DECIDUOUS CANINE TOOTH BUD EXTRACTION AND NUTRITIONAL STATUS OF CHILDREN AGED 2-5 YEARS IN KAJIADO DISTRICT, KENYA

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Deciduous canine tooth bud extraction and nutritional status of children aged 2-5 years in Kajiado District, Kenya

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other University.

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DEDICATION

I dedicate this thesis to my husband Timothy, my daughters Michelle, Maryanna and Carole, and the staff of Community Oral Health Department, Kenya Medical Training College for their love, support, and encouragement during this study.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND ACRONYMS

AMREF	African Medical and Research Foundation
AIDS	Acquired Immunodeficiency Disease Syndrome
ASAL	Arid and Semi Arid Land
CBS	Central Bureau of Statistics
CHWs	Community Health Workers
DCBE	Deciduous Canine Tooth Bud Extraction
FREQ	Frequency
GAM	Global Acute Malnutrition
HAZ	Height for Age Z- score
HFA	Height for Age
HIV	Human Immunodeficiency Virus
IEC	Information Education Communication
IMF	International Monetary Fund
KDDP	Kajiado District Development Plan
KDHS	Kenya Demographic Health Survey
KEMRI	Kenya Medical Research Institute
KMTC	Kenya Medical Training College
KIHBS	Kenya Institute of Household Budget Survey
MAM	Moderate Acute Malnutrition
MH	Mantel Haenszel
MCH/C	Mother Child Health/Clinic
MDGs	Millennium Development Goals

MoH	Ministry of Health
MOMS	Ministry of Medical Services
MPHS	Ministry of Public Health and Sanitation
MUAC	Mid Upper Arm Circumference
NCHS	National Centre for Health Statistics
NGO	None Governmental Organisation
OR	Odds Ratio
PEM	Protein Energy Malnutrition
PHC	Primary Health Care
POHC	Primary Oral Health Care
SAM	Severe Acute Malnutrition
SPSS	Statistical Package for Social Science
TBAs	Traditional Birth Attendants
UNICEF	United Nations Children's Fund
URTI	Upper Respiratory Tract Infections
WAZ	Weight for Age Z-score
WFA	Weight For Age
WFH	Weight For Height
WHO	World Health Organization
WHZ	Weight for height Z- score

OPERATIONAL DEFINITIONS

Anthropometric measurement: Is a measurement of physical growth dimensions of human body at different ages. Comparisons with standard references for age and sex help determine abnormalities in growth and development that may result from nutrient deficiencies or excesses.

Deciduous Canine Tooth Bud Extraction (DCBE): This refers to the removal/extraction/enucleation/gouging, of deciduous canine tooth bud in children aged 2-5 years.

Educational level: This is the level of formal education attained. None means no formal education at all, those with some education refers to those who have attended primary school. Those educated are those who had secondary and college education.

Nutritional status: In this study, nutritional status was assessed by measuring anthropometric characteristics to determine whether the individual is well nourished or undernourished. Children were classified as normal or malnourished. Those malnourished were classified as moderately or severely stunted, underweight or wasted. The cut offs were: z-scores of -2 to -3 were moderately malnourished while z-scores of less than -3 were severely malnourished.

Personal illness control: Conventional or unconventional intervention strategy of controlling an illness initiated by an individual.

ABSRACT

Deciduous Canine Tooth Bud Extraction (DCBE) is a harmful practice prevalent among pastoral communities in Kenya. The communities blame the canine tooth for 'causing' diarrhoea, fevers and growth retardation in their babies. As a remedy, DCBE is performed to 'increase child survival'. The practice which involves forceful extraction of teeth using un-sterile knives, bicycle wires, razor blades or bare hands, predisposes the babies to serious complications and even death. Malnutrition is also common among children in the pastoralist communities due to their nomadic way of life. Women and children who depend mainly on livestock for milk, meat and blood as their staple food, are left without food when the livestock move to other areas in search of pasture. The situation results in poor infant feeding practices, predisposing the child to common illnesses such as diarrhoea. The purpose of this study was to determine the relationship between prevalence of Deciduous Canine Tooth Bud Extraction (DCBE) and nutritional status of the children under five years in Kajiado District. This was a descriptive cross-sectional study carried out among the *Maasai* in Ngong and Magadi Divisions of Kajiado District, Rift Valley Province, Kenya between April and October 2009. A total of 420 *Maasai* mothers each with a child of under five year old living in *manyattas* (homesteads) were randomly selected from five (5) sub locations in Ngong and Magadi Divisions of Kajiado District. The study also included an average of 10 men, women and children from each sub-location for focus group discussion, and a total of 10 key informants for in- depth interview. Multistage and simple random sampling was used to select *manyattas*, and mothers with their children respectively. The respondents were interviewed

using structured interview schedule guide. Child nutritional status was assessed using standard anthropometric techniques. Data was analyzed using Statistical Package for Social Science (SPSS) Version 14 software. Nutritional data was thereafter transferred from Nutri-Survey, 2007(ENA, SMART) to SPSS and Excel programme was used to generate figures. The findings showed the prevalence of DCBE was 24.5%. Ngong Division had an average prevalence of 27.8% which was higher prevalence compared to Magadi Dvision (21.3%). The prevalence was significantly different ($p \leq 0.05$) between the selected sub-locations in the study. Respondents' awareness and support for the practice was high. Although consumed foods by the children were milk, porridge, *ugali*, tea with milk and sugar, *chapati*, fats, and beans. There was limited consumption of meat, fruits, and vegetables; the degree of chronic undernutrition with 15.0% classified as moderate stunting and 19.5% as severe stunting. The prevalence of Global Acute Malnutrition (GAM) was 20.7 %, Moderate Acute Malnutrition (MAM) was 13.3% and Severe Acute Malnutrition (SAM) was 7.4%. Although there was no significant relations between the practice of DCBE and nutritional status ($p>0.05$), the trend of undernutrition was higher among those that had undergone DCBE than those that had not. There were indications that children were targeted for DCBE due to their poor nutritional status. On the other hand, the complications due to DCBE affect the child nutritional status. These results therefore show that the practice of DCBE could be a nutritionally related out come among the children in the *Maasai* community living in Kajiado.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Since time immemorial, traditional tooth extraction has been a common practice among most communities in Africa. For instance, extraction of permanent lower central incisors has been reported in Tanzania as a community cultural practice (Mosha, 1983). In the United Kingdom (UK), African migrants were found to practice tooth gouging (Rodd and Davidson; 2000, Dewhurst and Mason, 2001).

Many pastoralists living in the Arid and Semi Arid Areas (ASAL) in the Eastern African region and other isolated parts of Africa are known to practise gouging and mutilation of deciduous canine tooth bud in children with the hope of treating childhood illnesses (Pinborg, 1969; Jones, 1992; Hassanali *et al.*, 1995). Traditional *Maasai* communities in Kenya remove developing canine in infants in addition to the extraction of mandibular central incisors (Hassanali and Amwayi, 1988). It is believed that the practice made its way to Maasailand from Sudan, to Tanzania and Uganda (Mosha, 1983; Pindborg, 1969; Baba and Kay, 1989).

Apart from other cultural practices such as Female Genital Mutilation (FGM), DCBE is one of the entrenched traditional practices among the *Maasai* communities in Kenya. Barnes (1964) observed that among the Teso, only 0.74% of the girls had their lower incisors removed and suggested that the practice of traditional tooth extraction was dying out. However, Hassanali and Amwayi, (1988) reported that the

rural *Maasai* still adhere to this custom, but the practice is less common (20%) in children of mixed parents.

Spot surveys and public campaigns on PHC/ Oral Health in Kajiado District by a team of oral health workers since 1985; have revealed that *Maasai* Traditional Birth Attendants (TBAs) remove deciduous canine tooth bud due to a belief that it causes infantile illness, diarrhoea and vomiting (Hassanali *et al.,* 1995). Socio-cultural practices in some communities such as the *Maasai* strongly influence the health status of the community members. Several visits to the *Maasai manyattas* (homesteads) by health teams observed prevalent cases of poor health as a result of malnutrition, malaria, pneumonia, poor sanitation, lack of water, HIV/AIDS, Tuberculosis and Upper Respiratory Infections (URTI) among other (Dossanjee and Hassanali, 2003).

Members of the *Maasai* community, particularly those living in the rural areas and who still adhere strictly to their cultural practices, largely depend on animal products such as milk, meat and blood as their staple food. However, due to their nomadic lifestyle, the children and mothers left behind as the men and *moran* look for pasture for livestock, are likely to experience inadequate food. The prevalence of malnutrition among children in Kenya is on the increase (KDHS, 2009) more so, among the pastoralists (Wefwafwa, 2010). The situation is deteriorating especially in Kajiado District (USAID, 2009), which is an Arid and Semi Arid Land (ASAL) and may be a reflection of food stress in the region. Both chronic and acute malnutrition prevalence rates are on the increase, and the situation in Kenya has been described as precarious (KDHS, 2009; KIHBS, 2007).

Although lack of food could result in poor infant feeding, cultural beliefs have also been found to have a powerful influence on feeding practices and eating patterns in some communities (Chaundry, 1984; Krugger and Gericke, 2001). For example, nomadic lifestyle affects nutritional status of mothers and children below five years old in the *Maasai* community. As pastoralists, and due to scarce rainfall received in their region, the *Maasai Morans* (herders) move with their cattle to areas away from home in search of pasture and water. They leave behind other members of their families, particularly women and children without adequate food (Dossanjee and Hassanali, 2003). This compromises the health status of the community members, especially that of women and children which may result in malnutrition. On the other hand, health facilities within Kajiado District are far apart and ill equipped, forcing members of the community to rely mainly on herbalists for treatment (KDDP, 2005).

The removal of deciduous canine tooth buds and even the permanent teeth from children is done using crude unsterile instruments posing serious dangers to the health of affected children (Jameison, 2006). Complications such as profuse bleeding, inflammation and sepsis due to low immunity of infants could occur and opportunistic infections introduced into the body. In addition, DCBE extraction could lead to the damage of the very delicate permanent teeth growing underneath. This mutilation may also lead to subsequent negative effects like malocclusion and psychological or social embarrassment due to poor aesthetics from remaining maloccluded teeth (Bataringaya *et al.,* 2005). Psychologically affected children are embarrassed and are uncomfortable to smile or talk freely in public leading to low self esteem.

Deciduous Canine tooth Bud Extraction (DCBE) should therefore be discouraged to spare children unnecessary pain and related complications. The purpose of this study therefore was to establish the relationship between DCBE and nutritional status among children aged 2-5 years old with the aim of providing data that will be useful in development of oral and nutritional policies and intervention strategies for pastoral communities

1.2 Problem statement

The practice of the removal of deciduous canine by the pastoral communities is a public health concern. This is due to the fact that pastoral communities believe that the practice helps prevent the child from dying due to diarrhoea and growth faltering, thus ensuring child survival. However, the practice is done secretly under unhygienic conditions using crude instruments which expose the children to risks such as viral transmission, profuse bleeding, anaemia and septicaemia among others. It also affects the child's feeding patterns and subsequently influences child growth negatively resulting in stunting, underweight and wasting. Long term effects of DCBE on occlusion of both deciduous and permanent teeth include: missing, hypoplastic, displacement, impacted canines and crowding of teeth (Bataringaya *et al.,* 2005). Although studies show that the *Maasai* traditional way of life, cultural practices, and other belief systems have significantly changed, enucleation of deciduous canine buds seems not to be diminishing but rather is on the increase.

The most recent country wide report (KIHBS, 2007) shows persistently poor malnutrition outcomes with marginal increase in stunting, 33%, wasting, 6.1% and

underweight, 20.2% with nutritional status reports on Kajiado District showing a deteriorating situation. This crisis in Kajiado District requires innovative solutions such as the prevention of DCBE which affects child feeding. On the other hand the malnutrition is related to greater susceptibility to poor physical growth, high rate of disability and illnesses such as diarrhoea, which are the reasons given for the practice of DCBE (Mongensen, 2000). There is therefore the need to provide reliable data on the correlation between the prevalence of DCBE and nutritional status which may help address factors contributing to these two existing problems.

1.3 Justification

In 2008, an evaluation of knowledge, attitude and practices, on primary health care and canine removal amongst the *Maasai*, showed that 72% of women had removed the tooth bud of their children, with 52% of these reported doing so, to cure diarrhoea (Hassanali and Wanzala, 2008). Proximate factors influencing the prevalence of this practice include: economic status, poverty, traditions and cultural beliefs, environment and health infrastructure. Past studies have not investigated the nutritional status of the affected children yet malnutrition is a common phenomenon among the nomadic communities. Malnutrition predisposes children to childhood illnesses such as diarrhoea, infections and poor growth. Deciduous canine tooth bud removal is a practice believed to cure such childhood illnesses.

Data on nutritional assessment among the pastoralist communities is scanty. The study therefore provides further information that could guide the Government of Kenya in determining the severity of nutritional impairment and probable causes and

assist in development of appropriate intervention strategies. There is no documented evidence on the relationship between DCBE and nutritional status of children under five years old among nomadic communities in ASAL of Kenya. The study also sought to assess the nutritional status of children in a selected pastoral community and to ascertain the existence of a correlation with the traditional health practice of DCBE.

The findings of this study will help address DCBE and nutrition related issues particularly among the rural communities, with high poverty index. It therefore, contributes in achieving Millennium Development Goal concerning reduction of child mortality. The study could provide policy makers with data that could help oral health workers take definitive action to provide quality care and support to the pastoralist communities. Furthermore, it could be a basis for developing Information Education Communication (IEC) materials for intervention through TBAs and other community members.

1.4 Research questions

1. What is the prevalence of Deciduous Canine tooth Bud Extraction (DCBE) among *Maasai* children aged between 2-5 years in Kajiado District in Kenya?

2. What are the feeding practices and nutritional status of children among *Maasai* Children aged between 2-5 years in rural semi-arid setting in Kajiado District in Kenya?

3. What are the community awareness level, attitude and practices on DCBE in Kajiado District in Kenya?

4. Is there a relationship between Deciduous Canine tooth bud Extraction and nutritional status of the children aged between 2-5 years old among *Maasai* community in Kajiado District in Kenya?

1.5 Hypothesis

Null hypothesis

There is a relationship between DCBE occurrence and nutritional status among children between 2-5 years old in the *Maasai* community of Kajiado District.

Alternative hypothesis

There is no relationship between DCBE occurrence and nutritional status among children between 2-5 years old in the *Maasai* community of Kajiado District.

1.6 Objectives of the study

1.6.1 Main objective

The main objective of this study was to determine the prevalence of Deciduous Canine tooth Bud Extraction (DCBE) and its relationship with nutritional status among the *Maasai* children aged 2-5 years old in Ngong and Magadi Divisions in Kajiado District.

1.6.2 Specific objectives

The specific objectives of this study were to determine:

- The prevalence of DCBE among children aged 2-5 years in Ngong and Magadi Divisions of Kajiado District.

- Awareness, attitude and practices on DCBE in Ngong and Magadi Divisions of Kajiado District.

- Food consumption pattern and nutritional status of children aged 2-5 years in Ngong and Magadi Divisions of Kajiado District.

- The relationship between the nutritional status and other related factors to DCBE among children aged 2-5 years in Ngong and Magadi Divisions of Kajiado District.

1.7 Theoretical and conceptual framework

DCBE is an intervention strategy (personal illness control), which is done to increase child survival (Mosley and Chen, 1984). A child to be sick or healthy is usually determined by many factors such as maternal care, environmental, nutrient, community values, taboos and cultural practices. In this case, a child is sick with for example diarrhoea and experiences loss of appetite, and other complications which result in growth faltering. As a measure to prevent or stop wasting and growth interference, the child in the *Maasai* community would undergo DCBE. This practice could result into complications such as bleeding, sepsis, anaemia, HIV infections and sometimes mortalities could result. As a result of DCBE, the child is also deliberately made sick hence, cannot feed on food or breast feed. This increases growth faltering and the child's life is put in more danger, hence the call for more resources to save

the child because community will still finally take the child to the hospital. The understanding of conceptual framework in the area of study allows one to conceptualise a problem and provides a means to link ideas and data obtained (Kombo and Tromp, 2006). In this research study, Mosley and Chen (1984) conceptual framework child survival was applied (Fig 1-1).

Independent and Dependent Variables

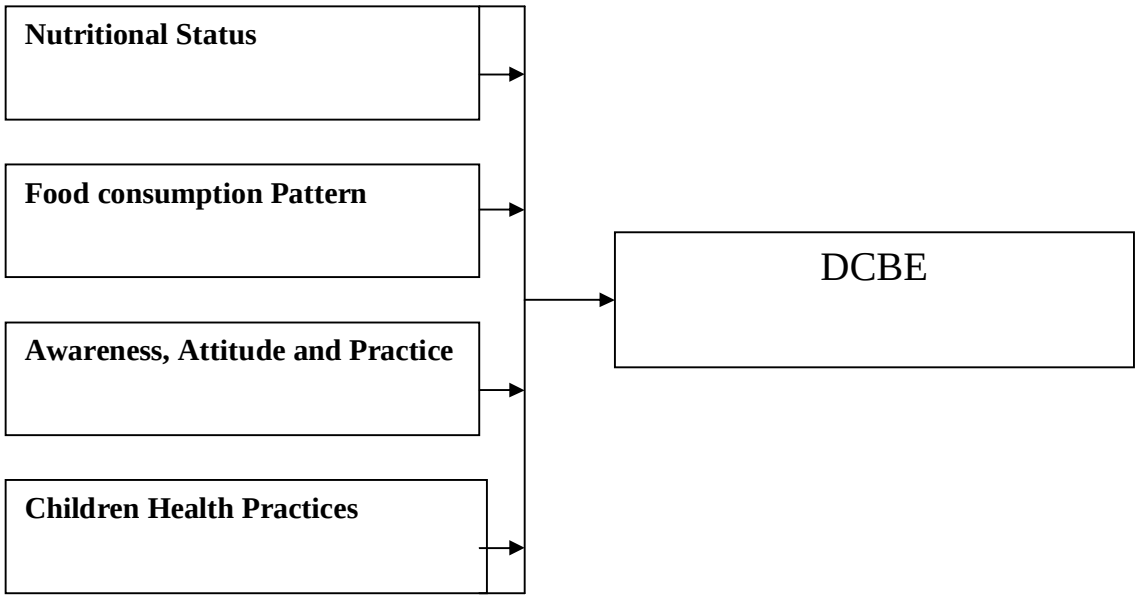


Figure 1-1: Conceptual framework for DCBE and nutritional status of 2-5 years old

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Traditional teeth extraction

For a long time, tooth extraction was traditionally practiced almost everywhere in the world. Loss of teeth is a familiar phenomenon among most communities and none finds it strange whenever a child looses teeth. Some people may occasionally lose their teeth due to pathological reasons like severe dental caries. In ancient times extraction of carious teeth was considered the simplest and most recommended way to relieve tooth pain (Inoue and Kochi, 1996). In addition, severe forms of teeth deformity or mutilation have been documented among diverse cultures of the world (Hardlicka, 1940).

Many of the procedures performed have direct relationship to dentistry. Operative procedures documented include removal or intentional extraction of teeth, teeth filing to create a diastema, crown amputation or horizontal teeth filling, single pointing of teething, tooth adornment with metal and stone inlays and changing of teeth position (Chindia, 1995). Researchers however have found that most communities in Africa intentionally extract healthy teeth for various cultural beliefs. In countries like Nigeria, Sudan, Uganda, Tanzania, and Kenya some communities extract deciduous buds of canine teeth as it is believed to prevent diarrhoea in young children.

In Kenya, traditional dental practices have always been common among most communities. The practice includes: extraction of lower anterior teeth as part of initiation rituals among the *Luo* and the *Maasai* communities. Extraction of the lower

anterior teeth is done to create an opening for feeding lockjaw patients, while deciduous lower lateral incisors are extracted in children among the *Turkana* for aesthetics (Hassanali *et al.*, 1994). Due to high prevalence of tetanus among some African pastoralist communities, the mandibular incisors are removed to create a gap to allow feeding of the patients (Blecker, 1964). The removal of lower incisors is slowly fading away, but DCBE practice remains prevalent especially among the *Maasai*. World Health Organization acknowledged challenges for 21st century (WHO, 1998) and identified a number of priority areas to strengthen national oral health programmes. In Africa, specific recommendations included the development of oral health systems, prevention of oral cancer and other opportunistic diseases in people living with HIV/AIDS and establishment of oral health information (Wilson and Topley, 2007). Thus, little attention has been given to oral traditional practices such as DCBE among the pastoralists.

2.2 *Maasai* and aspects of their dentition

Earlier reports, about the community by Hinde and Hinde (1901) and Blecker (1964) states that, like most other African pastoralists, the *Maasai* traditionally extract the lower permanent central incisor teeth; the custom is practiced to allow the treatment of tetanus, which is highly prevalent among pastoral communities in Africa. Although some other studies observed that these teeth had been extracted in all the *Maasai* examined (Schwartz, 1946), recent studies by Hassanali and Amwayi (1988) reported that 66-78% of the children had the lower permanent central incisors extracted. The teeth are normaly extracted as soon as they begin to protrude or immediately after the crown appears fully. The extraction is carried out by chiefs or

elderly women using crude knives, without any anaesthetic treatment. Some herbal medicines are applied after extraction to the wound to prevent infections.

2.3 The origin and the practice of Deciduous Canine tooth Bud Extraction (DCBE)

As a traditional practice, DCBE involves the removal of deciduous canine tooth germ or bud. The tooth buds are described as 'bad teeth', '*nylon teeth'* (Matee *et al.*, 1991); the 'worms' or maggots (Jamieson, 2006), '*Ebiino*' or '*Ebinyo* (Accorsi *et al*., 2003); Bataringaya *et al.*, 2005); 'killer deciduous canine tooth, or false teeth (Baba and Kay, 1989). The practice of removing such teeth has also been referred to as deciduous canine gouging, mutilation or germectomy (Mongensen, 2000).

Various studies done on DCBE do not state clearly the origin of the practice. In Uganda, the DCBE was reported first reported in the sixties by Pindborg (1969) who noted it among the witch doctors and other non dental medical practitioners. Recent reports indicate that the practice is still prevalent in many communities in Uganda (Baba and Kay, I989; Sebudde, 2006). The practice of DCBE is also carried out in Ethiopia (Welbury *et al.*, 1993), Southern Sudan (Woodruff, *et al.*, 1983), Ethiopia, and Tanzania (Mosha, 1983; Hiza and Kikwilu, 1992).

The prevalence of DCBE appears to be a common practice among Africans and has been reported to be on increase (Dagnew and Damena, 1990; Hassanali and Kibet, 2003; Wanzala *et al.*, 2005, and Jameison, 2006). The practice has also been found to be increasing in the urban areas due to rural-migration, and among the African immigrants in the United Kingdom and among the Jewish (Rodd and Davidson,

2000; Dewhurst and Mason, 2001; Holan and Mamber, 1994). Most studies revealed that DCBE procedure was mainly conducted in children between 4 and 18 months (Rasmussen *et al.,* 1992; Dagnew and Damena 1990; Kikwilu and Hiza, 1997; Hiza and Kikwilu, 1992; Hassanali *et al.,* 1995). Due to complications associated with the practice, it is a big public health problem in some communities (Sebudde, 2006).

DCBE is mainly practiced by pastoralist communities in rural arid and semi arid areas (Hassanali *et al.,* 1994). In Kenya the practice has been reported among the *Maasai* (Hassanali and Amwayi (1988) and other pastoralists communities such as *Turkana, Samburu, Kalenjiin* and *Somalis* (Hassanali *et al.,* 1995; Inoue and Sakashita, 1996 and Kipchumba, 1998). Recent cases have reported the practice of DCBE in some communities such as the Kamba in Kenya that no such history of such practice before (Kemoli (2008).

In a study of two aspects of *Maasai* dentition in Kenya in 1988 findings showed that 66-78% of the children examined had mandibular central incisor traditionally extracted, while 37% of the children between 5-7 years of age had deciduous mandibular incisor or canine extracted, (Hassanali and Amwayi, 1988). Later, out of a sample of 180 children, 87% of those aged 6 months to 2 years had undergone the removal of one or more deciduous canine teeth buds (AMREF, 1992). About 64% of children between 3-7 years had one or more deciduous canine buds extracted. This shows that the practice of extracting deciduous canine teeth buds appears to be on the increase in children aged 3-5 years of age among the rural *Maasai* (Hassanali and Amwayi, 1988).

2.4 The Underlying causes of the practice of DCBE

Childood illnesses among the Maasai children could have an influence in the traditional practice of DCBE. For instance, there is a high incidence of enteric diseases such as diarrhoea among nomadic communities (AMREF, 1992). Such illnesses have been reported to contribute to DCBE (Hassanali *et al.,* 1995). Report on the prevalence of the practice in a sample of 262 children below five years old in Magweta, a remote village in Tanzania indicated that 37.4% of the children had their deciduous canine tooth bud extracted (Hiza and Kikwilu, 1992). Most of the extraction was done on the bilateral apects of the lower jaw (60.5%) and all involved canines (99.4%). The study examined only those with history of extraction due to fever or diarrhoea in children aged 5 years and below. The pastoral communities also record the highest rate of mortality and morbidity in children. This could be attributed to the harsh environmental conditions, where water is scarce leading to poor hygiene standards. The high prevalence of diseases in the region is also a result of the hazards from flies due to poor storage of food such as milk and water (Olenja and Kraz, 1986; Were and Wanjala, 1986).

2.5 Awareness, attitude and practices of DCBE

2.5.1 Awareness of DCBE practice

The practise of DCBE could be due to lack of awareness of the complications associated with the practice. Kassim *et al.,* (2006) in a study of oral health status among Kenyans in rural setting reported that there was low level of oral health awareness among the people. In the study, 43% were not aware any causes of dental diseases, 50% were not aware of any preventive measures for dental diseases. Those

living in urban areas have been found to practice DCBE as well (Rodd and Davidson, 2000).

Recent studies on the perception of primary health care with regard to corresponding awareness, attitude and practices among the *Maasai* women revealed that women were aware that DCBE is carried out in infants (97.9%) while 70% had had their children undergo DCBE (Wanzala *et al.,* 2005). Deciduous Canine Tooth Bud Extraction is a traditional belief found among the African communities especially in the rural areas (Hassanali *et al.,* 1995). The gouging of deciduous canine tooth bud in many communities of East African Region is believed to be the cure for febrile illness, diarrhoea and vomiting (Wanzala *et al.,* 2005) and if it is not done, the baby would die (Baba and Kay, 1989; Welbury *et al.,* 1993). Other reports by Sebudde (2006) are that the deciduous tooth buds are removed in the children who have cough, diarrhoea, fever, vomiting and swelling of gums. In some cases, they will be very weak and are unable to breast feed. Diarrhoea has been reported to be a major contributor to malnutrition (Lo and Walker, 1983). Those on weaning diet usually have no appetite at all. These teeth are believed to be 'Maggots' that cause fever, diarrhoea and vomiting (Jamieson, 2006). Whereas teething may be associated with thumb sacking, gum rubbing drooling daytime restlessness, and temporary loss of appetite, it does not appear to be the cause of diarrhoea (Leung and Robson, 1989).

2.5.2 Reasons given for the practice of DCBE

The reason why children undergo DCBE has been attributed to failure of cure of childhood illnesses by conventional treatment. For instance, a study done by Kikwilu and Hiza (1997) revealed that 60% of the parents interviewed had taken their children to a hospital before visiting traditional healers for DCBE. About 70% of the respondents reported that they had attended hospital 3 times, with only 5.5% reporting that the treatment they received in hospital cured the conditions. After DCBE is performed, some parents hide their children at home and treat the wound inflicted on children with herbs for fear that health personnel could question them over their actions (Hassanali *et al.,* 1995). Rasmussen *et al.,* (1992) study found that those who performed DCBE had one or more visits to a government health facility. They were reported to resort to DCBE because the symptoms of the child's illness were persistent despite medical attention by the health practitioners.

2.5.3 The role of Traditional Birth Attendants and Traditional healers in Child Health

The removal of deciduous canine tooth bud is performed by TBAs (Kibet *et al.,* 2009) traditional healers (Kikwilu and Hiza, 1997; Graham *et al.*, 2000) and in some areas, the health workers have been reported to participate in the practice, particularly in Uganda (Jamieson, 2006). The Traditional Birth Attendants (TBAs) and others who perform DCBE could have financial gain from the practice (Graham, *et al.*, 2000). Sebudde (2006) reported that in Kanungu District in Uganda, the communities which practice DCBE were paying approximately 1-2 US dollars (1 US dollar =1200 UG Shs as at 2006).

Inspite of this, it has been reported that traditional healers play a pivotal role in health care in many communities, including in the management of illnesses such as malaria (Makundi *et al*., 2006). They collaborate with modern health care providers in improving health care in their communities. In Tanzania, traditional healers extract tooth buds or rub them with herbs to cure fever and diarrhoea (Kikwilu and Hiza, 1997). Although Ngilisho *et al.*, (1994) appreciates the role of the TBAs in community health, they point out that there is need to educate them (Naisho, 1984) about the importance to refer serious cases to hospital for specialized medical care.

2.5.4 How is DCBE carried out?

Extraction of deciduous canine tooth bud is carried out in various ways. In some communities, they rub the gum especially in the canine regions using herbs (Bataringaya *et al.*, 2005). Others extract using crude tools such as knitting needles, bicycle spikes, scissors or broken glasses (Jamieson, 2006). Other methods used include squeezing and sometimes using hot nails, penknife, and even applying salt on the gum (Graham *et al.*, 2000). Besides the instruments used being crude, they are not sterilized before they are used. With the high prevalence of infectious diseases such as HIV, the practice of DCBE has been cited as a possible danger to the health of the child Sebudde (2006).

2.5.5 Effects of DCBE practice

Although DCBE is performed by communities to ensure child survival, the practice ironically puts the lives of children at more risk. Previous studies have reported that DCBE has a lot of complications which include septicaemia, anaemia, difficulty in feeding, osteomyelitis, meningitis, tetanus pain and sometimes death (Stefani, 1987, Jamieson, 2006; Dewhurst and Mason, 2001; Matee *et al.*, 1991; Welbury *et al.*, 1993; Hassanali and Amwayi, 1988) Jamieson (2006) observed that multiple extractions compromise the health of the child, leading to increased risk of such infections as HIV /AIDS transmission.

The tooth bud gouging has implications for developing dentition, and is potential risk to the health and life of the child (Dewhurst and Mason, 2001). Dental abnormalities have been associated with dental mutilations among children in Uganda (Pindborg, 1969). Studies by Bataringaya *et al*., (2005), further reported on devastating effects of the practice of DCBE. The study revealed that (28%) had missing canine and mandibular first molar. The canine tooth was four times frequently missing in girls than in boys; it was also 3 times more commonly missing in maxilla than in the mandible. In addition, canines accounted for 12.8% of the malformed teeth observed in the study.

Mosha, 1983; Matee *et al.*, 1991; Rodd and Davidson 2000; and Dewhurst and Mason, 2001), further reported associated tooth abnormalities and adverse effects of DCBE on the permanent dentition and primary dentition. The practice was reported to result in, missing, multilated and malformed teeth. The primary and secondary canines and adjacent teeth were reported to be hypoplastic probably as a result of

unsuccessful extractions. Distal eruption of permanent lateral incisors and leaving their primary predecessors retained. Malocclusion and midline shift to the extraction side was observed among those that had undergone tooth enucleation. Rasmussen *et al.*, (1992), further reported enamel defects in primary teeth of those that have undergone the DCBE. In a study done among the Jop Adhola in Eastern Uganda, it was concluded that by analyzing the social causes, an insight into important mediating processes could have as much to do with actual health outcome in particular areas as health care per se Mongensen (2000).

2.6 Intervention strategies for the prevention of DCBE

Although many health interventions have been initiated to reduce disease prevalence among children globally, the burden persists especially among the poor, disadvantaged and socially marginalized communities (Petersen, 2004). Community based health education is one of the programmes that has been most successful in bringing about behaviour change and has contributed to disease control (Aryeetey *et al.*, 1999). In addition, WHO (2003) has recommended that oral health programmes could be carried out also through schools.

A successful community based education programme (‘*ebiino*’) has been developed and implemented in South-West Uganda Province of Rukungiri (Jamieson, 2006). The programme resulted in the number of hospital admissions due to DCBE related complications reduced. A similar educational initiative aimed at changing the attitude of the health workers in St. Mary Hospital in Gulu, Uganda from contempt to acceptance, has been reported (Stefani (1987). Other studies in Tanzania (Kikwilu

and Hiza, (1997), observed that villages in which the practice was first reported in the early 1980s, the prevalence of DCBE was 0.5%, while in those villages where the practice was not reported, it was 60%. There is therefore the need for health promotion strategies (WHO, 1986) and intervention programmes to be implemented in order to save the health of the children in the affected communities.

2.7 Child nutrition

2.7.1 Importance of child nutrition

Appropriate nutrition in infancy is essential for optimal human growth and development. Nutrition has been shown to influence adult health (McDonald, 2000). Contrary to common use, the term malnutrition refers not only to deficiency status, but also to excess or imbalance in the intake of calories, proteins and/or other nutrients (WHO, 1990). Malnutrition occurs when the body does not get enough amounts of nutrients. A person is undernourished if they do not get enough nutrients, and over nourished if they get excess. WHO now considers obesity as the biggest unrecognized public health problem (James *et al.*, 2001). The prevalence rate of obesity in some developing countries has reached even higher levels than in many industrialized nations (WHO, 2000). Malnutrition underlies 55% of all deaths in children below five years old globally, while undernutrition is a major risk factor accounting for over 28% of all the 2.9 million deaths in Africa annually (Pelletier *et al.,* 1994).

Malnutrition is one of the leading causes of disease (Ezzati *et al.*, 2002). For instance, childhood underweight has been cited as the leading cause of global burden

of disease (Ezzati *et al*., 2002). Globally, under nutrition is an underlying or associated cause in at least half of all childhood deaths (de Onis *et al.*, 2000; Branca and Ferrari, 2002; UNICEF, 2003; 2005; Pelletier *et al.,* 1994*).* This makes prevention of under nutrition in children one of the top priorities in efforts to reduce childhood mortality (Caulfield, *et al*., 2004). Effects of malnutrition on children have been established not to be limited to physical health, but extend to mental, social and spiritual wellbeing. The study on malnutrition and its effects on DCBE are therefore paramount. This could reduce the possibility that such practices could be passed from one generation to another, hence constituting a vicious spiral (Gillespie *et al.*, 1993).

