – free

	Total (N=196)		S-ECC (N=81)		Caries –free (N=115)			
Variables	**N**	**%**	**n**	**%**	**n**	**%**	**χ^2 (df)**	**p≤0.05**
Mode of feeding at birth								
Exclusive breast feeding	125	63.8	55	67.9	70	60.9		
Breast/bottle feeding	63	32.1	21	25.9	42	36.5	3.51(2)	0.173
Exclusive bottle feeding	8	4.1	5	6.2	3	2.6		
Duration of feeding								
<12	40	20.4	16	19.8	24	20.9		
12 - <24	62	31.6	23	28.4	39	33.9	0.92(2)	0.630
24 or more	94	48.0	42	51.9	52	45.2		
What was place in the bottle								
Milk	47	66.2	15	57.7	32	71.1		
Porridge	6	8.5	3	11.5	3	6.7	1.39(2)	0.500
Milk and porridge	18	25.4	8	30.8	10	22.2		
Not applicable	125		55		70			
Child fed on demand								
Yes	89	45.4	54	66.7	35	30.4	25.17(1.0)	**<0.001***
No	107	54.6	27	33.3	80	69.6		

***** Pearson's Chi-square

3.3.2 Nutritional status

The overall prevalence of underweight, stunting and wasting was 14.3%, 4.6%, and 3.6% respectively as shown in table 3.6

Table 3.6: Overall Nutritional status

Nutritional status	N=196	%
Stunting		
Stunted	9	4.6
Not Stunted	187	95.4
Wasted		
Wasted	7	3.6
Not Wasted	189	96.4
Underweight		
Underweight	28	14.3
Not Underweight	168	85.7

There were more females 17(17.7%), 4 (4.2%), and 5 (5.2%) who were underweight, wasted and stunted respectively when compared to males, but this difference was not statistically significant (Table 3.7).

Table 3.7: Nutritional status by gender distribution

	male (n=100)		female (n=96)				
Nutritional status	**N**	**%**	**n**	**%**	**χ^2**	**df**	**p ≤0.05**
Underweight							
Underweight	11	11.0	17	17.7	1.80	1	0.180
Not underweight	89	89.0	79	82.3			
Wasted							
Wasted	3	3.0	4	4.2	0.19	1	0.660
Not underweight	97	97.0	92	95.8			
Stunting							
Stunted	4	4.0	5	5.2	0.16	1	0.686
Not stunted	96	96.0	91	94.8			

When the caregivers residence, level of education, and occupation were considered in relation to underweight it was found that majority of the children who were underweight resided in rural areas 10(15.4%) and 18(13.7%) resided in urban areas. Eleven (%16.2) of caregivers had primary level of education and had informal employment 24(15.7%). There were no statistically significant differences among children who underweight and those who were not underweight (Table 3.8).

Table 3.8: Underweight among children in relation to caregivers place residence, level of education, and occupation

	Underweight (n=28)		Not underweight (n=168)			95 % CI		p
Variables	**N**	**%**	**n**	**%**	**OR**	**Lower**	**Upper**	**value**
Place of residence								
Rural	10	15.4	55	84.6	1.14	0.50	2.63	0.757
Urban	18	13.7	113	86.3	1			
Caregiver's level of education								
No Formal Education	0	0.0	4	100.0	UD	UD	UD	0.999
Primary Education	11	16.2	57	83.8	1.16	0.29	4.61	0.835
Secondary Education	14	13.6	89	86.4	0.94	0.25	3.63	0.933
Higher Education	3	14.3	18	85.7	1			
Caregiver Occupation								
Formal	4	9.3	39	90.7	0.55	0.18	1.69	0.291
Informal	24	15.7	129	84.3	1			

Similarly when stunting was considered 4(9.3%), 6(8.8%), and 5(7.7%) of the children caregivers had formal employment, primary education, and resided in rural areas respectively. There were no statistically significant differences in the caregivers place of residence, level of education, and occupation among children who stunted and those who were not stunted (Table 3.9).

