COMPLEMENTARY FEEDING PRACTICES AND NUTRITIONAL STATUS OF HIV EXPOSED INFANTS AGED 6- 24 MONTHS ATTENDING eMTCT DEPARTMENT AT GOMBE HOSPITAL, BUTAMBALA DISTRICT

BY

IBRAHIM KASUJJA

15/U/288/HND/GV

A RESEARCH REPORT SUBMITTED TO THE DEPARTMENT OF HUMAN NUTRITION AND HOME ECONOMICS IN PARTIAL FULFILMENT OF THE REQUIREMENTS LEADING TO THE AWARD OF THE DEGREE OF BACHELOR OF SCIENCE IN HUMAN NUTRITION AND DIETETICS OF KYAMBOGO UNIVERSITY

SUPERVISOR

JACENT KAMUNTU ASIIMWE (PhD)

AUGUST, 2018

DECLARATION

I KASUJJA IBRAHIM, hereby declare that this report is my original work and has never been presented by any other person.

Registration Number	Signature
15/U/288/HND/GV	.....Ibrahim Kasujja.....

APPROVAL

I hereby approve that the candidate, KASUJJA IBRAHIM, has successfully compiled this report, on a study concerning complementary feeding practices and nutritional status of HIV exposed infants (6-24 months) attending eMTCT department, for Early Infant Diagnosis (EID) and Elimination of Mother to Child Transmission (eMTCT) services at Gombe hospital, Butambala district.

…Jacent Asiimwe…… …7th-09-2018……..

Dr Jacent Kamuntu Asiimwe Date

Research supervisor

DEDICATION

This report is dedicated to Dr. Jacent Kamuntu Asiimwe (research supervisor), Dr Evelyn Isingoma (Ag. head of department of Human Nutrition and Home Economics, Kyambogo University) and her staff, Dr. Ssekamatte Samuel (Ag. Medical superintendent, Gombe hospital) and his staff, and Sr. Namuli Winnie (Ag. Principle nursing officer) at Gombe hospital, Butambala district.

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Lastly, I appreciate the efforts of my beloved parents who provided financial support, and fellow colleagues offering Bachelor of Science in human nutrition and dietetics who contributed towards attaining a successful study on complementary feeding practices and nutritional status of HIV exposed infants aged 6-24 months, at Gombe hospital.

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ABBREVATIONS AND ACRONYMS

Ag.	Acting
AIDS	Acquired Immunodeficiency Syndrome
ART	Antiretroviral Therapy
CBF	Continued Breastfeeding
CF	Complementary Feeding
CM	Chronic Malnutrition
DDS	Dietary Diversity Scores
EBF	Exclusive Breastfeeding
EID	Early Infant Diagnosis
HIV	Human Immuno-Deficiency Virus
IYCF	Infant and Young Child Feeding
MAD	Minimum Acceptable Diets
MAM	Moderate Acute Malnutrition
MF	Mixed Feeding
MMF	Minimum Meal Frequency
MUAC	mid Upper Arm Circumference
PCR tests	Polymerase Chain Reaction tests
eMTCT	Elimination of Mother to Child Transmission
SAM	Severe Acute Malnutrition
SD	Standard Deviation
YCC	Young Child Clinic

ABSTRACT

Breast milk contains less bioavailable iron and almost negligible vitamin D. A gradual decline in tissue stores of iron, vitamin A, vitamin D and other micronutrients occur in infants, starting at birth until infants are 24 months old. Exclusive breastfeeding alone cannot provide the nutrients required by the infants to meet their normal nutritional needs at 6 months until 24 months of age. At 6 months of age, the nutritional needs for energy, protein and micronutrients increases in infants than before the age of 6 months. Breast milk alone cannot fully nourish the infant's body for physical growth and mental development. It is very important to give infants nutritious family foods in order to meet their nutritional requirements, combined with continued breastfeeding until 24 months old. Poor complementary feeding is thought to be responsible for the increased burden of malnutrition in infants aged 6-24 months old. Because infants aged 6 to 24 months are in the critical window of opportunity period, poor feeding in terms of un-timely introduction of foods, poor feeding frequency and low dietary diversity should be avoided. Therefore interventions promoting optimal complementary feeding during the first 2 years of an infant's life can prevent 6% of the infant morbidity and mortality occurring every year in the world.

The main objective of the study was to assess the relationship between complementary feeding practices and nutritional status of HIV exposed infants (6-24 months), attending eMTCT department at Gombe Hospital, Butambala district.

In this study, 130 HIV exposed infants were assessed. Of these, only 35.4% were introduced to foods as recommended (at 6 months), 29.3% had received the recommended minimum meal frequency at various ages, 36.2% had consumed foods from four or more groups as recommended, 33.8% were initiated to breastfeeding within the first hour of life, 44.6% were exclusively breastfed for the first 6 months of age, 23.8% had continued breastfeeding for the first 12 months, 74.6% had a good nutritional status and 25.4% were malnourished, during the period of data collection.

In conclusion, the Socio demographic factors, complementary feeding and breastfeeding practices have greatly influenced the nutritional status of exposed infants, both positively and negatively, in addition interventions aimed at improving adherence to optimal complementary feeding guidelines need to be strengthened in order to improve the nutritional status of exposed infants who are receiving eMTCT services at Gombe hospital, Butambala district.

CHAPTER ONE

INTRODUCTION

1.1 Background

Complementary feeding refers to giving infants solid or semi-solid foods in addition to breastfeeding or replacement feeding at 6 months of age (Black, 2008).Optimal feeding is crucial for physical growth and cognitive development (Kamenju, 2016). HIV exposed infants are more vulnerable to malnutrition due to poor complementary feeding (Bloss, 2014)

In addition, frequent infections and poor caring capacity are thought to accelerate the risk of infant malnutrition (Dewey, 2008). It is recommended that optimal complementary feeding should start at 6 months of age when breast milk alone is no longer enough to meet the nutritional requirements of infants (WHO, 2018). Complementary feeding involves transitioning of infants at 6 months from exclusive breastfeeding to family foods (Agostoni, 2014). These foods should be highly nutritious and safe in a liquid, semi-solid or soft form (Caulfield, 2009). Consumption of nutritionally low-quality foods has contributed to a high burden of infant under nutrition (WHO, 2018).

Poor complementary feeding and insufficiently diverse diets result in inadequate dietary intake which is an immediate cause of under nutrition among infants, with HIV exposed infants being highly vulnerable compared to their non-exposed counterparts (MoH, 2011).

The Food and Agriculture Organisation of the United Nations (2017) reports that 22.9% and 7.7% of children under 5 years of age are stunted and wasted respectively in the world. Kamani (2016) reports that only 1 in every 6 infants below 2 years receives a minimum acceptable diet (MAD). In addition, only 52% of children below the age of 5 years receive a minimum meal frequency in the world (UNICEF, 2016). The Uganda Bureau of Statistics (2017) reports that, 29%, 10% and 4% of children below the age of 5 years are stunted, underweight and wasted respectively. In 2008, 20% of infants were receiving non-timely feeding and only 28% of infants had received adequate and timely complementary feeding (MoH, 2008).

Optimal complementary feeding should be in line with the World Health Organisation recommendation as being timely, adequate, and safe and properly fed (Hanson, 2014).

2.2 Problem statement

The Government and other stakeholders have implemented many strategies to improve nutritional status of infants (Butte, 2012). Poor complementary feeding has been widely documented. A significant proportion of exposed infants have suffered from the negative consequences of poor feeding (Fawtrell, 2007). These consequences include compromised immunity, poor catch-up growth, poor cognitive development, delayed milestones, poor weight gain, poor skeletal development, micronutrient deficiencies, and undernourishment (Gebru, 2011).

The 2016 global strategy on Infant and Young Child Feeding estimated that, only 50% of infants (6-24 months) were infected with HIV during pregnancy or at birth, 25% were infected during the breast-feeding period and the remaining 25% were at increased risks of Mother to Child Transmission of HIV (UNICEF & UNFPA, 2016).

The United Nation's Children Fund (2016) reports that 29% of infants (6-24 months) had received family foods before 6 months of age and 87% had received family foods after 6 months of age in Africa. Bloss (2014) reports that only 24 % adolescent girls are already mothers in Uganda with limited knowledge on proper infant feeding. In addition, the Uganda Bureau of Statistics (2017) reports that only 14% of infants (6-24 months) had received the Minimum Acceptable Diet.

The Uganda Demographic and Health survey (2016) reports that, almost 2.3 million infants suffer from malnutrition, due to poor dietary intakes and poor infant feeding.