2.7.2 Determinants of nutritional status in children

Malnutrition in developing countries is a result of myriad factors ranging from environment, political, economic situation, poverty and diseases. Almas Ali (1992) affirmed the above argument and stated that malnutrition is a by product of poverty and underdevelopment, and any improvement in nutritional status of the population can only take place as a part of the overall socio-economic development of the country (Naarayana, 1973). Low birth weight and dental diseases are some of the conditions more prevalent in children born to disadvantaged families and have been considered to be a result of nutritional inadequacy hence resulting in malnutrition, (Thompson, 1998). Socio-cultural practices such as DCBE could affect nutritional status of the child. The practice subjects the child to pain which influences feeding. There are also many related complications which occur as a result of the extraction of the teeth buds (Jamieson, 2006).

2.7.2.1 Infant feeding practises

The problem of malnutrition in the arid and semi arid areas in Kenya has been attributed to under nutrition due to inadequate dietary intake and diseases (Macharia *et al.,* 2006). Other underlying causes of malnutrition which manifest themselves at the household level are food insecurity, inadequate maternal and child care practices and poor environmental health (Kamau-Thuita *et al.,* 2002). In children, malnutrition is most likely to affect those who lack balanced diets and thus suffer from frequent illnesses without getting adequate medical care (Prechulek *et al.,* 1999). However, little attention has been given to nutrition and negative cultural practices such as DCBE. Adequate nutrition has been cited as a basic need and prerequisite to oral health, and its promotion has been made one of the eight elements of PHC (WHO, 1986). The relationship between nutritional status and oral health practices should also be investigated.

Smith *et al.,* (2000) highlighted that illness depresses a child's appetite and inhibits the absorption of nutrients. It diverts nutrients away from contributing to the child's growth and towards fighting illnesses. Diseases such as diarrhoea contribute to malnutrition (Lo and Walker, 1983), which has been the main reason for DCBE in the *Maasai* community. The *Maasai* believe that the deciduous canine tooth bud causes diarrhoea and vomiting and unless the teeth buds are removed, the child will die (Hassanali *et al.,* 1994).

2.7.2.2 Complementary feeding

Although Thompson (1998) observes that there is no "ideal" age at which weaning should commence, they agree that weaning is not recommended before the infant is

16 weeks old or before they are 5 kilograms in weight (Thompson 1998, Department of Health, 1994). Breast milk contains nutrients which protect the babies against infections, aid their growth and neurological development, as well as reducing their susceptibility to certain diseases in childhood and sometimes into adulthood (Lang, 1998; Ng'ando and Watts, 1990; WHO, 1990). Poor infant feeding and weaning practices, food shortages and diet imbalances can lead to conditions such as stunted growth, delayed motor and mental development, immune incompetence and frequent attacks of diarrhoea among others (Ng'andu and Watts, 1990, Patel and Pettifor, 1992; Steyn *et al.,* 1993;). In addition, macro and micronutrient deficiencies affect full human potential (Ocloo, 1993). Good nutrition is therefore essential for promotion of growth and health of the children under five years. Healthy children are free from frequent illnesses such as dirrhoea and therefore are less susceptible to undergo DCBE.

It has been established that exclusive breast feeding for the first six months reduces exposure of children to diarrhoea and disease causing pathogens. Mondal *et al.*, (1996) established that infants who were weaned late (4 months or more) suffered less from diarrhoeal diseases as compared to those in the same age group who were weaned early. The removal of decidous canine bud for at the age of 4 months affects breastfeeding of the child due to pain. The child is therefore debrived of breast milk which is essential for health and growth; in addition they become anaemic due to loss of blood. The gouging of the canine buds creates wounds that are the route of infections which also affects the feeding of the child. Thus, the child is predisposed to illnesses resulting in stunting, underweight or wasting. Meremikwu *et al.*, (1997)

in a study done in Nigeria in 1997 reported that breast-feeding has an influence on the prevalence of diseases such as dysentery, persistent diarrhoea and malnutrition. The study revealed that the proportion of children with persistent diarrhoea was significantly lower among those children who had been exclusively breast-fed than those who were not.

KDHS (2008-09), reported that, exclusive breast feeding is now becoming less common in Kenya. Only 32% of children less than six months of age are exclusively breast fed. By age 6-9 months (83%) of the children are given supplementary foods. Cameron and Hofvander (1983) found out that majority of the children become undernourished during the weaning or transitional period and that undernourished children suffer greater risk of death than well nourished children. Poor nutrition make children susceptible to infectious diseases (WHO, 1990) hence increases their chances of being subjected to DCBE among the pastoralists. There is need to investigate whether breast feeding could be a confounder in the relationship between DCBE and nutritional status of children under five years.

2.7.2.3 Dietary pattern and food adequacy

Many of the risk factors associated with leading causes of mortality and morbidity are and lifestyle choices. Dietary patterns are associated causes of sicknesses related to health behaviours. McKenzie and Pinger (1997) have recommended that a diet should not contain more than 30% of fats. Some communities could be taking more than these quantities. In a number of communities, nutritious foods like eggs and chicken are not consumed but sold for money, and the money is used to buy sugar to prepare porridge for children (Wood, 2008). According to Kabubo-Mariata *et al.*,

(2009), with the high prevalence of malnutrition, there is requisite to institute strategies to address child nutrition. Among the critical concerns to be addressed in Kenya include poverty alleviation, promotion of secondary school education for women, and promoting health care systems. The low income per capita in developing countries also limits the range of foods which families can afford to produce or buy. They also limit the possibilities of investing in supplies and equipment which are needed to increase food production or to improve food storage. Food shortages may be due to various causes including inadequate production, drought, excessive rains, and waste due to inadequate or poor storage (UNICEF, 2004).

Equally, proportional amount of produce is damaged by insects and rodents. In some instances, families sell a large proportion of their produce for economic gains at the expense of their food security before the next harvest (Koppert, 1977). The *Maasai* are semi-nomadic people, obtaining their livelihood through husbandry of cattle, goat and sheep. As a result of global warming, droughts are becoming severe, forcing the *Maasai* people to seek alternatives livelihoods. Herds are reducing everyday and most people are now relying on relief food. Food insecurity in *Maasai* community may be high and that is why the cases of malnutrition are on the increase. Oiye *et al.*, (2006) reported that the *Maasai* now rely on relief food. Malnourished children are more susceptible to diseases hence some could be made to undergo DCBE, which is a traditional practice carried out to prevent childhood illnesses (Wanzala *et al.*, 2005).

2.7.2.4 Maternal factors

Maternal related factors have been identified as among the underlying causes of childhood malnutrition. A study done in Kenya, by Thuita *et al.,* (2005) to assess the relationship between maternal factors and child nutrition in children aged 6-36 months, in an urban settlement, maternal factors were found to influence nutritional status of children. There was a significant positive association of at least one of the three child nutritional status indicators (height for age, weight for age and weight for height) with birth spacing, parity, maternal education level and marital status of mothers (UNICEF, 2006; 2008). The study identified child spacing and parity as the most important predictors of stunting in children. Maternal nutritional status was also shown to be positively associated with child nutritional status.

Nutritional outcomes have been attributed as a function of many factors such as food availability and infections. Other studies have also found out that other non-food and non-health factors such as care giver's knowledge, attitude and actions towards proper child care are equally important (Kamau-Thuita *et al*, 2002). Most pastoral communities in Kenya and especially the *Maasai* still strictly adhere to their traditions (Blecker, 1964). Child care giving behaviours and practices such as breastfeeding, providing emotional security, shelter, clothing, feeding, bathing, nurturing and showing affection, interaction and simulation (Zeitlin *et al.,* 1992) are intended to enhance further child development (Zeitlin *et al*., 1989; Martorell, 1993). In Kenya, shelter, women's workload and decision-making opportunities, traditional beliefs and practices and men's attitude towards child-care among others contribute to malnutrition and eventually to maternal and child deaths. Lisa *et al.,* (2003)

observes that malnutrition affects one in every three pre-school children in developing countries.

2.7.2.5 Basic factors

UNICEF (1998) developed a conceptual framework (Figure 2-2) on the causes of malnutrition, and classified them as immediate, underlying and basic causes. Immediate causes are lack of food intake and disease; and create a vicious cycle in which disease and malnutrition exacerbate each other (WHO, 1990). The underlying causes of malnutrition include limited access or availability of food in the household, inadequate health services, environmental conditions and social health care especially for women and children in the community.

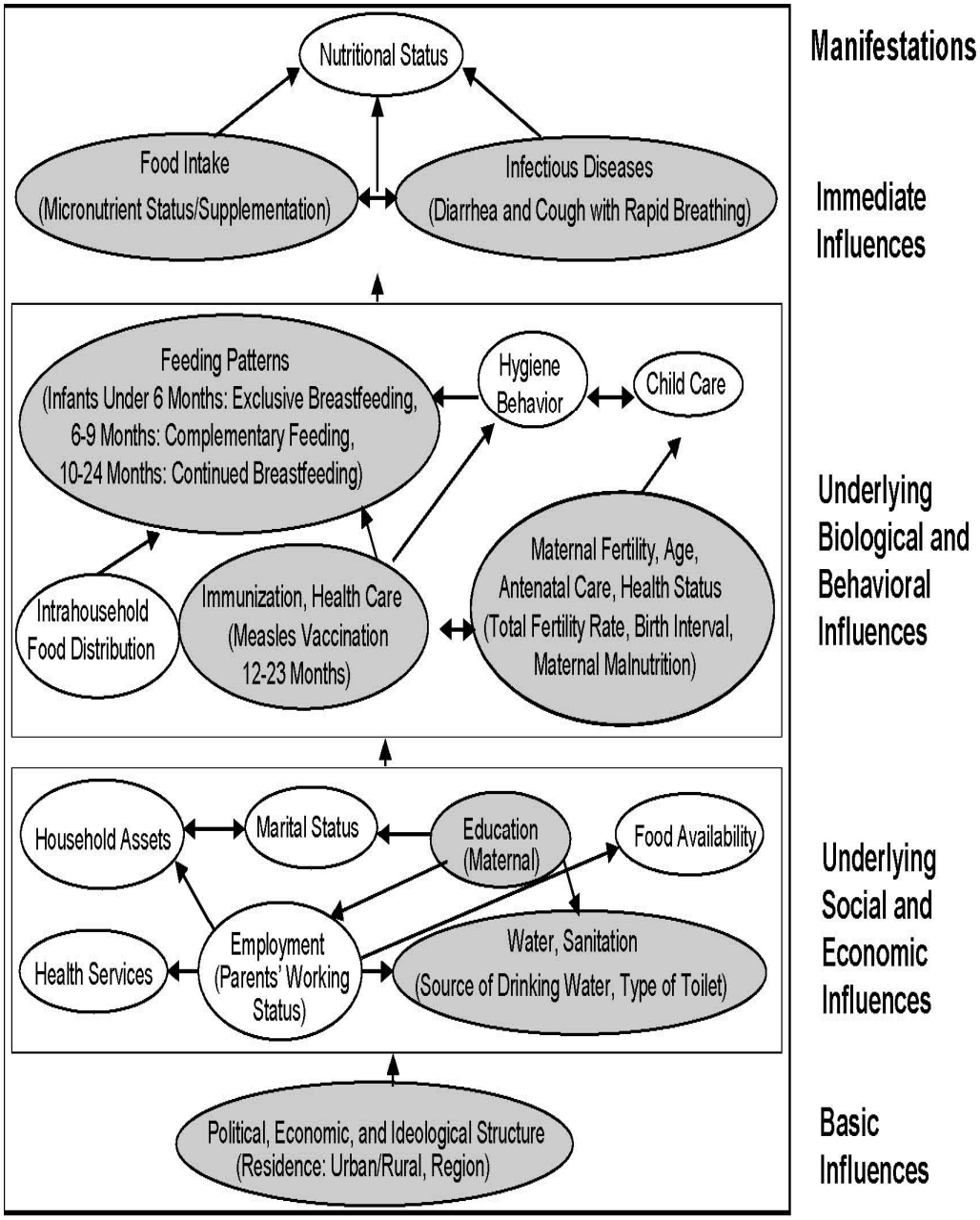


Figure 2-1: Conceptual Framework for Nutritional Status

(Adapted from UNICEF, 1998)

The basic causes include policies that affect the allocation of resources that influence what happens at community level, human, economic, political and cultural activities. For insatance, in Kajiado, government health facilities are few and sparsely distributed. The average distance to the nearest health facility is 10km. The doctor-patient ratio in the District is 1:66,412. This problem is aggravated by lack of public transport; however some people still travelling on foot. With a crude birth rate of 46.9/1000, the infant mortality rate is 45/1000, while the under 5 mortality rate is 74/1000. The adult literacy level by sex is 66.8% and 49.3% male and females, respectively (KDDP, 2005).

2.7.2.6 Status of women and nutrition

The status of women has also been identified to having an effect on child nutrition. Lisa *et al.,* (2003), found out that women with high status in the community have a strong positive influence on both long-term and short-term nutritional status of the children, leading to reduction in both stunting and wasting. The study estimated that, if women and men enjoyed equal status, the under three child underweight rate would drop by approximately 13%. This translates to about 13.4 million children being saved from malnutrition with fever in the South Asia region. Haddad (1999) agrees in the discussion on the consequences of low status of women and child health, Haddad said that discrimination of women affects the nutritional status of their children. If women are not empowered, they will not be able to influence decisions on for example desired size of the family, health seeking behaviour for children, resource allocation, wage allocation and even education levels. These inequalities are particularly important for child nutrition.

Inadequate knowledge on food requirements and preparations may impair the health of the child (Chaundry, 1984). Koppert (1977) reported that mothers often have to be persuaded to forcefully feed their sick babies with plenty of food and fluids. Even with food sufficiency, ignorance and cultural beliefs may also cause malnutrition. This situation can be seen in many communities even in developed countries where children are given too much fat and carbohydrates containing foods, causing obesity which is also a form of malnutrition. The nutritional status of the child is also influenced by the birth intervals. This is also disadvantageous to the infant child since breast milk is usually the major source of protein (Jellife, 1982).

2.7.2.7 Immunisation of children

Kenya Demographic and Health Survey has also shown a drop in the percentage of children getting full immunization (all six vaccines- ages 12-23 months from 79% to 65% and those with vaccination cards from 69% to 55% since 1993 (IMF, 2005). High illiteracy levels, poverty, strong traditional and cultural practices in the *Maasai* community also expose the infants to an unconventional treatment for enteric diseases including the removal of DCBE, with immediate and long-term hazards (Wanzala *et al.*, 2005). Recent reports by KDHS (2008-09), have however shown that immunisation coverage has increased since 2003, from 57% of children fully immunized in 2003 to 77% in 2008-09. Differentials were seen in regions where in Eastern province only 48-65% of children were fully immunized compared to Rift Valley (85%) and central province (86%). Coverage is high (87%) for children who have been in secondary school.

2.8 Dietary patterns of the *Maasai*

According to Fratkin (2001), pastoralist communities face among others challenges relating to population growth, diminishing land for pasture due to farming activities, ranchers, game parks, urban growth, increased commoditization of livestock economy, emigration by poor pastoralists, drought, famine, and conflicts. These problems according to Fratkin, intensify as modernization encourages privatization. For example, the *Maasai*, *Boran*, and *Rendile* communities in Kenya among other pastoralists in the East African region are fast responding to social political and economic challenges. Some have since resorted to economic diversification; including agro-pastoralism, wage labour, and increased market integration. These changes result in increased social and economic stratification, urban migration and diminished nutrition for women and children.

Kenya as a developing country is in the process of food transition from traditional dietary habits to modern lifestyles (Oniang'o and Komokoti (1999). Pastoral societies in East Africa face more demand on their way of life than any previous time. According to Maasai Association (2010), traditionally, the *Maasai* rely on meat, milk and blood (Adamson, 1967, Ole Saitoti and Bleckwith, 1980) from cattle for protein and caloric needs. These are given to a circumcised person (*o/esipolioi*), a woman who has given birth (*entomononi*), and the sick (*oltamueyiai*). Also, on regular basis drunken elders, *ilamerak*, used blood to alleviate intoxication and hangovers. However, its use in the traditional diet is waning due to reduction of livestock. The major factor pushing *Maasai* to diversify their staple diet has been their inability to sustain a population growing at some 3% a year on diet of livestock

products alone (Bekure, 1991). Due to improve infrastructure and communication, with neighbouring agricultural tribes, maize and other foods are easily been accessed.

Bwibo and Neuman (2003), gave historical accounts of food intake and dietary patterns in Kenyan households from 1902-1935, and noted that most diets were cereal-based, with few animal based food products. Among the *Maasai*, livestock products are still their staple foods. Nestle (1985) in a 24 hour-recall diet study across affluent groups, women and children in Olkarkar and Merueshi, reported that men , particularly *moran*s consumed more milk products than women and children. The availability of milk strongly influenced the quantity and types of other foods purchased. The change of dietary patterns and unavailability of food could have an influence on nutritional status of children especially among the *Maasai* in Kajiado. USAID (2009) points out that Global Acute Malnutrition (GAM) continues to rise in areas traditionally not affected by high levels of acute malnutrition including Kajiado District. Wefwafwa (2010), reporting on the nutrition situation in Kenya in the month of April and June 2010, notes that the top districts having the highest numbers of acutely malnourished children are Turkana (12,065) Kajiado (7,655) and Tana River (7,612).

2.9 Prevalence of malnutrition

2.9.1 Global nutritional status

Food and Agriculture Organization of United Nations (FAO) and the World Health Organization (WHO) in a joint report in 1992 indicated that 786 million people world wide suffered from chronic dietary energy deficiency in 1988-90. This is

equivalent to 20% of the total population in the developing world (Espy, 2008). From this, it is certain that many are children below 5 years old. The United Nations (UN) estimates that about 150 million children are underweight, while about a half a billion women are anaemic due to iron deficiency. Similarly, it is estimated that 226 million children below 5 years old globally are stunted, while 6 million are wasted and 183 million are underweight (UNICEF, 1998). According to Whitney and Rolfes (2008), the prevalence of overweight and obesity continue to rise drastically in developed countries, and particularly in the United States among women, the poor, the black and Hispanics. The prevalence of overweigh children has also risen to alarming rates, with an estimated 33% being overweight or "at risk of becoming overweight".

2.9.2 Prevalence of malnutrition in Asian countries

Maternal and child under-nutrition is prevalent in low and middle income countries. New findings estimate that the risks related to stunting, severe wasting and intrauterine growth retardation are linked to 2.2 million deaths (Black *et al.*,(2008) The highest prevalence of underweight, wasting and stunting is recorded in Asian countries followed by the Sub-Saharan Africa, while lowest rates are reported in Latin America (Smith, *et al*., 2000). The Kenyan situation especially among the Pastoralists could be worse.

India, Pakistan and Bangladesh account for half of the world's underweight children, while Nepal is the only country slipping backwards in underweight prevalence (UNICEF, 2007). Bhattacharyya (2006), in his study among the Indian children alleged to have observed children aged 3-5 years suffering prolonged or repeated

nutritional assaults with extremely low z-scores (Height for Age: 6-7, Weight for Age: 5-6 and Weight for height: 3-4), and identified as very severe type and were often with no *Kwashiorkor* or *Marasmus.* This is followed by sub-Saharan Africa and the Middle East/North Africa region respectively. Further, anthropometric status and higher mortality rate in girls as compared to boys was also evident in Asia, while anthropometric status of females in sub-Saharan Africa was equal or even better than that of males.

In India where boys are culturally favoured than girls, Bose *et al.*, (2007) in a study involving 533 (254 boys and 279 girls) between 3-5 years old rural children of *Bengalee* ethnicity found out that the rate of underweight and wasting was higher among girls, (underweight= 35.1%,wasting=12.2%) compared to boys (underweight=26.5%, wasting 6.3%). The overall (age and sex combined) rates of stunting, underweight and wasting was 23.9%, 31.0% and 9.4%, respectively. The study also reported that boys were heavier than girls at the age of 3 years. The nutritional and health status of females as compared to that of males is therefore favourable in Sub Saharan Africa (Svedberg, 1990). Report by Mason (2004), indicate that Asia has more undernourished people, but the rate in Africa is highest, for instance in Africa under nourishment has increased by 20% since the early 90's and doubled in the late 1990's to 40%.

2.9.3 Prevalence of malnutrition in Sub-Saharan Africa

An estimated 14% of the world's population is undernourished, and about 200 million (27.4%) are found in Africa, with sub-Saharan Africa accounting for about 33%. These figures are increasing (Mason, 2004) and largely contribute to the high

mortality rate. The commonest form of malnutrition in most developing countries is shortage (deficiency) of proteins and or energy giving foods. Balldin *et al.*, (1991) indicated that the group of diseases which these shortages give rise to have at times been called Protein-Energy-Malnutrition (PEM), or Protein-Energy- Deficiency. Beaton and Bengoa (1996) reported PEM is the commonest deficiency in the world and it is estimated that about 100 million children in the world are affected to a moderate or severe degree. For instance, the report indicates that in some countries, four in every five children had some form of PEM.

Many studies in Sub-Saharan Africa have reported differences in nutritional status in relation to sex. For example, male children have a higher prevalence of stunting compared to female children. Wamani *et al.,* (2007) reported that in all the 16 studies carried out, the prevalence and the mean z-scores of stunting were consistently lower in females than in males. The pooled estimates for mean scores were -1.59 for boys and 1.46 for girls with the difference being significant ($p \leq 0.001$). The stunting prevalence was higher in boys (40%) than in Girls (36%) in pooled data analysis; crude odds ratio 1.16 (95% CI 1.12-1.20), child age and individual survey adjusted odds ratio 1.18 (95% CI 1.14-1.12). Other variations have also been observed in relation to female literacy, where lower stunting in children was observed in educated mothers (Frongillo *et al.,* (1997). In African communities, children who weigh between 60-80% of expected weights for their age and without oedema are not easily diagnosed unless growth monitoring is done, 30% of them and sometimes many as 75% children in African communities are underweight (Latham (1979). The

underweight *Maasai* children between 2-5 years would be diagnosed in this research study since they live in Arid and semi-arid areas where there is scarcity of food.

2.9.4 Malnutrition in Kenya

According to WFP (2005), Kenya is classified as a low-income food deficit country. In 2004, it was estimated that 10 million Kenyans were experiencing chronic hunger, Kenya is plagued by acute food insecurity, primarily due to droughts, which threaten the lives and livelihoods of the vulnerable groups, particularly in the ASAL regions. Prevalence of malnutrition in Kenya has been on an upward trend. (CBS, 1994); Thorpe (2006) cited malnutrition as one of the causes of illness and death in children who survive neonatal period. According to CBS, *et al.,* (2004) the under-five mortality rates remain above 100 in every 1000 live birth, while infant mortality rates are well above 60. In addition, about 30% of under-five children suffer chronic malnutrition (stunted), almost 60% are severely malnourished (wasted), while 20% are underweight.

Malnutrition is a serious public health problem. In a cross sectional study done by Ngare and Mutunga (1999), the prevalence of stunting, underweight and wasting was 37%, 27% and 6% respectively. Stunting was highest among 12-23 months age group, and where a significant difference ($p \leq 0.05$) was found between boys and girls. Regional disparities in rates of malnutrition were observed in this study, where low rates were recorded in Kiambu (22.6%), while highest rate was in Kwale (56.6%). A report carried in one of the local dailies blamed the nutritional crisis in the pastoral *Samburu* community and who are cousins of the *Maasai* on prolonged drought, where lack of pasture and water as a result wiped out thousands of livestock.

According to demographic survey conducted in 2006, one out of every three children under five years of age nationwide suffers from malnutrition as a result of poverty exacerbated by drought. The report warns that the figures could further rise to unprecedented levels if no urgent measures are taken to rescue children from malnutrition (Daily Nation, 2010).

Nutritional assessments carried out over a period of time to ascertain nutritional status of children in Kenya revealed a deteriorating trend. According to UNICEF and WHO (2004), the situation in some ASAL areas is classified as serious. For instance in 2003, 20% of children under 5 years were underweight and the prevalence of severe was 4%. Later CBS *et al.,* (2004), observed that a third of children were stunted. The prevalence of stunting was higher among male children than among the females and higher in rural compared to urban areas. Wasting affected 6% of the pre-school children, with 1% being severely wasted. Prevalence was highest in 12-23 months' age group. This is a group largely affected by the introduction of complementary foods, which are likely to caused diarrhoea. The prevalence of wasting in North Eastern province was reported to be at an extreme of 27% and severe wasting alarmingly high (11%).

Earlier reports by Kenya Demographic Health Survey, conducted in 1998 (CBS, 1999) in Kenya, about 31% of the children are stunted (too short for age) and about 20% are underweight. The rates of underweight and stunting are approximately 10% higher in rural areas that urban areas. Meme *et al.,* (1998), reported the level of stunting in groups of children on feeding programmes as well as those not in the programme show a similar past nutritional experience. The stunting levels observed

were slightly higher than the 22% reported by the CBS (1994) in 1989 in children under five years. Similar results were obtained in Samburu District, where stunting was found to increase with age (Kielmann, 1988). Other studies have also reported the same levels in similar ecological zones in Kenya for schoolchildren.

A much earlier survey conducted by the Central Bureau of Statistics (CBS, 1991) shows that 24% of the schoolchildren in Kitui District (an arid area) and 26% in Kwale District were stunted. The nutritional status of girls was found to be generally better than that of boys, and is consistent with results of other studies on schoolchildren in other parts of Kenya, including Samburu (Kielmann, 1988), Kitui, and Kwale (CBS, 1991). Similar findings were also reported in Tanzania (Kimati and Scrimshaw, 1985). This observation may be attributed to gender roles where customarily, girls are socially involved in food preparation and therefore have a greater access to food. It will be appropriate to compare such findings with those of this study, since children under that age of 3 years have not been socialized into cultural gender roles.

Recent preliminary report by 2008, KDHS (2008-09), of the under five children, showed that 35% of Kenyan children are stunted, while 14% are severely stunted. Stunting increased with age, 46% of those aged 2 years were stunted and remaining at 32-35% among older children. Stunting levels were slightly higher for boys than girls for rural than urban areas. Stunting was higher (42%) in Rural –North Eastern province than Urban-Nairobi (29%). Children of educated mothers were much less stunted than children whose mothers had primary level of education than or never attended school. Underweight reflect chronic and acute malnutrition. Children who

were under underweight were 16%, with 4% classified as severely malnourished. 4% were classified as severely underweight. About 7% of children were wasted, while 2% severely wasted. Wasting was markedly higher in Eastern province, where 20% of the children under five years were wasted compared to 2% in western province. Nutritional Data elicited by the study are needed for comparisons.

Other findings by KIHBS (2007), had estimated that the national figure for acute malnutrition in children under five years old as 6%. However there are huge variations in various regions of the country. For instance ASAL areas where there is high rate of food insecurity and other problems such as lack of water and higher risks of diseases, the rates of acute malnutrition are between 15-20% of children under five and sometimes substantially higher (Ministry of Public Health and Sanitation and Ministry of Medical Services, 2009)

2.9.5 Malnutrition in Arid and Semi -Arid Land in Kenya

In the Arid and Semi-Arid Land (ASAL) areas in Kenya, the prevalence of malnourished children remains high. A recent comparative study carried out by Macharia *et al.,* (2005) in Kathonzweni Division of Makueni District found out that the prevalence of stunting among 6-59 month old children was slightly higher in some areas. For example, in areas where the World Vision had instituted intervention projects, the prevalence was 46.5%, while those that had not been included in the project, the rates were 42.1%. Underweight in the project areas was 25.2%, while in the non study areas was 28.3%, and compared to the national figure of 22.2%. Although there was no significant difference in prevalence of stunting and underweight between these two areas, the prevalence of stunting and underweight

was higher than the national levels. This showed the severity of malnutrition in many communities in the ASAL areas. In the same study, a significant relationship was found between children's age and their nutritional status, based on prevalence of wasting, and underweight ($P<0.01$), while nutritional status based on stunting, was significantly associated with birth order. Overall, there was no significant difference in prevalence of stunting, wasting and underweight between World Vision's project area and non project area

Kenya has a national chronic malnutrition (height for age) rate of 33% which translate to one in three children being stunted; primarily due to poor nutrition and poor child care practises. In drought prone areas this situation has in the past spiralled to alarming proportions of between 30-40% during food shortage periods, while child diarrhoeal rates range from 20-60% in two weeks recall period. In areas where drought is most severe, most indicators of child welfare needs were prevalent in addition to poor access to water and sanitation (GOK, 2004).

2.9.6 The prevalence of malnutrition among children in Kajiado District

Findings reported in the last two consecutive years indicate that nutritional status in Kajiado is deteriorating. The World Vision results presented by Oyie *et al.*, (2006) were disheartening; malnutrition situation was on the increase. Recent reports by USAID (2009) states that Global Acute Malnutrition (GAM) continues to rise in areas traditionally not affected by high levels of malnutrition. Wefwafwa (2010) stated that the top districts having the highest numbers of acutely malnourished children are Turkana (12,065) Kajiado (7,655) and Tana River (7,612). In a survey carried out in Niamey in Niger, between 1985 and 1987, a very strong relationship

was found between an increase in food prices due to a shortfall in crop production and under nutrition (Espy, 2008). The lack of food, combined with poor health conditions leads to malnutrition, leading to increased morbidity and mortality, especially among children under five years old, the elderly, and the sick.

A study on the *Maasai* ethnic groups carried out in 2006 in Northern Tanzania found out that 31% of the children were undernourished, with 6% being severely malnourished Nyaruhucha *et al.,* (2006). Children aged 2-3 years old were the most affected. Although most mothers report that they breastfed their children for more than one year, 54% weaned their children as early as two months after birth. The most common food used to wean babies was porridge (gruel) made from maize flour and mixed with cow's milk (46%). Generally, 87% of households were facing some degree of food insecurity where some either experienced food shortage for 3-4 months (40%) or reported to eat less than three meals per day (75%). *Maasai* economy is increasingly dependent on the market economy. Families in the community supplement their income by sale of milk, livestock, charcoal and firewood. The money they get is used to purchase beads, clothing and grains, in addition to paying school fees for their children. Livestock also serves as a social utility. They establish close ties with other individuals and communities through exchange of livestock.

2.10 Measuring growth and nutritional status of children

Various methods have been developed to measure nutritional status in children (Asuzu, 1991). Selection of index or indices depends upon many factors, and no one

factor is completely adequate in all situations. WHO, (2006) recommends that growth charts prepared by the US National Centre for Health Statistics (NCHS) should be used to assess the nutritional status of children from birth to 10 years old in the developing countries. Other methods advocated mainly by the WHO (2006) are those based on anthropometric assessments of individuals' height and weight. Pacey and Payne (1985) said that, anthropometric measurements are valid nutrition indicators in so far as representing the actual 'state' of the (nutritional) system. Other tools such as growth reference charts have often viewed as the best for assessing the health and nutrition status of children (de Onis and Habicht, 1996; Garza and de Onis *et al., 2004*). Such tools are universally used as routine components in paediatric examinations, as atypical growth patterns could be an early indication of medical, nutrition, or developmental problems (Cooney *et al.*, 1994).

In Kenya, the key indicators are height, weight and age. In growth monitoring programmes, weight-for-age is the measurement used to classify children with malnutrition (Oniang'o, 1988). Hoorweg and Niemeijer (1989) observe that weight-for height is a tool used to monitor nutritional history, while height-for-age reflects previous nutritional history. Weight-for-age serves general, combined index of nutritional status. The WHO, Child growth standards were introduced in Kenya in 2008. The standard replaced the NHC referenced for measurement of child malnutrition (Bhattacharyya, 2006; WHO, 2003). Stunting, which is low weight-for-age is an important anthropometric measurement, which is indicative of long-term nutritional status of the child. This is the best measure for cumulative growth. However, this is not very sensitive and is used only for long-term observations, and

by the time growth failure is detected, much damage control will have been done (Bhattacharyya, 2006). Measuring height is simple and consistent and therefore overcomes the difficulty which is experienced when using other methods such as budget surveys (Sahn and Stifel, 2002).

Prudhon *et al.,* (1996) recommended that the weight for height index is expressed as a percentage of the reference median rather than as the z - score. Many researchers recommend the z - score because of marked differences in the reference distribution of weight and height in children (Cole, 1993). In such situations and for longer term follow up, weight or height for age are the most preferable indicators although the choice of the indicator varies with the situation. For instance, Cole *et al.,* (2000) and Abrantes *et al.,* (2002) indicated that Body Mass Index (BMI)-weight/height, is now the most preferred indicator for the risk of obesity, as well as of Chronic Energy Deficiency (CED) in adults (WHO,1990). The use of Weight-For- Age (WFA) as a measure of nutrition in children under 5 years old has been criticized for not differentiating acute, chronic and past (recent or remote) under nutrition (Bhattacharyya, 2006).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study design

This was a community–based study which adopted a descriptive cross-sectional approach process of variable interaction and the link between dependent and independent variables (Borg and Gall, 1996). The study was undertaken in the villages (*Manayattas*) of two Divisions of Kajiado District, Kenya. Random sampling techniques were used to select women and children to obtain data on DCBE and nutritional status among children.