Table 3.9: Stunting among children in relation to caregivers place of residence, level of education, and occupation

Variables	Stunted (n=9)		Not stunted (n=187)			95 % CI		p
	n	%	n	%	OR	Lower	Upper	≤0.05
Place of residence								
Urban	4	3.1	127	96.9	0.38	0.10	1.46	0.144
Rural	5	7.7	60	92.3	1.00			
Caregiver's level of education								
No formal education	0	0.0	4	100.0	UD	UD	UD	0.999
Primary education	6	8.8	62	91.2	1.94	0.22	17.06	0.552
Secondary education	2	1.9	101	98.1	0.40	0.03	4.58	0.458
Higher education	1	4.8	20	95.2	1.00			
Caregiver occupation								
Formal	4	9.3	39	90.7	3.04	0.78	11.84	0.095
Informal	5	3.3	148	96.7	1.00			

Among the children who were wasted, their caregivers 6(3.9%) had informal education, 5(7.4%) had primary level of education, and 2(3.1%) resided in rural areas. There were no statistically significant differences in the caregivers place of residence, level of education, and occupation among children who wasted and those who were not wasted (Table 3.10).

Table 3.10: Wasting among children in relation to caregivers place of residence, level of education, and occupation

Variables	Wasted (n=7)		Not Wasted (n=189)		95 % CI			p
	n	%	n	%	OR	Lower	Upper	≤0.05
Place of residence								
Urban	5	3.8	126	96.2	1.25	0.24	6.62	0.793
Rural	2	3.1	63	96.9	1.00			
Caregiver's level of education								
No formal education	0	0.0	4	100.0	UD	UD	UD	0.999
Primary education	5	7.4	63	92.6	4.01	0.75	21.29	0.103
Secondary education	2	1.9	101	98.1	1.00			
Higher education	0	0.0	21	100.0	UD	UD	UD	0.999
Caregiver occupation								
Formal	1	2.3	42	97.7	0.58	0.07	4.98	0.618
Informal	6	3.9	147	96.1	1.00			

3.3.3: Comparison of the nutritional status of children with severe ECC and children who were caries - free

There was no statistically significant differences in the nutritional status of children with S - ECC and children who were caries - free for Stunting (p=0.311), Underweight (p=0.859) and Wasting (p=0.451) .The prevalence of underweight was however slightly higher in children with S - ECC (14.8%) when compared to children who were caries – free (13.9%). A child identified with S- ECC was 1.08 [95% CI =

0.48 – 2.42] times more likely to be underweight when compared to a child who was caries - free as presented in Table 3.11.

Table 3.11: Comparison of the nutritional status of children with Severe ECC and who were caries - free children

	S - ECC (n=81)		Caries - free (n=115)			95 % CI		p
Variables	**N**	**%**	**n**	**%**	**OR**	**Lower**	**Upper**	**≤0.05**
Stunting(HAZ)								
Stunted	2	2.5	7	6.1	0.39	0.08	1.93	0.311
Not Stunted	79	97.5	108	93.9	1			
Wasted (WHZ)								
Wasted	4	4.9	3	2.6	1.94	0.42	8.91	0.451
Not Wasted	77	95.1	112	97.4	1			
Underweight(WAZ)								
Underweight	12	14.8	16	13.9	1.08	0.48	2.42	0.859
Not Underweight	69	85.2	99	86.1	1			

Multivariate analysis was done in order to determine the relationship between underweight and S- ECC among the participating children. Five factors associated with underweight and/or S - ECC at P≤0.05 during bivariate analysis were considered for multivariable analysis upon fitting the factors using binary logistic regression. Adjusting for child's age in years, child's oral hygiene status , child feeding on demand, place of residence and caregiver's level of education, occurrence of S – ECC was not significantly associated with underweight (AOR=1.23; 95% CI: 0.45 – 3.35; p=0.689). However, a child with S – ECC was 1.23 times more likely to become underweight when compared to a child who was caries – free. However adjusting for other factors, age 3 years was found to be statistically

significantly associated with underweight (AOR=2.83; 95% CI: 1.15 – 6.96; p=0.023). A child aged 3 years was 2.83 times more likely to be underweight when compared to one aged 4 years (Table 3.12).