This study aimed at assessing complementary feeding practices, in order to improve the nutritional status of infants (6 - 24 months) attending eMTCT clinic in Gombe hospital, Butambala district.

2.3 Justification

According to the Uganda demographic and health survey (2016), 26.5% and 1.1% of children below 5 years of age were stunted and wasted, respectively in the south central region.

The purpose of this study was to assess the relationship between complementary feeding, in terms of '*age of introduction to foods'*, '*infant's dietary diversity'*, and '*meal frequency'* and nutritional status of infants (6-24 months) attending eMTCT clinic in Gombe hospital, Butambala district.

The findings of this study may be used by the Ministry of Health (MoH) and other Non-Governmental Organisations (NGOs) to implement programmes aimed at promoting infant feeding as a way of improving infant's nutritional status in areas with similar circumstances.

1.4 Research objectives

1.4.1 General objective

The general objective of this study was to;

Assess the relationship between complementary feeding practices and nutritional status of exposed infants (6-24 months) attending eMTCT services at Gombe hospital, Butambala district.

1.4.2 Specific objectives

The specific objectives of this study were to;

i. Assess the nutritional status of exposed infants aged 6 to 24 months.
ii. Analyse the socio-economic factors associated with complementary feeding associated and the nutritional status.
iii. Determine the dietary diversity of the infants.
iv. Determine the minimum meal frequency of infants.

1.5 Research indicators

The following were the research indicators of this study.

- Nutritional status of infants.
- Socio-demographics and economic factors
- .Infant dietary diversity
- Timely and appropriate complementary feeding
- Meal frequency

1.6 Research questions

i. What is meant by the term complementary feeding?
ii. How important is complementary feeding to exposed infants?
iii. What are the nutritional requirements of exposed infants?

iv. Do complementary feeding practices affect the nutritional status of HIV exposed infants?

1.7 Research hypothesis

The null hypothesis of this study was that;

There is a significant relationship between complementary feeding practices and nutritional status of exposed infants attending eMTCT services at Gombe hospital, Butambala district.

1.8 Expected outcomes

The expected outcomes of this study were to;

Increase awareness and sensitization on exclusive and continued breast feeding (EBF & CBF).

Improve complementary feeding of exposed infants at 6 months, through routine maternal nutrition counselling (MNC) and Infant and Young Child Feeding (IYCF) counselling.

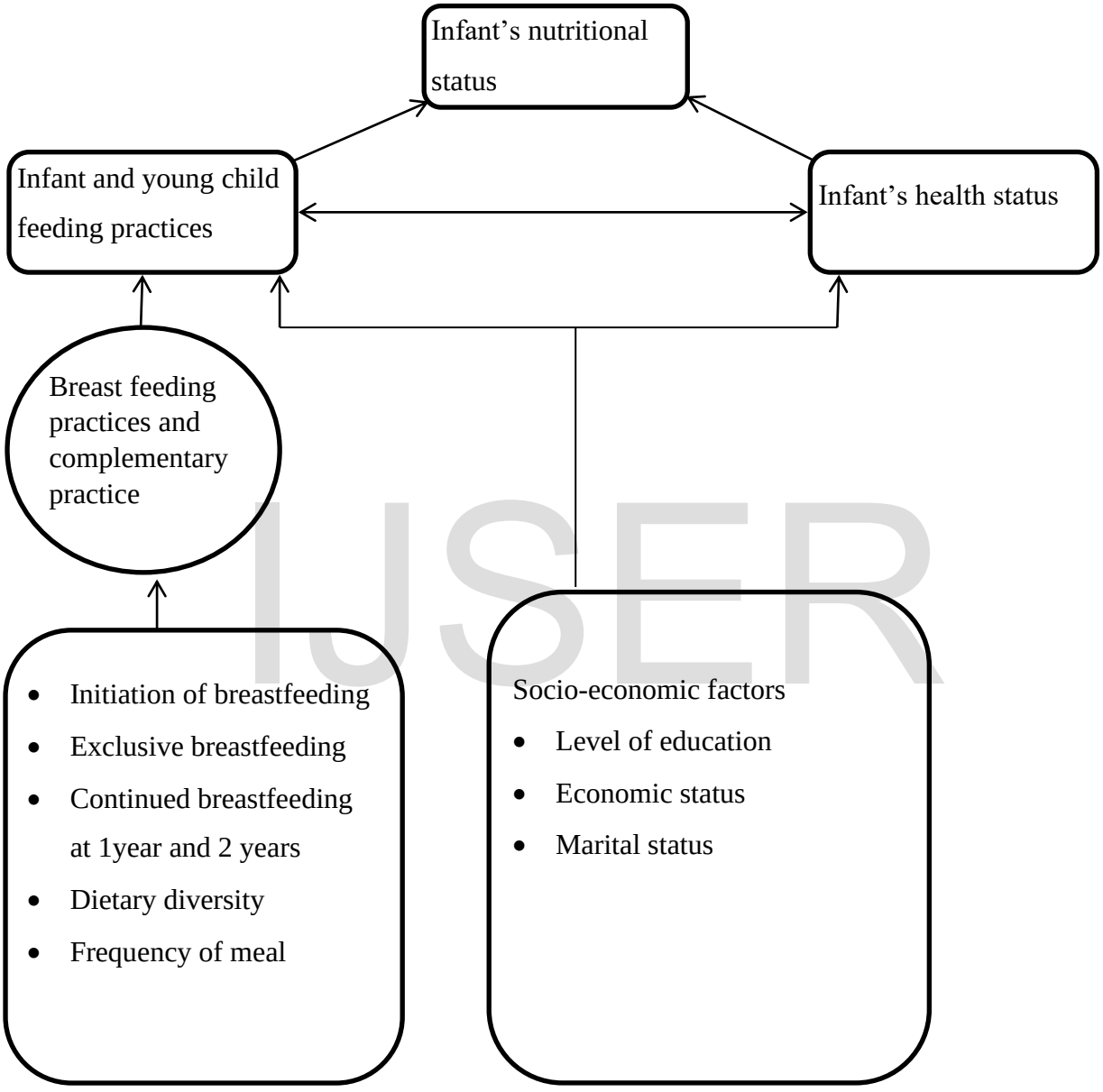
Help caregivers of exposed infants to adhere to the World Health Organisation (2016) Infant and Young Child Feeding guidelines.

1.9 IYCF Conceptual Framework

Infant and young child feeding (IYCF) practices are thought to modify the nutritional status of HIV exposed infants (Wilson & Rogers, 2010). Poor infant feeding practices including sub-optimal breastfeeding and inadequate complementary feeding deteriorates the nutritional outcomes in children below age of 2 years, and good infant feeding is thought to improve the nutritional outcomes, together with adequate dietary intakes, and proper caring capacity (Vassalo & Markson, 2012).

The figure below shows the link between infant's nutritional status and infant and young child feeding practices.

Figure 1: Relationship between complementary feeding and nutritional status of infants.



Source: UNICEF& Engle *et al*, 2008

CHAPTER TWO

LITERATURE REVEIW

2.1 Complementary Feeding and Malnutrition trends

2.1.1 Global and regional trends

Globally, complementary feeding rates have increased from 12% in 1995 to 28% in 2010 for exposed infants in low income countries (Mullary, 2011). Complementary feeding rates in Eastern and Southern Africa increased from 35% in 1995 to 47% in 2010 (Anigo, 2012). In addition, the complementary feeding rates were higher in South Asia than in Africa (40% in 1995; 45% in 2010) (Dewey, 2011).

The Food and Agriculture Organisation (2017) of the United Nations reports that, only 29.5% of children (under 5 years of age) were stunted, 22.9% were underweight and 7.7% were wasted in the world. In Sub-Saharan Africa, almost 40% of children (under 5 years of age) were stunted, 21% were underweight and 9% were wasted (Kumar, 2012).

The stunting rates are declining in the world, partly because of optimal infant feeding practices (Agostoni, 2014). In addition, the wasting rates (6% in 2011) were not high in East Africa (Anigo, 2012).

This study aimed at promoting optimal complementary feeding practices in order to improve the nutritional status of exposed infants (6 - 24 months) attending eMTCT services at Gombe hospital.

2.2 National trends

The Ministry of Health (2016) reports that, only 68% of infants (6-24 months) had received adequate complementary feeding. In addition, the minimum acceptable diet (MAD) rate was at 6% in 2006 and 11% in 2011 in Uganda (USAID, 2012).