Triangulation methods involving the use of key informant interviews, focus group discussions and scheduled interviews were used to obtain primary and secondary data, and to fill in existing gaps. Multidisciplinary approach was used to collect both qualitative and quantitative data. The data therefore was obtained from the natural settings, attempting to make sense of, or interpret, phenomena in terms of the meaning people bring out (Denzin and Lincoln, 1994). Qualitative methods provided description of community's dietary patterns; perceptions, attitude, practices and the situation on DCBE. Quantitative methods provided data on the prevalence of DCBE, and nutritional status of children aged 2-5 years.The design also allowed for development of hypothesis rather than testing it (Mugenda, 2008)

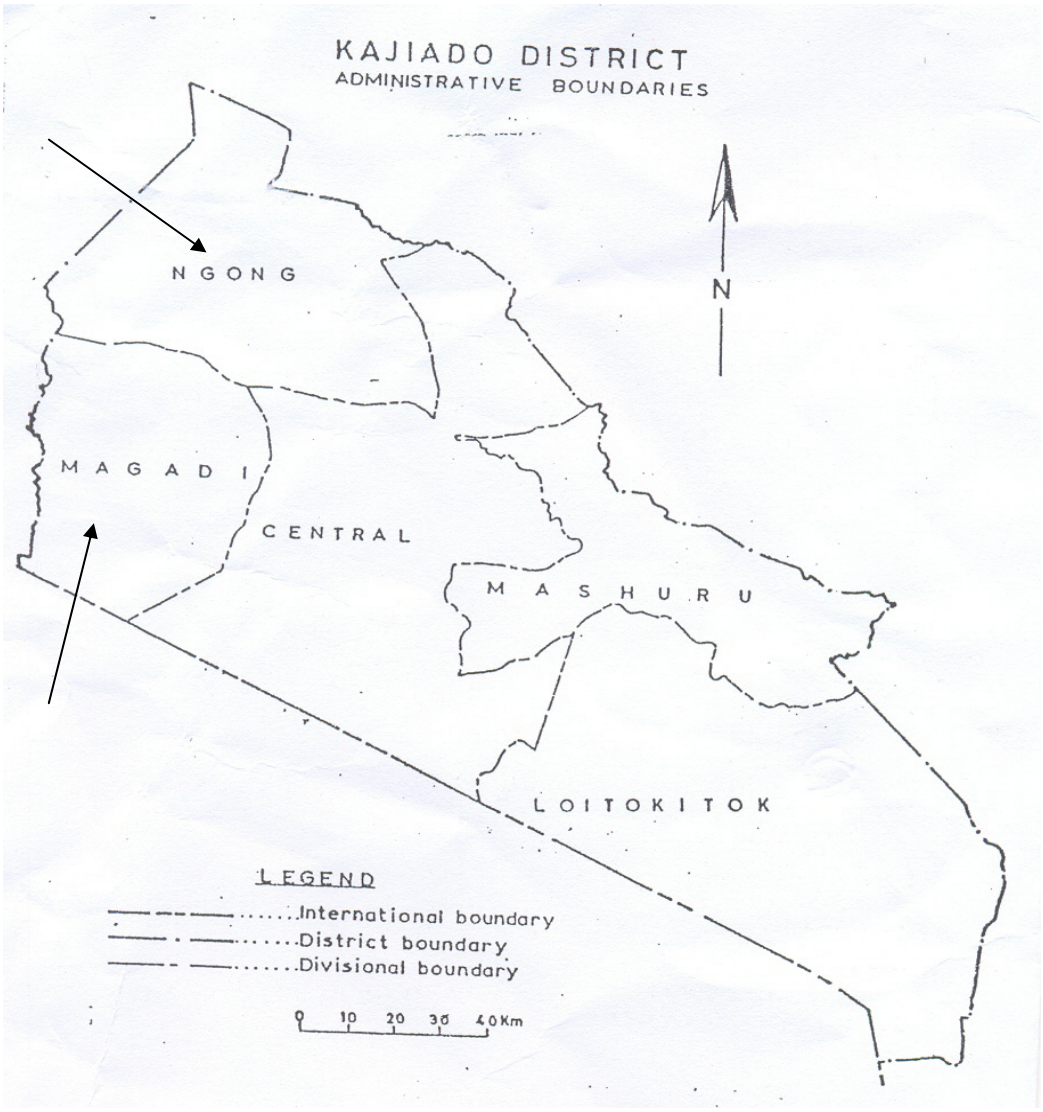
3.2 Independent and dependent variables

Dependent variable: Deciduous Canine Tooth Bud Extraction.

Independent variables: Nutritional status; feeding patterns; awareness, attitude and practices; maternal and child socio-demographic characteristics; breastfeeding and immunisation were independent variables.

3.3 Study site

The study was done in five sub-locations-Oltepesi and Eremit in Ngong Division and Magadi, Oldorko and Oloika in Magadi Divisions of Kajiado District in Kenya. Kajiado is one of the 18 Districts within the Rift Valley province. It is about 30 Kilometres south of the city of Nairobi, the southern part of the Rift Valley province. It borders Tanzania to southwest, Taita-Taveta District to the Southeast, Machakos and Makueni District to the East, Nairobi Province to the Northeast, Kiambu District to the North and Narok District to the west as shown in Figure 3:3.The District covers an approximated area of about 21,902.9 Square Kilometres and it is divided into seven administrative Divisions namely; Ngong, Magadi, Isinya, Central, Namanga, Mashuru and Loitoktok. It has 47 locations and 120 sub-locations. According 2002-2008 District Development Plan, the population was 484,249, with an annual growth rate of 4.51%. The inhabitants exclusively speak *Maa* language.



The study areas

*Adopted from KDDP (2005)

Figure 3-1: Map of Kajiado District showing the study site

This study was carried out specifically in Ngong and Magadi Divisions which are next to each other. Ngong receives better rainfall because of its altitude of 2,073m, and has more settled urban population. It has a higher population density of 66 persons per square km. This is different from Magadi, which has a population density of 11 persons per square kilometre, and lower rainfall because of its altitude of 500 metres above sea level (KDDP, 2005). Ngong is further divided into 10 locations and 29 sub-locations while Magadi has 4 locations and 13 sub-locations (KDDP, 2005). Magadi District has poor road network in the interior of the District.

3.4 Study population

This was defined as all the *Maasai* children aged 2-5 years and their mothers in Oltepesi and Eremit in Ngong Division; Magadi, Oldorko and Oloika sub-locations in Magadi Division. Selection of children aged between 2-5 years was done because this age group shows the evidence of DCBE in their erupted deciduous teeth more clearly than those groups of children with non erupted teeth (Wanzala *et al.*, 2008).

3.4.1 Criteria for exclusion

- All non- *Maasai* mother and their children as identified by field assistant
- Children above 5 and below two (2) years (the practice of DCBE is evident in children aged between 2-5 years, Hassanali and Amwayi, 1988)
- Children of mothers who did not give consent.

3.5 Sample size determination

The sample size for this study was determined according to the formula of Fisher (1958).

$$n = \frac{Z^{2}_{1-\frac{\alpha}{2}} P(1-P)}{d^{2}}$$

$$= \frac{1.96^{2} \text{ x } 0.7 \text{ x } (1-0.7)}{(0.05)^{2}}$$

Where: n = sample size to be determined

P (Prevalence of DCBE among children ranging from ages 4 months to 14 year with median age of five years) =70% (Wanzala *et al.*, 2005)

Z (Standard errors from mean) = 1.96

α = Level of significance = 5%

d (Absolute precision) = 5%

$$n = \frac{1.96^{2} \text{ x } 0.7 \text{ x } (1-0.7)}{(0.05)^{2}} = 323$$

Source: *Statistical Method for Research Workers*, Fisher (1958).

Because of the large study population, and in order to increase representation and precision, about 30% of the calculated sample was added, hence 420 subjects were sampled.

3.6 Sampling procedures

A list of all sub-locations from each Division was obtained from the District Officer from each Division. Two sub-locations in Ngong and three in Magadi Division were picked by simple random sampling. Simple random sampling technique was used to select the representative sample to participate in the study, since the populations were considered homogeneous (Easton and McColl, 2005) equal number of respondents was studied in each Division (Two hundred and ten, 210) mothers and their children aged 2-5 years were selected from each Division).

3.7 Selection criterion in the community

Multistage cluster sampling was used in this study (de Vaus, 1991). This method is appropriate for large communities. It is a technique in which the population is divided into large units from which a first stage cluster sample is randomly selected. Then a second stage sample is selected from those cluster samples selected in the first stage. MacMahon and Pugh (1970) said that this method of dividing the population into progressively smaller units can be used to create as many "stages" as desired. The following stages were followed:

3.7.1 Selection of a District and Divisions

Maasai community occupy two Districts in Kenya, Kajiado and Narok. DCBE is known to be practiced in these two Districts. Kajiado District was selected by tossing a coin (simple random sampling) for the study. Kajiado has seven (7) administrative Divisions (KDDP, 2002). All the divisions were listed; Ngong and Magadi were purposefully selected because the two areas had some contrasting features. Ngong

had predominantly urban, settled population while Magadi population was low, rural, sparsely distributed within the locations and semi- nomadic. Further, both Divisions (Ngong and Magadi) were easily accessible.

3.7.2 Stage one: selection of locations

Using the old boundaries (KDDP, 2002), a list of all four (4) locations and 13 sub-locations in Magadi division and ten (10) locations and twenty nine (29) sub-locations from Ngong division was obtained from the District Officers in the respective areas. Using simple random sampling method, one location, Keekonyokie from Ngong Division, and Shompole from Magadi Division were selected for the study.

3.7.3 Stage two: selection of sub locations

From the list of each location selected in Ngong and Magadi divisions, two sub-locations (Eremit and Oltepesi) from Ngong Division and three sub-locations (Magadi, Oldorko and Oloika) were selected using simple random sampling.

3.7.4 Stage three: selection of clusters

The record from Central Bureau of Statistics (CBS) and with the help of assistant chief of each sub-location assisted in identifying clusters. All clusters were listed, and by use of simple random method, clusters with several *Manyattas* (homesteads) were selected for the study. A total of fourteen (14) clusters were selected for the study.

3.7.5 Stage Four: selection of *Manyattas*

All the *manyattas* (homesteads) were given numbers for easy identification to avoid revisiting the same. The assistant chief in each sub-location assisted in identifying the *manyattas.* The 5 *manyattas* from each cluster, which were included in the study, were selected using simple random sampling. (Each manyatta approximately-12 households)

3.7.6 Stage Five: selection of subjects in the *Manyattas*

In the *manyattas*, systematic sampling was used to select the households. About 30 households were studied per cluster. All mothers with their children 2-5 years old were identified at the doorstep. Subjects for study were selected using simple random sampling. If a mother had more than one child aged 2-5 years one of her children was selected using simple random sampling. A total number of 420 children and their mothers were included in the study, 210 from each Division.

3.7.7 Selection of the subjects for focus group discussion

In each sub-location, ten *manyattas* with mothers having children aged 2-5 years were selected using simple random sampling. Only mothers with children 2-5 years were included in the study. A total number of 10 women participated in Focus group Discussion (FGD) in each sub-location. The same number and procedure used for selection of mothers was used to select the men and children. In each sub-location one FGD session was conducted for each group of respondents.

3.7.8 Selection of key informants

Specific community elders, leaders, key people in the community were purposefully selected as key informants. One adult male and female from each sub-location were included in the study. Those selected included TBAs, Chiefs and specific respected elders in the community.

3.8 Research instruments

3.8.1 Translation and adaptation of the questionnaires

All the questionnaires (Appendices 1-7) were translated from English to *Maa* dialect, which is the language used by the community, by three professionals fluent in English and *Maa* language and back-translated to English by two other independent translators. A group of health workers including one of my supervisors who understood the *Maa* language reviewed the *Maa* version of the questionnaire and made corrections accordingly. The questionnaires were also checked to reflect sensitivity to culture and use of appropriate words.

3.8.2 Structured interview guide for selected mothers in the household

Structured interview guide (Appendix 1) was developed for interview schedule, which was used to obtain data from mothers on issues pertaining to:

- Demographic characteristics
- Birth weight
- Immunization/vaccination
- Breast feeding
- Child Nutrition

- Parity

Interview schedule guide included closed ended and open-ended questions to capture expressions by respondents (Appendix 1).

3.8.3 Structured interview guide for key informants

This was used to collect data from in-depth interviews with key informants selected from the community members (Appendix 2).

3.8.4 Oral examination form

Oral examination was done on children 2-5 years. This is the age at which missing teeth could indicate DCBE. The oral cavity was observed using natural lighting and recording in a specially designed form, (Appendix 3) which captured the following:

- The teeth present (deciduous and permanent teeth were recorded).
- Teeth un erupted
- Teeth missing due to DCBE
- Erupted teeth

3.8.5 Focus group discussion guide

Focus Group Discussion guide containing about 10 questions (Appendix 4) was used in the discussions. The discussions were carried among homogenous groups, of men, women accompanied by children. Age- set, sex, parity and class level were used to define homogeneity. Women and men were interviewed separately. Groups interviewed were not less than 8 in number. Men having age difference of not more than ten years (same Age-set) formed a group. Mothers with children aged 2-5 years

were included in the discussions. Children who were 5 years old and in nursery school and could understand were included in the discussions. Notes were taken during the discussions and proceedings recorded in a tape recorder.

3.9 Data collection procedures

3.9.1 Procedure followed in data collection from the selected respondents

With the assistance of a translator, the study was explained to the mothers of their children 2- 5 years willing to be included in the study. The mother was requested to consent only after explanation. The mothers signed by thumb printing a written consent but were made to understand that, joining the study and signing the consent was voluntary. Structured questionnaires were administered to them. One Oral Health Officer assisted by the Investigator carried out oral examinations on selected children aged 2-5 years old. The investigator also took the weight and height of the children. Later, one Focus Group Discussion (FGD) was carried out among groups of 10 men, women and their children in each sub-location. A moderator and two note takers were involved. In-depth interviews were conducted with purposefully selected- male and female (two) informants from each sub-location using key informant interview guide (Appendix, 4). The key informants were known members of the community who were respectable and knowledgeable and could influence in decision making on various issues in the community.

3.9.2 Oral examination to determine the prevalence of DCBE

Oral health examination was done by a Community Oral Health Officer, under supervision of the Investigator. An oral examination was performed on a child seated or held by the mother facing a source of light. Using natural source of light a spatula was used to distract the oral tissues. Disposable latex gloves were used on each child. The teeth were recorded as erupted, un-erupted, and missing due to DCBE, erupted and extracted (traditional). The data was recorded in a designed oral examination form.

3.9.3 Qualitative data to determine awareness, attitude and practices

Awareness, attitude and practices of DCBE were obtained by use of interview schedule; In-depth interviews and FGD. FGD guide containing 14 questions was developed. The questions were administered to participants who were about 8 - 12 in number. The local interpreter assisted in interpretation. The questions were open and closed- ended, propping and in-depth discussions were undertaken to elicited more information on DCBE practice. Prop of population awareness about the presence of DCBE practice in the community was done. The study elicited information on whether there were children who had undergone DCBE in the study area, persons who were involved in the practice and how they performed it. The respondents gave the reasons why the practice was common in the study area, its benefits and whether the practice was of any benefit and whether it should continue or not.

3.9.4 The assessment of food consumption patterns.

A weekly food eating pattern was obtained from each of the respondents and entered in food frequency table containing various groups of foods (Appendix, 5).

3.9.5 Measurement of child nutritional status

Anthropometric measurements, for stunting: Height for Age (HFA); underweight: Weight for Age (WFA); and wasting: Weight for Height (WFH) was taken using WHO guidelines. The three indices were expressed as standardised scores (z-scores) or standard deviation units from median for the child growth standards recommended by the World health Organisation (WHO, 2006).

The heights of the children were taken while standing since they were above 24 months. The child was placed at the middle of the height board, with the head, buttocks, against the board and legs fully extended by straightening the knees. The child looked straight ahead with the cursor positioned on the top of the head. The child was not wearing shoes. The measurement was recorded to the nearest 0.1cm. Two height measurements were taken and if the difference between both readings was less than 1cm, an average was calculated and recorded.

Digital bathroom scales with clear glass windows (*seca*, made in Germany) which measured up to 25 kilograms were used to obtain weight of the selected children. Children were made to remove shawls, *kanga* (gowns) and jackets and other excess clothes and to only remain with light clothing. The scales were always adjusted to zero (0.00) before using them. Weight was taken in kilograms (to the nearest 100

grams). Two weight measurements taken and an average calculated and recorded. A known weight of 5 kg was used to check the weighing scales.

3.9.5.1 Determining the age of children

Confirmation of the age of children was done using immunisation card and also by use of the dental age. Mothers were asked to recall the date of birth of the child and cards were used to confirm. Children who had developed the first permanent molars were automatically not included in the study since these teeth develops at about 6 years. Age was recorded in months.

3.9.5.2 The z-scores

The study used z-scores to describe anthropometric status of children. The z-scores measures differences between the value for an individual and the median value of the reference population for the same age or weight divided by standard deviation of the reference population. This allows observation on normal curve thereby detecting of movements towards or away from median (WHO, 2006). The z-scores provided information on how many standard deviation units an individual child measurement was away from the median of reference population. A z-score which showed a positive means that the child average (mean) is higher than the reference mean, while a negative z-score means that measurement are lower than reference mean.

3.9.5.3 The Anthropometric cut-offs

In order to determine which children are malnourished, each child's weight and height need to be compared with data of standard population (WHO, 2006). One of

the methods is calculation of z-score of each child. The z-score are measures of standard deviation and shows how far the child deviates from average. The z-score cut-offs used considered as not malnourished when z-scores values were less than two (<-2) z-scores, irrespective of indicator used. The children were considered moderately malnourished when z-scores were between <-3 to -2 z- scores and severely malnourished when z-score was -3 and below irrespective of indicator used. Therefore, children who fall on more than two standard deviations below reference median were regarded as malnourished, while those who fall more than three standard deviations below the reference median were considered severely malnourished. Acute malnutrition (wasting) was classified as Global Acute Malnutrition (GAM), Moderate Acute Malnutrition (MAM) and Severe Acute Malnutrition (SAM). The standard cut- offs for GAM cases were those children with Weight for-Height (WFH) index below a z-score of -2. The MAM children were those with WFH between a z-score of -2 and -3 z-scores while the SAM children were those below a z- score of -3.

3.10 Pre-testing questionnaire and the anthropometric tools

To overcome the cultural, illiteracy and language problems, two local moderators were trained for one week on the data collection techniques before they participated in the project. Interview schedule guide, focus group discussion guide, nutritional assessment form and examination forms developed were pre-tested two times before use. The instruments were piloted on a sample of 42 mothers and children in Oltepesi sub-location. This was done to determine the duration of the interview (about 7-10 minutes) and to test the feasibility of the study. Final corrections were done on the

instruments after pre-testing. Weighing scales were tested daily using a known weight of 5 kilogram.

3.11 Ethical consideration:

3.11.1 Risks

There were no risks anticipated to cause pain or discomfort to the child. Some children who did not cooperate in opening their mouths were excluded. The field assistants explained the procedures to the mother and children who could understand.

3.11.2 Research Permission

The proposal of this research study was forwarded to Scientific Committee and Ethical Review Committee in KEMRI for approval (Appendix 6). Permission to carry out this project in Kajiado District was obtained from the provincial administrators (District Officer and the chiefs), Appendix,7; District Medical Officer of Health (MOH, Kajiado) and District Education Officer and Divisional Educational Officer, head teachers and head of the *Manyatta* selected.

3.11.3 Consent and assent

Subjects gave informed consent. Consent forms (Appendix 8) were provided for signature or thumb printing. Before the mother and child were allowed to make decision to participate in the study, the following guidelines were applied for all participants:

- Participation was voluntary.
- Mother and child had right to withdraw.

- No penalty or loss of any sort waste is incurred after withdrawal.
- Participants were free to ask any question after explanations.
- Only children aged 2-5 years were allowed to take part in the study.
- One was only allowed to take part in the project after signing the consent form.

Children who could understand were given the opportunity to assent before they were examined (Appendix 9).

3.11.4 Confidentiality of the information collected

The recorded information was kept confidential by the author at Community Oral Health Department (KMTC) under lock and key. No identity of any specific mother or child was disclosed in reports or publications.

3.12 Data management and analysis

Data was cleaned, coded and analyzed using Statistical Package for Social Science (SPSS, version 14) computer package. Nutritional status was analysed using Nutri-Survey, 2007 (ENA for SMART), the z-scores obtained were based on WHO reference points and were transferred to SPSS for further analysis. The analysis of data involved descriptive statistics. Means, standard deviation and medians for continuous variables data such as age, birth weight**,** current weight and height were recorded. Frequency distribution including proportion and cross tabulation and proportions for categorical data such as gender, occupation, nutritional status,

immunisation, knowledge, practices, attitude and breast feeding was obtained. Chi-square was used to determine the relationship between nutritional status and DCBE practice (categorical data). A dichotomous variable (DCBE) was captured as presence or absence. A P-value of less than 0.05 was considered significant. Non-statistic computerized z –scores was done to classify children as stunted, wasted, or underweight. Relative risks between DCBE and nutritional status were assessed using Odds Ratio (OR). In addition, the influence of various independence variables were assessed by odds ratio and adjusted for stratum differences using Mantel-Haenszel (MH). Analysis of variance and Duncan's multiple range tests to detect if there is any statistical significance between DCBE and Dietary pattern of children in all ages included in the study. Student's t-test to detect if there is statistical significance between the DCBE and non-DCBE in children 2-5 years old was used.

Excel computer programme was used to develop graphs and charts. Data was presented in form of tables, charts and graphics. The entered data was stored in flash disks and Compact Disks (CDs). Qualitative data was transcribed, translated and analysed thematically. Relevant conclusions and recommendations were documented. The factors that were found to be associated with DCBE could be used to develop intervention strategies for prevention of DCBE.

CHAPTER FOUR

4.0 RESULTS

4.1 Sample profile

4.1.1 Demographic characteristics of children by sex

Table 4-1 below summarizes demographic characteristics of the children included in the study by sex. A total of 420 children were included in the study. In total 50.2% children were sampled from Magadi Division (211) while 49.8% (209) were from Ngong Division.

Table 4-1: Distribution of study Population by site and sex

Examination area		**Sex of Index Child**				**Total**	
		Male		**Female**			
Division	**Sub-location**	**n**	**%**	**n**	**%**	**n**	%
Magadi	Oloika	37	50.7	36	49.3	73	17.4
	Magadi	34	49.3	35	50.7	69	16.4
	Oldorok	38	55.1	31	44.9	69	16.4
	Total	**109**	**51.7**	**102**	**48.3**	**211**	**50.2**
Ngong	Oltepesi	52	50.5	51	49.5	103	24.5
	Eremit	59	55.7	47	44.3	106	25.2
	Total	**111**	**53.1**	**98**	46.9	**209**	**49.8**
Total		**220**	**52.4**	**200**	**47.6**	**420**	**100.0**

4.1.2 Ages (in months) of the children included in the study

Figure 4-1 shows the age of the children included in the study. The children identified were between 2-5 years. The mean and median age was 3.25 and 3.0 years, respectively.

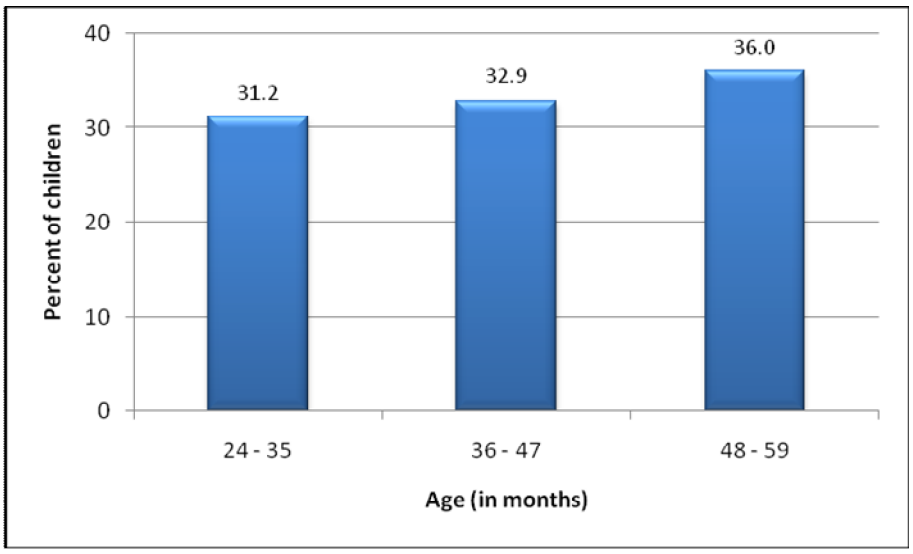


Figure 4-1: Age group of index children in months

4.1.3 Care of the children in the study area

Care-takers of the children in the study area were mainly mothers (92.4 %), very few fathers (2%) and 6.0% relatives such as brothers, sisters, aunts and grandmother, cared for the children (Figure 4-2).

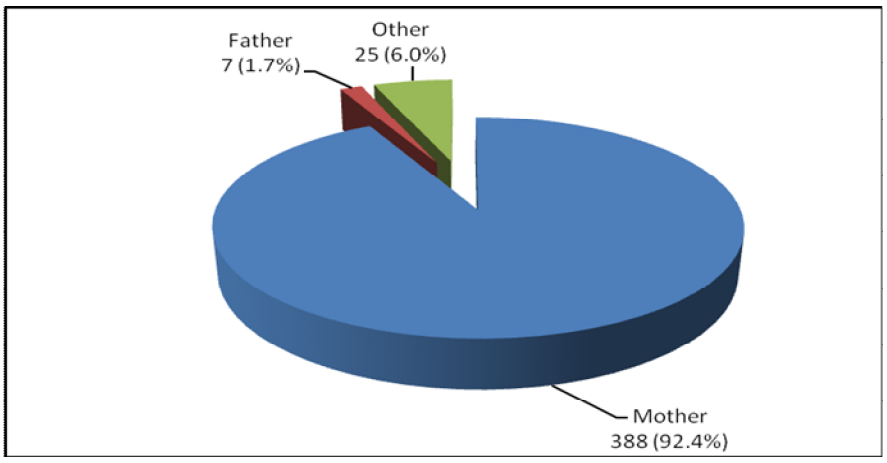


Figure 4-2: Care takers of the children in the study area

4.1.4 Age distribution of the mothers of children examined

The age of the majority of the mothers (72.6%) was between 20-40 years as shown in Table 4-2.

Table 4-2: Age range distribution of the mothers examined

Age-group of the mothers	Number (n)	Percentages (%)
≤19 yrs	2	0.5
20 - 29 yrs	155	36.9
30 - 39 yrs	150	35.7
40 - 49 yrs	80	19.0
>49 yrs	33	7.9
Total	420	100

4.1.5 Marital status and type of marriage of the respondents

The results of this study show that 94.8% of the subjects interviewed were married and 5.3% were single, including those divorced, widowed or not married. Those in polygamous marriage were 197 (46.9%), while 201(47.9%) were in monogamous marriage. About 22 (5.2%) did not indicate whether they were in monogamous or polygamous marriage (Figure 4-3).

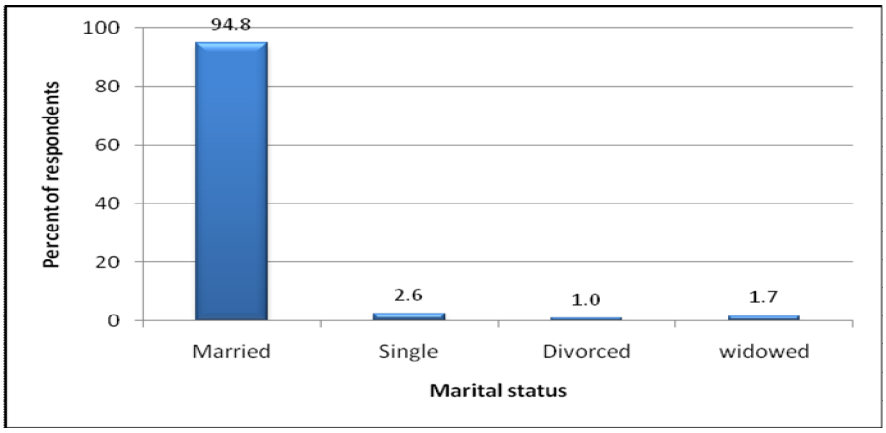


Figure 4-3: Marital status of the respondents

4.1.6 Education level of the respondents included in the study

Figure 4-4 shows the respondents' educational level. Most, 375 (89.3%) of the respondents had no formal education; while 35(8.3%) had attended primary school, 7 (1.7%) secondary school and a few, 3 (0.7%) had college education.

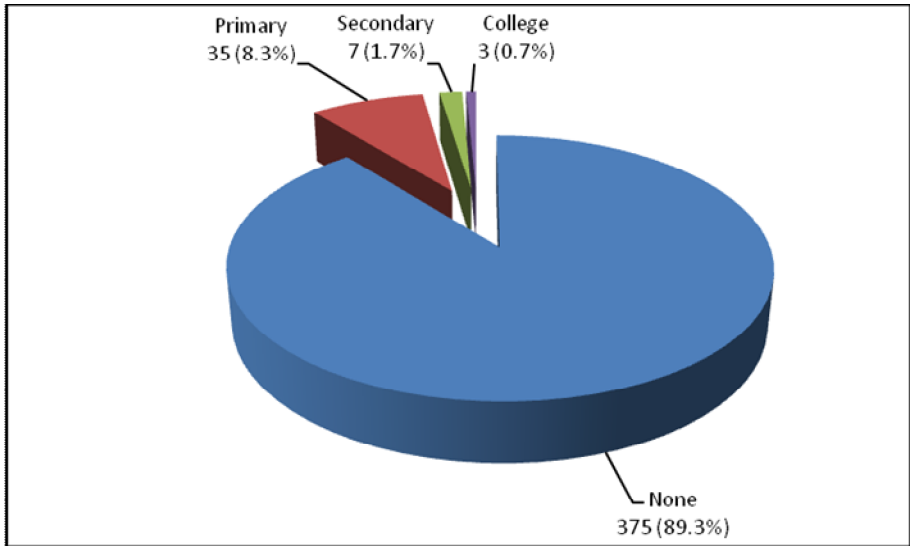


Figure 4-4: Highest educational levels of respondents

4.1.7 Parity of the selected mothers

The number of children borne to the mother of the index child ranged from 1-10 with a mean of 4.12, median of 4 and mode of 3. Most of the respondents had more than five children as shown in Figure 4-5.

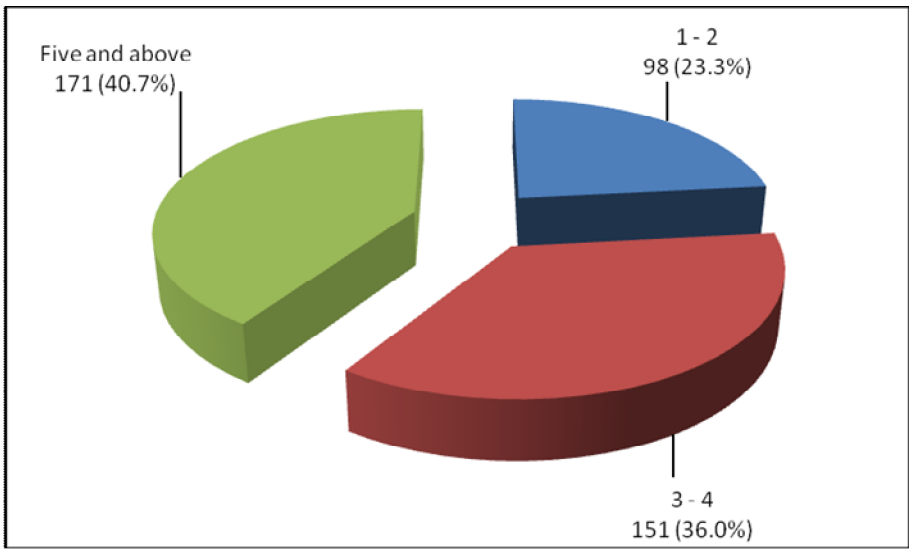


Figure 4-5: Parity of the selected respondents

4.1.8 Source of income of respondents

Income of the respondents was mainly from livestock 82.6%. Minority were in business (14.8%), salary (1.4%) and farming (1.2%) as shown in Figure 4-6. From focus group discussion most of the mothers said that *("… women are never considered in wealth distribution, they are, however, supposed to provide food for the family by their own means. Hence, some are engaged in charcoal burning as a way of earning a living").*

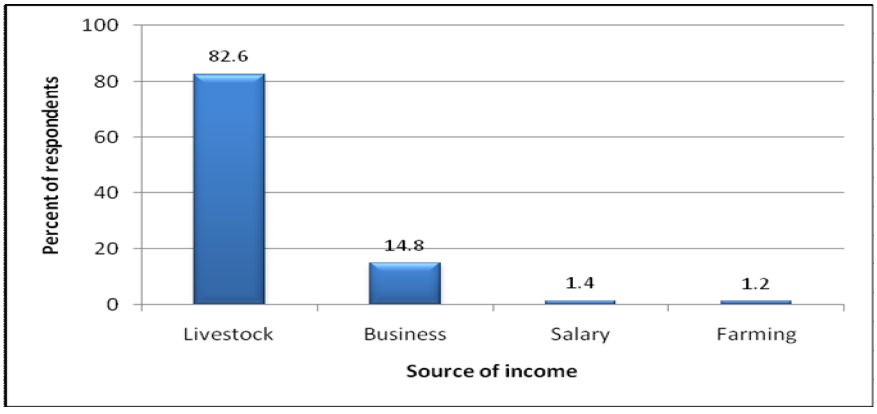


Figure 4-6: Source of income of the respondents

4.1.9 Position of the index child in the family

Figure 4-7 below presents the position of the index child. About 21.9% of the children were first borne while 19%, 19.5%, and 17.9% were second, third and fourth born respectively.