Table 3.12: Logistic Regression Predicting underweight using caries status, Child's age in years, Child's oral hygiene status, Child feeding on demand, Place of residence and Caregivers level of education

		95 % CI		p
Variables	**AOR**	**Lower**	**Upper**	**value**
Caries status				
S-ECC	1.23	0.45	3.35	0.689
Caries – free	1			
Child's age in years				
3 years	2.83	1.15	6.96	**0.023**
4 years	1			
5 years	UD	UD	UD	0.999
Child's oral hygiene status				
Excellent	UD	UD	UD	0.999
Good	0.41	0.05	3.17	0.395
Fair	0.69	0.13	3.70	0.661
Poor	1			
Child fed on demand				
Yes	1.15	0.47	2.80	0.765
No	1			
Place of residence				
Rural	0.87	0.36	2.12	0.763
Urban	1			
Caregiver's level of education				
No Formal Education	UD	UD	UD	0.999
Primary Education	0.91	0.21	4.03	0.901
Secondary Education	0.83	0.20	3.50	0.803
Higher Education	1			

Therefore, fail to reject the null hypothesis that states that there is no difference in the nutritional status of children aged 3 – 5 with severe ECC when compared to children who are caries – free.

CHAPTER FOUR

4.0: Discussion

The present study found that children with severe ECC were mainly from urban areas when compared to children who were caries – free. This finding is similar with other studies that have shown that children residing in urban areas have a higher caries experience than their rural counterparts [62]. The mean dmft of children with severe ECC in the present study was 7.5 ± 1.9. This was comparable to a study carried out among preschool children of low socio – economic status in India that found a mean dmft of 8.9[55]. Studies in the, USA, and Canada among preschool children found mean dmft scores of 9.6 ± 3.6 and 10.5 respectively[56, 57]. These differences could be due to variations in dietary practices among different populations.

In the present study, decayed component accounted for 92.3% of the dmft and this finding was similar to other studies[8] .Untreated tooth decay reflects a low availability and accessibility of preventive and curative dental services. Also, the Kenya National Oral Health Policy and Strategic plan[58] reports that dental clinics in most government facilities are understaffed and underequipped. Therefore, those who are able to access these clinics in the event of pain from dental caries get their teeth extracted rather than filled.

The maxillary incisors, mandibular molars and maxillary molars were the most affected by dental caries in the present study. This was in accordance with other studies[59, 33]. This pattern of dental caries affecting the primary maxillary incisor and first molar teeth and sparing the mandibular incisor teeth is in most cases is thought

to be related to the protective effect of mechanical cleansing of the tongue and to the cleansing action of saliva due to the presence of the orifice of the duct of the sublingual glands close to the lower incisors.

The oral hygiene status was found to be related to the development of dental caries experience in the present study and there was a statistically significant difference in the oral hygiene status, with children without dental caries having good and excellent oral hygiene when compared to children with severe ECC. This finding was similar to a study carried out among preschool children in Saudi Arabia that found a highly significant relationship between caries and debris indicating that cares free children had a lower debris index compared with high caries group[11]. This could probably be due to poor oral hygiene practices among children with S – ECC.

Improper feeding habits such as night feeding or sipping from a bottle during the night are significant risk factors for severe ECC [60]. In the present study, majority of the children with severe ECC were fed on demand when compared to children who were caries – free. The habit of night time feeding provides critical caries promoting conditions, such as large volume of substrates (sucrose, glucose, and fructose) and sufficient time for bacteria to produce acid production. While the accumulation of the acid products damages the teeth directly, it also facilitates the adhesion of bacteria to the tooth surface and interaction between bacteria as well .In addition owing to the permeability of bacterial plaque, the buffering capacity of saliva is weakened or diminished. Ultimately, a prolonged exposure of the teeth in acidic environment causes dental caries.

The WHO child growth standards reference was used to evaluate nutritional status. This growth reference provides a scientifically reliable yard stick of children's growth

achieved under desirable health and nutritional conditions and establishes the breastfed infant as the normative model against which all alternative feeding methods must be measured in terms of growth, health and development.