The Uganda Demographic and Health survey (2016) reports that only 14% of infants (6-24 months) had received the minimum acceptable diet, 29% were stunted, 10% were underweight and 4% were wasted. The stunting rates have gradually reduced from 48% in 1988 to the current 29 %, while wasting rates have stagnated between 3 to 5% over the same

period. Hence, improving complementary feeding of exposed infants can reduce 10 % of childhood mortality, which occur every year in the world (Ochola, 2010).

2.2 Complementary Feeding Practices

2.2.1 Definition of complementary feeding

Complementary feeding refers to giving infants other family foods (solid or semi-solid) in addition to breastfeeding or replacement feeding to meet their nutrient requirements from 6 months of age (WHO&UNICEF, 2005). Complementary foods are specifically prepared from other foods not consumed by family members or from the same foods available for family members and modified in order to meet the eating skills and needs of the infant (Raddi, 2012).

2.2.2 Appropriate Complementary Feeding

Introduction of complementary foods to exposed infants before 6 months of age (too early) is not advisable (Hasooni, 2014). Because it increases childhood under nutrition, frequent illnesses and poor physical growth and cognition (Bhan, 2010). Introduction of foods too late (after 6 months of age) is not advisable (Agostoni, 2014). Because it increases the risk in infants to chronic diseases in adult life, and reduces child spacing (Caulfield, 2009)

The World Health Organisation (2016) recommends appropriate feeding to HIV exposed infants aged 6 to 24 months of age (WHO, 2016).

Appropriate feeding should be;

Timely, (foods are introduced when the need for energy and nutrients exceeds what breast milk can be provide when infants are at 6 months of age).

Adequate, (foods should provide sufficient energy, protein, and micronutrients to meet the increasing nutritional needs of the infants) (Bloss, 2014).

Safe, (foods are hygienically stored and prepared, and infants should be fed with clean hands using clean utensils).

*Properly fed***,** (foods given are consistent with infant's signals of appetite and satiety) meal frequency and feeding method should actively encourage the infants to consume sufficient foods using fingers and spoon but not bottles and teats (Gebru, 2011).

2.3 Importance of Complementary Feeding

After 6 months of age, breast milk is no longer sufficient to meet the infant's nutritional needs during catch up growth (Stekettee R.W., 2012). And this increases the risk of infant under-nutrition (Kramer, 2013). The studies state that infants aged 6 to 24 months require foods that are both energy and nutrient rich (Lartey, 2010).

Optimal complementary feeding reduces risk of micronutrient deficiencies including iron and zinc deficits, diarrhoea and respiratory infections as well as Childhood mortality (AAP & ACOG, 2014). Furthermore, appropriate complementary feeding can prevent stunting and acute malnutrition, and improve cognitive and psychosocial development (Apio, 2017).
The above benefits can only be achieved when complementary feeding is optimal, appropriate, adequate and safe.

2.4 Minimum Meal Frequency

For HIV exposed infants, the World Health Organisation (2016) recommends that;

i. Infants (6- 8 months) should receive 2 to 3 meals per day.
ii. Infants (9 - 11 months) should receive 3 to 4 meals per day.
iii. Infants (12-24 months) should receive 3 to 4 meals plus 1 to 2 snacks every day.

2.5 Food consistency

The United Nation Children's Fund and World Health Organisation (2012) recommend that, complementary foods should be liquid, puree or semi-solid and soft in texture.

The HIV positive mothers/caregivers should ensure that infants (6 - 24 months) are fed from diverse diets made up of family foods obtained from 4 or more food groups (Cristina, 2014).

HIV exposed infants should be;

Fed on mashed, semi-solid foods, and softened with breast milk, beginning at the age of 6 months and then fed on energy dense combination of soft foods from 6 to 11 months.

Fed on *'finger foods'* starting at 8 months of age and then transition to a liberal soft family diets at 12 months of age.

2.6 Dietary diversification

The World Health Organization (2016) states that HIV positive mothers/caregivers should comply with the following statements to ensure dietary diversification (Claudia&Cartetti, 2016).

HIV exposed infants aged 6 to 24 months should be;

i. Introduced to varieties during complementary feeding, fed on vitamin A-rich fruits and vegetables daily.
ii. Fed meat, poultry, or fish daily or as often as possible, fed on fortified foods, such as iodized salt, vitamin A-enriched sugar, iron-enriched flour or other staples.
iii. Fed on vitamin-mineral supplements when animal products and/ or fortified foods are not available, fed directly or assist older infants when they feed themselves.

Alessandra Knowles and Andriano (2014) state that HIV positive mothers/caregivers should;

i. Offer favourite foods and encourage infants to eat when they lose interest or have depressed appetites.
ii. Avoid giving drinks to infants with low nutrient value, such as tea, coffee and sugary beverages and experiment with different food combinations, tastes, textures, and methods for encouragement if infants refuse.
iii. Feed infants slowly and patiently with minimized distractions during meals, and do not force infants to eat.

2.7 Hygiene and care during complementary feeding

The United Nation Children's Fund (2011) and World Health Organisation (2013) clearly explain the key important issues on hygienic practices concerning complementary feeding.

HIV exposed infants have a low immunity, most especially if they are not immunised or if they live in unhealthy environment (Bhan, 2010). Ensuring good hygiene during the preparation of foods can save about 15% of infant's mortality (Gebru, 2011).

The HIV positive mothers/caregivers should;

i. Wash hands (for both mother and infants) before food preparation and eating.

ii. Store foods safely and serve foods immediately after preparation to infants.
iii. Use clean utensils to prepare and serve food to infants.
iv. Serve infants using clean cups and bowls, and *'not'* feeding bottles or teats.

When infants reach 6 months of age, HIV positive mothers can decide to stop or continue breastfeeding (Hanson, 2014).

When infants teeth, mothers can stop breastfeeding due to fear of increasing the risk of Mother to Child Transmission of HIV (Agostoni, 2014).

The infants immune system at 6 months of age is still weak, mothers/caregivers should provide affordable, feasible, adequate, sustainable and safe foods (AFASS) to infants (WHO, 2015) Because it stimulates normal growth and development in infants below 24 months (Gebru, 2011), and safe foods given to infants reduce the risk of diarrhoea, pneumonia, ear infections and malnutrition (Anigo, 2012).

Infants can be fed on commercial formulas or cow's milk as a replacement feeds just like the non-exposed counterparts (Jones, 2012).

HIV positive mothers/caregivers should ensure use of safe water in complementary feed preparation, and sanitation when at home (Black, 2008). Infants should be '*fed on demand'* with sufficient infant formula to strength immunity for an active life during infancy (AAP & ACOG, 2014)

2.8 Complementary Feeding Determinants

Decisions on feeding of exposed infants are often guided by multiple of factors (WHO, 2011). These determinants of complementary feeding include;

i. Maternal beliefs on feeding, which are based on culture, comments and information from peers and relatives.
ii. Maternal knowledge on infant feeding, caregivers/mothers perception that the infant only needs additional foods to counteract signals of hunger, reduce crying and being able to sleep throughout the night.
iii. Infant's health.
iv. Mothers/caregivers influence on the kinds of foods to give the infants.
v. Lack of maternal time and other resources needed to prepare foods for the infant, can influence complementary feeding (UNICEF, 201O)

2.9 WHO Recommendations on Infant and Young Child Feeding

The World Health Organisation (2016) recommends that;

HIV positive mothers should receive quality care of ART services. In this case mothers should receive lifelong antiretroviral therapy,

Exposed infants who are being breastfed should receive antiretroviral prophylaxis interventions to reduce the risk of Mother to child HIV transmission, infants should be exclusively breastfed for the first 6 months of life, infants should continue breast feeding until they make 1 year if the mother is HIV positive.

Infants should be;

Introduced to family foods at 6 months of age, and receive complementary foods until 24 months of age

When HIV positive mothers decide to stop breastfeeding the infants at 6 months of age, they should stop gradually within one month, and infants should receive ARV prophylaxis for one week after breastfeeding is fully stopped.

HIV positive mothers should not stop breastfeeding exposed infants abruptly because it is not advisable.