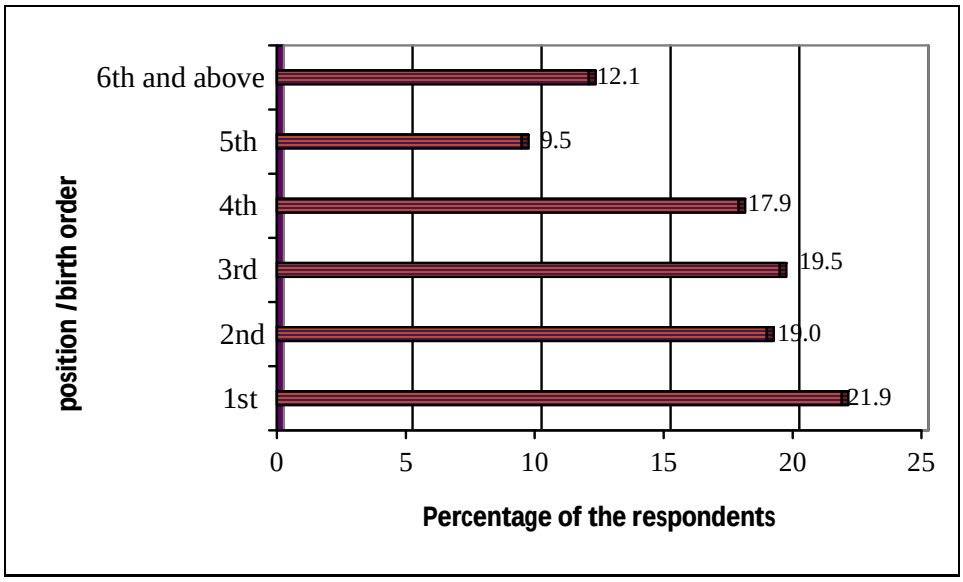


Figure 4-7: Position / birth order of the index child in the family

4.2 Health and dietary practices of the children

4.2.1 Immunization status of the children selected

The study results showed that, 31.2% had their immunisation cards available while 68.8% did not have. Only 17.1% of the children examined had immunization programme on schedule. In one of the focus group discussion in Magadi Division, the women said, *"We take our children for immunization, those who do not take is probably because of negligence, ignorance, lack of commitment and distance to the health facility. Lack of education among women makes it difficult for men to convince their wives to go to clinic"*. The findings also showed that about 20.9% had

never had any immunization at all. The vaccine that was skipped by most of the children was measles (26%).

4.2.2 Duration of breast feeding and care of the baby

Figure 4-8 shows duration of exclusive breastfeeding of the baby. More than half (63.6%) of the mothers exclusively breastfed their newborn babies during the first month only while a few breastfed for a period of four months (14.5%) and six months (9.5%). The results also revealed that more than 90% of the mothers fed and cared for their children themselves.

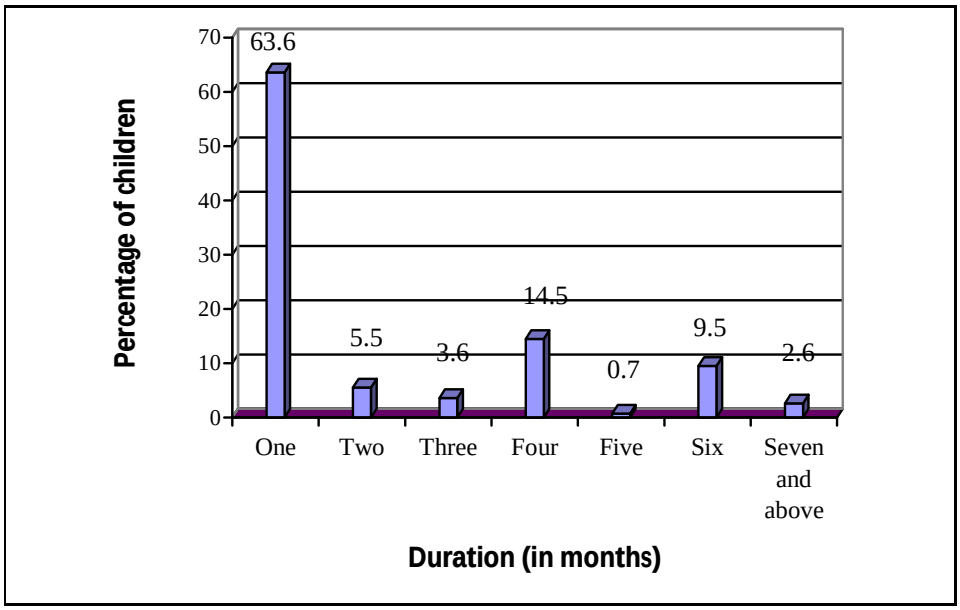


Figure 4-8: Percentage of children exclusively breastfed

4.3 Prevalence of DCBE of children 2-5 in Ngong and Magadi Division

4.3.1 Prevalence of DCBE in relation to study areas

The study revealed that, out of 420 children who underwent oral examination, 103 (24.5%) had undergone DCBE. However, one of the key informants, reported that,

"*There were many children in our community who have had removal of canine tooth bud, however many of them hide…*"). On oral examination, the findings show that DCBE was mostly carried out in the lower jaw. Left and right lower deciduous canine had been extracted in 23% (n=98) of children compared to 8 (1.9%) who had removed on the upper right jaw, while 6(1.4%) of them had been extracted on the left upper jaw. More children (27.8%) had undergone the practice of DCBE in Ngong Division compared to 21.3% in Magadi Division. However, there was no significant difference (p=0.200) in prevalence of DCBE between the two study areas,

Table 4-3. Within the sub-locations, prevalence ranged from 11.6% in Magadi to 41.7% in Oltepesi.There was significantly different (P≤ 0.00) in the prevalence due to study locations as shown in Table 4-3.

Table 4-3: Prevalence of DCBE in relation to area of examination

Division		Practice of DCBE		Significance
	n	Freq	%	
Magadi	211	45	21.3	$\chi^{2=}$1.641 df=1 P-value 0.200
Ngong	209	58	27.8	
Sub-location				
Oltepesi	103	43	41.7	$\chi^{2=}$34621 df=4 P-value 0.000
Oloika	73	21	28.8	
Magadi	69	8	11.6	
Eremit	106	15	14.2	
Oldorok	69	16	23.2	

N=420

The results show that the practice was more common in some sub locations than others, For instance men in Eremit said that, "*The practice is now not common because there are many hospitals, culture is no more followed and Christianity is infiltrating into the community, but a few still practice it because it is a quick non expensive way of treating a child"*.

4.3.2 Prevalence of DCBE by sex and age of the index child

Although male had higher prevalence (26.8%) compared to female (22.6%) there was no significant difference between gender (p=0.200); Table 4-4 shows that the practice of DCBE was highest (26.0%) among 5 year old children compared to children aged 4 (22.6%), 3 (25.8 %) and 2 (23.9%) years.

Table 4-4: Prevalence of DCBE in relation to sex and age of index child

Sex of index child	Practice of DCBE		Statistics
	freq	%	
Male(n=220)	59	26.8	$\chi^{2=}$1.641,df=1,
Female (n=200)	44	22.6	P-value 0.200
Age of index child			
2 years(n=67)	16	23.9	$\chi^{2=}$34621
3 years (n=124)	32	25.8	df=4
4 years(n=133)	30	22.6	P-value 0.000
5 years(n=96)	25	26.0	

N=420

4.3.3 Prevalence of DCBE by socio-demographic characteristics

Table 4-5 describes the prevalence of DCBE in relation to some socio-demographic characteristics of the respondents interviewed. Those who were in monogamous marriages were less likely to allow their children undergo the practice of DCBE compared to those in polygamous marriage (Adjusted MH Odds Ratio 1.039-2.615). There was significant difference (p=0.00) in the prevalence of DCBE among those who were married (24.6%) compared to those who were not married (22.7%).

The results showed that those who had primary, secondary and college education had higher prevalence of DCBE compared to those who had no education. This difference was however was not significant (p=0.115). The practice of DCBE occurred almost equally among all the socio-economic groups, that is, housewives (24.5%) and those in business, farming or employed (24.6%). The prevalence of DCBE was also significantly different (p=0.00) between respondents whose source of income was livestock (24.5%), business (25.0%), farming and formal employment (9.1%).

Table 4-5: Socio-demographic characteristics of respondents and DCBE prevalence

Socio-demographic characteristics		**Practice of**		**Significance**
		freq		
Level of Education	None (n=375)	16	23.9	$\chi^{2=}$5.93 df=3 P-value 0.115
	Educated (n=124)	32	25.8	
Marital status	Married (n=398)	98	24.6	$\chi^{2=}$83.97 df=1 P-value 0.000
	Not married (n=22)	5	22.7	
Occupation	Housewife (n=355)	87	24.5	$\chi^{2=}$48.942,df=1 P-value 0.000
	Business, employed, farmer (n=65)	16	24.6	
Source of income	Livestock (n=347)	88	25.4	$\chi^{2=}$128.291 df=1 P-value 0.000
	Business (n=62)	14	22.6	
	On salary, farming (n=11)	1	9.1	

4.3.4 Child health practises and DCBE: Immunisation and breast feeding

The findings presented in Table 4-6 show that the practice of DCBE was significantly different (p=0.00) among those that had immunization cards (20.6%) and those without the cards (26.3%). Among the DCBE children, 19.4% had immunization on schedule compared to 41.2% who were not on schedule, this difference was significant (P=0.00). On breastfeeding practices and prevalence of DCBE, the results indicated that the prevalence of DCBE was significantly (p=0.00) different among who breastfed for less than 24 months (n=123) compared to those who breastfed for 24 months and above (n=297). There was a significant (P=0.00) difference in the practice of DCBE among those who exclusively breastfeed at six months compared to those that did not exclusively breastfed, as depicted in

Table 4-6 : Prevalence of DCBE in relation to child health practices

Child health practices		Practice of DCBE		Significance
		freq	%	
Immunisation card present	Card present (n=131)	27	20.6	$\chi^{2=}$23.311 df=1,P-value 0.000
	No card (n=289)	76	26.3	
Immunisation status	On schedule (n=72)	17	23.6	$\chi^{2=}$27.272 df=1,P-value 0.000
	Not on schedule (n=17)	7	41.2	
Length of breast feeding	Less than 24 months (n=123)	25	20.3	$\chi^{2=}$27.272 df=1,P-value 0.000
	24 months and above (n=297)	78	26.3	
Exclusive Breast-feeding at 6months	Yes (n=43)	12	23.5	$\chi^{2=}$60.592 df=1,P-value 0.000
	No (n=380)	91	24.7	

N=420

4.4 Awareness, attitude and practice on DCBE in Ngong and Magadi Divisions

4.4.1 Origin of DCBE practice in *Maasai* community

Those interviewed reported that the practice of DCBE originated from the calves, (58.6%) while some had no clue on its origin (26.4%). A few (6.4%) alleged that their grand parents know while others said they only know it as a cure for infantile illnesses (1.7%). Others comprised, 6.9 % of respondents gave various reasons such as the practice was a tradition, diffusion from other communities or they found their parents doing it and just adopted it. One key informant said, *"This removal of the teeth originated from the treatment calves (Olashe), in the 1960's. The calves had terrible diarrhoea, looked pale and could not feed. When examined, four teeth*

protruding observed. The teeth were extracted, and the diarrhoea stopped. The calves started feeding, and since then, the practice was adopted as a common treatment for infants with diarrhoea."

4.4.2 Awareness of the practices of DCBE in the study area

The awareness of DCBE was high. One of the key informants, quoted thus: "*ketii nkera kumok tolosho le maa naitayioki ilala lekitishu kake keisudoo nkera kumok nemelimu ajo eitayioki ilala lekitishu"* ("There are many children in our community who have had removal of canine tooth bud, however many of them hide, they will not tell you…"). Figure 4-9 shows that 91% of those interviewed reported that, there are children in their community who have had DCBE, while 9 % said they have not seen and are not aware of DCBE. The practice was perceived to be common as reported by 70% of respondents. Among the 420 respondents interviewed (97.4%) percieved that DCBE was performed by TBAs. Among the mothers whose children had undergone DCBE (103), 85.8% of them claimed that the canine tooth bud extraction was done by a TBA, 9.5% said it was done by a traditional healer, while 2.8% reported that they did it, while 1.9% said it was performed by a grand parent or a relative. Regarding the general oral health, 43% did not know any causes of dental diseases, while a half of them did not know any preventive measures for dental diseases.

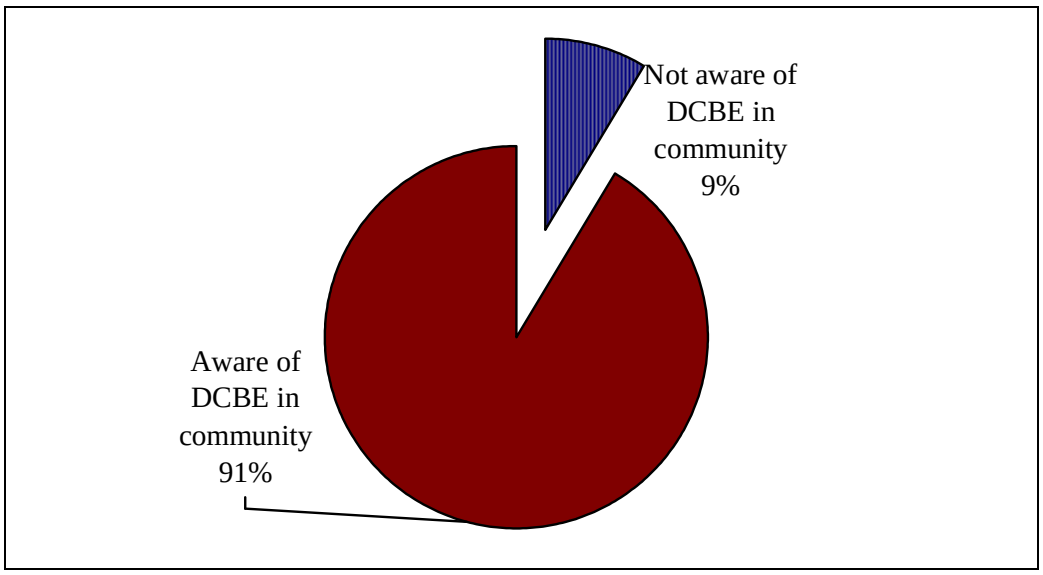


Figure 4-9: Respondents' awareness of DCBE

4.4.3 Age at which DCBE was done on children examined

Figure 4-10 shows that the practice of DCBE in children was frequently carried out at the age of 0-4 months 266 (63.3%) while others did it at the age of 5-12 months, 149 (35.5%).

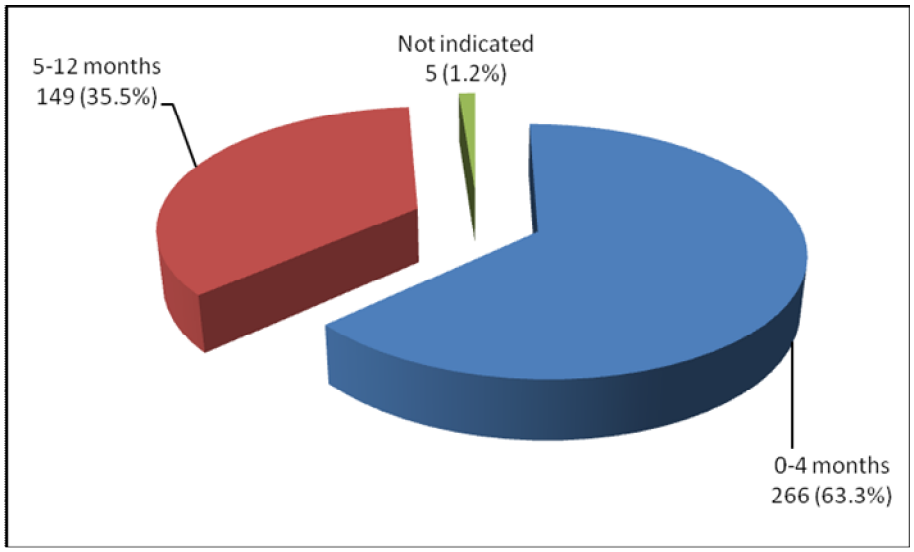


Figure 4-20: Age at which DCBE was done in children

4.4.4 Instruments used for the extraction of the canine tooth bud

The most commonly used instrument for DCBE was the penknife - *Nkalem* (98.2%). Razor blades, wires, fingers and other gadgets are rarely used. One of the men in Ngong said, *"They use penknife (Enkalem) others use a needle or squeeze using fingers depending on who is providing the treatment"*. One of the practising TBA who was a key informant in Magadi said, *"…a small knife called (Emponet) is used to pluck it out…, sometimes there is no need of washing it or sharpening it because the mouth is small, and smooth…"* One of the practicing TBA who was a Key Informant said *"enkalem eitaunyieki ashu ol'tidu ashu atukunyaki ilkimojik.* ("The main instrument used is penknife, (*Enkalem*).

4.4.5 Health status of the index child two weeks before examination

Figure 4-11 shows that slightly more than half of the children (55%) had recently been sick, at least two weeks prior to the study. Most of them suffered from fever(35%, diarrhoea (11.0%), and URTI (9.0%).

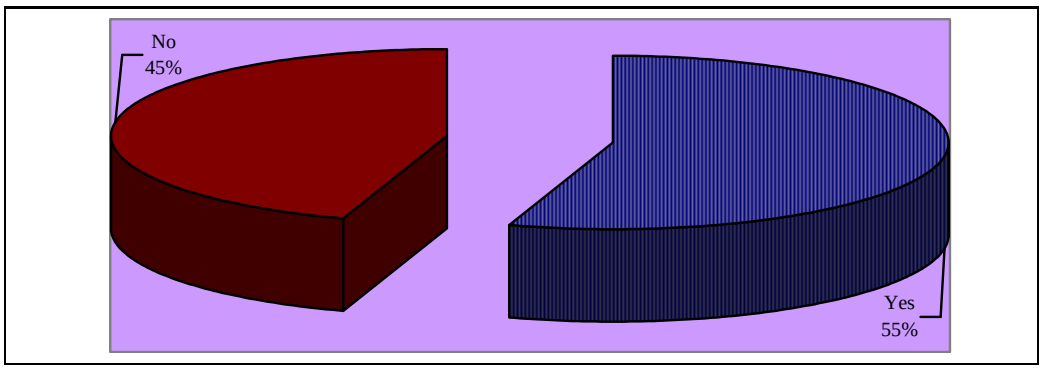


Figure 4-31: Children reported sick two weeks before the study was done

4.4.6 Health status of the child when DCBE was performed

About 89.6% of the respondents reported that their children were sick at the time of the DCBE operation. The symptoms of sicknesses were mainly diarrhoea (79.6%), fever (17.2%) and sore throat (3.2%) as shown in Figure 4-12. The main reasons for the diarrhoea were given by men in a focus group discussion who said "*Women give the children fats and some do not wash their hands, the child could get bad diarrhoea…").*

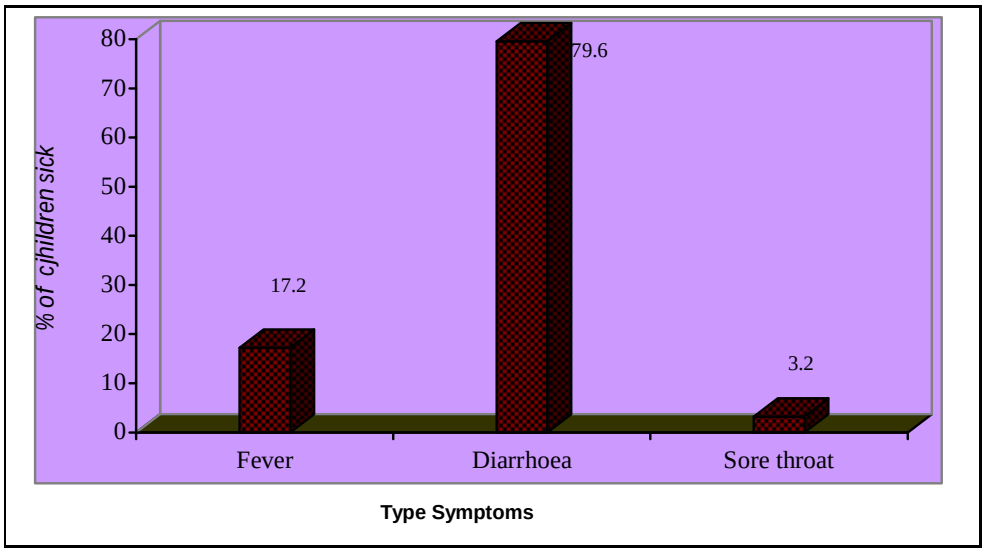


Figure 4-12: Symptoms of illnesses suffered by the child at the moment DCBE Operations

The findings also revealed that of those children who were sick during DCBE, only 64.9% took their children to the hospital for treatment, 24.0% were treated at home by TBAs while 11.4% claimed that their children got healed without any intervention.

4.4.7 Payments for DCBE practice

About 90.4 % of the respondents reported that monetary rewards are given to those performing DCBE. However, sometimes livestock (2.6%) and milk (7.0%) could also be given as gifts. The money that TBAs charged the mothers was between Ksh. 20 and Ksh. 200. Most of them reported paying Ksh.50 (24.3%), Ksh 100 (38.3%) Ksh 20 (15.8%) and Ksh 200 (11.7%), as shown in Figure 4-13. Others, (9.9%) did not pay.

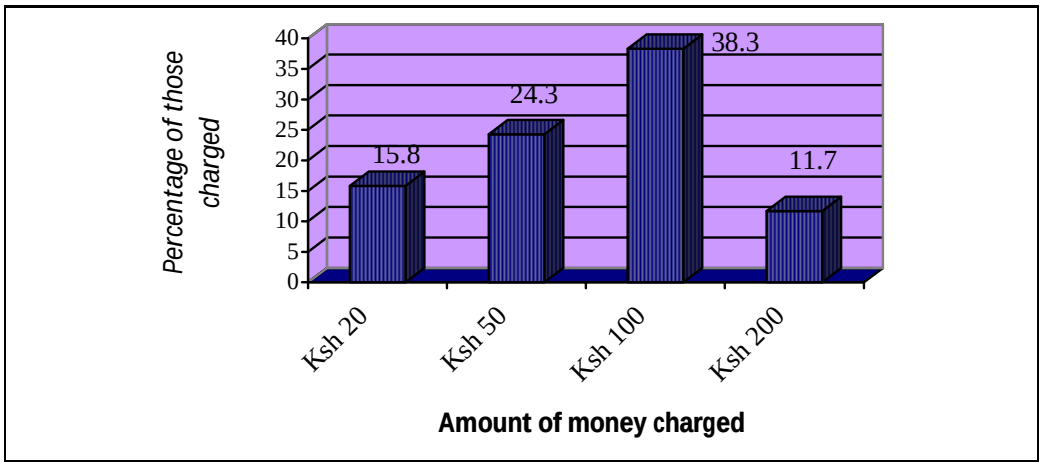


Figure 4-43: The money charged by practitioners for DCBE

4.4.8 Complications arising from the extraction of DCBE

About 80% of the mothers of respondents who had undergone DCBE claimed to have no complications. Probing further, they acknowledged that bleeding (28.6%), anaemia (29.1%), growth faltering (27.2%), feeding problems (26.7%) and infections (25.0%) are almost common complications that could occur during DCBE. Among those who acknowledged that there were complications, the results of the study shows complications associated with DCBE were reported to be bleeding (87.6%), malocclusion (25.7%), feeding problems (32.9%), infections (42.4%), anaemia (41.2%), and malocclusion (25.7%), as shown in Figure 4-14. The children in a

focus group discussion, reported that they are subjected to a lot of pain, *"The young children who undergo DCBE feel a lot of pain and sometimes we also cry "… we are told not to cry because we are promised a big gift of… .Like a cow of your own").*

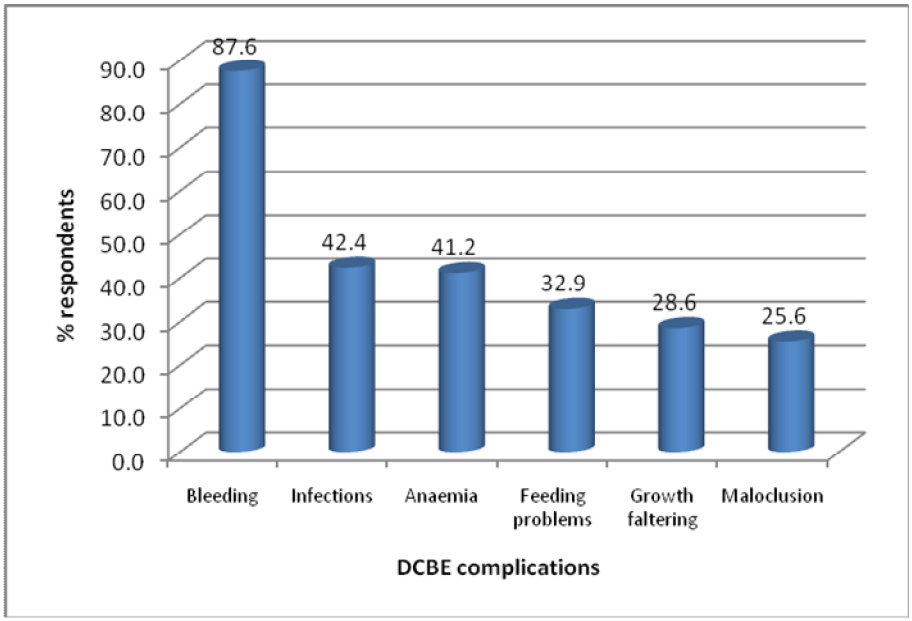


Figure 4:54: Types of DCBE complications as reported by respondents

4.4.9 Treatment given to the child who has undergone DCBE

Different methods were used to treat complications due to DCBE. Those living near Lake Magadi used sodium bicarbonate which was locally available. In the women's FGD, the respondents reported the use of salt or salty water, honey, onions, or sodium bicarbonate to treat the wound. Sometimes they apply *ugali* to block the bleeding vessels. Development of profuse bleeding was associated with curses. In such cases, *Enkopito*, which is the bark of a special tree, is tied around the fore limb of the baby to stop further complication, and appease any bad spirit.

4.5 Respondents' Perceptions on DCBE

4.5.1 Respondents' perceived benefits of DCBE

Figure 4-15 shows the perceived benefits of DCBE. Many 84.0% reported DCBE as being important in stopping of diarrhoea, 91% reported that it stops vomiting, while 84.3 % alleged that it improves child's appetite and growth (89.8%). About 76.4% claimed to prevent death of a child.

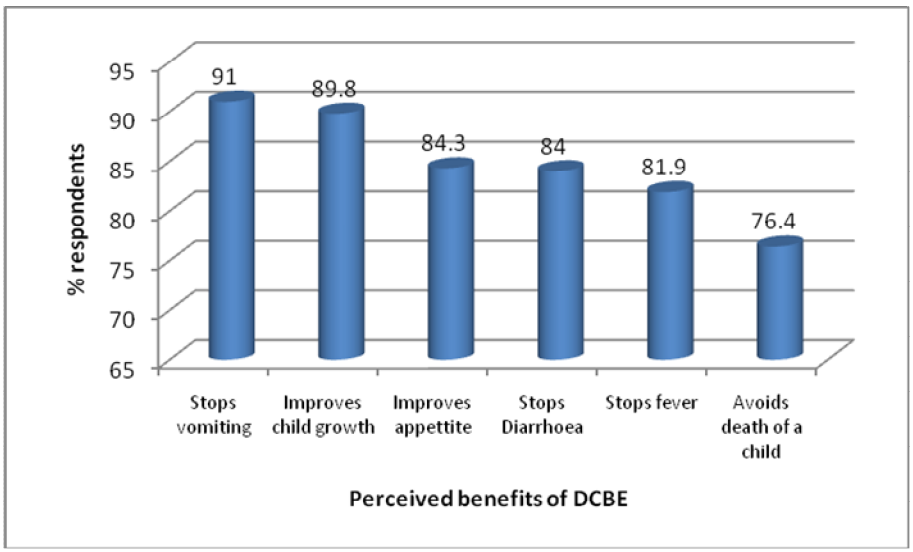


Figure 4-65: Respondents' perceived benefits of DCBE

4.5.2 DCBE prevalence versus the respondents' support of the practice

The results indicated that more than one half of the respondents supported the continuity of the practice of DCBE. Support of DCBE was due to the belief that it was good (56%); other reasons for its support includes it being a cure for illness (51.4%), maintaining family harmony (52.0%), observing tradition (56.6%), and 6.4% of the respondents had no specific reasons for supporting it. Those who did not support DCBE said it was dangerous (25.1%), old fashioned (24.1%), a bad tradition

(46.6%) and had no value (82.6%). Further, the results showed that there were statistical significant differences (p-value=0.00) in the prevalence of DCBE among those who supported the practice and those who did not.

4.5.3 Perceived dangers of not undergoing DCBE

About 55.0% of the respondents strongly felt that DCBE should be done to avoid death among children. Elderly women within FGD in Oloika and Oldorko said, *"…a child suffering from DCBE cannot be treated in the hospital; the child should not be taken to hospital because it will worsen the situation; and if treated in hospital, the child could die…"* Some of the perceived consequences of not undergoing DCBE were development of illnesses (83.3%), retarded child growth (40.2%) and death of the child (27.4%). The respondents (34.8%) believed that bad spirits would follow a family if DCBE was not carried out.

4.5.4 Perception on wasting and faltering versus prevalence of DCBE

Tables 4-7 and 4-8 show responses on the perception that child wasting and faltering contributed to DCBE. Significant difference ($p \leq 0.05$) was noted in relation to percieved wasting and DCBE. On comparing those with DCBE alone and perception of faltering the results show some significance ($\chi^2 = 8.495$, $p=0.004$), Table 4-8.

Table 4-7: Perception on child wasting and prevalence of DCBE

Perceived child wasting	DCBE done		DCBE not done		χ^2	P-value
	Freq	%	Freq	%		
Perceived to contribute to DCBE (n=243)	68	28.0	175	72.0	3.729	0.053
Did not perceive to contribute to DCBE (n=177)	35	19.8	142	80.2		
Total (n=420)	103	24.5	317	75.5		

Table 4-8: Perception on growth faltering and the prevalence of DCBE

Perception that growth faltering contribute to DCBE	DCBE done (χ^2 = 8.495, df=1, p=0.004).		DCBE not done (P-value >0.005)		χ^2	P-value
	Freq	%	Freq	%		
Does not contribute to DCBE (n=283)	64	22.6	219	77.4	1.952	0.162
Contribute to DCBE (n=120)	35	29.2	85	70.8		

N=403 (non respondents=17)

4.6 Food consumption patterns and nutritional status of children 2-5 years

Table 4-9 shows the frequency and the types of foods taken by the respondents in a week. The children mostly consumed - tea with milk sweetened with sugar (98.1%), *ugali* (96%), milk (69.0%), fats (99.8 %) and beans (50.7%). There was very low consumption of meat (chicken, beef, fish, goat, duck, lamb and offal); fruits and vegetables. The commonly consumed fruits were oranges (1.9 %) and mangoes (1.2%), while commonly consumed vegetables were cabbages (7.1%) and kales (2.1%). Although duck, chicken and fish were important sources of meat, it was least consumed by most of the households. Most respondents (89.5) never ate chicken, Fish (96.0 %,) or even eggs (80.0%). In fact, women in a focus group discussion mentioned that although meat was eaten irregularly, they would rather stay without it than eat duck or chicken. Fats were given to children daily. The reasons for giving the fats were reported by women and men in focus group discussions that, "*Fats are given to children because it improves their health, and help them to have loose stool hence become hungry and have big appetite. This enabled them to breastfeed more and grows faster...")*. Food stuffs such as *chapati*, potatoes, rice, and whole maize were common in the market and were also frequently taken by the subjects. On food availability in household of children aged 2-5 years, about 37.1% of the respondents reported that they had a problem of food availability hence they did not have enough food for their children.

Table 4-9: Food frequency consumption pattern of the respondents

Foods / *endaki* (and food groups)	**7-day food frequency ***				
	Never (%)	**1-2 per week (%)**	**3-4 per week (%)**	**5-6 per week (%)**	**Daily Consumption (%)**
Vegetables					
Sukuma / *Sukuma*	32 (7.6)	16 (39.0)	130 (31.0)	52 12.4)	9 (2.1)
Cabbages / *kabeji*	12 (2.9)	87 (20.7)	155 (36.9)	96 (22.9)	30 (7.1)
Tomatoes / il*nyanya*	37 (8.8)	156 (37.1)	86 (20.5)	64 915.2)	24 (5.7)
Carrots / *ilnganayio*	147 (35.0)	111 (26.4)	53 (12.6)	40 (9.5)	14 (3.3)
Other veges / *empoga*	57 (13.6)	130 (30.8)	106 (25.2)	63 15.0)	19 (4.6)
Fruits					
Fruits/ ilng'anayiok	269 (64.0)	36(8.6)	16 (3.7)	22 (5.1)	5 (1.1)
Oranges / *illmachungwa*	189 (45.0)	61 (14.5)	26 (6.2)	36 (8.6)	8 (1.9)
Mangoes/*ilnganayio lejim*	189 (45.0)	56(13.3)	25 (6.0)	42 (10.0)	5 (1.2)
Pears / illpeas	387 (92.1)	16(3.8)	6 (1.4)	4 (1.0)	3 (0.7)
Wild fruits / *ilng'anayiok lentim*	310 (73.8)	12(2.9)	5 (1.2)	4 (1.0)	2 (0.5)
Legume grains					(
Legumes	240 (57.1)	7 (1.7)	27 (6.5)	30 (7.1)	97 (23.1)
Peas/enchoko	295 (70.2)	12 (2.9)	5 (1.2)	17 (4.0)	76 (18.1)
Beans – *imposho*	12 (2.9)	10 (2.4)	74(17.6)	72 (17.1)	213 (50.7)
Lentils / *imbenek naanyori*	413 (98.3)	0 (0.0)	3(0.7)	1 (0.2)	(2) (0.5)
Animal foods					
Eggs / *ilmosor*	336 (80.0)	40 (9.5)	11 (2.6)	8 (1.9)	5 (1.2)
Milk / kule	6 (1.4)	11 (2.6)	68 (16.2)	18 (4.3)	290 (69.0)
Chicken / i*kukui*	376 (89.5)	20 (4.8)	8 (1.9)	5 (1.2)	2 (0.5)
Fish / isengerr	403 (96.0)	6 (1.4)	0 (0.0)	2 (0.5)	4 (1.0)
Beef / *inkiri*	16 (3.8)	86 (20.5)	103(24.5)	103 (24.5)	16 (3.8)
Duck/*embaata*	400 (95.2)	5 (1.2)	2(0.5)	11(2.9)	1 (0.2)
Goat /*enkine*	10 (2.4)	50 (11.9)	142(33.8)	47 (11.2)	3 (0.7)
Lamb/*enkerr*	18 (4.3)	70(16.7)	127(30.2)	28(6.7)	4 (1.0)
Liver /*emonyua*	32 (7.6)	26(6.2)	68 (16.2)	10(2.4)	0 (0.0)
Kidney / *ilarakuj*	41 (9.8)	16(3.8)	69 (16.4)	4 (1.0)	1 (0.2)
Intestines / i*monyit*	26 (6.2)	27(6.4)	69(16.4)	4 (1.0)	3 (0.7)
Starch					
Chapati/*echapati*	2 (0.5)	26 (6.2)	118 (28.1)	165 (39.3)	83 (19.8)
Potatoes / i*nkuashen*	2 (0.5)	6 (1.4)	19 (4.5)	204 (48.6)	170 (40.5)
Rice / *ormushele*	2 (0.5)	22 (5.2)	67 (16.0)	125 (29.8)	192 (45.7)
Ugali/enkurrma *or ugali*	1 (0.2)	5 (1.2)	1 (0.2)	5 (1.2)	403 (96.0)
Whole maize/ *ilpaek*	11(2.6)	91 (21.7)	17(4.0)	149 (35.5)	34(8.1)
Tea+ milk & sugar / *shaai we sukari*	4 (1.0)	2 (0.5)	0 (0.0)	2 (0.5)	412(98.1)
Fats					

*In parenthesis are number of children/households who consumed the respective foods

4.7 Nutritional status of selected children 2-5 Years old

4.7.1 Prevalence of under nutrition in children 2-5 years old

The malnourished children were classified as moderately or severely stunted, underweight or wasted. The cut offs were: z-scores of -2 to -3 were moderately malnourished while z-scores of less than -3 were severely malnourished. Based on Height for Age the children as shown in Figure 4-16, 2-5 years who were undernourished, 15% and 19.5% were moderately and severely stunted respectively. Based on Weight for Age and the degree of composite (both long term and short term) under nutrition, 21% and 9.5% were moderately and severely underweight respectively. It was also observed that children who were moderately wasted were about two-fold those who were wasted severely.