In the present study there were more females who were underweight, stunted, and wasted when compared to males. This was however, not statistically significant. The present study found that 4.9%, 2.5%, and 14.8% of children with severe ECC were underweight, stunted and wasted respectively. This finding could be explained by inability to chew the available food and absorb enough nutrients resulting in faltering nutritional status. A study carried out in the Italy among 2- 6 year old found that 11% were e underweight, 11.11%overweight and 22.2% to be at risk of overweight[61]. In another study in the USA on the BMI of children with severe ECC, 11.%, 11%, 9% were found to be underweight, overweight and at risk of overweight respectively [41]. These differences could be due to differences in cultural, dietary practices and the primary determinants of nutritional status among the different populations. In Kenya, the main determinants of nutritional status among children under 5 years of age include poverty, hunger and drought.

There were no statistically significant differences in the nutritional status of children with severe early childhood caries and those without caries in this study. This is similar to other findings of a study carried out on the nutritional status and dental caries status among a large sample of four and five year old South African children, however, found no significant association between the prevalence of caries and stunting or wasting but an association was found between decayed, missing and filled surfaces and wasting [46].

Children with severe ECC were 1.23 times more likely to be underweight when compared to caries – free children. Severe ECC may affect general health and development because toothache associated with caries may affect food intake and sleep 3. Poor dental health and toothache may contribute to children's low weight gain, and the growth and cognitive development of young children, as well as the quality of their lives 3.

In the present study, malnutrition was reported among children with severe ECC and children who were caries - free. This finding could be explained by the levels of malnutrition in Nyanza reported in the Kenya Demographic and Health Survey 2008 – 2009 which reported that 19%, 2%, and 14% were underweight, wasted and stunted respectively[40]. When the caregivers residence, occupation, and level of education was considered it was found that majority of the caregivers of children who were wasted, stunted, and underweight resided in rural areas, they had informal employment and had primary level of education .This may result in low socio – economic status and affect access to health care, food security and hence affect the overall nutritional status.

Study limitations

The study design did not include taking radiographs; hence caries experience could have been under reported. This study was carried out among a hospital population and therefore it will be difficult to extrapolate the findings to the entire population.

Conclusions

Based on the findings of the study, the following conclusions can be drawn:

1. The mean dmft of children with S - ECC in NNPGH, Kisumu was 7.5

2. There was a statistically significant difference in the oral hygiene status of children with S - ECC and to those who were caries - free

3. There was a statistically significant difference in the infant feeding practices and weaning practices. There were more children with S - ECC were breast fed on demand when compared to those who were caries - free.

4. Malnutrition was reported among both groups of children

5. There was no statistically significant difference in the nutritional status of children with S – ECC and caries – free children.

Recommendations:

1. There is a need to create awareness on infant feeding practices and oral hygiene status for all children below 5 years of age. This may be done through maternal child health clinics.

2. There is a need to improve accessibility and availability of dental services for all children below 5 years of age.

3. There is a need to provide nutritional support for all children below 5 years of age at NNPGH. This may be done through a feeding programme.

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APPENDIX I: CAREGIVERS QUESTIONNAIRE

A: DEMOGRAPHY

Questionnaire No.....

Residence: _____

Level of education of caregiver

No formal education ☐

Primary school ☐

Secondary school ☐

higher education ☐

I don't know ☐

Caregivers occupation

Formal ☐

Informal ☐

Other(Specify).....

B: DIETARY PATTERNS

Mode of feeding at birth:

Exclusive breast feeding ☐

Breast feeding and bottle ☐

Exclusive bottle feeding ☐

Duration of breast/bottle feeding_____

What did you place in the bottle? _____

Did your child sleep with the bottle in the mouth? Yes ☐ No ☐

APPENDIX II: CLINICAL EXAMINATION FORM

ID No._____ **AGE: __ __ /__ __ /__ __**

D D / M M/ Y Y

GENDER: Male ☐ Female ☐

ANTHROPOMETRY

	First	Second	Average
Weight			
Height			
head circumference			

ORAL HYGIENE STATUS:

Teeth	**55**	**51**	**65**	**75**	**71**	**85**
Score						

Score	**Criteria**
0	No plaque
1	A film of plaque adhering to the free gingival margin and adjacent area of the tooth. The plaque may be seen in situ only after application of disclosing solution or by using the probe on the tooth surface.
2	Moderate accumulation of soft deposit s within the gingival pocket, or the tooth and gingival margin which can be seen with the naked eye.
3	Abundance of soft matter within the gingival pocket and/or on the tooth and gingival margin.