CHAPTER THREE

METHODOLOGY

3.1 Study area

The study was conducted at the Early Infant Diagnosis (EID) unit, Pre-ART care clinic and the Young Child Clinic (YCC) affiliated to Elimination of Mother to Child Transmission (eMTCT) department of Gombe hospital in Butambala district. Gombe hospital is located in Katonga region, Buganda kingdom in central Uganda. Butambala district has a land coverage of 405.6 km^2 and a population density of 245.1/km^2. $km^{2.}$. Butambala district consists of Kibibi, Kalamba, Bulo, Ngando and Budde sub counties. The district contains 31 parishes and 90 villages. It shares district boundaries with Gomba in the west, Mityana in the northwest, Mpigi in the northeast and Kalungu in the south (see map attached). Butambala district was populated with approximately 86,800 people in 2002 and more currently with 99,400 people in 2012. (UNHS, 2016/17).

Gombe hospital is approximately 68 kilometres, south west of Kampala city .Butambala district headquarters are approximately 31 kilometres from Mpigi town. Gombe hospital admits infants from Butambala and neighbouring districts. Most infants who received Early Infant Diagnosis and Pre-antiretroviral therapy services at the eMTCT clinic of Gombe hospital were Baganda and Banyankole.

3.2 Study design

A descriptive cross sectional design was used to gather both qualitative and quantitative data on the Socio demographic factors, complementary feeding practices, nutritional status of HIV exposed infants.

Quantitative data on breastfeeding (BF), minimum meal frequency (MMF) and dietary diversity were gathered. Anthropometric (nutritional) indices were used to classify the nutritional status. Weight for height/length Z-scores (WHZ) were used to classify Acute Malnutrition, Weight-for-age Z-scores (WAZ) were used to classify underweight, and Height/length-for-age Z-scores (HAZ) were used to classify Chronic Malnutrition (stunting).

Key Informant interviews and Focus group discussions were used to obtain Qualitative data on hygiene, care and maternal knowledge on complementary feeding.

A qualitative 24 hour recall was used to assess the dietary diversity, during the period of this study.

3.3 Sample size computation and study population

3.3.1 Sample size determination

The Calculated sample size involved use of Kish Leslie formula $\mathrm{n} = \frac{\mathrm{Z2\ P(Q)}}{\mathrm{D2}}$

(Kish Leslie, 1965).

Where;

P represented, the prevalence estimator 14% (MAD indicator) (UBOS, 2017).

Therefore $\boldsymbol{P} = 0.14$

Z represented, the standard normal deviate at 95% confidence interval.

There fore $\boldsymbol{Z} = 1.96$

D represented, the desired precision estimate.

Therefore $\boldsymbol{D} = 0.05$ and $\boldsymbol{Q} = 1 - P$

Sample size was calculated as;

$$\mathrm{n} = \frac{(1.96)2\ \times 0.14(1 - 0.14)}{(0.05)2}$$

$\boldsymbol{n} = 185$ Respondents

Then,

Finite population correction was done to produce a sample size which was proportional to the 325 exposed infants (estimated from the Health Unit Quarterly Report) attending eMTCT clinic of Gombe hospital with in the fourth Quarter (April-June),

Therefore,

According to Israel formula $\mathbf{n} = \frac{\mathrm{n} \div 1 + (\mathrm{n} - 1)}{\mathrm{N}}$ (Isreal, 1996)

Where;

'**N**' represented, the desired sample size

N represented, the estimated population size (325), estimated from HMIS form 106a

$$\mathbf{n} = \frac{185 \div 1 + (185 - 1)}{325}$$

$$\mathbf{n} = 118 \text{ HIV exposed infants } (6 - 24 \text{ months})$$

A sample size of 118 exposed infants would have been used, but due to the possibility of 10% non-response, the estimated sample size was increased to 130 exposed infants.

3.3.2 Study population

This study population included all HIV exposed infants (6-24 months) who had received eMTCT services of Gombe hospital, during the commencement of data collection.

3.3.3 Target population

This study targeted 130 HIV exposed infants who received EID and Pre-Antiretroviral therapy services at eMTCT department of Gombe hospital, during the commencement of data collection.

3.4 Sampling and Sample selection

3.4.1 Sampling technique

Gombe hospital was purposively selected in Butambala district.

A systematic sampling technique was used in the selection of participants, and the sampling interval of 3 was used, as calculated below;

Calculated sampling interval $\text{kth} = \frac{\text{Average monthly attendance}}{\text{Required sample size}}$

$$\text{Kth} = \frac{325}{130} = 2.5$$

This study achieved a sample size of 130 respondents.

3.4.2 Inclusion criteria

This study included exposed infants (6-24 months) receiving eMTCT services at Gombe hospital, Butambala district.

3.4.3 Exclusion criteria

This study excluded all non-exposed infants admitted to various in-patient wards at Gombe hospital, and exposed infants whose primary caregivers did not consent to participate in the study.

3.5 Standardization and pre-testing of tools

3.5.1 Standardization

This study involved standardization of data collection tools, in order to obtain consistent and accurate data on complementary feeding practices and nutritional status of infants who received eMTCT services at Gombe hospital.

Electronic weighing scales at the Young Child Clinic and or Pre-ART care clinic were recalibrated, for accurate weight measurement.

Height boards were recalibrated, for accurate heights measurements.

The age group specific coloured MUAC strips (6 months to under 5 years) were used, with application of standard procedures for accurate assessment of the nutritional status.

3.5.2 Pretesting

Semi-structured questionnaires and 24 hour recall questionnaires were pre-tested on 5 respondents at the commencement of data correction.

3.6 Data collection procedure

Data collection occurred during working days, from Monday to Saturday.

3.6.1 Nutritional status

Measurement of MUAC were carried out to assess recent nutritional status.

Weight for height Z-scores were computed to classify wasting , Height for age Z-scores were computed to classify stunting, and Weight for age Z scores were computed to classify underweight among exposed infants.

3.6.2 Key Informant Interview

Key informant interviews (KIIs) were done, to obtain qualitative data on hygiene and care during complementary feeding, and maternal knowledge on infant and young child feeding.

3.6.3 Focus Group Discussions

Two Focus Group Discussions (FGDs) were held with purposively selected HIV positive mothers/caregivers to interactively discuss the rationale of complementary feeding. Each Focused Group Discussion had 6 participants and interactive conversions on complementary feeding practices were completed within 30 to 45 minute.

3.7 Data collection tools

This study involved use of various tools for qualitative and quantitative data collection.
The table below shows the data types and tools used during the commencement of this study.

Table 1: Data collection tools.

Data type	Tools
Anthropometric indices for determining nutritional status.	1) Electronic weighing scales 2) Height boards 3) MUAC strips 4) WHO Z-score charts
Dietary diversity scores of exposed infants	5) 24-hour recall questionnaires 6) Food group guides 7) IYCF charts
Complementary feeding practices and socio-economic characteristics	8) Semi-structured questionnaires 9) Focused group discussions and 10) Interview guides

3.8 Data analysis and tools

3.8.1 Data analysis

Filled semi-structured questionnaires were checked, edited and coded for accuracy of recorded responses prior to data entry.

Data on Socio-demographic factors, dietary diversity, minimum meal frequency and nutritional status were analysed using descriptive statistics and Chi-square tests to establish their relationships.

Qualitative data from FGDs and KIIs were sorted and arranged in general categories, as identified in the interview guidelines, and then coded. The common themes were identified, and inferences were made from each theme. Conclusions were drawn and then triangulated with the data from the completed questionnaires.

3.8.2 Data analysis tools

Most qualitative and quantitative data on complementary feeding practices and Socio-demographic factors was analysed using SPSS version 16. Data on nutrition status assessments was analysed using Nutri-survey version 7.

3.9 Ethical considerations

The LC1 chairman and the Medical superintendent of Gombe hospital granted a permit, to conduct the data collection at the Early Infant Diagnosis unit, Pre-Art care clinic, and Young Child Clinic under the eMTCT department of Gombe hospital .

Participants/respondents were required to sign an informed consent form before participating in the study. Participant information was kept confidential, even after data collection. Consent was both verbal and written depending on the literacy status of the respondents. This study respected the culture, religion, values and beliefs of the participants.

CHAPTER FOUR

PRESENTATION OF RESULTS

4.1 Socio-demographic factors

Socio-demographic factors are known to influence both complementary feeding practices and the nutritional status of infants, and these factors were analysed using descriptive statistics.

The table below shows the Socio-demographic characteristics of HIV exposed infants who had participated in this study.

Table 2: Socio-demographic characteristics

Socio-demographic factors	***Frequency (N)***	***Percentages (%)***
Sex		
Male (boys)	44	33.8
Female (girls)	86	66.2
Total	**130**	**100**
Age		
6 to 8 months	21	16.2
9 to 11 months	43	33.1
12 to 17 months	49	37.7
18 to 24 months	17	13.1
Total	130	100

From table 2 above; more than a half (66.2%) exposed infants were girls, and most (37.7%) exposed infants were aged 12-17 years.