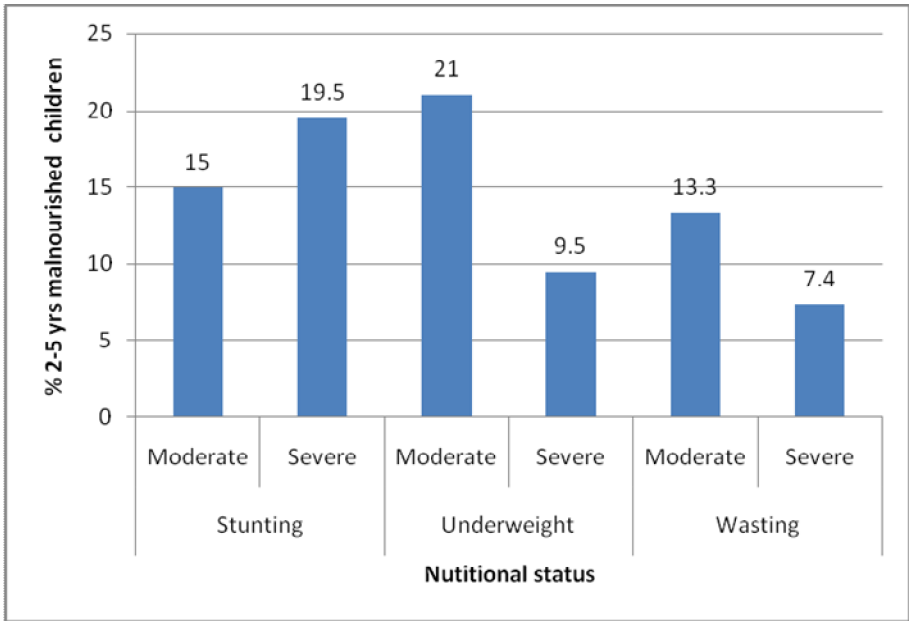


Figure 4-16: Prevalence of undernutrition in children 2-5 years old

4.7.2 Acute malnutrition status of children 2-5 years

From the prevalence of wasting, (acute malnutrition) the results in Figure 4-17 shows that the proportions of Global Acute Malnutrition (GAM, a z-score of -2.) was 24.5% in boys compared to 16.5% in girls; Moderate Acute Malnutrition (MAM, a z-score of <-3 to -2) was 15.5% in boys and 11.0% in girls while Severe Acute Malnutrition (SAM, a z-score below -3) was 9.1% in boys and 5.5 % in girls.

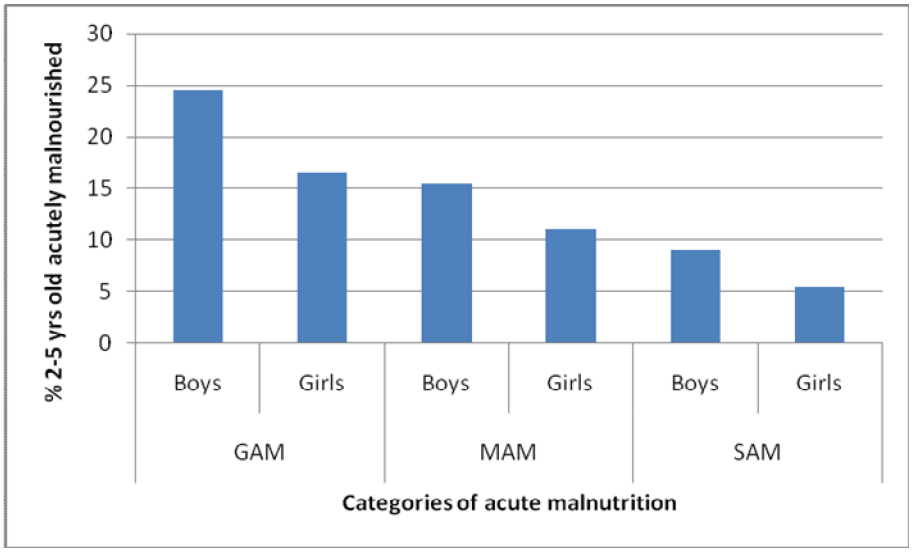


Figure 4-17: Acutely malnourished children in relation to sex

4.7.3 Nutritional status of the children in relation to the area of study

As depicted in Table 4-10, there was no significant difference ($p>0.05$) in the distribution of underweight, stunting and wasting between Ngong and Magadi Divisions. Significant differences were also not found among stunted, underweight and wasted children from sub-locations under study. However, the findings showed high prevalence of stunting (52.2%), underweight (35.8%) and wasting (26.4%) in

Magadi, Eremit and Oloika sub-locations respectively. GAM was highest in Oloika sub-location (26.0%) and Eremit (26.4%) as shown in Table 4-10.

Table 4-10: Nutritional status of children 2-5 years by area of study

Examination area		Nutritional status						
		Moderate		Severe		Total		Stats
		n	%	n	%	n	%	
		Nutritional Status (WAZ - underweight)						
Divisions	Magadi (n=211)	41	19.4	16	7.6	57	27.0	χ^2=0.480 df=1 p=0.488
	Ngong (n=209)	47	22.5	24	11.5	71	34.0	
	WAZ total	**88**	**21.0**	**40**	**9.5**	**128**	**30.5**	
	Nutritional Status (HAZ - stunting)							
	Magadi (n=211)	38	18.0	43	20.4	81	38.4	χ^2=0.891 df=1 p=0.345
	Ngong (n=209)	25	12.0	39	18.7	64	30.6	
	HAZ total	**63**	**15.0**	**82**	**19.5**	**145**	**34.5**	
	Nutritional Status (WHZ - wasting)							
	Magadi (n=211)	25	11.8	14	6.6	39	18.5	χ^2=0.002 df=1 p=0.963
	Ngong (n=209)	31	14.8	17	8.1	48	23.0	
	WHZ total	**56**	**13.3**	**31**	**7.4**	**87**	**20.7**	
Sub-locations	**Nutritional Status (WAZ - underweight)**							
	Oltepesi (n=103)	24	23.3	9	8.7	33	32.0	χ^2=0.032 df=1 p=0.857
	Oloika (n=73)	12	16.4	7	9.6	19	26.0	
	Magadi (n=69)	17	24.6	6	8.7	23	33.3	
	Eremit (n=106)	23	21.7	15	14.2	38	35.8	
	Oldorok (n=69)	12	17.4	3	4.3	15	21.7	
	WAZ total	**88**	**21.0**	**40**	**9.5**	**128**	**30.5**	
	Nutritional Status (HAZ - stunting)							
	Oltepesi (n=103)	12	11.7	21	20.4	33	32.0	χ^2=0.081 df=1 p=0.775
	Oloika (n=73)	16	21.9	9	12.3	25	34.2	
	Magadi (n=69)	14	20.3	22	31.9	36	52.2	
	Eremit (n=106)	13	12.3	18	17.0	31	29.2	
	Oldorok (n=69)	8	11.6	12	17.4	20	29.0	
	HAZ total	**63**	**15.0**	**82**	**19.5**	**145**	**34.5**	
	Nutritional Status (WHZ - wasting)							
	Oltepesi (n=103)	14	13.6	6	5.8	20	19.4	χ^2=0.004 df=1 p=0.952
	Oloika (n=73)	13	17.8	6	8.2	19	26.0	
	Magadi (n=69)	4	5.8	7	10.1	11	15.9	
	Eremit (n=106)	17	16.0	11	10.4	28	26.4	
	Oldorok (n=69)	8	11.6	1	1.4	9	13.0	
	WHZ total	**56**	**13.3**	**31**	**7.4**	**87**	**20.7**	

*In parenthesis is the proportion of respondents, **N=420**

4.7.4 Nutritional status in relation to the sex of the index child

As shown in Table 4-11, although the prevalence of underweight, stunting and wasting was higher in boys than in girls, the differences were however not significant. One-third of all children were found to be underweight, while about 35% were stunted. About a fifth of all children were found to be wasted.

Table 4-11: Nutrition status of selected children 2-5 years old by sex

Nutritional status of children		**All (N=420)**	**Boys (n=220)**	**Girls (n=200)**
WAZ	**Prevalence of underweight (<-2 z-score)**	128 (30.5%) (25.4-35.6 95% C.I.)	72 (32.7%) (27.1-38.4 95% C.I.)	56 (28.0%) (22.6-33.4 95% C.I.)
	Prevalence of moderate underweight (<-2 z-score and >=-3 z-score)	88 (21.0%) (17.8-24.1 95% C.I.)	46 (20.9%) (16.7-25.1 95% C.I.)	42 (21.0%) (17.9-24.1 95% C.I.)
	Prevalence of severe underweight (<-3 z-score)	40 (9.5%) (6.4-12.6 95% C.I.)	(26) (11.8%) (9.0-14.6 95% C.I.)	14 (7.0%) (2.6-11.4 95% C.I.)
HAZ	**Prevalence of stunting (<-2 z-score)**	145 (34.5%) (26.0-43.0 95% C.I.)	78 (35.5%) (30.6-40.3 95% C.I.)	67 (33.5%) (20.0-47.0 95% C.I.)
	Prevalence of moderate stunting (<-2 z-score and >=-3 z-score)	63 (15.0%) (10.5-19.5 95% C.I.)	30 (13.6%) (10.5-16.7 95% C.I.)	33 (16.5%) (9.1-23.9 95% C.I.)
	Prevalence of severe stunting (<-3 z-score)	82 (19.5%) (13.1-26.0 95% C.I.)	48 (21.8%) (17.2-26.4 95% C.I.)	34 (17.0%) (8.3-25.7 95% C.I.)
WHZ	**Prevalence of global acute malnutrition (<-2 z-score and/or oedema)**	87 (20.7%) (15.5-26.0 95% C.I.)	54 (24.5%) (19.0-30.1 95% C.I.)	33 (16.5%) (11.1-21.9 95% C.I.)
	Prevalence of moderate acute malnutrition (<-2 z-score and >=-3 z-score, no oedema)	56 (13.3%) (9.2-17.4 95% C.I.)	34 (15.5%) (11.9-19.0 95% C.I.)	22 (11.0%) (6.3-15.7 95% C.I.)
	Prevalence of severe acute malnutrition (<-3 z-score and/or oedema)	31 (7.4%) (4.1-10.6 95% C.I.)	20 (9.1%) (4.7-13.4 95% C.I.)	11 (5.5%) (2.4- 8.6 95% C.I.)

*In parenthesis is the proportion of 2-5 children who were malnourished at 95% C1

4.7.5 Age group of index child in relation to nutritional Status

With regard to age of the index child and nutritional status, Table 4-12 shows the results of the findings which indicate that ages 4 and 5 years appears to be most affected by underweight while ages 2 and 5 are more affected by stunting. However, there were no significant differences observed ($p>0.05$). There were no significant differences in nutritional status due to immunization status and the duration of exclusive breastfeeding.

Table 4-12: Child health practices and nutrition status of children 2-5 years old

Child age*, health practices and feeding pattern of the baby		Nutritional status of children 2-5 year													
		HAZ					WAZ					WHZ			
	(n)	Moderate		Severe			Moderate		Severe			Moderate		Seve	
		n	%	n	%	χ^2=1.181, df=1, p=0.277	n	%	n	%	χ^2=0.578, df=1, p=0.447	n	%	n	%
Age of the child (months)	24m (67)	17	25.4	15	22.4		12	17.9	5	7.5		5	7.5	6	9.0
	36m (124)	17	13.7	25	20.2		23	18.5	7	5.6		15	12.1	6	4.8
	48m (133)	15	11.3	24	18.0		29	21.8	13	9.8		16	12.0	12	9.0
	60m (96)	14	14.6	18	18.8		24	25.0	15	15.6		20	20.8	7	7.3
Immunis-ation status of the child	Fully (136)	22	16.2	26	19.1	χ2=0.008, df=1, p=0.927	29	21.3	7	5.1	χ2=0.112, df=1, p=0.927	16	11.8	5	3.7
	Not fully (36)	4	11.1	6	16.7		9	25.0	2	5.6		10	27.8	1	2.8
Exclusive breast feeding in Months	<1 (267)	45	33.6	49	45.0	χ^2=0.368, df=1, p=0.544	55	42.0	27	23.7	χ^2=1.722, df=1, p=0.189	36	28.0	16	13.6
	Two (23)	4	17.4	6	26.1		9	39.1	4	17.4		4	17.4	2	8.7
	Three (15)	1	6.7	6	40.0		3	20.0	2	13.3		1	6.7	1	6.7
	Four (61)	5	8.2	12	19.7		14	23.0	5	8.2		9	14.8	8	13.1
	Five (3)	0	0.0	1	33.3		0	0.0	0	0.0		1	33.3	0	0.0
	Six (40)	5	12.5	7	17.5		6	15.0	2	5.0		3	7.5	3	7.5
	7+ (11)	3	27.3	1	9.1		1	9.1	0	0.0		2	18.2	1	9.1

*Age groups classifications: 2 years is ages 2-2.9 years; 3 years are 3-3.9; 4 year is 4-4.9; and 5 years is only those who are exactly 5.0.

4.7.6 Relationship between nutritional status and feeding patterns

Table 4-13 reflects the relationship between nutrition status and daily meal frequency (number of meals consumed per day). The less the number of meals that had been given to children, the higher the prevalence of malnutrition. However, there were no significant differences in nutritional status among those who consumed more number of meals in a day. Although children in households who had reported sufficient food availability were comparatively more underweight, less stunted and wasted, there were no significant differences among those who had reported not having enough food in their households with those who had reported having sufficient amount.

Table 4-13: Relationship between nutritional status and feeding patterns of children

Child age*, health practices and feeding pattern of the baby		Nutritional status of children 2-5 year													
		HAZ					WAZ					WHZ			
	(n)	Moderate		Severe			Moderate		Severe			Moderate		Seve	
		n	%	n	%		n	%	n	%		n	%	n	%
Age of the child (months)	24m (67)	17	25.4	15	22.4	χ^2=1.181, df=1, p=0.277	12	17.9	5	7.5	χ^2=0.578, df=1, p=0.447	5	7.5	6	9.0
	36m (124)	17	13.7	25	20.2		23	18.5	7	5.6		15	12.1	6	4.8
	48m (133)	15	11.3	24	18.0		29	21.8	13	9.8		16	12.0	12	9.0
	60m (96)	14	14.6	18	18.8		24	25.0	15	15.6		20	20.8	7	7.3
Immunis-ation status of the child	Fully (136)	22	16.2	26	19.1	χ2=0.008, df=1, p=0.927	29	21.3	7	5.1	χ2=0.112, df=1, p=0.927	16	11.8	5	3.7
	Not fully (36)	4	11.1	6	16.7		9	25.0	2	5.6		10	27.8	1	2.8
Exclusive breast feeding in Months	<1 (267)	45	33.6	49	45.0	χ^2=0.368, df=1, p=0.544	55	42.0	27	23.7	χ^2=1.722, df=1, p=0.189	36	28.0	16	13.6
	Two (23)	4	17.4	6	26.1		9	39.1	4	17.4		4	17.4	2	8.7
	Three (15)	1	6.7	6	40.0		3	20.0	2	13.3		1	6.7	1	6.7
	Four (61)	5	8.2	12	19.7		14	23.0	5	8.2		9	14.8	8	13.1
	Five (3)	0	0.0	1	33.3		0	0.0	0	0.0		1	33.3	0	0.0
	Six (40)	5	12.5	7	17.5		6	15.0	2	5.0		3	7.5	3	7.5
	7+ (11)	3	27.3	1	9.1		1	9.1	0	0.0		2	18.2	1	9.1

*Age groups classifications: 24 months are ages 2-2.9 years; 36 months are 3-3.9; 48 months are 4-4.9; and 60month are only those exactly 5years.

4.7.7 Socio-demographic factors of the respondents and child nutritional status

With regard to the educational level, marital status, employment and source of income of the mother and the nutritional status of the index child, the results showed no statistical significant difference in nutritional status based on stunting, underweight and wasting ($P>0.05$). However, the mother's education had an inverse relationship with nutritional status. The proportion of stunted, underweight and wasted children was high among those whose mothers were not or had low level of formal education (none and primary). As shown in Table 4-14, children of housewives, in polygamous marriage and those who depended on livestock were most likely to be both chronically and acutely malnourished.

Table 4-14: Socio-demographic factors of the mother and child nutritional status

Socio-demographics characteristics of the mother		Nutritional status of children 2-5 year*											
		HAZ				WAZ				WHZ			
	N=388	Moderate		Severe		Moderate		Severe		Moderate		Severe	
		n	%	n	%	N	%	n	%	n	%	n	%
Educational level	None (n=348)	50	14.4	30	8.6	76	21.8	35	10.1	50	14.4	30	8.6
	Primary(n=33)	3	9.1	0	0.0	8	24.2	1	3.3	3	9.1	0	0.0
	Secondary (n=6)	0	0.0	0	0.0	1	16.7	0	0.0	0	0.0	0	0.0
	College (n=1)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Marital status	Married (n=398)	61	15.3	80	20.1	85	21.4	40	10.0	53	13.3	31	7.8
	Not married(n=22)	2	9.1	2	9.2	3	13.6	0	0.0	3	13.6	0	0.0
Type of marriage	Monogamous (n=201)	30	14.9	49	24.4	43	21.4	19	9.5	22	10.9	11	5.5
	Polygamous(n=197)	31	15.7	31	15.7	42	21.3	21	10.7	31	15.7	20	10.2
Employment	Housewife (n=335)	50	14.9	68	20.3	74	22.1	33	9.9	46	13.7	27	8.1
	Farmer (n=2)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	Business (n=51)	9	17.6	10	19.6	11	21.6	3	5.9	7	13.7	3	5.9
Source of income	Livestock (n=323)	47	14.6	65	20.1	73	22.6	31	9.6	44	13.6	27	8.4
	Business (n=57)	10	17.5	12	21.1	12	21.1	4	7.0	8	14.0	3	5.3
	Salary (n=6)	0	0.0	1	16.7	0	0.0	0	0.0	0	0.0	0	0.0
	Other (n=2)	2	100.0	0	0.0	0	0.0	1	50	1	50.0	0	0.0

*There was no significant difference in stunting, underweight and wasting among the different socio-economic groups ($p>0.05$).

4.7.8 Breastfeeding and nutritional status of children studied

Table 4-15 shows that there was no significant difference ($p>0.05$) in nutritional status among those children who breastfed exclusively between one month and seven months or more.

Table 4-15: Breast feeding and nutritional status

Duration of exclusive breast feeding in months	**Nutritional status**						**significance**
	Moderate		**Severe**		**Total**		
	n	**%**	**n**	**%**	**n**	**%**	
Nutritional Status (WAZ - underweight)							
One and below (n=267)	55	20.6	27	10.1	82	30.7	χ^2=0.594 df=1 p=0.441
Two (n=23)	9	39.1	4	17.4	13	56.5	
Three (n=15)	3	20.0	2	13.3	5	33.3	
Four (n=61)	14	23.0	5	8.2	19	31.1	
Five (n=3)	0	0.0	0	0.0	0	0.0	
Six (n=40)	6	15.0	2	5.0	8	20.0	
Sevens and above (n=11)	1	9.1	0	0.0	1	9.1	
WAZ total	**88**	**21.0**	**40**	**9.5**	**128**	**30.5**	
Nutritional Status (HAZ - stunting)							
One and below (n=267)	45	16.9	49	18.4	94	35.2	χ^2=0.402 df=1 p=0.526
Two (n=23)	4	17.4	6	26.1	10	43.5	
Three (n=15)	1	6.7	6	40.0	7	46.7	
Four (n=61)	5	8.2	12	19.7	17	27.9	
Five (n=3)	0	0.0	1	33.3	1	33.3	
Six (n=40)	5	12.5	7	17.5	12	30.0	
Seven and above (n=11)	3	27.3	1	9.1	4	36.4	
HAZ total	**63**	**15.0**	**82**	**19.5**	**145**	**34.5**	
Nutritional Status (WHZ - wasting)							
One and below (n=267)	36	13.5	16	5.99	52	19.5	χ^2=1.118 df=1 p=0.290
Two (n=23)	4	17.4	2	8.7	6	26.1	
Three (n=15)	1	6.7	1	6.7	2	13.3	
Four (n=61)	9	14.8	8	13.1	17	27.9	
Five (n=3)	1	33.3	0	0.0	1	33.3	
Six (n=40)	3	7.5	3	7.5	6	15.0	
Seven and above (n=11)	2	18.2	1	9.1	3	27.3	
WHZ total	**56**	**13.3**	**31**	**7.4**	**87**	**20.7**	

4.7.9 Recent weight loss in children 2-5 years old included in the study

The findings showed that slightly more than one half (56.7%) of the respondents reported that their children had weight loss in the previous one month prior to the study. The reasons given by mothers for weight loss in children were due to fever (50.2%), diarrhoea (16.4%), URTI (8.6%) and lack of food (6.4%).

4.8 Relationship between DCBE and nutritional status of children aged 2-5 years

4.8.1 Practice of DCBE in children in relation to their nutritional status

There was no significant relationship ($p>0.05$) between the practice of DCBE and nutritional status. However, DCBE was more likely to be practiced in undernourished groups than those not undernourished. The prevalence of severe wasting was two times higher among children who had undergone DCBE (12.6%) than those children who had not undergone DCBE (7.4%). Similarly, moderate stunting was higher among children who had undergone DCBE (20.4%) than those children who had not undergone DCBE (13.2%). At the same time, the percentage of moderate underweight children was higher among children who had undergone DCBE (20.4%) than those children who had not undergone DCBE (19.6%) as presented in Table 4-16. Further, the Odds Ratio (OR) of 1.417 indicates that DCBE was more likely in the malnourished group. However, the results {95% CI, OR=1.417 (0.838 - 2.395); χ^2=1.355, p=0.244} showed that this association between nutritional status (being malnourished) and the practice of DCBE was not significant.

Table 4-16: Nutritional status and the practice of DCBE in children 2-5 year old

N=420		DCBE practice						
Nutritional status		DCBE (n=103)		Non DCBE (n=317)		Total		Significance
		n	%	n	%	n	%	
Underweight	**Nutritional Status (WAZ - underweight)**							
	Moderate	26	25.2	62	19.6	88	21.0	X^2=0.056
	Severe	11	10.7	29	9.1	40	9.5	df=1
	WAZ total	37	35.9	91	28.7	128	30.5	p=0.814*
Stunting	**Nutritional Status (HAZ - stunting)**							
	Moderate	21	20.4	42	13.2	63	15.0	X^2=2.905
	Severe	17	16.5	65	20.5	82	19.5	df=1
	HAZ total	38	36.9	107	33.8	145	34.5	p=0.088*
Wasting	**Nutritional Status (WHZ - wasting)**							
	Moderate	13	12.6	43	13.6	56	13.3	X^2=3.299
	Severe	13	12.6	18	5.7	31	7.4	df=1
	WHZ total	26	25.2	61	19.2	87	20.7	p=0.069*

***Not statistically significant**

4.8.2 Possible confounding exposture factors in the relationship between DCBE and nutritional status

4.8.2.1 Relationship betwe

en DCBE and breastfeeding

The risk of children undergoing DCBE when underweight, stunted and wasted while they have been exposed to exclusive breast feeding was not significant as shown in Table 4-17. This indicated that breastfeeding practice did not confound this relationship

Table 4-17: Risk association of DCBE and nutritional status versus breast feeding as first exposure factor

Exposure	Strata	Stratum Specific OR (95% CI)	Adjusted OR(95% CI)
Underweight			
Breastfeeding	**Exclusive breast feeding for the 1st six months (n=40)**	OR = 1.833 (0.382 - 8.81)	OR = 1.390 (0.867 - 2.230
	Not exclusively breast fed for the 1st six months (n=380)	OR = 1.35 (0.825 - 2.223)	
Stunted			
Breastfeeding	**Exclusive breast feeding for the 1st six months (n=40)**	OR = 0.36 (0.068 - 1.866	OR = 1.146 (0.722 - 1.820
	Not exclusively breast fed for the 1st six months(n=380)	OR = 1.302 (0.799 - 2.122	
Wasting			
Breastfeeding	**Exclusive breast feeding for the 1st six months (n=40)**	OR = 1.833 (0.382 - 8.810	OR = 1.415 (0.837 - 2.392)
	Not exclusively breast fed for the 1st six months(n=380)	OR = 1.371 (0.785 - 2.394	

4.8.2.2 Relationship between DCBE and immunisation

There was increased risk of children undergoing DCBE when fully immunised among the underweight as shown in Table 4-19. The adjusted OR showed increased

risks as well. The crude OR = 1.392, 95% CI= (0.870 - 2.228), was lower than the adjusted OR, indicating possible confounding in the relationship between DCBE and being underweight

Table 4-18: Risk association of DCBE and nutritional status versus immunization as second exposure factor

Exposure	Strata	Stratum Specific OR (95% CI)	Adjusted OR (95% CI)
	Underweight		
Immunization status	Fully immunized (n=136)	OR = 2.575 (1.100 - 6.025)	OR = 2.838 (1.358 - 5.931)
	Not fully Immunized(n=36)	OR = 3.800 (0.848 - 17.036)	
	Stunted		
Immunization status	Fully immunized (n=136)	OR=1.011(0.437-2.336	OR=1.446 (0.708-2.953)
	Not fully Immunized(n=36)	OR=5.000(1.051-23.789	
	Wasting		
Immunization status	Fully immunized(n=136)	OR=1.440(0.506-4.096)	1.359 (0.577-3.201)
	Not fully Immunized(n=36)	OR=1.214(0.274-5.379)	

CHAPTER FIVE

5.0 DISCUSSION

5.1 Socio-demographics Characteristics

The subjects for the study were sampled from Oltepesi and Eremit sub-locations of Ngong Division; Oldorko, and Oloika sub-locations of Magadi Division. Polygamy was the most common form of marriage among the *Maasai.* This was partly due to the values the community places on their traditions and unity of the family (Ole Saitoti and Beckwith, 1980). However modern western cultures are slowly penetrating the community. The respondents who had no formal education were the majority, reflecting the high illiteracy level in the *Maasai* community (Maasai Association, 2010). Most of the population had no formal employment, as those employed were only 0.5%. The main source of income was from livestock business, while a few relied on salary and agriculture.

The age of children was between 2-5 years. This group indicates the general health of the family and the entire community (MPHS/MOMS, 2009). The children examined were in the first, second, third and fourth position in the family. More than two thirds of the mothers interviewed were between 19 and 40 years, therefore within the child bearing age bracket. The mothers were the main care givers of the children in the study area. The amount of care by the mother could therefore have positive implications in nutritional status of the child (Kamau-Thuita, *et al.*, 2002; UNICEF, 1998).

5.2 Prevalence of DCBE among children 2-5 years old in Kajiado District

Oral examinations revealed a 24.5% prevalence of DCBE, which was almost twice as high as that (12.9%) reported by Wanzala *et al*., (2008) among the under one year old children in a study done in parts of the study area. Though it is the mandibular incisors that are usually extracted to create a gap to allow feeding (Blecker, 1964), the results of this study established that extraction of the lower jaw canines was also common. The prevalence of DCBE was higher in lower jaw than in upper jaw. Holan and Mamber (1994) also established that extraction of mandibular canines was found to have been performed in 46 (76%) children as compared to only 16 (26%) whose maxillary canine had been extracted.

Recent studies conducted in Kajiado District indicate that the practice was on the rise (Kibet *et al.,* 2009; Wanzala *et al.,* 2005). The practice which was previously reported among the pastoralists could also be spreading to other communities who had no such history before (Kemoli, 2008). Jameison (2006) reveals that gouging of the unerupted deciduous canine teeth occurs in approximately one in three children in some areas in Uganda. Earlier reports in Tanzania also indicated a rising trend in the DCBE prevalence (Kikwelu and Hiza (1997). The high prevalence of DCBE in African communities could be influenced by ignorance and cultural practices. In Kenya, the practice has been reported among the *Maasai* (Hassanali and Amwayi (1988) and other pastoralists communities such as *Turkana, Samburu, Kalenjin* and *Somalis* (Hassanali *et al.,* 1995; Inoue and Sakashita, 1996 and Kipchumba, 1998). The practice has also been found in urban area and in the developed countries such as United Kingdom (UK), among the African migrants (Dewhurst and Mason, 2001).

Similarly, Rodd and Davidson (2000) have also reported canine enucleation among Somali children born in the UK, while Holan and Mamber (1994) discovered the practice of DCBE among migrant Ethiopian Jewish.

Significant difference was noted in relation to the prevalence of DCBE among the different sub-locations under study. Notably, the practice of DCBE was diminishing in some parts of Kajiado. For example, in Eremit sub location; the practice was not common. This was confirmed by one of the focus group discussions which revealed that the practice of DCBE was not common in some areas, may be due to the spreading Christian beliefs which could be an important prevention strategy in DCBE. On the contrary, the practice of DCBE was on the rise rather than decreasing in other parts of Kajiado District. Out of the five sub-locations under the study, Oltepesi and Oloika sub-locations of Ngong Division, were leading in the prevalence of DCBE. The high prevalence of DCBE in sub-locations such as Oltepesi and Oloika implies that children in these areas are at more risk of DCBE than those in other areas. The areas where the prevalence was high could be due to lack of awareness about the risks of DCBE and therefore community based intervention programmes need to be initiated and should be targeted to these areas first.

The prevalence of DCBE appeared to be significantly different ($p \leq 0.05$) in relation to age. The practice was more evidently observed among 5 year old children compared to those aged 4, 3 and 2 years old. Findings from a study done in Ethiopia confirmed the practice among 70% of the population, and in Southern Sudan 100% among the infants younger than 18 months admitted in a hospital (Baba and Kay, 1989). The difference in the findings could be attributed to the differences in the ages of the

children observed and the time the study was carried out. There was more evidence of the DCBE practice with increased age as the child's primary dentition nears complete eruption, hence missing teeth were more evidently observed in the mouth.

In relation to sex, male children had higher prevalence of DCBE (26.8%) compared to females (22.0%), however the difference was not significant. This shows that the practice of DCBE was done on all the children regardless of their sex. It also implies that intervention programmes should target all children because they are all at risk of DCBE. Although the literacy levels of the respondents did not present any significant difference in the prevalence of DCBE, evidence suggests that there are other underlying factors other than educational status that are related to prevalence of DCBE. The study also established that the type of marriage influenced the practice of DCBE. Those who were in monogamous marriage were less likely to allow their children undergo the practice of DCBE compared to those in polygamous marriage. Cultural beliefs could be the reason for this observation. Those who support traditional practices such as polygamous marriage could also be proponents of practices such as DCBE.

The findings further indicated that the prevalence of DCBE was significantly ($p=0.00$) different among who breastfed for less than 24 months compared to those who breastfed for more than 24 months. This may be due to the fact that only about one half of the mothers exclusively breastfed their newborn babies only the first month, a few breast-fed for a period of four months (14.5%). Mondal, *et al.*, (1996) note that infants who are introduced to complementary food late (4 months or more) suffered less from diarrhoeal diseases as compared to those in the same age group

who are introduced early. In this weaning period, children become undernourished, Balldin *et al.*, (1991) and could suffer from protein-energy-malnutrition, hence are susceptible to diseases (Cameron and Highlander, 1983). According to Meremikwu *et al.*, (1997), breast-feeding has an influence on the prevalence of diseases such as persistent diarrhoea and malnutrition. The study revealed that the proportion of children with persistent diarrhoea was significantly lower among those children who had been exclusively breast-fed than those who were not (Mondal *et al.*, 1996).

There was significant difference in the prevalence of DCBE among the fully immunised and not fully immunised. It revealed that the children whose immunisation was not on schedule were more susceptible to DCBE than those on schedule. The reasons could be because DCBE was an intervention procedure, if the child was not immunised, they became sickly due to low immunity, and were therefore more likely to be subjected to DCBE.

5.3 Awareness, attitude and practices on DCBE

Though many studies have reported that DCBE was discovered in pastoral communities, they do not give accounts of the origin (Kemoli, 2008; Jamieson, 2006; Hassanali and Amwayi 1988). The study revealed that the respondents believed that the practice came through *Maasai* clans of Tanzania, as they moved to Kenya with their livestock, while others said the practice was passed to them by their parents (Baba and Kay I989; Mosha, 1983; Pindborg, 1969). This therefore suggests that the practise could have diffused into the community from the neighbours as a result of movements due to their migratory patterns and their nomadic lifestyle.

Awareness about DCBE practice was very high among the respondents, further, indicating that the practice was widespread. About 91.4% of those interviewed reported that, there are children in the community who have had DCBE and that the practice was very common (70%). One of the key informants, quoted thus: "*ketii nkera kumok tolosho le maa naitayioki ilala lekitishu kake keisudoo nkera kumok nemelimu ajo eitayioki ilala lekitishu."* ("There are many children in our community who have had removal of canine tooth bud, however many of them hide, they will not tell you…") This shows that the practice is common in some parts of the community, and oral examination of the severe gum and missing teeth due to DCBE could only be confirming a few cases yet the practice could be wide spread.