DENTAL CARIES ASSESSMENT

55	54	53	52	51	61	62	63	64	65
85	84	83	82	81	71	72	73	74	75

Tooth status	code for deciduous teeth
Sound	A
Decayed	B
Filled with decay	C
Filled no decay	D
Missing as a result of caries	E
Sealant, varnish	F
Bridge abutment or special crown	G

APPENDIX III: CONSENT FORM

The purpose of the study

I, Dr. Dorah Catherine Wasunna, from the University of Nairobi would to conduct a study aimed at comparing the nutritional status of children with Severe Early Childhood caries and caries – free children. The information that I obtain will be part of my research thesis as a partial fulfillment for the degree of Master of Dental Surgery in Paediatric Dentistry.

How do you participate?

I shall ask you some questions and record your answers. This information will assist me to be better able to understand the nature of severe early childhood caries. I shall then measure your child's weight using a Salter weighing scale, measure your child's height using a standard height board and a tape measure to measure head circumference. I shall then examine your child's mouth and record observations. The examination shall be carried out using sterile instruments and materials.

Voluntary participation

You and your child's participation in the study are voluntary. You can terminate your participation at will without any consequences. Also understand that participation in the study does not entail financial benefits.

Anticipated risk

No risk is anticipated for participating in the study.

Confidentiality

The information given to the researcher will be kept in strict confidence. No information, by which your identity can be revealed, will be released or published. If you are satisfied with my explanation and you are willing to have your child participate, please sign the consent form.

Consent form

I_____of_____

Having understood the nature of the study as explained to me by Dr. Dorah Catherine Wasunna of University of Nairobi is willing to have my child participate in the study.

Name of Caregiver: _____Signed _____Date_____

I confirm that I have explained the nature of the study to the patient and caregiver

Name of Investigator: _____Signed_____ Date_____

ARIFA YA RUHUSA

Madhumuni ya utafiti

Mimi, Dr Dorah Catherine Wasunna, kutoka Chuo Kikuu cha Nairobi nitakuwa nafanya utafiti kwa lengo la kulinganisha hali ya lishe ya watoto, mkali ya kuoza meno uchangani na wasio na muozo wa meno. Habari nitayopata utakuwa utafiti wa Thesis yangu kama sehemu ya kutimiza degree ya Master of Dental Surgery in Paediatric Dentistry.

Jinsi gani unaweza kushiriki?

Mimi kukuuliza na rekodi ya majibu yako. Habari hii itasaidia kuelewa asili ya mapema ya kuoza kwa meno utotoni. Nitampima mtoto wako uzito kwa kutumia kilo cha Salter, urefu wa mtoto wako kutumia kiwango urefu wa bodi na mkanda hatua kwa hatua kichwani. Nitachunguza mdomo wa mtoto wako na kuandika kumbukumbu. Ukaguzi utakuwa ukifanywa kwa kutumia vyombo na vifaa safi.

Ushiriki wa hiari

Ushiriki wako na moto wako katika utafiti ni hiari yako. Unaweza kuondoka kwa ushiriki wa utafiti bila madhara yoyote. Pia elewa kuwa ushiriki katika utafiti haina faida ya fedha.

Kutarajia hatari

Hakuna hatari yeyote kwa ajili ya kushiriki katika utafiti.

Siri

Habari inayotolewa kwa mtafiti itawekwa siri. Hakuna habari itayoweza kukutambulisha, itatolewa au kuchapishwa. Kama umeridhika na maelezo yangu na uko tayari kumshirikisha mtoto wako, tafadhali tia saini kwenye fomu ya idhini.

Idhini fomu

Mimi_____wa_____

Baada ya kufahamu hali ya utafiti kama nilivyoelezewa na Dr. Dorah Catherine Wasunna wa Chuo Kikuu cha Nairobi niko tayari kumshirikisha mtoto wangu katika utafiti.

Jina la Mlezi: _____Signed _____Date _____

Mimi nathibitisha kwamba nimemelezea mlezi asili ya utafiti.

Jina la Mchunguzi: _____Signed_____ Date_____