The table below shows the Socio-demographic characteristics of the primary caregivers who had participated in this study.

Table 3: Socio-demographic characteristics of primary caregivers

Socio-demographic characteristics	***Frequency (N)***	***Percentages (%)***
Sex		
Male (men)	31	23.8
Female (women)	99	76.2
Total	**130**	**100**
Age		
15-24 years	64	49.2
25-49 years	49	37.7
>50 years	17	13.1
Total	**130**	**100**
Marital status		
Married	57	43.8
Divorced/Single	36	27.7
Cohabiting	37	28.5
Total	**130**	**100**
Education background		
No formal education	43	33.1
Completed primary education	48	36.9
Completed secondary education	20	15.4
Completed tertiary education	19	14.6
Total	**130**	**100**
Family size		
0-2 members	2	1.5
3-5 members	71	54.6
>5 members	57	43.9
Total	**130**	**100**
Religious affiliations		
Traditionalists	10	7.7
Christians	50	38.5
Muslims	70	53.8
Total	**130**	**100**

From table 3 above; majority (76.2%) of the primary caregivers were females, almost a half (49.2%) were aged 15-24 years, most (43.8%) were married, more than a third (36.9%) had completed primary education and more than a half (53.8%) were Muslims.

The table below shows the economic factors of the primary caregivers who had participated in this study.

Table 4: Economic factors

Economic factors	***Frequency (N)***	***Percentages (%)***
Employment		
Not employed	53	40.8
Self employed	50	38.5.
Salary employed	27	20.8
Total	**130**	**100**
Main source of incomes		
No main source	21	16.2
Farming	51	39.2
Waged labour	18	13.8
Small scale business	8	6.2
Housewife	13	10.0
Domestic help	19	14.6
Total	**130**	**100**

From table 4 above; more than a third (40.8%) of the primary caregivers were not employed, less than a quarter (20.8%) were salary employed and minority (6.2%) were operating small scale businesses.

4.2 Complementary feeding practices

4.2.1 Age of introduction and meal frequency

The complementary feeding practices including ages of introduction to family foods and meal frequencies per day were analysed using descriptive statistics and chi-square tests.

The table below shows the ages of introduction to foods and the meal frequency throughout the study period.

Table 5: Ages of introduction to foods and Meal frequency

Complementary feeding practices	***Frequency (N)***	***Percentages (%)***
a. Ages of introduction to foods		
< 6 months	19	14.6
At 6 months	46	35.4
> 6 months	44	33.8
Didn't know	21	16.2
Total	**130**	**100**
b. Minimum meal frequency (MMF) per day		
Between 6-8 months	10	7.7
Between 9-11 months	8	6.2
Between 12-24 months	20	15.4
Total	**38**	**29.3**
c. Below minimum meal frequency (MMF) Per day		
Between 6-8 months	11	8.5
Between 9-11 months	35	26.9
Between 12-24 months	46	35.4
Total	**92**	**70.8**

From table 5 above; most exposed infants (64.6%) were not introduced to family foods as recommended, only 29.3% had received the minimum meal frequency per day as recommended in the 2016 IYCF guidelines.

4.2.2 Dietary diversity

Dietary diversity depends on the number of food groups used to prepare meals for consumption by exposed infants within 24 hours. Only 36.2% exposed infants were given meals from the recommended number of food groups (≥ 4 food groups) per day, more than a quarter (39.2%) were given meals prepared from three food groups per day, and 24.6% were given meals prepared from two or less food groups a day.

The table below shows the different food groups used to assess infant's dietary diversity throughout the study period.

Table 6: Food groups used to determine dietary diversity

Food groups	*Responses*	*Frequency (N)*	*Percentages (%)*
A. Grains, roots or tubers.	Yes	12	9.2
	No	166	90.8
B. Vitamin A rich plant foods.	Yes	18	13.8
	No	110	86.2
C. Other fruits or vegetables.	Yes	51	39.2
	No	71	54.6
D. Meat, poultry, fish or sea foods.	Yes	20	15.4
	No	108	83.1
E. Eggs.	Yes	3	2.3
	No	125	96.2
F. Pulses/legumes/nuts.	Yes	7	5.4
	No	121	94.6
G. Milk and milk products.	Yes	17	13.1
	No	111	85.4

From table 6 above; less than a quarter (9.2%) exposed infants had consumed foods from grains, roots or tubers,, less than a third (13.8%) had consumed vitamin A rich plant foods, most (39.2%) had consumed foods from other fruits or vegetables. Only 15.4% of exposed infants had consumed foods from meat, poultry, fish or sea foods, almost negligible (2.3%) exposed infants had consumed eggs, minority (5.4%) had consumed foods made from pulses, legumes or nuts and less than a third (13.1%) had consumed milk or milk products.

4.3 Hygiene and care during complementary feeding

4.3.1 Hygienic practices

Most primary care givers (58.5%) were not washing their hands before giving meals to infants, more than a half (52.3%) were considering hygiene during meal preparation and when serving meals to exposed infant, 12.3% were un-hygienically preparing meals and serving infants. Most primary caregivers (55.4%) were not cleaning feeding utensils using standard protocols. In addition, 6.9% usually boiled feeding utensils before serving meals, 29.2% rinsed feeding utensils in boiling water for a few minutes, and only (8.5%) washed feeding utensils using water and soap before serving meals to exposed infants during the commencement of this study.

4.3.2 Care practices

Majority (39.2%) of the primary care givers during the period of this study were mothers, 36.9% were close relatives, and the minority were either fathers (9.2%) or housemaids (14.7%).

4.4 Knowledge on complementary feeding

4.4.1 Texture of complementary foods

Most primary care givers (43.8%) had the knowledge that all foods except hard textured ones were suitable, 13.8% had the knowledge that soft foods were most suitable, 5.4% had the knowledge that liquid foods were most suitable, 4.6% had the knowledge that hard foods were most suitable, and 27.7% did not have knowledge on which foods could be suitable during the period of complementary feeding.

4.4.2 Feeding of infants

More than a third of primary caregivers (34.6%) had given only one type of food to exposed infants all year round, and 20.8% were not sure whether they had given one food type to exposed infants or not.

4.4.3 Importance of timely introduction of foods

Almost a third of the primary caregivers (34.6%) had knowledge on timely introduction of foods (because of increased nutrient requirements at 6 months), 27.7% had some knowledge on timely introduction of foods (because the infant should grow well), 37.7% had limited knowledge on timely introduction of foods (30% because of culture, and 7.7% because infants pick and put things into the mouth at 6 months).

4.5 Breast feeding practices

Breast feeding includes early initiation (introducing infants to breastfeeding within the first hour of life), exclusive breastfeeding for the first 6 months, and continued breastfeeding for the first 24 months of age.

The table below shows the magnitude of breastfeeding practices throughout the study period.

Table 7: Breastfeeding practices

Breastfeeding practices	***Frequency (N)***	***Percentages (%)***
a. Early initiation		
Initiated to breastfeeding	44	33.8
Not initiated	86	66.2
Total	**130**	**100**
b. Exclusive breastfeeding		
Exclusively breastfed	58	44.6
Not exclusively breastfed	72	55.4
Total	**130**	**100**
c. Continued breastfeeding		
Breastfed after 6 months	31	23.8
Did not breastfeed after 6 months	99	76.2
Total	**130**	**100**

From table 7 above; majority (66.2%) of the exposed infants were not initiated to breastfeeding within the first hour of life, 55.4% were not exclusively breastfed for the first 6 months of life, and 76.2% were not breastfed after 6 months of life.

4.6 Nutritional status

Majority (74.6%) of the exposed infants were well nourished, 13.8% were moderately malnutrition, and 11.5% were severely malnutrition. In addition, 43.8% were not at risk of malnutrition, while 30.8% were at risk (mildly malnourished).

The table below shows the magnitude of malnutrition among infants throughout the study period.