Among the reasons given for the removal of deciduous canine were to stop diarrhoea, vomiting, improve child's growth, appetite, and to stop fever. The perception that a child who had acute malnutrition (wasted), significantly influenced the decision to perform DCBE. This shows that there could be some strong rooted beliefs in the community that needs to be addressed. Intervention strategies need to target change of attitude and above reasons for DCBE. Although some earlier studies attempted to educate the community and reported change of attitude, more than half of the respondents still favoured the practice. Some other communities have preferred it being done in hospital with aseptic techniques (Stefani, 1987).

As to when the practice of DCBE is carried out, the study revealed that it was mostly carried out when the baby is 0-4 months old, while a few were at 9-12 month. This confirms the findings of studies done by authors who also established that DCBE procedure was carried between the age of 4 and 18 months (Kikwilu and Hiza, 1997;

Pindborg, 1969; Dagnew and Damena, 1990). Though arguments were presented that the practice promotes health, not all children who are sickly, and having retarded growth did not undergo DCBE. Some children with *Nosikirai* (non-closure of the fontanel) have symptoms like those of 'bad teeth', but they would not undergo DCBE. The signs and symptoms for those children who are thought to be having 'bad teeth', become sick suddenly with no known cause, they are weak, pale, with diarrhoea and fever or vomiting. The child has to be examined by a TBA, who was seen as an expert in identifying the 'bad teeth', and certify whether or not the child needs to undergo DCBE. This shows the important role that TBAs play in the practice of DCBE (Kibet *et al.*, 2009). Apart form removing the tooth bud, the child may be given, *Oloyiapasei*, (a medicinal herb) which could also help in stopping diarrhoea.

It was clear from the findings that there was lack of awareness on the causes of infant illness in the community under study. It is also worth noting that some respondents claimed that the cause of diarrhoea among children was the canine tooth bud and therefore DCBE had to be done. Respondents revealed they sought DCBE treatment when no improvement in diarrhoea was forthcoming after visits to hospitals. Rasmussen *et al.*, (1992) found that most of those who performed DCBE had undertaken at least one or more visits to a government health facility. Kikwilu and Hiza (1997) also revealed in a study that 60% of the parents interviewed had taken their children to a hospital before visiting traditional healers for DCBE. A number of respondents reported that they did not take their children to hospital, because herbs are available in the community.

Regarding the oral health awareness, the findings showed that half of the respondents were not aware of any causes of dental diseases, or any preventive measures. Findings by Kassim *et al.,* (2006) in a study of oral health status among Kenyans in rural setting also reported that there was low level of oral health awareness among the people. The lack of awareness on the cause of oral health illnesses points to the need for community awareness programmes to be initiated. In addition, the distribution of oral health care personnel to the rural facilities in Kenya has been consistently poor. Most of the rural communities especially in ASAL areas are underserved. The community oral health officers who were to complement and provide basic oral health care (MOH, Kenya, 2002-2012) in the communities are not absorbed by the government. There is therefore the need to have community oral health workers in the health centres especially in the rural areas such as Kajiado to provide oral health prevention through for example schools (WHO, 2003) and other basic oral care to the people.

The removal of deciduous canine was carried out using a penknife, *Nkalem*, also called *Emponet,* a needle or squeezing out the bud using fingers. In some communities they rub the gum with some herbs on the area where the canine grows (Bataringaya *et al.*, 2005). Extraction was sometimes performed using knitting needles, bicycle spokes, scissors or broken glasses (Jamieson, 2006). In most instances, instrument used to extract the tooth are not sterilized prior to surgery. However the respondents were not aware of serious complications of DCBE.

The lack of knowledge on transfer of infections such as HIV therefore poses more risks to the DCBE children in the study area. The practice was one of the sources of

pain, suffering and oral disability (Graham *et al*., 2000). Jamieson (2006) adds that the health of the child was further compromised when multiple extractions occur increasing the risk of Human Immunodeficiency Virus /AIDS transmission. During the operation, the respondents interviewed said they did not have complications. However, they acknowledged that bleeding, anaemia, growth faltering, feeding problems and infection, were almost common complications that could occur during the DCBE operation. None of them mentioned HIV/AIDS or other implications on dentition. However removal of deciduous canine is a major health concern in the Maasai community. The practice is one of the sources of pain and suffering among children. The five year old children in a focus group discussion, reported that they are subjected to a lot of pain, *"The young children who undergo DCBE feel a lot of pain and sometimes we also cry "… we are told not to cry because we are promised a big gift of… .Like a cow of your own").* According to Jamieson (2006) the health of the child is further compromised when multiple extractions occur increasing the risk of HIV /AIDS transmission.

There were no reported cases of direct deaths resulting from DCBE. However it was widely believed that children with DCBE should not be taken to health facility because they could die. Although deaths due to DCBE cannot be ruled out, the community could easily attribute it to other causes other than DCBE. In 1983, Mosha published a report examining 124 children in Tanzanian who were receiving treatment at a hospital following DCBE, where ten infants died as a direct result of the extraction. According to the respondents the tooth bud removed was treated with caution. Some Men in a focus group discussion in Magadi said that, when the tooth

was removed from the child, they either hang it on the child's neck or hide it under the cooking stones (*Osoit lenkima*) so that the child does not experience pain. According to others the tooth bud should be hidden in *Osoit lenkima* to avoid curses in the family.

The treatment of the wound after extracting the tooth varied from one area to another, and ranged from the use of salt to blocking the blood vessels with *ugali*. For example, those living near Lake Magadi used sodium bicarbonate which was locally available to rub on the wound. Some women described how they treat the DCBE wound, *"aikisuj inewueji te enkare sidai nikipik enkiti shimpi neishiu ekerai amu ketii sii inkamulak naishiunyie"*. ("We wash the wound with clean water and apply salt to the wound after the canine tooth bud operation. The child will heal very fast since saliva in the mouth was the other best treatment for the wound"). An informant in Magadi reported that, "*If the child happens to develop profuse bleeding, it is said to be associated with curses. In this case, Enkopito, which is a bark of a special tree, is tied around the fore limb of the baby to stop further complication, and appease any bad spirit.")*. This finding revealed traditional beliefs that exposed the children to infections, and further cause complications and anomalies of the injured dental structures (Hassanali and Kibet, 2003).

The study revealed that the TBAs and the mother in-law were identified as the main people who decide on the practice of DCBE. Most (97.4%) of the respondents reported that it is the TBAs who are responsible for the removal of DCBE. TBAs are highly respected and are trusted as they play an important role in the health of the children in the community. In other communities, traditional healers, older women

and men who make a living from this specific practice are involved in promoting DCBE (Graham *et al.*, 2000). The role of TBAs in the practice of DCBE in the *Maasai* of Kajiado was common knowledge to the community members. Among those who underwent DCBE, (85.8%) said extraction was done by TBA, 9.4% by traditional healers, 2.8% by mother and 1.9 % by others. This confirms the earlier findings that the removal of deciduous canine tooth bud was mainly by TBAs (Hassanali and Kibet, 2003) and traditional healers (Kibet *et al.*, 2009). In this present study mothers were also involved in the practice of DCBE.

TBAs' involvement could be driven by the monetary gain since they were rewarded after the surgery. It was established that the money that TBAs charge to undertake DCBE ranged between Ksh.20 to Ksh. 200. The rewards were mostly monetary and sometimes livestock and milk. Sebudde (2006) revealed that some communities in Uganda, who practice DCBE, paid approximately 1-2 US dollars which was about (1 US dollar =1200 UG Shs). The practice is also done under cover. Those involved did not reveal their gains to others. This finding reveals that monetary gains could hamper the stoppage of this practice. This could explain why there are little gains in combating the practice. Despite the TBAs having been targeted for education especially in areas such as Oltepesi by the oral health team, (Wanzala, *et al.*, 2005), the area still has the highest prevalence of DCBE compared to other areas.

There should be a change of tactics that include targeting more members of the family, particularly the mother in-law with sensitization programmes. This was a concern by some members of the community. For instance, in a discussion with men, they requested that, "*Ore pee Etumi Hataar Ena siai Oolala torok naa pee eitingeni*

intomonok orpayiani pooki tenebo" ("all people including women should have a workshop, to be educated on health issues and teeth". Women on the other hand said, "we need health education workshop that includes the health practitioners in the homes and health clinics, women should also be encouraged to visit the clinic when they are sick"). Sensitization programmes need to be initiated among the pastoral communities. Health personnel have a role in the prevention of diseases and should involve all members of the community. The training and education should focus on community-based strategies of prevention and creation of awareness on such practices that have an impact on their health (WHO, 1986).

5.4 Perceived benefits of DCBE to the child

More than half (54.0%) of the respondents supported the practice of DCBE. The proponents of the practice argued that DCBE was very important in stoppage of diarrhoea, avoiding death, stopping vomiting, improving a child's appetite and stopping fever. The *Maasai* belief that the deciduous canine tooth buds cause diarrhoea and vomiting was so strong that they believed that unless the tooth buds were removed, the child would die despite conventional medical treatment (Hassanali *et al.,* 1994). Although 65.2% did not believe that there would be bad spirits following the child or family if DCBE was not carried out, some (29.5%) said that the child would not die if DCBE was not carried out, while 27.4% still believed the child could die if DCBE was not carried out. This study unearthed deep rooted perceptions that exist in the community. Such beliefs are common in the communities that practice DCBE (Stefanie, 1987).

5.5 Food consumption patterns of children 2-5 years old in Ngong and Magadi Division

Earlier studies indicated that the *Maasai* predominantly consumed milk and beef (Blecker, 1964; Nestle, 1985; Adamson, 1967; Bekure, 1991 and Maasai Association, 2010). Observations revealed that Maasai children in Ngong and Magadi Divisions mostly consume milk which was drunk fresh or in tea sweetened with sugar, *ugali* and beans. Maize meal was cooked to make porridge or *ugali.* Porridge was cooked with milk and fats or butter when available, otherwise water was used. The consumption of fats (extracted from milk-ghee, cheese) was very common among children. McKenzie and Pinger (1997) recommend that a diet should not contain more than 30% of fats. The reasons for giving the fats were reported by women in focus group discussions. Among the reasons for giving the fats are to improve or enhance appetite and breastfeeding, "*Fats are given to children because it improves their health, and help them to have loose stool hence become hungry and have big appetite, this enable them to breastfeed more and grow faster...").* Consumption of fats therefore could be the main cause of diarrhoea in children.

Although diarrhoea was blamed on DCBE (Dagnew and Damena, 1990; Wanzala *et al.*, 2005), the main root cause could be fats intake. Weak or sickly children are fed more frequently. In some communities, it was believed that when a person was sick, their food ration should be reduced. Koppert (1977) reported that mothers often had to be persuaded to forcefully feed their sick babies with plenty of food and fluids, rather than take fatalistic view of the situation. This could explain why children were fed more frequently on milk.

The overall consumption of vegetables and fruits was very low. This could be because the study area is Arid and Semi Arid Land (ASAL), therefore fruits and vegetables are rarely available to the respondents. Further, Bwibo and Neumann, (2003) also gave account of earlier studies reported by Mc Nab (1929) that diets of communities living in near Lake Magadi were lacking in vegetables. When available, cabbages and kales were important vegetables mainly due to acquired taste. Mangoes and oranges were important sources of vitamins for the Maasai community rivalling the wild fruits. Oiye *et al.,* (2006) reported that consumption of wild fruits was on the decline mainly due to protracted droughts while oranges and mangoes were almost always available in the markets.

The Maasai Association (2010), recently reported that the *Maasai* community are now dependent on foods such as maize meal, rice, potatoes, cabbages (known to *Maasai* as goat leaves), and other foods. The blood which was given in special occasions especially to the sick and breast-feeding mothers was rarely taken. Therefore, the *Maasai* traditional diet is waning may be due to change of lifestyle and reduction in livestock in the community. The results showed that the overall consumption of meat, vegetables, and fruits was low and therefore the children did not have a balanced diet. This could be attributable to transition from traditional dietary habits to modern lifestyles (Oniang'o and Komokoti (1999. It appears that the *Maasai* are growing dependent on other foods other than their traditional diet of meat, milk and blood, and their diets was becoming cereal-based, with few animal based food products like most Kenyan households (Bwibo and Neumann 2003).

5.6 Nutritional status of the children 2-5 years old

Overall nutritional status of children showed that 34.5% were stunted, 30.5% were underweight while 20.7% were wasted. The above levels may be reflecting food stress in the study area which is traditionally a region with food deficit. According to KDHS, (2008-2009), a high prevalence of low Height- for- Age among the one-year-old children indicates chronic nutrition and health problems in the population, i.e. the problems of stunting. Stunting and underweight are common indicators of chronic malnutrition among the under five -year- old children. Low Weight –for- Age is also the first stage of protein energy malnutrition. It is by far the most important nutrition problem as it affects up to 30% of all children between one and five years (Wood 2008). The prevalence of acute under nutrition was high (moderate and severe) compared with the findings of other communities in Tanzania (Matee *et al.*, 1997), 31.6% were stunted, 14.6% were underweight, and 2.9% were wasted. CBS, *et al.*, (2004) surveyed other ASAL areas in Kenya (North- Eastern province) and established that the prevalence of wasting in North Eastern province was extra-ordinarily high at , 27% and severe wasting was very high (11%). Nonetheless, the above findings were based on a relatively small sample size. However, this evidence suggests that some areas, particularly those occupied by the pastoral communities are harsh and could be experiencing inadequate food supply. Those that are affected most in such situations of food scarcity are children, and this could explain the undernutrition status of children. It is also worth noting that the study area is Arid and Semi Arid Land (ASAL), this may be one of the reasons why children had higher prevalence of stunting.

During the study, scenes of mothers queuing for a ration of relief food, whose supply was erratic, were common in the study area. This situation was repeated in the homesteads visited. Carcasses of livestock were spread all over the *Manyattas.* The animals in the area, not only provide the families with money to buy medicine, pay school fees, but they are a source of milk, meat and blood. Scarce food and lack of balanced diet, could have been the reason for the children becoming vulnerable to preventable infections, as their body immune system is not able to fight them.

Chronic malnutrition situation was also high in the study area attributable to perennial lack of food and drought situation which was frequently experienced in the area. The problem of malnutrition in the arid and semi arid areas in Kenya has been attributed to undernutrition due to inadequate dietary intake and diseases (Macharia *et al.,* 2006). This problem could be increased further by early introduction of supplementary foods as shown by a cross sectional study done by Ngare and Mutunga (1999), where the prevalence of stunting, wasting and underweight were 37%, 6%, and 27% respectively. Stunting was highest among 12-23 months age group. This is the age at which complementary foods were introduced. The results of the study showed the majority of the children were not exclusively breast-fed for six months. Although the Ministry of Health's strategic plan 199-2004 (Ministry of Health, 1999) aimed at reducing malnutrition among under-five year olds 30%, reducing the proportion of under-five morbidity and mortality rates attributable to key childhood diseases and malnutrition from 70% to 40% (Kabubo-Mariata *et al.,* 2009) this could succeed if exclusive breast feeding and provision of diet was promoted in pastoral areas like Kajiado District.

The findings further established that boys appeared to be at greater risk to the different forms of malnutrition than girls. The difference in nutritional outcome for boys and girls is a common phenomenon in Sub-Saharan Africa. Wamani *et al.*, (2007) reported that in all the 16 studies carried out in Africa, the prevalence and the mean z-scores of stunting were consistently lower in females than in males. Sverdberg, (1990) confirms that there is a tendency for boys to have a somewhat higher probability of being undernourished than girls. In addition, Bose *et al.*, (2007) in a study involving 533 (254 boys and 279 girls) between 3-5 years old rural children of *Bengalee* ethnicity found that boys were more malnourished than girls. The reasons for the higher risks of malnutrition in male children, particularly among the *Maasai* community could be due to the nature of the community's culture, where young boys are supposed to be out of the homestead most of the time taking care of the goats and sheep. The girls mainly remain at home fetching firewood and water. Apparently, the cultural traditions of the *Maasai*, do not give preference to the feeding of a boy or girl child. However, when they grow up to young adults the feeding pattern may change (Nestle, 1985). When the girl child among the *Maasai* grows up, she is highly valued because of socio-cultural practice such as early marriages and could be favoured in terms of feeding, hence some are confined at home for months or years so that they 'grow faster'.

With regard to age of the index child and nutritional status, the findings show that those children who were 4 years suffered a higher rate of acute malnutrition GAM, while 2 and 5 year olds suffered more chronic malnutrition and underweight respectively. The children aged 2 years may have been more susceptible to

nutritional illnesses due to the fact that when they stop breastfeeding they were susceptible to childhood illnesses such as diarrhoea (Meremikwu *et al.*, 1997) may be due poor child caring practices and hygiene. The lack of balanced diet for along time could cause chronic malnutrition and childhood underweight which may have been cited as the leading cause of global burden of disease (Ezati *et al*., 2002). That could be the reason for chronic malnutrition situation in those aged 2- 5 years in the study area.

An interesting dimension of under nutrition in *Maasai* community was that factors such as source of income, type of occupation and illiteracy did not show any significant difference ($p \leq 0.05$) in the prevalence of malnutrition. However there was higher proportion of stunted, underweight and wasted children among those whose mothers had little or no education (dropped at primary, or none) compared to children of educated mothers. Thuita *et al.*, (2005) showed that maternal factors influence nutritional status of the children. The reasons for the observed results could be due to limited variety of food stuffs and strict cultural dietary patterns that the community members values regardless of their status. The choice of food taken was dependent also on the prices and availability in the market. Lisa *et al.*, (2003), found out that higher economic status of women had a strong influence on both long-term and short-term malnutrition. From focus group discussion it emerged that women are never considered in wealth distribution. They are, however, supposed to provide food for the family by their own means. Mothers in FGD said that, "*...meorikini oshi nkituaak mali tor maasai naa keyieuni neinuraki olmarei en'daa too nkoitoi enye makeon, metaa kepej kuliek inkuk pee etum en'daa,* ("… women are never

considered in wealth distribution. They are, however, supposed to provide food for the family by their own means…"). The present occupational and educational status of women among the *Maasai* could also have an influence on the nutritional status of the children and the practice of DCBE but this was not the case in the present study.

Childhood illnesses and nutritional problems are common to children under-five years (Thorpe, 2006). Children suffering from illness are unable to properly use the nutrients in food they eat. Consequently, the overall picture of the study showed that the number of children who had been sick were more malnourished compared to those who were healthy. In addition, DCBE children had suffered childhood illnesses during the extraction of the canine bud. This was expected since poor nutrition and immunity of the child may contribute to being vulnerable to diseases such as diarrhoea and lower respiratory tract infections (Kielmann, 1988). For instance in ASAL areas where there is food insecurity and other problems such as lack of water and higher risks of diseases, the rates of acute malnutrition are between 15-20% of children under five and sometimes substantially higher (Ministry of Public Health and Sanitation and Ministry of Medical Services, 2009). These common childhood illnesses have been the reasons for DCBE (Hassanali, 2007). Food intake is crucial for child development. The interaction of an inadequate diet with infections is main cause of under nutrition which may influence the practice of DCBE.

In terms of dietary patterns, the net effects on nutritional outcomes were shown by wasting. The percentage of wasted children was significantly higher ($p=0.043$) among children who ate only twice per day, than those who ate three times per day or more. Wasting shows recent malnutrition, and may reflect recent lack of availability

of food in the homestead. The results show acute malnutrition is a reflection of acute shortage of food during the study. About a half of the households had food insecurity. This could have been due to long dry season that the community experienced.

During the study period there was severe drought and the livestock were dying in large numbers. Livestock are the main livelihood for the *Maasai* community. The families were relocating to different areas where there was pasture for their livestock and food for their families. The evidence of wasting also suggests the lack of food for the family, which affects the frequency of food intake which could affects development of the child (Ng'andu and Watts, 1990; Patel and Pettifor, 1992; Steyn *et al.*, 1993). It was also a show of extreme hunger and poverty, which should be eradicated as part of Millennium Development Goals (United Nations, 2000). The basic causes of under nutrition in developing countries are poverty, poor hygiene conditions and little access to preventive and health care (Mosley, 1983; Mosley and Chen, 1984). However, inadequate food should be immediately addressed among the pastoralists.

In addressing child under nutrition due to poor food supplies, nutrition education should be initiated in these areas. Due to cultural beliefs some locally available foods such as eggs, chicken, fish and wild fruits are rarely taken, in fact it is a *taboo* to eat them, yet they could form part of a balanced diet. The local peasant and small scale farmers should be assisted in diversification of food production, and increase in livestock production especially after loss due to drought.

5.7 Relationship between nutritional status and the practice of DCBE

There is a vicious cycle between malnutrition and morbidity. Malnutrition tends to worsen the situation of most illnesses. These illnesses affect the nutritional status of children. This cycle may apply to DCBE practice among the *Maasai* children. The results of this study clearly showed that there was no relationship between DCBE and nutritional status of children 2-5 years old in the Maasai community in Kajiado District. However, there were indications that the Maasai community targeted children for DCBE based on their nutrition status. This was because the observed rates of stunting, underweight and wasting were higher among DCBE than in non-DCBE children. The removal of deciduous canine tooth bud and its complications could have also affected the nutritional status of the children.

In addition, there could also be other factors related to malnutrition that drive the community to the practice of DCBE. Some studies have reported that DCBE was also practiced by pastoralist including the *Maasai* as a method of controlling diarrhoea (Hassanali *et al.*, 1995, *Wanzala et al.*, 2008). Diarrhoea is a major contributor to malnutrition (Lo and Walker, 1983) and it is apparent that the DCBE practice is related to the overall health status of children. However, there was no significant difference in the undernutrition indicators among DCBE and non-DCBE children. This could mean that the *Maasai* method of identifying the malnourished children was to some level falsified. The observation that there was no significant difference in malnutrition status among the two groups was an indication that there are those who could be wrongly targeted for DCBE.

In the relationship between DCBE and nutritional status among the children immunisation for instance, was a possible confounder. Among the underweight children, the risk of DCBE was greater in the immunised than those not fully immunised. Although immunisation provides health protection to the child (Lang, 1998), it appears that they do not prevent children from illnesses such as diarrhoea which predisposed them to DCBE. This study showed that all the groups of children in the study areas were all at risk of DCBE; and therefore all of them should be targeted in the prevention programmes.

Community's perceptions of child wasting also contributed to DCBE. Perceived wasting was sisgnificantly associated with DCBE. The prevalence of severe wasting was almost two times higher among children who had undergone DCBE than those children who had not undergone. The myths in the community was that child growth faltering and wasting was as a result of DCBE. Certainly, despite DCBE being harmful, it does not have long term effects on nutritional status of the children. However, moderate stunting and underweight was higher among children who had undergone DCBE than those children who had not undergone DCBE.

The findings of the study indicated that the practice of DCBE among the children 2-5 years in the *Maasai* community may have significant influence on their nutritional status. The pain and complications that occured as a result of the extraction of deciduous canine bud could have influenced the health status of the child. According to UNICEF, (2006), disturbances in nutrition as a result of acute inadequacy of food intake, severe and repeated infections, invariably affect the growth of the child.

DCBE ‘operation’ and its complications could have an influenced child nutritional status.

The findings of the study showed that, being a male or female did not influence the the practice of DCBE. It therefore showed that all children are at risk of DCBE regardless of their sex orientation. However age was a factor in DCBE as well as in malnutrition prevalence. Results of the study showed that those children who were 2 and 5 years suffered more acute and chronic malnutrition, while the practice of DCBE also was significantly highest among 5 year old children compared to children aged 4, 3 and 2 years. Similarly, a study of children in Samburu, an ASAL area, malnutrition was found to increase with age (Kielmann, 1988). DCBE becomes more evident to have occurred with increased teeth eruption age of the child, and by 4 years eruption calendar in most children is completed.

UNICEF (1998) developed a conceptual framework on the causes of malnutrition, and classified them as immediate, underlying and basic causes. Immediate causes are lack of food intake and disease; and they create a vicious cycle in which disease and malnutrition exacerbate each other. The findings of the study indicate that the burden of under nutrition in the children 2- 5 years in *Maasai* community was high and has a significant influence in the practice of DCBE. The disturbance in nutrition affects the growth of the child (UNICEF, 1990). These adverse conditions are closely linked to the general standard of living and population’s ability to meet basic needs for nutritious food, safe water, good housing acceptable levels of environmental sanitation, and ready and easy access to health care, which are lacking in most developing countries (Jameison *et al.,* 2006).

The results of this study established that a high proportion of the respondents experienced food unavailability. This was a total reflection of food inadequacy in the areas and had an impact on nutritional status and some socio-cultural health practices such as DCBE. The findings showed trends that children who were malnourished were more likely to undergo DCBE. In other countries such as USA, the prevalence of overweight and obesity for instance continue to rise. Those greatly affected are the women, the poor, the black and Hispanics. In fact an estimated 33% of the children are overweight, or at risk of overweight (Whitney and Rolfes, 2008). However, Black *et al*., (2008) reported that the highest prevalence of underweight, wasting, and stunting is recorded in Asian countries. The prevalence of under nutrition on the other hand is increasing in Africa (Mason 2004) and in countries such as Kenya especially among the children under five years (CBS, 1994). Further, according to WFP (2005), Kenya is classified as a low-income food deficit country.

Although malnutrition has been considered the product of food shortage, there is growing evidence that it is a far more complex problem involving interplay of factors such as inadequate food preparation, poor production and unequal distribution of food, infections and disease and ignorance about nutrition. The undernourished children become more susceptible to illnesses such as malaria, diarrhoea, fever and vomiting hence interference of appetite and food intake, hence malnutrition. Thorpe (2006) cited malnutrition as one of the causes of illness and death in children who survive neonatal period. Most of the common child illnesses in the area were diarrhoea, fever, and URTI. DCBE was mostly therefore performed to "cure diarrhoea". After the operation respondents in the study claimed that the child would

eat well and significant growth would be observed in the child. However, results showed that children who are malnourished are common in ASAL areas (WFP, 2005) and are at risk of DCBE.

Maasai pastoral lifestyle is also in transition (Fratkin, 2001). The *Maasai* community is responding to challenges that have resulted in increased social and economic stratification, urban migration, and diminished nutrition for women and children. Population growths, loss of livestock due to drought and famine have made many men to seek wage labour leaving their families without food and livestock. The women are left to feed the children without any assistance, yet they are not economically empowered. Lisa *et al.,* (2003), found out that high women status have a strong influence on both long-term and short-term nutritional status of the children, leading to reduction in both stunting and wasting. Frongilo *et al.*, (1997) also reported that higher energy availability and female literacy and gross products were the most important factors associated with lower prevalence of wasting. Nutrition intervention strategies for the *Maasai* community should include uplifting the low standard of living of the women by promoting formal education.

Barriers to good quality health care services of any kind in most communities are related to infrastructure. The area under study has very few health facilities which are ill equipped and sparsely distributed. Such areas have few oral health care personnel. With increasing poverty and given the fact that many children are becoming malnourished, this situation could have contributed to continuity of the practise of DCBE in the community.

The undernourished children become more susceptible to illnesses such as diarrhoea, fever and vomiting hence interference of appetite and food intake, leading to malnutrition. The results of this study established that of all the affected children in the area, diarrhoea was common among them. DCBE was therefore performed to "cure diarrhoea". After the operation respondents in the study claim that the child would eat well and significant growth would be observed in the child. However, results showed that children who had DCBE were more likely to be wasted. However, stunted children were also potential risk candidates for DCBE. Although DCBE has been cited as a health seeking behaviour, it is a harmful practice which could contribute directly to child morbidity. The risks of HIV/AIDS infections, malocclusion of teeth and even death may have been underestimated in the community, which could be the reason why the practice has been on an upward trend. The results suggest that the problem of malnutrition in child population in the area under study was already a burden to the community. Although DCBE is a cultural practice it is harmful and therefore need to be discouraged.

5.8 Limitations of the study

- One pastoral community: The study was restricted to one pastoralist community living in five sub-locations in Ngong and Magadi Divisions of Kajiado District. The findings are therefore limited to a specific geographical area.

- In assessment of nutritional status, the morbidity in the past two weeks, and food intake in past week, (food frequency), number of meals eaten and foods

consumption in the past 24 hours influence nutritional status. In this study, 24 hour dietary really was not captured.

- Poor road system and long distances: There was severe drought in the area; about half of the population in the study area had migrated to other areas especially on the hills. This made data collection difficult, and to get representative sample size, larger areas with poor road network had to be covered.

- Limited information: Some of the mothers were cooperative but could not remember exact dates when the children were born, or their birth and did not have immunization cards, nor remember the last vaccination and other vital information.

- Cultural practices: Some of the mothers could not give detailed information on the practice of DCBE because it was their culture and therefore were not willing to share some information due to some fear.

- In some cases, DCBE and Nutritional status was observed long after the children when children had already had DCBE long after. The effects of DCBE on nutritional status may be could have been more profound immediately or within one month of the practice.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

- The prevalence of DCBE among the children was high, ranging from 12% to 42% in the sub-locations under the study. There was significant difference in the practice due to geographical locations.
- Awareness about DCBE practice was high among the respondents, indicating that the practice was widespread. However the respondents were not aware of the serious complications of DCBE.
- The study showed that the practice of DCBE was highly correlated with perception that it promotes positive growth and development among the children. This was the main reason for significantly high support for the practice among the community members interviewed.
- The support for the practice of DCBE was high, with more than half of the respondents reporting that the practice should not stop but it should continue. The perception that a child who had acute malnutrition (wasted) and growth faltering significantly influenced the decision to perform DCBE. The prevalence of DCBE and the support were significantly correlated.
- Most frequently consumed foods by the children were milk, porridge, *ugali* tea with milk and sugar, *chapati*, fats and beans. There was limited consumption of meat, fruits, and leafy vegetables.

- The rate of malnutrition among the children was generally high, with high rates of stunting, underweight and wasting. The *Maasai* children in the study area faced acute and chronic nutritional stress. The overall picture depicts a crisis requiring urgent response(s).

- There was no significant relationship between the practice of DCBE and nutritional status. All children in the study area were at risk of undergoing DCBE, regardless of their nutritional status. However, undernutrition was higher among children with DCBE than those without.

6.2 Recommendations

As all children in pastoral communities are at risk of undergoing DCBE, it is recommended that:

- The intervention programmes to prevent DCBE, the MOH should target all children. Those who are responsible for the removal of DCBE were within the community. There is therefore the need to provide opportunities to the community to develop initiatives and programmes that targets members of the family, especially the mother in-laws due to their big role in health care of the infants.

- Community health workers' programmes existing in the community should include appropriate cultural educational materials targeting parents and TBAs. They should also institute infant public health measures, targeting promotion of exclusive breast-feeding, stopping the introduction of fats in infants and encouraging balanced diets. Full immunization of children and prevention of acute infant illnesses should be encouraged.

- The rate of malnutrition and DCBE practice were higher in some areas compared to others. Attention should therefore be given for improving nutritional status and prevention of DCBE especially in Oltepesi, Oloika and Oldorok sub-locations. The high malnutrition situation among children aged 2-5 years old in Kajiado is critical, necessitating emergency response and targeted efforts by all stakeholders. MOH and partners should put appropriate measures to reduce malnutrition at its earliest stages to prevent its irreversible effects, considering that this is the period of highest mental and psychomotor development in children.
- The areas where the prevalence of DCBE was high could be due to lack of awareness about the risks of DCBE. Some *Maasai* socio-cultural values should be countered. It occurs that religious values may have had some influence on socio-cultural practices such as DCBE prevalence in Eremit sub-location. There is therefore the need to include faith-based organisations in the prevention programmes existing in the area.
- This study suggests that further studies should be designed to:
    - Determine the effects of DCBE and malnutrition the first month after DCBE
    - The HIV transmission due to DCBE needs to be investigated.

- Study potential change of DCBE as a cultural practice as a result of awareness against the practice.

- Further interesting studies should be done to determine if the practice of giving fats to children at 0-4 months has an influence on diarrhoea and DCBE.

REFERENCES

Abrantes, M.M., Lamounier, J. A, Colosimo E. A. (2002). Recommendations for the use of Body mass index for the classification of overweight and obese children and adolescents. *Food and Nutrition Bulletin, 23 pp 262–265.*

Accorsi, S., Fabianai, M., Ferrarese N, Lukwiya, M., Declich S. (2003). The Burden of Traditional Practices, Ebino and Tea-tea, on child health in Northern Uganda. *Soc. Scie. Med, 57 (11) pp. 2183-91.*

Adamson, J. (1967). *Maasai*. In: *The people of Kenya*: Collins. London

Almas Ali, (1992). '*The status of health in Nepal'* Resource centre for primary health care, Nepal and south-south solidarity, India.

AMREF, (1992). *Nomadic Health Unit: Annual Reports,* 1991, 1992, 1996, AMREF, Nairobi, Kenya.

Aryeetey, M. E, Alolu, C., Wagatsuma, Y., Bentil, G., Nkrumah, F.K and Kojima, S. (1999). Health Education and community Participation in control of urinary Schistosomiasis in Ghana. *East Afric. Med. J. Vol. 76 pp324-329.*

Asuzu, M.C. (1991). A Comparative study of the commonly used Nutritional Assessment tools for Primary Health Care. *East . Afr. Med. Journal, 68,* (1) 913-22.

Baba, S.P., and Kay, E.J. (1989). The mythology of the killer deciduous canine tooth in Southern Sudan. *Journal of Paedodontics, 14,* pp48-49

Balldin, B., Hart, R., Huenges, R., and Versluys, Z. (Eds.) (1991). *Child Health: A manual for Medical assistants and other rural workers. Nairobi*: African Medical and Research Foundation.

Bataringaya, A, Ferguson, M., Laloo R. (2005). The impact of ebinyo, a form of dental mutilation, on the malocclusion status in Uganda. *Community Dent Health, 22,* (3), pp 146-50.

Barnes, D.S. (1964). Tooth Morphology and other aspects of Teso dentition. *Amer. J Phys. Anthrop, 30,* p 183.