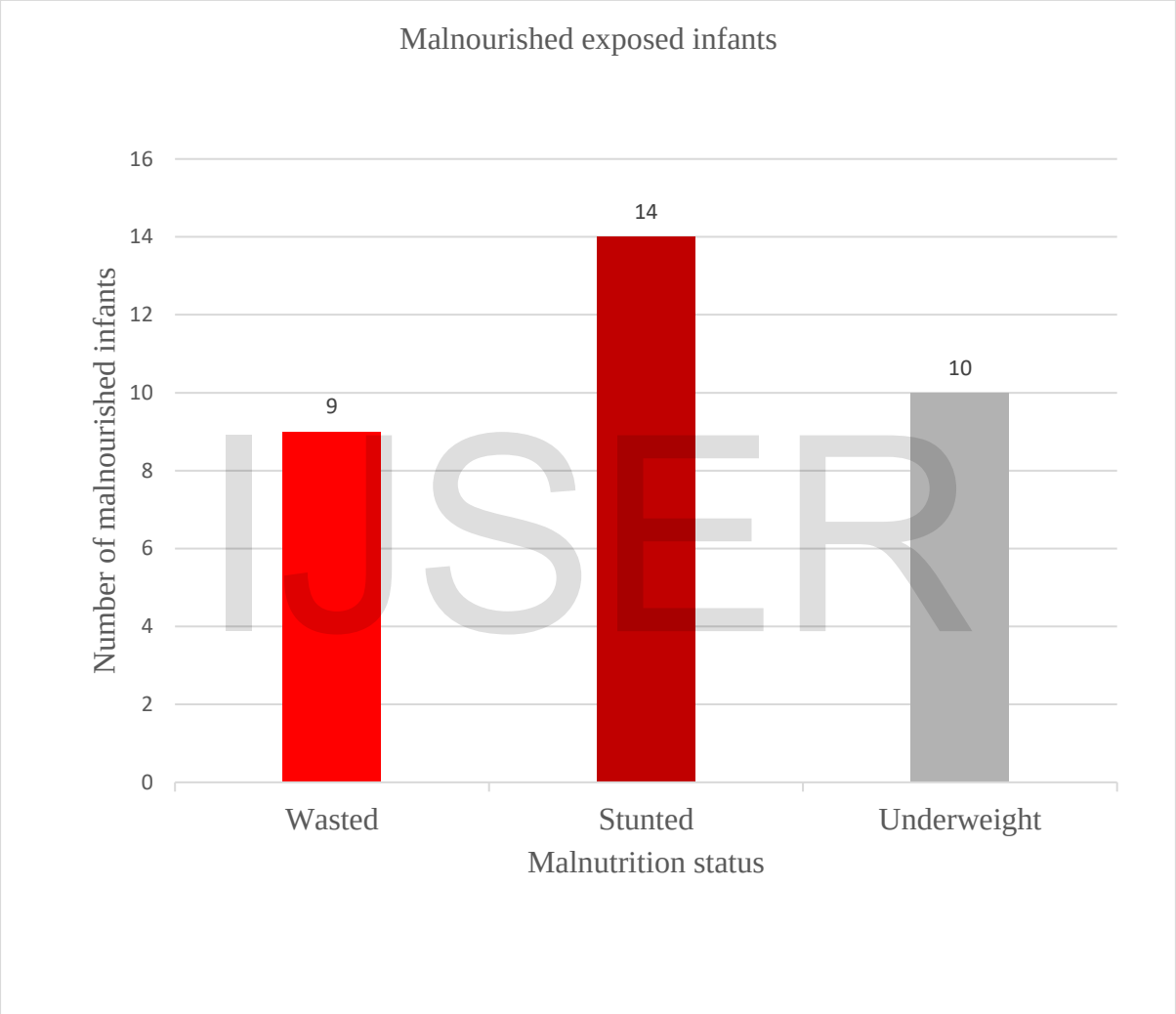
Table 8: Malnutrition status

Under nutrition forms	***Frequency (N)***	***Percentages (%)***
a. Acute malnutrition (wasting)		
Moderate (≥ -3 to < -2 SD)	6	4.6
Severe (< -3 SD)	3	2.3
b. Chronic malnutrition (stunting)		
Moderate (≥ -3 to < -2 SD)	8	6.2
Severe (< -3 SD)	6	4.6
c. Underweight		
Moderate (≥ -3 to < -2 SD)	5	3.8
Severe (< -3 SD)	5	3.8
Total	**33**	**25.4**

From table 8 above; nearly a quarter (25.4%) of HIV exposed infants were generally malnourished, 2.3% were severely wasted, 4.6% were severely stunted and 3.8% were severely underweight.

The figure below shows the number of malnourished infants based on mid upper arm circumference assessment.

Figure 2: Number of malnourished infants



From figure 2 above; most exposed infants (10.8%) were stunted, 7.7% were underweight, and 6.9% were wasted.

Socio-demographic factors and Nutritional status

The relationship between Socio-demographic factors of primary caregivers and nutritional status were assessed using chi-square tests. P values were used to determine the levels of

significance. Relationships with p-values < 0.05 were considered as *'significant'* and relationships with p-values > 0.05 were considered as '*not significant'*.

Table 9: Socio-demographic factors and Nutritional status cross tabulations

Primary Caregiver's Socio-demographic factors	***Normal nutrition status*** *(n=97)*	***Acute malnutrition*** *(n=9)*	***Chronic malnutrition*** *(n=14)*	***Underweight*** *(n=10)*
	P- values	*P-values*	*P-values*	*P- values*
Age				
< 25 Years	0.999	0.002	0.079	0.003
Between 25-49 years	0.001	0.979	0.615	0.789
> 50 years	0.785	0.654	0.004	0.925
Marital status				
Married	0.005	0.092	0.089	0.059
Single	0.072	0.001	0.065	0.086
Divorced	0.064	0.087	0.003	0.098
Cohabiting	0.997	0.985	0.867	0.615
Employment				
Salary employed	0.025	0.059	0.067	0.087
Wage employed	0.004	0.099	0.998	0.096
Self employed	0.006	0.078	0.095	0.077
Unemployed	0.987	0.001	0.045	0.003
Education				
Not educated	0.989	0.091	0.002	0.045
Educated	0.003	0.925	0.939	0.947
Main source of income				
Farming	0.876	0.001	0.098	0.998
Small scale business	0.098	0.919	0.078	0.578
No main source	0.945	0.087	0.045	0.003

From table 9 above; the relationship between primary caregiver's ages (25-49 years) and normal nutritional status was significant (P=0.001), the relationship between primary caregivers ages < 25 years and acute malnutrition was significant (P=0.002), the relationship between primary caregivers ages >50 years and chronic malnutrition was significant

(P=0.003). The relationship between married primary caregivers and normal nutritional status was significant (P=0.005), the relationship between single and divorced primary caregivers with acute malnutrition (P=0.001) and chronic malnutrition (P=0.003) was significant. The relationship between wage employed (P=0.004) and salary employed (P=0.025) primary caregivers and normal nutritional status was significant, the relationship between unemployed primary caregivers and acute malnutrition (P=0.001), chronic malnutrition (P=0.045) and underweight (P=0.003) was significant. The relationship between educated primary caregivers and normal nutritional status was significant (P=0.003), the relationship between uneducated primary caregivers and chronic malnutrition (P=0.002) and underweight (P=0.045) was significant. The relationship between primary caregivers with no main source of income and chronic malnutrition (P=0.045) and underweight (P=0.003) was significant, the relationship between peasant farmers and acute malnutrition was significant (P=0.001). There was no significant relationship between the primary caregiver's religion and nutritional status of HIV exposed infants.

Complementary feeding practices and Nutritional status

The relationship between complementary feeding and nutritional status was assessed using Chi-square tests.

Table 10: Complementary feeding and Nutritional status cross tabulations

Complementary feeding	***Normal nutrition status*** *(n=97)*	***Wasting*** *(n=9)*	***Stunting*** *(n=14)*	***Underweight*** *(n=10)*
	P-values	*P-values*	*P-values*	*P-values*
a. Age of introduction				
Before 6 months	0.087	0.059	0.865	0.002
At 6 months	0.003	0.099	0.678	0.459
After 6 months	0.089	0.078	0.025	0.091
b. Meal frequency				
Recommended meal frequency	0.001	0.879	0.998	0.978
Not recommended	0.995	0.002	0.001	0.005
c. Dietary diversity				
Recommended mean dietary diversity	0.004	0.919	0.943	0.965
Not recommended	0.998	0.001	0.009	0.003

From table 10 above; the relationship between the '*recommended age of introduction to foods'* and normal nutritional status was significant (P=0.003), the relationship between '*earlier introduction to foods'* (<6 months) and underweight was significant (P=0.002), the relationship between '*later introduction to foods'* (> 6 months) and stunting was significant (P=0.025). The minimum meal frequency and normal nutritional status was significant (P=0.001) and the relationship between mean dietary diversity and the normal nutritional status was also significant (P=0.004). The relationship between the recommended '*minimum meal frequency'* and normal nutritional status was significant (P=0.001), the relationship between *'contrary meal frequency'* and wasting (P=0.002), stunting (P=0.001), and underweight (P=0.005) was significant. The relationship between recommended *'adequate dietary diversity'* and normal nutritional status was significant (P=0.004), the relationship between poor *'inadequate dietary diversity'* and wasting (P=0.001) and underweight (P=0.003) was significant.

Breastfeeding practices and nutritional status

The relationship between breastfeeding and nutritional status of HIV exposed infants was assessed using chi-square tests.

Table 11: Breast feeding and nutritional status cross tabulations

Breastfeeding	***Normal nutritional status*** *(n=97)*	***Wasting*** *(n=9)*	***Stunting*** *(n=14)*	***Underweight*** *(n=10)*
	P-values	*P-values*	*P-values*	*P-values*
a. Early initiation				
Initiated in <1 hour after birth	0.005	0.998	0.095	0.087
Not initiated	0.987	0.001	0.005	0.078
b. Exclusive Breastfeeding				
Exclusively breastfed	0.004	0.070	0.065	0.096
Not exclusively breastfed	0.098	0.003	0.015	0.001
c. Continued breastfeeding				
Breastfed after 6 months	0.011	0.087	0.099	0.081
Not breastfed after 6 months	0.097	0.005	0.091	0.003

From table 11 above; the relationship between *'early initiation'* with in < 1 hour and normal nutritional status was significant (P=0.005), the relationship between '*not initiated'* exposed infants and wasting (P=0.001), and stunting (P=0.005) was significant. The relationship between *'exclusive breast feeding'* and normal nutrition status was significant (P=0.004), the relationship between *'no exclusive breastfeeding'* and wasting (P=0.003), stunting (P=0.015) and underweight (P=0.001) was significant. The relationship between *'continued breastfeeding'* for at least 12 months and normal nutritional status was also significant (p=0.011), and the relationship between 'not breastfeed infants' after 6 months of age and wasting (P=0.005) and underweight (P=0.003) was significant.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Socio-demographic and economic factors

Socio-demographic and economic factors are confounders, which affects complementary feeding and nutritional status of exposed infants (Ekesa, 2011).

5.1.1 Age

This study revealed a significant relationship between the ages of primary caregivers and nutritional status. Primary caregivers between 25-49 years were most likely to have well-nourished infants (P=0.001), because they are mature adults, and concentrate more on providing adequate care and nutritious foods to their infants other than wasting much of their time in pleasure and luxurious aspects, furthermore these practice infant feeding as recommended by the WHO (2016) IYCF guidelines. Primary care givers between 15-24 years were most likely to have acutely malnourished infants (P=0.002), and underweight infants (P=0.003), because they are still in adolescent age and are young adults who are mentally developing, these concentrate more on enjoying youth life without putting more emphasis on proper caring and nursing their infants, furthermore these practice infant feeding contrary to the current IYCF guidelines, and with limited knowledge on optimal complementary feeding. Primary caregivers aged 50 years and above were most likely to have chronically malnourished infants (P=0.004), because they are aging, and are experiencing physiological and psychosocial changes in their life, hence require support from strong adults and cannot provide adequate care and nutritious foods to their grandchildren, furthermore these practice inappropriate complementary feeding. The findings in this study are comparable to the results from another study, were 69% of primary caregivers (25-49 years) had well-nourished infants, and 31% of primary care givers between 15-24 years and those above 50 years had malnourished infant (Joan & Micheal, 2014).

5.1.2 Marital status

This study revealed a significant relationship between the marital status and nutritional status. Married primary caregivers were most likely to have well-nourished infants (p=0.005) because women are more likely to be getting support from their husbands inform of emotional, food and finances and may therefore be able to feed their children, furthermore these practice infant feeding in line with the current IYCF guidelines. Single primary caregivers were most likely to have acutely malnourished infants (P=0.001), because single mothers may be the sole providers and may not have sufficient resources to feed their children, furthermore single mothers may prioritize non-food items like clothes, nice hair fashions and so on, other than purchasing nutritious foods for their children. Divorced primary caregivers were most likely to have chronically malnourished infants (P=0.003) because divorced women have unstable marital status and are not stay-home mothers, and looking after children may not be their primary role, hence infants are not given safe and nutritious foods and are domestically violated by their step-mothers. The relationship between cohabiting primary caregivers and normal nutritional status of exposed infants was not significant (P=0.997), because less stable marital status does not greatly impact the nutritional status of their infants. The findings in this study are contrary to the results from another study, were the relationship between marital status and nutritional status of infants was not significant (Sulan & Babrael, 2016). Therefore, stable marital status greatly improve the nutritional status of infants and unstable marital status greatly deteriorate the nutritional status of children.

5.1.3 Employment

This study revealed a significant relationship between salary and waged employment on nutritional status of HIV exposed infants. Salary employed primary caregivers were most likely to have well-nourished infants (P=0.025) because employed women are getting money at the end of every month throughout the year, and even if they do not get financial assistance from their husbands, these salary employed women may afford purchasing safe and nutritious foods for their infants, furthermore these mothers may practice infant feeding in line with the recommendations. Wage employed primary caregivers were also most likely to have exposed infants with normal nutritional status (P=0.004) because women are receiving wages at the completion of any assigned activity from their bosses, these wages help them live in better conditions as they provide the basic needs including food, shelter , and health services to their

children. Un-employed primary caregivers were most likely to have wasted (P=0.001), stunted (P=0.045) and underweight infants (P=0.003), because unemployed women are living in a miserable life, and do not have any source of income, even life they adopt copying mechanisms for their survival, their children will have a poor nutritional status since infant feeding may remain contrary to the WHO (2016) IYCF guidelines. There was no significant relationship between self-employment and normal nutritional status (P=0.006) because self-employed women are getting enough money to settle the needs of their children, further more self-employed women may not deviate from the current IYCF guidelines. The findings in this study are in agreement with the results of another study in which income earners had most of their children well-nourished as compared to non-income earners (Daniel & David, 2012).

5.1.4 Education

This study revealed a significant relationship between education and nutritional status. Educated primary caregivers were most likely to have well-nourished exposed infants (P=0.003) because educated women are more literate, can obtain more correct knowledge on infant and young child feeding, and can prioritize purchasing safe and nutritious foods for their infants in comparison to non-educated women, further more educated women struggle to practice infant feeding in line to the current IYCF guidance from the WHO. Un-educated primary caregivers were most likely to have chronically malnourished infants (P=0.002) and underweight infants (P=0.045), because uneducated women are illiterate, and may have miss-information have on infant feeding, furthermore there feeding practices are always contrary to the IYCF guidelines. Infant feeding is thought to improve according to the education status, and more educated caregivers most probably have children with good nutrition status. The findings in this study are similar to the results of another study in which educated women had most infants well-nourished as compared to the non-educated caregivers (Josha & George, 2015).

5.1.5 Main source of incomes

This study revealed a significant relationship between the main source of incomes and nutritional status. Peasant farmers were most likely to have acutely malnourished exposed infants (P=0.001) because such farmers depend on subsistence farming for their livelihood needs, peasant farmers are more likely to spend much time in digging on marginal piece of land and in case of adverse seasonal changes, they become more vulnerable to poverty,

hunger and household food insecurity which drastically deteriorates the nutritional status of their children. There was no significant relationship between small scale businesses and normal nutritional status (P=0.098), wasting (P=0.919), stunting (P=0.078) and underweight (P=0.578), because small scale entrepreneurs can get enough money from local markets, retail shops and other small scale enterprises to support them in meeting the daily basic needs of their children, furthermore these have access to loans and credit that enables them live in better conditions with their children. Primary caregivers without *'a main source of income* 'were most likely to have chronically malnourished infants (P=0.045) and underweight infants (P=0.003), because they are poor and cannot afford to support themselves, and cannot work hard to improve their living conditions, and more so have no start-up capital, hence they cannot provide adequate care and nutritious foods to their children, furthermore there are no resources to help improve the nutritional status of their children. The findings in this study are comparable to the results of another study in which most peasant farmers had most of their children malnourished as compared to commercial farmers (Daniel & David, 2012).