Beaton, G. H. and Bengoa, J.M. (Eds), (1996). Nutrition (In) *Preventive Medicine.* Geneva, World Health Organisation. Paper back, pp590, World Health Organisation monograph series (62).

Bekure, S (1991). *Maasai herding:* An analysis of the livestock production system of Maasai pastoralists in Eastern Kajiado District, (Kenya study). Addis Ababa, International. Livestock centre for Africa.

Borg, R.W. and Gall, J. P. (1996). Educational Research. An introduction.6th Edition, New York: Longman Publishers.

Bose K, Biswas S, Ganguli S, Khatun A, Mukhopadhyay A, Bradra M, (2007). Stunting, underweight and wasting among Integrated Child development

Services (ICDS) scheme children aged 3-5 years of Chapra, Nadia District, West Bengal, India. *Matern. Child Nutr, 3* (3)216-21.

Bhattacharyya, A M. (2006). Composite index of anthropometry failure (CIAF) classification: Is it useful? *Bull. World Health Organ, 84*, (4), pp 335-335.

Black, R.E.; Morris, S.S.; Bryce, J. (2008). Where and why 10 million children dying every year? *Lancet. 371*: 510-526.

Blecker, S. (1964). *Maasai Herders of East Africa*. Denneis Dobston, London.

Branca, F. and Ferrari, M. (2002). Impact of micronutrient deficiencies on growth: the stunting syndrome. *Ann Nutr Metab, 46,* Suppl 1:8-17.

Bwibo, O.N. and Neumann, G, C. (2003). The need for Animal Sources of Foods by Kenyan Children. *J. Nutr. 133*:393S-3940S November 2003.

Cameroon, M. and Hofvander, Y. (1983). *Manual for feeding of young children*. Third edition. Oxford University Press.

Caulfield, L. E., de Onis, M., Blossner, M. and Black, R.E. (2004). Under nutrition as an underlying cause of child deaths associated with diarrhoea, pneumonia, malaria, and measles. *Am J Clin Nutr, 80,* pp193-8.

CBS, MOH and ORC-Macro (2004). *Kenya demographic survey 2003*. Central Bereau of Statistics (CBS) (Kenya) Ministry of Health (MOH) (Kenya)

and ORC Macro. Calverton Maryland. USA. Accessed 6/5/2009. Available: *http://www.measuredhs.com/pubs/pdfoc.cfm*.

CBS, (1999). *Kenya Demographic and Health Survey; 1998. National Council for population and Development,* Ministry of Planning and national development, Nairobi Kenya. Macro International Inc. Calverton Maryland.

CBS, (1994). *Fourth rural child nutrition survey*. Nairobi: Ministry of Planning and National Development.

CBS, (1991). *Report on height monitoring in primary schools (Kwale and Kitui Districts) Nairobi, Kenya*: Ministry of Planning and National Development.

Chaundry, R. H. (1984). Determinants of dietary intake and dietary adequacy for preschool children in Bangladesh. *Food Nutr Bull. 6,* pp 24-33.

Chindia, M. L. (1995).Traditional dental Practises. *East Afr. Med. J, 72,* (4) pp 205.

Cole, T.J. Bellizzi, M.C, Flegal, K.M., Dietz, W.H. (2000). Establishing a standard definition for child overweight and obesity worldwide: International survey. *British Medical Journal, 320*, pp 1240–1243.

Cole, T.J. (1993). The use and construction of anthropometric growth reference standards. *Nutrition Research Reviews, 6*, pp 19–50.

Cooney, K., Pathak, U., Watson, A. (1994). Infant growth charts for children 0 to 18 years of age. *Arch Dis Child, 71*, pp159 -160.

Dagnew, M. B. and Damena, M. (1990). Traditional child health practises in communities in north-west Ethiopia. *Tropical Doct, 20,* (1), pp40-1.

Daily Nation, (2010). Hunger and Disease send Children to an Early Grave. Thursday, February, pp32.

Denzin, N., and Linchon, Y. (1994). *Handbook of Quantitative Research*. London: Sage Publications.

de Onis, M., Blossner, M., Borghi, E., Frongillo E.A. and Morris, R. (2004). Estimates of global prevalence of childhood underweight in 1990 and 2015. *Jama, 29,* .pp2600-6.

de Onis, M., Frongillo, E. A. and Blossner, M. (2000). Is Malnutrition declining? an analysis of changes in levels of child nutrition since 1980. *Bull. World Health Organ.* Vol. 78. No. 10 pp 1222-1233.

de Onis, M. and Habicht, J.P. (1996). Anthropometric reference data for international use: Recommendations from a World Health Organization Expert Committee. *Am J Clin Nutr, 65*, pp 650 -658.

Department of Health (1994). *Weaning and the Weaning diet.* (Report on Health and Social Subjects No. 45) HMSO, London.

de Vaus, D. A. (1991). *Surveys in Social Research*. 3rd edition. London: UCL Press.

Dewhurst, S.N. and Mason, C. (2001). Traditional tooth bud gouging in a Ugandan family: A report involving three sisters. *Int J Paediatr Dent, 11*(4) pp 292 –7.

Dossanjee, H. and Hassanali, J. (2003). Recent Observation of some Social and Cultural norms of Maasai Community in Kajiado District- Kenya. *African Journal of Health Sciences, 4*, pp206-208.

Easton, V.J. and Mc Coll, J. H. (2005). *Sampling.* In *Statistic Glossary*, Version 1.1(online) Available http://www.stats.gla.ac.uk/step/glossary.

Espy (2008). Global nutritional status Accessed:19/6/2008.Availlable: http://www.healthguidance.org/authors/482/Mike-Espy(2008,19th)

Ezzati, M, Lopez A D, Rodgers, A, Vander Hoorn, S Murray C.J.L. and the Comparative Risk Assessment Collaborating Group. (2002). Selected major risk factors and global and regional burden of disease. *Lancet*; *360*, pp 1347-60.

Fisher, R.A. (1958) *Statistical Methods for Research Workers.* 13th Edition., New York: Hafner Publishin Co., 1958.

Fratkin, E. (2001). East African Pastoralism in transition: Maasai, Boran, and Rendile Cases. *African Studies Review.44*, No. 3 (December 2001) pp1-3.

Frongilo, E.A., de Onis, M., and Hanson, K. M.P. (1997). Socio-economic and demographic factors are associated with worldwide patterns of stunting and wasting of children. *Journal of Nutrition*, 127, pp 2302-2309

Garza, C., de Onis, M. (2004). Rationale for Developing a new International Growth Reference. *Food Nutr Bull, 2*, (suppl 1) ppS5 -S14.

Gillespie, S., Mason, J., Martorell, R. (1993). How Nutrition Improves. In: *State of the Art series*. United Nations Administrative Committee on Coordination-Subcommittee on Nutrition *(ACC/SCN*): Geneva.

GOK, (2004). Economic Survey Central Bureau of statistics, Ministry of planning and National developments: Various issues.

Graham, A E, Domoto, K P, Lynch H and Egbert A M, (2000). Dental Injuries due to African Traditional Therapies for Diarrhoea. *West J. Med*, *173*(2) 135-137.

Haddad, L. (1999) Women Status: Levels Determinants, consequences for Malnutrition, Interventions, and Policy. *Asian development Review, 17* (12) pp 96-131.

Hardlicka, A. (1940). Ritual ablation of anterior teeth in Siberia and America. *Smithsonian Miscellaneous Collection*, 99, pp1-37.

Hassanali, J. and Wanzala, P. (2008). Enucleation of Deciduous canine tooth buds infants in Sub-Saharan Africa. *Developing Dentistry. 9* (1) pp 8-10.

Hassanali, J. (2007). Deciduous canine tooth bud removal in infants in East Africa. Scientific Letter. *East Afr. Med. J. 84,* pp 500-501.

Hassanali, J. and Kibet, P. (2003). Deciduous and permanent tooth Anomalies arising from deciduous canine tooth bud removal in infancy among the Maasai. *Afr J. Oral Scie, 4,* pp 233-5.

Hassanali, J. Amwayi, P. and Muriithi, A. (1995). Removal of deciduous canine tooth buds in Kenyan rural Maasai. *East Afr. Med. J, 71,* pp 716-9.

Hassanali J, Amwayi P, Muriithi A. (1994). Social Aspects of dental health of the Rural Maasai community in Kenya. *Discovery and innovation*. *6*, pp 363-365.

Hassanali, J. and Amwayi, P. (1988). Report on two Aspects of the Maasai Dentition. *East Afri Med J, 65*, pp 798 – 803.

Hinde, S.L., Hinde, H. (1901). *The Last of Maasai*. W. Heinemann, London.

Hiza, J. F. and Kikwilu E. N. (1992).Missing primary teeth due to tooth bud extraction in remote village in Tanzania. *Int. J paediatric dentistry. 2,* (1), pp31-34.

Holan, G. and Mamber, E. (1994). Extraction of primary canine tooth buds, prevalence and associated dental abnormalities in a group of Ethiopian Jewish children. *Int. Journal of Paediatric Dentistry. 4,* pp25-30.

Hoorweg, J. Niemeijer, R, (1989). *Intervention in Child nutrition evaluation studies in Kenya*. AMREF. Kegan Paul International Ltd, London WCB 3SW.

Hosmer, D. W. Klar, J., Lemeshow, S., and Lwanga, S. (1990). *Adequacy of Sample Size in Health Studies*. John Wisley and Sons, Inc. for WHO.

IMF, (2005). *Kenya: Poverty reduction strategy paper*. January 2005, IMF country Report No. 05/11. International Monetary Fund. Washington. DC.

Inoue, K. T., Sakashita, R, (1996). Eds: *Culture and dental health in Kenya*. Therapia Publishing Company- Tokyo.

Inoue, N. and Kochi, S., (1996). Recent ablation of anterior teeth in Aniu. *Journal of anthropology Nippon science, 95*, pp 305-324.

James, P.T, Leach, R., Kalamara, E. Shayeghi, M. (2001). The worldwide obesity epidemic. *Obes Res, 9* (Suppl 4) 228S-233S.

Jameison, L.M., (2006). Using qualitative methodology to elucidate themes for a traditional tooth gauging education tool for use in a remote Ugandan community, *Health Education Research, 21*, pp 477-487.

Jellife, E. F. P. (1982). Feeding Utensils and Infants Diarrhoea in Less Developed Countries. *Amer. J. Dis Child, 136*:667.

Jones, A. (1992). Tooth mutilation in Angola. *British Dental Journal, 173*, pp 177-179.

Kabubo-Mariata, J.; Ndege G.K and Mwabu D.K, (2009). *Journal of African economies. 18,* (3), pp 363-387.

Kamau-Thuita, F., Omwega, M, and Muita, J.W.G. (2002). Child Care practices and Nutritional status of children aged 0-2 years in Thika, Kenya. *East Med. J, 79,* (10), pp 524-529.

Kassim, B. A., Noor, M.A. and Chindia, M.L. (2006). Oral Health Status among Kenyans in rural arid setting: Dental caries experience and knowledge. *East Afr Med. J, 83,* (2), pp 100-5.

KDDP, (2005). *Kajiado District Development Plan, 2005-2010*. Ministry of Planning, GOK

KDDP, (2002) *Kajiado District Development Plan, 2002-2008*. Ministry of planning, GOK

KDHS, (2008-09) Demographic and Health Survey, Preliminary Report. 2008-09. Kenya National Bureau of Statistics.

Kemoli, A.M (2008). Prevalence of molar incisor hypomineralisation in six to eight year olds in two rural Divisions in Kenya. *East Afr Med. J, 85* (10) pp 514-520

Kibet, P, Hassanali J., and Wanzala, P. (2009). The role of Traditional birth Attendants (TBAs) in the Prevention of DCBE Among the Maasai community in

Kajiado, Kenya. Unpublished report of a study carried on TBAs in October-December 2008

Kielmann, A. A. (1988). *Unit of Applied Human Nutrition. Assessment of the nutritional impact of the Wamba Food Security Programme.* Nairobi: Unit of Applied Human Nutrition, Department of Food Technology and Nutrition, University of Nairobi, pp 31-6.

Kikwilu, E. N. and Hiza, J.F.R. (1997). Tooth bud Extraction and rubbing of herbs by traditional healers in Tanzania: Prevalence and sociological and environmental factors influence the practises. *International Journal of Paediatric Dentistry, 7, (*1), pp 19-24.

KIHBS (2007). *Kenya National Bureau of Statistics***.** Ministry of Planning, 2006

Kimati, V. P., Scrimshaw, N. S. (1985). The Nutritional Status of Tanzanian children: A cross-sectional Anthropometric Survey report. *East Afr Med J, 62*, pp 105-17.

Kipchumba, P.J., (1998). *Diet and Dental Caries among the Turkana in Lokichogio Division*. Dissertation Submitted to the Department of medical Education, Kenya Medical Training College.

Kombo, D.K. and Tromp, D.L.A. (2006) *Proposal for thesis writing*: *An Introduction.* Pauliness publication Africa.

Koppert, J. (1977). *Nutritional rehabilitation*: *Its Practical Application*. Tri-med Books LTD.

Krugger, R. and Gericke, G. J. (2001). Breast feeding practices of mothers with children (aged 0-36 months) in a rural area of South Africa: A qualitative approach. *Journal of Family Ecology and Consumer Sciences, 29, pp* 60-71.

Lang, S. (1998). *Breast feeding Special Care babies.* Bailliere Tindall , W.B Saunders 24-28 Oval Road London,NW1 7DX.

Latham, M.C. (1979). *Human Nutrition in the Tropical Africa*. Connel University, Ithaca, New York, USA, 1979 pp 286.

Leung, A. K. and Robson, W.L. (1989). Acute diarrhoea in children. What to do and what not to do. *Post grad med, 86,* (8), pp 161-4.

Lisa, C.M, Usha, R.K, Aida, N. Laurence, H and Reynaldo, M. (2003). The importance of women's status for child nutrition in developing countries, (Research report 131). *International food policy Research Institute*, pp 35-59.

Lo, C.W. and Walker, C.A. (1983). Chronic proprated diarrhoea of infancy: a protracted disease. *Pediatrics 72,* (6) pp786-800

Maasai Association, (2010) ***Maasai People***. http//www. Maasai-association.org/maasai. Html

Macharia, C.W, Kogi-Makau W., and Muroki N.M. (2006). Comparative study on the Nutritional status of children (6-59 months) in a world Vision project area and non-project area in Kathonzweni Division Makueni District, Kenya. *African Journal of Food Agriculture Nutrition and Development*, 5, (1) 2005.

Macharia, C.W., Kogi-Kamau, W., Muroki N.M, (2005). Dietary intake, feeding and care practices of children in Kathonzweni Division, Makueni District, Kenya. *East Afr Med. J, 81*, (8), pp 402-407.

MacMahon, B. and Pugh, T.F. (1970). *Epidemiology. Principles and Methods.*. Little Brown and Company, Boston.

Makundi, E. A., Malebo, H., Mhame, P. Kitua, A. and Warsame, M. (2006). Role of traditional healers in the management of severe malaria among children below 5 years of age: The case of Kilosa and Handeni Districts, Tanzania. *Malaria J, 5*, pp 58.

Mason, B. (2004). Report on undernourishment in Africa http//www.wsws.org/articles/2004/sep2004/food-506. shtml. Accessed on 16/09/2008

Martorell, R. (1993). Enhancing human potential in Guatemalan adults through improved nutrition in early childhood. *Nutrition today* (January/ February), pp 6-13.

Matee, M. I. and van Palenstein Helderman, W.H. (1991). Extraction of 'nylon' teeth and associated abnormalities in Tanzanian children. *Afri Dental Journal, 5*, pp 21-5.

McDonald, A, (2000). *Infant feeding*. In: *Nutrition and Health*. Chris Holden and Anita MacDonald. Bailliere Tindall. Pp33.

McKenzie J. and Pinger R. R. (1997). *Introduction to community Health*: Web Enhanced Edition. Jones and Bartlett publishers. Internations. Barb House, Barb Mews ,London W6 7PA UK.

Mc Nab, J. **(1929).** Disease incidence and diet of natives at Lake Magadi in 1929. *East African Med. J. 17*: 249.

Meme, M. M., Kogi-Makau, W., Muroki, N. M. and Mwadime, R. K. (1998). Energy and protein intake and nutritional status of primary schoolchildren 5 to 10 years of age in schools with and without feeding programmes in Nyambene District, Kenya. *Food and Nutr Bull, 19*, pp 334-342.

Meremikwu, M.M., Asindi, A.A, Antia-Obong, O.E. (1997). The influence of Breast feeding on occurrence of dysentery, Persistent diarrhoea and

malnutrition among Nigerian children with diarrhoea. *Western Afric J. of Med*. 111,(4), pp 205-9

Ministry of Health, (1999). *The National Sector Strategic Plan*: 1999 – 2004. MOH

MOH, Kenya, (2002-2012). The national Oral Health Policy and Strategic plan.

MPHS/MOMS, (2009). ***National guidelines for Integrated Management of*** *Acute Malnutrition*. 2009. MOH

Mondal, J. K.: Gupta, P. Gupta, D. N. , Ghosh, N; Sikder, S.N; Rajendran K. *et al.*, (1996). Occurrence of diarrhoeal diseases in relation to infant feeding practices in a rural community in west Bengal, India. Acta Paediatrica 85: 1159-62

Mongensen, H. O. (2000). "False Teeth" and real Suffering: the social Course of "Germectomy" in Eastern Uganda. Culture, *Medicine and Psychiatry, 24,* pp 331-351.

Mosha, H. J. (1983). Dental Mutilation and associated abnormalities in Tanzania *Odontostoma*. *Trop*, 4, pp 215.

Mosley, W. H., and Chen, L. C. (1984). '*An Analytical Framework for the study of child survival in Developing Countries*' In: *W.H, Mosley and L.C Chen (eds) Child survival Strategies for Research, population and development Review. Supplement, 10,* pp 25-45.

Mosley, W. (1983). *Will primary health care reduce infant and child mortality?* A critique on some current strategies with special references to Africa and Asia. Seminar on social Policy. Health policy and Mortality Prospects, Paris, 28February-4 March Paris. Institute National d'Etudes Demographiques (INFD).

Mugenda, G. A., (2008). *Social science Research*: *Theory and principles*. Kijabe printing press.

Naarayana, R. (1973). The socio-economic status rating scale. *Ind Soc Sci*: pp 206-19

Naisho, J., (1984). *TBAs training package,* AMREF, Nairobi.

Nestle, P.S (1985). Nutrition of Maasai women and children in relation to subsistence food production, PHD thesis, Queen Elizabeth College, University of London. UK. 223pp.

Ng'ando, N. H. and Watts, T (1990). Child growth and duration of breast feeding in urban Zambia. *Journal of Epidemiology and community Health, 44,* pp 281-285.

Ngare, D.K., Mutunga J.N (1999). Prevalence of Malnutrition in Kenya. *East Afr. Med. J, 76,* (7) 376-80).

Ngilisho, L. A, Mosha, H. J, Poulsen, S. (1994). The role of Traditional Healers in the treatment of toothache in Tanga region, Tanzania. *Community Dent. Health, 11*, (4) 240-2.

Nyaruhucha, C. N. M., Msuya, J. M., Mamiro, P.S., and Kerengi, A. J. (2006). *Tanzania Health Research Bulletin, 8,* (3) pp 162-167.

Ocloo, E. (1993). Chronic undernutrition and the young. *Proceedings of Nutrition Society, 52*, pp 11-17.

Olenja, J. M. and Kratz, C. (1986). Medicine and Health, In: *Socio-cultural profile- Narok District*. Institute of African studies, University of Nairobi.

Ole Saitoti, T. Beckwith, C (1980). *Maasai*. H. Hamilton, London.

Oniang'o, R.K. (2005) Nutritional development in Kenya since 2001. Nutriview 2005/3.

Oniang'o R.K and Komokoti, A (1999). Food habits in Kenya: The effects of Change and Attendants. *Appetite, 32,* (1), pp 93-96.

Oniang'o, R. K., Bwibo, N, Ndombi, I. O. and Rogo, K. (1988). *Feeding the child*. Heinemann Kenya Ltd, Kijabe Street.

Oiye, S. Simel, J., Oniag'o, R. and Johns, T. (2006). The Maasai food system and food and nutrition security, (In) Indigenous food systems pp131-249.

Pacey, A. Payne, P. (1985). *Agricultural Development and Nutrition.* London Hutchinson: FAO & UNICEF; 1985 Food system Indicators; pp. 73–94.

Cooney, K. Pathak, and Watson, A. (1994). Growth charts for children 0 to 18 years of age, *Arch. Dis. Child*, *71*, (2), pp 159-160.

Patel, D. N. and Pettifor, J.M. (1992). Malnutrition in South Africa. *The South African Journal of food Science and Nutrition, 4*, (2), pp 2122-23.

Pelletier, D. L., Frongillo, E A. Jr, Schroeder, D. G., and Habicht J-P. (1995). The Effects of malnutrition on child mortality in developing countries *Bull WHO, 73,* pp 443-8.

Pelletier, D. L., Frongillo, E. A. Jr, Schroeder, D. G. and Habicht J-P (1994). A Methodology for estimating the contribution of malnutrition to child mortality in developing countries. *Journal of Nutrition, 124*, (suppl.10) 2106S- 122S.

Petersen, P. E. (2004). Challenges to improvement of oral health in the 21st Century the approach of WHO Global Oral Health Programme. *Int. Dent J, 54,* pp 329-343.

Pindborg, J.J. (1969). Dental mutilation and associated abnormalities in Uganda**.** *American Journal Physical Anthropology, 31,* pp383-90

Prechulek, H. Aldana, J.M and Hassan (1999). Feeding Practices and malnutrition in Children in Rural Bangladesh. *Food and Nutri. Bull, 20,* (4): 396-400.

Prudhon, C., Briend, A., Laurier, D., Golden, M.H. and Mary, J.Y (1996). Comparison of weight and height based indices for assessing the risk of death in severely malnourished children. *American Journal of Epidemiology 144*, pp 116–123.

Rasmussen, P., Elhassan, E. and Raadal, M (1992). Enamel defects in Primary canine related to Traditional treatment of Teething problems in Sudan. *Int. J. Paediat. Dent, 2,* (3) pp 151-5.

Rodd, D and Davidson, L E (2000). 'llko dacowo' canine enucleation and Dental sequelae in Somali children. *Int. J. of Paediatr. Dent, 10*, pp 290-7.

Sahn, D.E and Stifel, D.C (2002). Robust comparisons of Malnutrition in developing countries. *American Journal of Agricultural Economic, 84,* (3) pp716-36.

Schwartz, J. (1946). The Teeth of the Maasai. *Journal of Dental Research 26: 17-20*

Sebudde, S. (2006). False Teeth still a public health problem among children in Kanungu District- South Western Uganda. *Educational Research and reviews Vol. 1* (15) pp 156-161.

Smith, Lisa C., Haddad, Laurence, J. (2000) Explaining Child malnutrition in developing Countries: a cross-country analysis. *International Food Policy Research Institute (IFPRI). Research Reports Number 111*

Stefani, A. (1987). Influence of health Education on local beliefs. Incomplete success, is partial failure. *Trop. Doct., 17,* (3), pp 132-4.

Steyn, N. P. Badenhorst, C.J. Nel , J.H., and Ladzani, R. (1993). Breastfeeding and weaning practices of Ped mothers and dietary intakes of their pre-school children. *The S.A Journal of food science and nutrition, 5,* (1) pp 10-13.

Svedberg, P. (1990). Undernutrition in Sub-Saharan Africa: Is there a Gender bias? *Journal of Development Studies,* 26, (3) pp 469-486.

Thompson, M. J. (1998). *Nutritional requirements of Infants and young Children: Practical guidelines*. Black well Science Ltd. Osney Mead, Oxford, OXZ OEL, 25 John Street, London WC1N2BL.

Thorpe, S. (2006). Oral Health Issues in the African region: Current Situation and Future Perspectives. *J, Dent Educ. 70* (11) pp 8-15

Thuita, F.M.; Mwadime R.K.N ; Wang'ombe J.K. (2005). Child Nutritional status and maternal factors in an Urban slum in Nairobi, Kenya. *East Afri Med J, 82,* (4) pp 209-215.

United Nations (2000), United Nations-Millennium Development Declaration. Resolution A/55/L.2. New York: United Nations.2000; pp1-9.

UNICEF, (2008). *Tracking the progress in Maternal, newborn and child survival*: The 2008 Report. New York.

UNICEF, (2007). Statistics on under nutrition, progress for children. *Childinfo.org*

UNICEF, (2006) *Strategy for improved Nutrition of Children and women in developing countries. Policy Review paper,* E/IECEF/1990/1.6,UNICEF, New York

UNICEF, (2005). The state of the world's children 2005 United Nations children's fund. New York. Accessed:18/1/2010.Availble at *http://www.unicef.org/publications/index_24432.html*

UNICEF, (2004) *Drought, AIDS and child malnutrition in Southern Africa: Preliminary Analysis of Nutritional data on Humanitarian Crisis.* Nairobi: UNICEF; Eastern and Southern African Regional Office.

UNICEF and WHO, (2004) Low birth weight. Country, Region, Global estimates, United Nations Children's Fund. New-York and World Health Organization, Geneva. Available at: Http//www.unicef.org/publications/file/low_birthweight_from_EY.pdf.

UNICEF, (1998). *The situational analysis of children and women in Kenya, Nairobi*. Ministry of Planning and National Development and UNICEF, Kenya Country Office, 1998:11-195.

USAID (2009) Kenya- Food insecurity. The last situational report No. 3, Fiscal year (FY) 2010

Wamani, H, Astrom, A.N, Peterson, S., Tumwine, J.K, Tylleskar, T. (2007). Boys are more stunted than girls in sub-Saharan Africa: A meta-analysis of 16 demographic and health surveys. *BMC Paediatr, 10*, (7):17.

Wanzala, P., Sawe, J., Hassanali, J., Kibet, P., Mutai, J. and Muniu, E. (2008). Enucleation of deciduous canine tooth bud (DCBE) in infants of the Maasai community in Kenya. *Journal of the Kenya Dental Association, 1,* (1) pp15-22.

Wanzala, P, Hassanali, J and Kibet, P. (2005). Perceptions of Primary Health Care with regard to corresponding knowledge, attitude, and practices amongst the Kenyan Maasai: *East Afr Med J, 82,* pp 23-27.

Wefwafwa, T. (2010) Nutritional surveys. Kenya Nutrition Bulletin Vol.3/10 pp1-4.

Welbury, R. R, Nunn, J.H., Gordon, P.H. and Green-Abate, C. (1993). 'Killer' canine removal and its sequelae in Addis Ababa *Quintessence int, 24,* pp 323.

Were, G. S. and Wanjala, C. S. (1986). Kajiado District socio-cultural profile. Ministry of planning and national development and institute of African studies, Nairobi.

WFP, (2005). World-Hunger in Kenya. World Food Programme of United nations . Rome Accessed: 3/9/2009. Available: http*//www.wfp.org/country_brief/indexcountry.asp? country=404*).

Whitney, E., and Rolfes, S.R. (2008). Understanding Nutrition. Eleventh Edition. pp24-28. Thomson Higher Educatation. 10 Davis Belmont CA 94002-3098.

WHO, (2006). Child Growth Standards. World Health Organization. Accessed 4/9/2009. Available: *http://www.who.int/childgrowth*.

WHO, (2003). *Oral Health Promotion through school*. WHO information series on school health document 11 Geneva: World Health Organisation. NMH/NPH/ORH/SCHOOL/03.3.

WHO, (2000). Obesity. Preventing and managing the global Epidemic. World *Health Organisation*, Report No. 894.

WHO, (1998). *New Challenges of Health for All in the Twenty First Century*, A51/5 Geneva: WHO.

WHO, (1990). Diet nutrition and the prevention of chronic diseases; World health Organisation, *Technical report, 797*. pp. 69–72.

WHO, (1986). *Ottawa Charter for Health Promotion*: 1st International Conference in Health Promotion, Geneva: WHO.

Wilson, I., and Topley, M. (2007). Training project in oral urgent treatment for Tanzanian rural clinical officers. *Developing dentistry, 8*, (1), pp 17-20.

Wood, C (2008). Community Health, Third Edition ,AMREF.

Woodruff, A.W., Adamson, E.A., El Suni, A., Maughan, T.S. Kau, M., and Bundru, N., (1983). Infants in Juba, Southern Sudan: the first six months of life. *The lancet, 2* pp 262-4

Zeitlin, M. F., Megawangi, R. Kramer, E.M and Armstrong, H.C (1992). Mothers and children's intakes of vitamin A in rural Bangladesh. *Am. J. Clinical Nutrition, 56*, (1) 136-14.

Zeitlin, M., Houser, R and Johnson (1989). *Active maternal feeding and nutritional status of children 8-20 month old Mexican children*. Paper prepared for the society for research in child development, Kansas City MO., USA.

APPENDICES

Appendix 1: **Structured Schedule interview Guide**

Ematua Euni: Eneikunakina enkikikuanare

Number ☐

Part 1: Demographic Data

1. **Examination area / Euweju ejurrore**

   ☐ 1. Magadi*/ Emakat* ☐ 2. Ng'ong

2. **Sub-location** / Emurua

   ☐ 1. …… . ☐ 4. …… .

   ☐ 2. …… ☐ 5. ……

   ☐ 3. …… .

3. **Household number** ----------*Esiana Olmarei* _____

4. **Relationship of the respondents to the baby** / *Kaa ebaakinore oliking'ilikuanishore ena enkerai*

   ☐ 1. Mother / *Ng'otonye* ☐ 4 Others specify /*kulie ake*

   ☐ 2. Father / P*apai lenye* ----------

   ☐ 3. Maid / Enkaisiaiyioni

5. Marital status ; *Empukunoto Ekiyama*

   ☐ 1. Married/eyama ☐ 4. Widow /*enkoliai*

   ☐ 2. Single/meyama ☐ 5. Separated/*Etoorote*

   ☐ 3. Divorced/*kidapashate*

6. Type of Marriage/aa kiyama (1) Monogamous (2) Polygamous1) *Enkitok nabo* 2) *Inkituak komok*

7. Number of Spouses/*Esiana oo nkituak* ----------

8. Age of the mother ----------Years

Ilarin le ng'otonye ----------

9. Respondent's highest education /*Kaji etabayie tenkisoma*

☐ 1. Non/*eitu eloo* sukuul

☐ 2. Primary/*ekisoma eprimari*

☐ 3. Secondary /*ekisoma esekondari*

☐ 4. College /*ekisoma ee kolej*

☐ 5. Adult education/*enkisuma ooltung'anak kituak*

☐ 6. Any other, specify,/*kulie ake*

---

10. Respondent's occupation/*Kaa siaai eesita*

☐ 1. Housewife/*Esiaai enkaji*

☐ 2. TBA/*enkaitoyioni*

☐ 3. Farmer/*Kiremisho*

☐ 4.Businesswoman/*Enkunchai*

☐ 5. Employed/*Ingero te siaai*

☐ 6. Others/*Kulie ake*----------

11. Sources of income / *Kaaji oishi etumie impesai*

☐ 1. Livestock / *Nkishu*

☐ *2.* Business / *Orkunchai*

☐ 3. Salary/*Ormushara* --------

☐ 4. Farming /*enkiremo*

☐ 5. Any other specify / *Enkiremore Kulie ake* ----------

---

12. Age of index baby / *llarin lenkerai edukuya*

Years/*illarin* ----------months/*lapaitin* ----------months confirmed (Verify using MCH /treatment card and dental formula / *pee eishoru empalai esipitali/elala)*

13. Sex of index baby

☐ 1. Male ☐ 2. Female

Empukunoto enkerai too marei 1) Olee (2) Entito

14. Number of Children the mother of the index child has----------

-Esiana Oo enkera naata ng'otonye _____

15. Position of the child in family. ----------

Erishata eina enkerai too lmarei - _____

Part 11: Knowledge Attitude and Practice

Erubaat 11: *Eng'eno Oo kiaas*

Part A: Knowledge

16. a) Are there children who have had DCBE in your community?/*Ama ketae inkerra naitavioki ilala torrok tena murrua inyi?*

☐ ***1. ee---- 2. meetae***------

16 (b) what causes of 'this disease'?/*ainyioo nayau ena moyian*

☐ 1. Evil spirits *ildeketa*

☐ 2. Bad people who throw false teeth to children*/iltung'ata torrok onangaki nkera ilala torrok.*

☐ 3. It is caused by calves*/lasho*

☐ 4. The disease has been there for years/*etii oshiake enamoyian toolarin kumok.*

☐ 5. I don't know/*mayiolo*

☐ 6. Others specify*kulie ake*---

---

17. How frequently do you remove DCBE because of /*Kekatitin aja intayu ilala torrok naa kanyio*

Reason *Kanyio ekipirta*	Always *Enaake*	Most of the of the time/*nkatiti n pookin*	Half of the time *Toonkolong'i kuti*	Never (No) *eituaikat a*
Stop diarrhoea *pee eiboyo elototo enkoshoke*				
Stop vomiting *pee eiboyo elopare*				
Improve child growth *Pee ebulu enkerai*				
Improve appetite *kitadedeyie enkinasata endaa*				
Stop fever *Pee eiboyo oloirobi*				

18. At what age is DCBE done? / Tia rishata itaiuni ilala torrok?

☐ 1. 0-4months / *teinoto o metabaiki ilapaitin oong'wan*

☐ 2. 5-8months / *metabaiki ilapaitin isiet.*

☐ 3. 9-12months/ *Too- olapatin ooudoo metabaiki tomonaare*

☐ 4. Any other, Specify / *ketii Kulie ake* _____

19. What are the benefits of DCBE?/Anyio dupoto olala torrok

☐ 1. Healthy baby/*biotisho enkerai*

☐ *2* No diarrhoea/*metae elototo enkoshoke*

☐ 3. No fever / *meta oilorobi*

☐ 4. No wasting / mesasu

☐ 5. Avoid death/*keiboyo keeya*

☐ 6. Any other, specify / *O Kulie ake* ----------

20. Through whom did you learn about removal of DCBE? *Eteng'ae nikintayiolo ekitaiunoto Oo lala torrok?*

☐ 1. Mother in law / *Enkaputani*

☐ 2. Friend / *tenchoruet*

☐ 3. Spouse / *Te Nkitok*

☐ 4. TBAs /*tenkaitoyioni*

☐ 5. Any other, specify */ O kulie ake* ----------

21. What is the origin of DCBE? / Kajiei terunye ilala torrok?

☐ 1. Originate from the DCBE in calves (COWS) / *Ilashoo eing'ua*

☐ 2. It has always been done by our parents / *ino yeiyieo*

☐ 3. Its a cure for infantile illness / *embaata emoyian oo'nkera kutiti*

☐ 4. Grandparents know / *nookoko oo oloonkuyiaa oyiolo*

☐ *ake*----------

☐ 5. Do not know / *maiyiolo*

☐ 6. Any other specify / *kulie*--

22. Does child Malnutrition cause the removal of deciduous canine? / *Amaa, kidiem esaso enkerai ataa ninye naiko peyie eitauni ilala torrok ?*

☐ 1. Yes / *ee*

☐ 2. No / aa----------

23. If yes, how does malnutrition contribute to DCBE? / *Ama tena ninye kaji eiko peyie ejing'uno esaso olala torrok?*----------

24. Does child wasting (loss of weight) in children contribute to DCBE? / *Kediem menatishu enkerai ayau entorroni oolala ?*

☐ 1. Yes / ee

☐ 2. No / aa

25. Has your child had diarrhoea at any one time? */ Keeta enkata nashamo enkerai ino enkoshoke?*

☐ 1. Yes / ee ☐ 2. No / aa

26. If Yes to the above question, how was the child Treated? / *Amaa teneshoma, kaji eikunakaki ambaata?*

☐ 1. Taken to the hospital and treated / sipitali eewaki

☐ 2. Was treated at home by TBA / *Etabaake enkaitoyioni*

☐ 3. Child got healed by itself / *eshiuo openy*

☐ 4. DCBE was done and baby got well / *Eitaayioki ilala torrok neishiu*

☐ 5. Any other, specify / *O kulie ake* ----------

PART B: Attitudes / *Ndamunot*

27. What happens if you do not remove DCBE? *Kanyio naasa teitu itayiu ilala torrok?*

What happens / *Kanyio naasa*	Never/almost never / *etuaikata*	About half the time / *terishata kiti*	Most of the time /*terishata sapuk*	Always/almost always / *enkata pookin*
Child will develop illness / *Ketum enkerai emoyian*				
Child will have retarded growth / *kiboyo embulunoto enkerrai*				
There will be bad spirits / *keyau intokitin torrok*				
Child will die / *keye enkerrai*				

28. Do you support the practice of DCBE? / Inyorraa iyie enkitaiunoto olala torrok?

☐ 1. Yes / ee ☐ 2. No / aa

29. If yes to the above, why do you support? *Tena ee, kaa nyio pee iiruk enkitaunoto?*

☐ 1. 1ts good / *esidai*

☐ 2. It's a cure / *embaare*

☐ 3. Family pressure / *ormarie ojo peyie easi*

☐ 4. Traditional / *orkuaak*

☐ 5. Any other Specify / *Okulie ake*----------

---

30. If No to (27) above, why don't you support? / *Tena aa anyio pee miiruk ?*

☐ 1. Its dangerous / *keeta batisho*

☐ 2. Its old fashion / *olkuaak musana*

☐ 3. It's a bad traditional practice */ olkuaak intorrono*

☐ 4. Religion / *olkuaak le nkanisa*

☐ 5. No value / *meeta tipat*

☐ 6. Others indicate / *o kulie ake* ----------

31. Do you support the removal of lower incisors? / *Inyorraa enkitaunoto oo lala lembuata?*

☐ 1. Yes / ee 2. No / aa---

<u>Part C: Practice / *Nkiasin*</u>

32. Is the practice of DCBE common in this community? / *Amaa kesapuk enkitayunoto Oo lala torrok te murrua?*

☐ 1. Yes / *ee*

☐ 2. No / *aa*

☐ 3. Not Sure */ mara asipani*

33. Who decides for removal or none removal of DCBE in your household? / ***Eing'ae najo pee etaiuni ilala torrok te enkaji inyi?***

☐ 1. Self / *iyie*

☐ 2. Spouse */ enkitok*

☐ 3. Mother In-law /*enkaputani*

☐ 4. TBA enkatoyioni

☐ 5. Any other, specify / *kulie ake* ----------

34. Who normally removes DCBE? / Eing'ae oshi naitau ilala torrok?

☐ 1. TBA / *Enkatoyioni*

☐ 2. Child's parents / *intoyio enkerai*

☐ 3. CHW / *ilaramtak le biotisho*

☐ 4. I don't know /*maiyiolo*

☐ 5. Any other, specify / *kulie ake* ----------

---

35. How is the tooth bud removed? / ***kaikoni eneitauni lala torrok?***

Item Usage / *Imaasa naasieke*	Never/almost never / eituaikata	Barely used / Keasieki oshiake	Most of the time / *Enkatitik kumok*	Extensively used / *Eesishoreki oleng*
Razor / embe				
Wire / *enkorini*				
Finger / *orkimojino*				
Penknife / *enkalem*				

36. What is the reward or fee for removal of DCBE? *Kanyio ole koisayio le kitaunoto Oo lala torrok?*

Rewards *NKishoroti*	Quantity / *kebaa elaata*	Never/almost never *Etuaikata*	About half the time / *katitin kuti*	Most of the time / *katitin kumok*	Always / almost always *Katitin pookin*
Money/ *Empisae*					
Livestock / *nkishu*					
Milk / *kule*					

37. What extend does DCBE cause the following common problems? / Keeta batisho tenetaini lelo alala torrok?

Problems / *Nyamalitin*	**Not at all (No) / *metae pii***	**Some /ore *kulie naa kesipa***	**Great extend */oleng'***	**Very great Extend / *katitin kumok oleng'***
Bleeding / *keaku keo orsarge*				
Anaemia / alau *osarge tosesen*				
Infections / *moyiaritin*				
Interfered with feeding / *kelaikino ainosa endaa*				

Growth faltering *keaku mme bioto/*				
Malocclusion *Kepaashayu lala*				

Appendix 2: Structured Interview Guide for Key informants

/Ematua enapishana: Erikoroto olang'eni

Q1 How did the practice DCBE reach your community and where did it originate from? *Ama ekitaunoto olala torrok kaji eikuna peyie etabaikia e murua inyi naa kaji eing'ua*

Q*2*) what are the causes of this 'disease' (DCB)?/*kanyioo nayau ena moyian (ilala le kishaa)*

Q3. What are the factors that contribute to the practice of DCBE in your community? *Kakua sipaat naisho meitauni lala torrok tiatua murrua?*

Q4 In the family, who decides that the child should undergo DCBE and why? *Ama tormarei aing'ai onyorra enkerai metauni lala torrok naa anyio?*

Q5. Which community members are involved in the removal of DCB and why? *Kakua tung'anak te murua oitau ilala torrok naa ainyio?*

Q6. In your opinion, do you support DCBE practice? Give reasons for your answer? *Ama to-oduaat ino inyorra enkitaunoto oo lala torrok? kanyioo*

Q7 Are there complications that could arise after the removal of DCBE and why? *Ketii nyamalitin naatumi teneitauni ilala le kishaa? kanyioo?*

Q8. Do you have a problem of food in your community and are there children who are undernourished? *Katae enkerra menat esesen tena marrua?*

Q9. In your opinion, why are these children undernourished? *Am ate duata ino kanyio peyie etae inkera menat*

Q10 In your opinion, is there a relationship between DCBE and undernourishment? If yes how? *Ama tonduaat inono, keeta enabaikino ilala torrok ooesaso?*

Q11. What role can you play in the prevention of DCBE? *Inchoru enduaat ino ni indim iyie aiborie enkitaunoto olala torrok?*

Q12 What roles can other community members play in the prevention of DCBE? *Kaaji eiko emurrua teiniboyo ekitaunoto olala torrok?*

Q13 Give your suggestions on how to Prevent DCBE. *Inchoru endamu*

Appendix 3: Oral Examination Form

/ Empalai Ematua eimiet: enjurrunoto enkutuk

table / *Meza* 2: Oral examination form / *Empalai enjurrunoto enkutuk*

PEASE, INDICATE THE CORRECT CODE FOR EACH OF THE TEETH / enjurrunoto olalae

UPPER JAW / lala le shumata	TOOTH *olalae*	55	54	53	52	51	61	62	63	64	65
	CODE *Itodolu olalae*										
LOWER JAW / lala le abori	TOOTH *Olalae*	85	84	83	82	81	71	72	73	74	75
	CODE *itodolu*										

CODES / *Alama*:

1 = Erupted / *etubulua*

2 = Un erupted / *eitu ebulu*

3 = Un erupted/erupted and extracted (DCBE) /*eitu ebuluu neitauni*

4 = Erupted and extracted traditionally / *etubulua neitauni enkaitoyioni*

If the child has had DCBE ask the following Questions /Teneitayioki enkerai olalae inkilikuana induaat enyenak:

1) When was DCBE done to the child? ***Anu eitayioki ilala lenkerai?***

Months/lapaitin----------years / *ilarrin*----------

2) Who did the DCBE?/ *Eng'ai naitayio lelo ala?*

☐ 1. TBA/enkatoyuni

☐ 2. Traditional healer / ilabaak

☐ 3. The mother /*ngotonye*

☐ 4. Others, indicate / *kulie ake*----------

3) What instrument did the operator use? / *Kakuai maasai itayunyeki*?

☐ 1. Knife / enkalem 2. Wire / *enkorini*

☐ 3. Razor blade / *embe* 4. Others, please indicate / *kulie ake* -------

4) Was the child sick at the moment of Extraction? / ***Ama kemoi enkerai tenkata naitayioki olalae* ?**

☐ 1. Yes / *ee* 2. No / *aa*

(5) What was the child suffering from during that time of operation? /*aa moyian**?***

☐ 1. Malaria */ Enkonjang'ani*

☐ 2. Diarrhoea / *elototo enkeshoke*

☐ 3. Wasting / *esaaso*

☐ 4. URTI/*oloiro*bi

☐ 5. Others, indicate / *kulie ake*

6) Had she/he been taken to the hospital for the illness? /*Kewaaki enkerrai sipitali te karaki ina moyian?*

☐ 1. Yes / *ee* 2. No / *aa*

7) **What complications did the child have after DCBE*? Kakua nyamalitin enoto enkerai pee eitauni ilala torrok?***

Complications / *inyamalitin*	Never/almost never /*eituaikata*	About half the time / te *rishata kiti*	Most of the time / te *rishata sapuk*	Always/almost always /*ekaata pookin*
Bleeding / *empukunoto orsarge*				
Anaemia / *alau osarge*				
Infections / *moyiaritin*				
Interfered with feeding / *meisho enya endaa*				
Growth faltering / *mebulu*				

(8) How did you manage the complications / *Kainyoo intaasa nena nyamalitin?* -

---

Appendix 4: Quiding questions to Focus Group Discussion

Ematua eile: Erikoroto Oo kirorot olturnu

Q1. What are the common ailments affecting the children in your community? *Oshi inyamalitin emoyian naata inkera emurai inyi?*

Q2. What is DCBE, and what causes this 'disease'? *kanyioo enkitaunoto oolala lekishaa naa kanyioo na yau*

Q3 How common is the practice of DCBE in this community? *Keisaput enkitaunoto ekununo ekitaunoto olala lekishaa te murrua?*

Q4. Why do community members practice DCBE? *Kanyio pee etau iltunngonaka le emuruai ilala lekishaa?*

Q5. In your opinion, do you support DCBE practice? Give reasons for your answer? *Ama ten'duata ino inyorra iyie ekitaunonoto Oo lala lekishaa toonkera? Tolimu aajo kainyoo peyie inyorra*

Q6. Who are involved in the practice and why? *Kakua oosita ina naa kanyioo?*

Q7. What are the complications of DCBE and do they manage? *Kakua nyomalittin etumi tenkitaunoto olala le kasha naa kanyio eesi pee eiboori*

Q8. Are there children who are undernourished in this community? *Ketae inkerra menat te murua?*

Q9. In your opinion, why are these children undernourished? *Ama to duaat kanyio paa menat nena kera?*

Q10. In your opinion, is there a relationship between DCBE and undernourishment? If yes, how? *Ama tendamunoto ino keeta enebaikino ilala lekishaa oesaso enkerai? kaa ebaikino?*

Q11. In what ways can the practice of DCBE be eradicated? *tiaoitoi endiemi aesho ekitaunoto olala lekishaa?*

Q12. What role can you play in the prevention of DCBE? *Kanyioo iindim ataasa pee im'booyo enkitaunoto oo lala lekishaa?*

Q13. What roles can other community members play in the prevention of DCBE? *Kaa eidim ikulie tungera le murrua ataas peyie eibooyi enkitaunoto oolala lenkishaa?*

Q14. In your opinion, which strategies can be used to prevent the practice of DCBE in this community? *Ama te damunoto ino kanyioo eidimi ataas pee eboori enkitaunoto olala le kishaa te murrua?*

Appendix 5: Nutrition assessment form

Ematua Enguan: Empalai nalimu Embiotisho)

Questionnaire Number ☐

Part A: Anthropometric Measurements Ayiolua enkiroshi

(1)

Date of birth / *entariki natoiwoki* ------

----

(2) Age of the baby / *Ilarin le nkerai* -

----

(3) Birth order/ *eniaja teinoto*

(4) Birth weight / *Enkiroishi pee'eini* -

----------kilograms

(5) Current weight / *enkiroishi einakata* ---------- Kg

(6) Current Height / *ekadori* ----------

----------cm

(7) Mid upper Arm circumference:

_____cm

Enabaa elalai orpirankash _____

Part B: Immunisation / *orkordata*

(8) Immunisation: Immunisation card available

☐ Yes / *ee* ☐ 2. No / *aa*

Orkordata: ketae empalai okordata 1) ----------*ee* 2) *aa*----------

(9) On schedule? / *esujar*----------

☐ 1. Yes / *ee* ☐ 2. No / *aa*

a) On schedule:/*esujaaroto*

☐ 1. Yes / *ee* 2. No / *aa*

b) Discontinued (*ketapalaa)*

☐ 1. Yes / *ee* ☐ 2. No / *aa*

(10) Immunised? *kekorda?*

☐ 1. Yes / *ee* 2. No / *aa* ------

c) Fully immunised?

☐ 1. Yes / *ee* 2. No / *aa* ------

Keishua orkordati etuu aikataa ekordei ----------

(11) Skipped vaccines Indicate ----------

*Tolimu orkordati oeidaki.*_____

(12) Last vaccination received---------- and when? ----------

Kanu ebayie orkordata _____ naa kanu? _____

Part C: Breast feeding and general feeding practices / enkitanaata enkerai enkishoroto endaa

(13) How long was the baby breast fed? ***Kerishata naaba etanaa ekerai****?*

_____

(14) At what age did you wean your child?/*kanu interua ooru enkerai olkina*--------

---------- ---------- (record in months /tolimu too lapaitin)

(15) How long did you exclusively breast fed the baby? / *kerishata nabaa etanaa orkina ake?* 1 2 3 4 5 6 7--------months / *olapatin*

16. Who feeds the child? / Aingai naitoti enkerai?

Persons */itung'anak*	Never/almost never / eitu *aikata*	About half the time /*erishata kiti*	Most of the time / te rishata sapuk	Always/almost always / *pookin kaata*
Mother / *ng'otonye*				
Maid / *esinka*				
Sibling / *naang'arie kina*				

Father / *papai*				
Relatives / *elaatia*				

17. What sort of food do you feed your child? / kaa mpukunoto endaa enya enkerai*?*

Starch / Im*kuashen*	Animal protein /*endaa okinshu*	Vegetable proteins /*mpoka*	Fruits / *ling'anayio*	Fats / *eilata*

18 How many times do you feed your child? / *inkatitin ajae intoti enkerai*

☐ Every hour / *isaai pookin*

☐ Once a day / *te ndama*

☐ Two times a day / *katitin aare te ndamaa*

☐ Three times a day / *katitin uni te nkolong*

☐ Others Indicate / *kulie ake* ----------

(19) Does the baby have any food allergies?

☐ 1. Yes / *ee*

☐ 2. No / *aa*

Keeta enkerai endaa nemenyor osesen?

(20) If yes which foods is the baby allergic to? *Tena ee aa nabo?*

_____

(21) Do you experience difficulty in feeding the child?

☐ 1. Yes / *ee*

☐ 2. No / *aa*

Enta oshi enyamali te nincho enkerai en'daa?

(22)If yes which difficulties / *kakua nyamalitin?*----------

(23) Does the child feed oneself?

☐ 1. Yes / *ee* 2. No / *aa*

Keidim enkerai aitotio keon?

(24) Which foods do the baby likes / *kakua daiki enyor enkerai?* ----------

(25) Which food does the baby dislikes / Kaa *daa menyor enkerai*----------

(26) Do you have enough food to feed your child?

☐ 1. Yes / *ee* ☐ 2. No / *aa*

Iata endaa naidip aitotio enkerai ino*?*

(27) Is there a problem of food availability in the homestead?

☐ 1. Yes / *ee* 2. No / *aa* ----

Ketai olong'or lendaa tiang? 1) *ee*-------- 2) ----------*aa*

28) Has your baby become sick recently (the last one month?)

☐ 1. Yes / *ee* 2. No / *aa*

Ketamoyia enkerai ino too nkolongi naata natulusoitie (olapa obo otulusoyie)

1) aa---------- *2) ee*----------

(29) If yes, what sickness? *Amaa tenetamoyia, kaa moyian?*

☐ 1. Malaria / *enkonjangani*

☐ 2. Diarrhoea / *elototo enkoshoke*

☐ 3. Fever / *ekirowuaj osesen oloitobi*

☐ 4. Others indicate /*kulie ake*--

(30) Has your baby experienced any drop in weight recently (two weeks?)

☐ 1. Yes / *ee* 2. No / *aa*

Ketadoyie enkerai ino enkiroshi too nkolongi nataana? 1) ee 2) aa

(31) If yes to above, why? / Tena ee naa anyio?

☐ 1. Weaning / *enkishoroto en'daa olkina otoonoki*----------

☐ 2. URTI / *imoyiaritin oo igoso olkipieu*----------

☐ 3. Malaria / *Ekonjang'ani* -

☐ 4. Teething / *eishoi ekutuk*

☐ 5. Diarrhoea / *elototo enkoshoke*

☐ 6. Lack of food / *meetai endaa* ----------

☐ 7. Other reason / *kulie ake* -

PART D: Frequency & food type consumed / *Etumoto ekulie ndaaki napaasha kaaku ndaaki oishi inynya te mshata Oo nkolongi wiki*

Indicate by marking (x) / *ntodolu tolama le (X)*

Table / *Meza* 1: Food Frequency Table / *Etodalu emesa*.

Foods / *endaki*	Frequency of food intake per week					
	Never / *aitu kata*	1-2	3-4	5-6/	Throughout the week	
Veges / e*mpoga*						
Sukuma / *Sukuma*						
Cabbages / *kabeji*						
Tomatoes / il*nyanya*						
Carrots / *ilnganayio*						
Fruits ilng'anayiok						
Oranges / *illmachungwa*						
Mangoes/*ilnganayio lejim*						
Bears / illpeas						
Wild fruits / *ilng'anayiok lentim*						

Legumes						
Peas/enchoko						
Beans – *imposho*						
Lentils / *imbenek naanyori*						
Green grams/ *endengu*						
Animal proteins /						
Eggs / *ilmosor*						
Milk / kule						
Chicken / i*kukui*						
Fish / isengerr						
Beef / *inkiri*						
Duck/*embaata*						
Goat /*enkine*						
Lamb/*enkerr*						
Offal						
Liver /*emonyua*						
Kidney / *ilarakuj*						
Intestines / i*monyit*						
Starch						
Chapati/*echapati*						
Potatoes / i*nkuashen*						
Rice / *ormushele*						
Ugali/enkurrma *or ugali*						
Whole maize/ *ilpaek*						
Tea+ milk & sugar / *shaai we sukari*						

Appendix 6: KEMRI / National Ethical Review Commitee

Appendix 7: Permission from Provincial Administration

Appendix 8: Consent Form: Ematua Dukuya: Empalai ejurrorre

Title of the study: **Deciduous canine tooth bud extraction and nutritional status of children 2-5 years old in Kajiado District in Kenya**

Ekitayunoto oolala lekisha (A Taa ilala oji torrok): Oembiotisho ashu enkitotio o nkera natii tiabori ilarin imiet tolkerenket lorkejuodo ten kop e Kenya

PART A

Introduction

I am Peris Jelagat Kipchumba from the Institute of Tropical Medicine and Infectious Diseases, Jomo Kenyatta University of Agriculture and Technology. Pursuing doctorate Degree in public health. As partial fulfilment of the requirement I am undertaking a study to determine the relationship between deciduous canine tooth bud extraction and nutritional status of children aged 2-5 years in Kajiado District.

Deciduous canine tooth bud extraction is a practice prevalent among children in the pastoral communities mainly in Sub-Saharan Africa and Kenya. Studies have shown that the practice is performed for some reasons. Malnutrition too is a prevalent phenomenon among children in the pastoralist communities due to their nomadic way of life. The two situations have an influence in the health of the children.

You are therefore invited to participate in this study whose main objective of is to establish the relationship between prevalence of deciduous canine tooth bud extraction and nutritional status of children 2-5 years in Kajiado District. We kindly request you to read this form and ask any questions you may have before agreeing to participate in the study.

Enkiterunoto

Kaji nanu Peris Jelagat Kipchumba endakitari oorkeek omoyiartin nashurtakinoi te sukul naji Jomo Kenyatta University Of Agriculture and Technology. Pee aidip enakisuma kaayieuni naas enjurrore naipirta enkitayinoto oolala (anaa iloshi oji torrok) we nabaikinore biotishu oonkera natii tiabori ilarin imiet tolkerrenget lorkejuado.

Ore enkitainoto oolala odanyi enyirrt enkerai kiti tenkalem na enkiasat naitaasi inkera oltugana oidurraa anaa ilaramatak. lolosho lolkila-orok, lolosho le-kenya. Ore tenjurrorre natujurruoki na-nchere enkiasat naasi tenkipirta, oontokitin kumok ore si esaso onkera na nabo oo nyamalitin tiatua ilaramatak tenkaraki olkuak lenye lenaidurra. Ore enkitainoto elelo ala oe saso onkera eitanyamal oleng biotisho onkera. Kintomon iyie pee kiaku tenebo tena jurrore, naa ore enkipirta enye naa pee kiyiolou enebaikino enkitayunoto o lala lekisha o batisho oonkera natii tiabori ilarin imiet tolkerenket lorkejuado. Kinkilikuani sii pee isum ena palai ninkilikuanu kikilikuanat naba ana iniyieu eton eitu inyorra aku tenebo ena kisuma ashu enjurore.

Ore enaitasheki ena jurrorre naa keji Peris Jelagat Kipchumba ore ninye naa endakitari orkeek omoyiaritin nashurtakinoi te sukul naji ene Jomo Kenyatta University Of Agriculture and Technology.

Purpose of the study

The main objective of the study is to determine the prevalence of Deciduous Canine tooth Bud Extraction (DCBE) and nutritional status among the *Maasai* children below five years of age. The information gathered from this study could be used to advise policy and to modify intervention programmes which will go along way in improving the nutritional status and the general quality of life of children 2-5 year old.

Enkipirta ena jurrore.

Ore enkipirta ena jurore naa nchere enkitaunoto oolala (anaa iloshi torrok loonkera) obiotisho onkera natii tiabori ilarin imiet to losho loolmaasai tolkerrenket lolkejuado. Ore pookitoki nayiolouni naipirta ena jurrorre naa ninye eishoorki too naipirta nkitanapat esirkali naa ninye sii naishoru enkoitoi sidai naiyiolounyeki biotisho onkera natii tiabori illarin imiet.

Study procedures

If you agree to take part in this study, you will be interviewed on various issues such as awareness, attitude and practice of DCBE. You will also be asked about the nutritional issues of your child, breastfeeding, nutritional assessments and some oral examination done on your child.

Enkoitoi Enjurrore

Teniaku intonyorrayie ena jurrorre, naa eikinkilikuani nkikilikuanat ana engeno, wendamunoto oo enkitayunoto olala, eikinkilikuani sii inaipirta biotisho enkerai ino, naa keingurari sii atua enkutuk.

Risks of study participation

There are no risks anticipated to cause pain or discomfort to your child. The investigators will explain the procedures to you and the children who can understand.

Batisho Enjurore

Meetae batisho naitekini ajo ketum enkerai ino, ore lelo ajurrok aikiliki iyie tenebo oenkerai ino inkoitoi nasujari niindim atoningu.

Research benefits

If you agree to participate, physical examination, weight and height measurements of your child shall be taken. If the child requires any medical attention, you will be advised accordingly. The information gathered from this study will be used to modify intervention programmes which can improve the health and nutritional status of children.

Dupoto ena jurrore

Ore teneaku intonyorrayie aaku tenebo, naa keingurari ajur empukunoto enkerai ino, neipimi ilkiloi, wenkadori. naa teneeta enkerai ino ae nyamali ake ninye nayieu naa ekiutari anaa enashaakino. Ore pooki ngeno we iyiolounoto natumi tenajurrorre

naa ninye eyasishoreki pee etumi aitobira enkotoi naingorieki biotisho oonkera ondaiki enye.

Study costs

If you accept to take part in this study, there will be no payment to you and for the study procedures.

Elaata enajurrore

Meetae aitoki nikilaakini tininyorraa aku tenebo enajurrore mikijokini sii peyie ilak ntokitin nikiantaasi tena jurrorre.

Confidentiality

The information collected from you and your child will be strictly private and confidential and will be kept under lock and key. Your names or that of your child will not be used in any report of this study, or in any reports, publications or presentations. In case the officials from Institute of Tropical Medicine and Infectious Diseases (ITROMID, KEMRI), or Jomo Kenyatta University of Agriculture and Technology will review your records for the study, they will protect your privacy.

Ekisudoroto

Ore pooki toki nayiolouni teyie we nkerai ino meetai likai tung'ani olikini eshumi neikenori te nkikenet. Ore entarrnan ino wene nkerai ino nemeeta ae wueji nelimunyeiki tiatua enajurrorre ashu tiawueji ake ninye pooki ashu eitodoluni tiae wueji. Teneitoki aatayie tipat inanatayioloki teyie ilofisani Lena jurrore lechoto

orkiek omoyiaritin Na shurtakinoi le Jomo Kenyatta, ashu le KEMRI aingura impala ena siai keke meeta ake sii ninche likai tungani oitodol..

Participation information

Participation is voluntary and there are no risks at all. It is your decision to participate or not to participate in this study. If at anytime you wish to withdraw from participating in the study, you can do so, and this will not affect any future participation or relations with anyone or any institution.

Orkilikuai lenyorrarrotu

Ore pee eku intonyorraiyie enajurrorre na iyie ake makewan otonyorrayie, me eikitaarakaki. Metae si enyamali tukul, eyieunoto ino pee inyorra ashu ipal. Tenitonyorrayie, nintoki ayieu niany nemetii sii enyamali, sii ena tenintoki aadamu kenya ake ayiea niaku tenebo iyiooki tena siai ashu tiae nanyanyukie inkolongi inono napuonu ashu olningo lino olikae tungani a ashu ae idara.

Contacts and questions

The researcher conducting this study is Peris Jelagat Kipchumba. You may ask any questions you have now, or if you have any questions later, you are encouraged to contact her through mobile telephone number: 0722 7719864, or email pkibet@yahoo.com

If you have any questions or concerns regarding the study and would like to talk to someone other than the researcher (s), you are encouraged to contact the following:

The Director,

Institute of Tropical Medicine and Infectious Diseases (ITROMID)

Jomo Kenyatta University of Agriculture and Technology (JKUAT)

P.O. Box 62000 - 00200, Nairobi

Telephone no: 067- 52711

Email: itromid@kemri.org.

OR

The Chairman

KEMRI National Ethical Review Committee,

S.L.P. 54840 00200, Nairobi

Phone number 2722541, 2713349, 0722 205901

email: itromid@kemri.org.

Tiniyieu nioshi esimu ashu nkilikuanisho

Ore enkajurroni enajurrorre naa Peris Jelagat Kipchumba indim aikilikuanu ina niyieu tenakata ashu aikata tenioshoki ninye esimu 0722-719864 ashu email pjkibet@yahoo.co.uk.

Tiniyieu nikilikuanu inkikilikuanat naipirrta ena jurore, ninyieu nikilikuan likae tungani neme ena ajurroni, indim ake si airorie kulo tungana.

Orkitok lenchoto enjurore to lkiek omoyiaritini nashurtakinoi (ITROMID) te Jomo Kenyatta University of Agriculture and Technology (JKUAT) P.O Box 62000-00200, Nairobi.

Esari esimu 067-52711

Email: Director@itromid.jkuat.ac.ke

Ashu

Oloopeny olorika le KEMRI National Ethical Review committee.

P.O Box. 54840 00200, Nairobi

Inabari esimu 2722541, 2713349,0722205901.

Email : info@kemri .org.

Part B: Participant consent form

Please read the information sheet (PART A) or have the information read to you carefully before completing and signing this consent form. If there are any questions you have which are not clear to you regarding this study, please feel free to ask the investigator prior to signing the consent form.

Empalai olojurri

Kiomono iyie isuma orkilikuiai otii erubata edukuya (A) ashu incho kisumakini niningu aitobiraki eton eitu ipiki orkimojino atukunya ena palai. Kiomon iyie peyie ikilikuani entoki akeninye neitu iningu tena jurore, eton eitu itukuny.

Who will consent? The absence of the principal investigator, a trained field worker/assistant will do the consent.

Aing'ai oishoyo ejurrore meshomo dukuya

Oremetii olorikito ejurrore naakeidim olotilenye anaa oltungani oisumishaki enajurrore aishooi meshomo dukuya.

Participant Statement

I, Mr, Mrs, Miss,

……..

Hereby give consent to Peris Kipchumba or trained field assistant by the name ---------- to include me and my child in the proposed study entitled "**Deciduous Canine Tooth Bud Extraction and Nutritional Status of children aged 2-5 years old in Kajiado District, Kenya**".

I have read the information concerning this study, and I fully understand the aim of the study and what will be required of me if I accept to take part in the study. The risks and benefits have been explained to me. Any questions I have concerning the study have been adequately answered and I am satisfied.

I understand that I can withdraw from this study anytime if I wish so without giving any reason and this will not affect my access to normal health care and management.

I understand that I will be interviewed three times from the implementation of this study to the end. I therefore consent voluntarily to participate in this study.

Orkilikuai lenyoraroto

Nanu Mr./Mrs./Miss …….. Natonyoriki----------peyie apik nanu oe nkerai ai atua enajurore oo lala lekisha tenebo inaipirta enkitotio o kera natii tiabori ilarin imiet tokerenket lorkejuodo te Kenya. Aisoma orkilikuai orpirta enajurrorre, natoninguo aitobiraki enkipirta ena jurore na ore pooki toki nayieuni te nanu natonyorrayie pee eya erubata tena jurore. Ore batisho ashudupoto nainosakaki nanu. Ore sii enkikilikuanat pookin naipirta ena jurore natolikiaki natoninguo. Atayiolo si ajo kaidim atung'uai ena jurrore enkata pookin tenayieu ata tenamaata emporet, meidim sii ena ainyala aitoki nabo ebiotosho ashu likae mabarishoi. Atayiolo sii ajo kaidimi naikilikuanishore katini uni atuni enkiterunoto ometabai enkitingoto,ena jurrore.

Name of Participant or Respondent .....*(Enkarna)*

Relation to the index child (subject).....

*(Enibaikino oe nkerai)*Signature /*Atukuny te nkalamu* .....

Thump print /*atukuny torkimojino lekedienye* ----------

Date / Entariki.....

Name of the person taking consent……

Ekarna oltungani ogiraiaaikilikuan----------

Signature / *Entukunyata*…..... Date /

entariki……Name of the investigator / *enkarna eilo ojurisho*

……

Signature / *Entukunyata*…..Date /*Entariki* ……

Appendix 9: Assent form for children below five years old

Ematua Eare: Eneikunakinoi enkikilikuanare

The following are instructions that will be followed when carrying out the study on children:

- *The guardian in this study shall be a relative to the child, grandmother, uncle, Auntie, sister, brother, cousin, Nephew, and niece. All should be above 18years.*
- *If the mother/guardian accepts the child to be examined and the child four (4) years and above refuses, then do not examine the child.*
- *If the child accepts to be examined and the mother/ guardian cooperate, then include them in the study – go ahead carry out the interview and examine the child.*
- *If both the mother/guardian and the child four years and above refuses to cooperate in the study then exclude them, do not examine and do not interview the mother.*
- *The child four (4) years and above should give an assent before being included in the study by answering yes /No to the following question :*

1. Would you kindly please open your mouth for dental examination?

1) Yes/----- 2) No--

2. Would you kindly please allow me to take your weight and height measurements?

1) Yes----- 2) No----------

Name of the child----------

Name of the mother/ guardian ----------

Thumb print----------/Sign----------

Eneikunakinoi enkikilikuanare

- *Iji ikunari ejurrore oo enkera.*
- *Ore olorikito enkerai naa oltugani oota enaibakinore, aa Kokoo, Olenkapu, Nepapa, Olalashe, Enkanashe, neyieuni neeta pooki ilarin 18 neilep.*
- *Tenenyorraa Ngotonye ashu olorikito Enkerai meingurari , neany Enkerai naata ilarin ooguan (4) neilep eingurari tapala ejurrore.*
- *Tenenyorraa Enkerai meingurari nenyorraa sii Ngotonye ashu olorikito, tipika pooki atua ejurrore, nilo dukuya ajurr ninguraa Enkerai.*
- *-Tenemenyorra Ngotonye ashu olorikito, neeta Enkerai ilarin okuni (3) neilep, tapala ejurrore, nimijurr nimínguraa Ngotonye.*
- *-Ore Enkerai oolarin ooguan neilep, naampaka metonyorrai etoneitu ejurri, ajo ee arashu aa.*
- *Tabolo enkutut pee aing'uraa ilala linonok. 1)ee 2)aa*
- *Kayieu naipim enkadori ino we enkiroshi ino. 1)ee 2)aa.*

  Enkarna Enkerai----------

  Enkarna Olorikito/Ngotonye----------

Entukunyata olkimojino----------