5.2 Complementary feeding practices

5.2.1 Age of introduction to foods

This study revealed a significant relationship between ages of introduction to family foods and nutritional status. Only 14.6% were introduced to foods earlier than 6 months and were most likely to be underweight (P=0.002), because *'too early complementary feeding'* and '*mixed feeding'* increases risks to recurrent, and acute infections (including diarrhoea and acute gastroenteritis), micronutrient deficits (mainly Vitamin A deficiency, Iron deficiency anaemia and Zinc deficiency) and can result into retarded linear growth and impaired cognitive development. Underweight rates were reducing with increasing ages of introduction to foods before 6 months. More than a quarter (35.4%) were introduced to foods at the *'recommended age'* (at 6 months) according to the 2016 WHO Infant and Young Child Feeding (IYCF) Guidelines, and were well nourished (P=0.003), because '*timely complementary feeding'* enable infants to meet their increased nutrient requirements for physical growth and development. The stunting and wasting rates reduced as infants were receiving timely complementary feeding. Only 16.2% were not introduced to family foods too early or at 6 months of age, these infants could be vulnerable to impaired psychosocial development and diarrhoeal diseases due to poor caring capacity and un-hygienic preparation of foods. Furthermore 33.8% were introduced to foods *'later than'* 6 months of age and these

infants were most likely to have stunting (P=0.025) because breast milk alone could not meet the increasing nutrient requirements at 6 months, and also poor caring capacity and contamination of meals worsened the severity of stunting. Greater negative deviations from the recommended age of introduction to foods increased wasting, underweight and stunting among infants. Slight deviations from the IYCF WHO (2016) recommendations increased malnutrition risks among infants. Feeding infants as recommended had improved the nutritional status of HIV exposed infants. The findings in this study were in agreement to the results in the Uganda Demographic and Health survey (2016), in which any inconsistencies in timely feeding increased the deterioration of the infant's nutritional status (UBOS & ICF, 2017).

5.2 Meal frequency

For breastfed HIV exposed infants, the minimum meal frequency (MMF) is receiving solid or semi-solid foods at least twice a day for infants (6-8 months), and at least three times a day for infants (9-24 months). For infants (6-24 months) who were not breastfed, the minimum meal frequency is receiving solid, or semi-solid foods or milk at least four times a day. This study revealed a significant relationship between meal frequency per day and nutritional status. The nutritional status of infants improve with increasing meal frequency across all ages. Only 29.3% had received the MMF a day for breastfed infants and non-breastfeed counterparts, as '*recommended'* by the World Health Organisation (WHO) Infant and Young Child Feeding Guidelines (2016) and were most likely to have a good nutritional status (P=0.001), because the primary caregivers adhered to the current IYCF guidelines on Minimum meal frequency, and were feeding infants from a healthy environment with minimal contamination of foods. Contrary to the recommendation on meal frequency, almost (70.8%) were not receiving the '*minimum number of meals'* (two meals at 6-8 months, three meals at 9-11 months and four meals at 12-24 months a day) for breastfed infants and four meals a day at 6-24 months for non-breastfed peers, and were most likely to have wasting (P=0.002) , stunting (P=0.001) and underweight (P=0.005) because of constrained nutritional quality and quantity in households, and lack of sufficient knowledge on meal frequency together with poor caring capacity. The minimum meal frequency was gradually decreasing with increasing ages of infants from 6-24 months, this negative deviation contributed to (25.4%) malnutrition. The findings in this study are comparable to the results

in the Demographic and Health survey (2016) in which more than half of the infants, had not received the recommended meal frequency (UDHS, 2016).

5.2.3 Dietary diversity

According to the Food and Agriculture Organisation (2010) and the Uganda Demographic and Health Survey (2016), the following food groups were used to calculate the dietary diversity scores of children.

A. Grains, roots or tubers.
B. Vitamin A rich plant foods.
C. Other fruits or vegetables.
D. Meat, poultry, fish, sea foods.
E. Eggs.
F. Pulses/legumes/nuts.
G. Milk and milk products.

Based on the recommended dietary diversity scores (DDS) from the WHO IYCF guidelines (2016), infants should be fed on foods prepared from *'four or more food groups'* listed above. This study revealed a significant relationship between dietary diversity and nutrition status. Dietary diversity scores (DDS) had increased with increasing ages of infants from 6 to 24 months, this positive deviation resulted in normal nutrition status among 74.5% exposed infants (P=0.004). Only 7.7% had consumed foods from *'one group'*, less than a third (15.4%) from *'two groups'*, more than a quarter (39.2%) from *'three groups'*, and only 36.2% from '*four or more groups'*. Almost all infants who were most likely to have a normal nutritional status had consumed foods from *four or more groups* as recommended. Contrary to this recommendation, more than a third (30.8%) were most likely to be at risk of malnutrition because they had consumed foods from only three groups, or their primary caregivers lacked sufficient knowledge on dietary diversity, and un-hygienically prepared meals for the infants. Nearly a quarter (25.4%) were most likely to be malnourished and had consumed foods from two or less groups. Infants who had consumed foods from *'four or more groups'* were most likely to be well-nourished (P=0.004) because of adequately diverse diets in terms of nutritional quality and quantity. Infants who had consumed foods from *'two or less groups'* were most likely to be wasted (P=0.001) and underweight (P=0.003) because of inadequate dietary intakes of both macro and micro-nutrients required by the body for

physical growth and development. The findings in this study directly reflect the results in the Uganda Demographic and Health survey (2016) in which 86% children under 2 years of age had not received a minimum acceptable diet (MAD) (UBOS, 2017).

5.3 Breastfeeding

Good nutrition reduces vulnerability to malnutrition, immune suppression, and disease in exposed infants (Black, 2008). A good nutritional status should be maintained, in the first 1000 days (critical window of opportunity) of the infant's life (Bloss, 2014). This study revealed a significant relationship between breastfeeding and nutritional status. More than a quarter (33.8%) exposed infants were*' initiated to breastfeeding'* with in the first hour of life and were most likely to have a good nutritional status (P=0.005) because colostrum is highly nutritious and help infants build a strong immunity against diarrhoea and acute respiratory infections. More than a half (66.2%) who were '*not initiated to breastfeeding'* were also most likely to have wasting (P=0.001) and stunting (P=0.005) because a strong suckling reflex is not established and this restricts the quantity of breast milk across the breastfeeding period for the first 6 months of life. Only 44.6% exposed infants were *'exclusively breastfed'* and were most likely to be well-nourished (P=0.004) because exclusive breastfeeding on demand is thought to meet all the nutritional requirements of an infant for the first 6 months of life. Almost (55.4%) were *'not exclusively breastfed'* and were most likely to have wasting (P=0.003), stunting (P=0.015) and underweight (P=0.001) because breast milk is always the best food for infants below 6 months of age, mixed and replacement feeding results in contamination of foods and increase diarrhoea, and worm infestation in infants below 6 months, further more mixed feeding is always non-timely and not on demand hence deteriorates the infant's nutritional status. Less than a quarter (23.8%) had *'continued breastfeeding for at least 12 months'* and were most likely to have a normal nutritional status (P=0.011) because breast milk combined with other nutritious and safe foods starting at 6 months meets the nutrient requirements of the infants most especially Iron and Vitamin A needs and this improves the nutritional status. More than two thirds (76.2%) had *'not continued breastfeeding from 6-12 months'* and were most likely to have wasting (P=0.005) and underweight (P=0.003) because of the fear of Mother-to-Child Transmission of HIV when infants start teething, poor dietary intakes associated to mixed feeding and bottle feeding and poor caring capacity during feeding hours, in that infants receive less nutrients than what is required by the body. In this study the breast feeding rates gradually decreased with increasing deterioration of the nutritional status across various ages. The findings in this

study are comparable to national rates in the Uganda Demographic and Health survey (2016) in which only 66% infants under 6 months were exclusively breastfed and the overall breastfeeding rates were gradually declining with increasing ages of children (MoH, 2016).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In conclusion, the Socio-demographic factors, complementary feeding and breast feeding greatly influenced nutritional status of HIV exposed infants. Primary caregivers who lived in better conditions, had practiced according to the Infant and Young Child Feeding (IYCF) guidelines and had most of their exposed infants well-nourished compared to their peers.

6.2 Recommendation

From the above conclusions, the following conclusions are key;

6.2.1 Recommendations for policy

There is need to promote appropriate, adequate and optimal complementary feeding among HIV exposed infants, including the promotion of house hold dietary diversity and modification of diets used as complementary foods. This can be achieved through conducting continuous practical demonstrations by Community Health Workers (CHWs), and in all health facilities.

There is need to conduct continuous nutritional assessments, and screening of exposed infants at the Early Infant Diagnosis (EID) units, Young Child Clinics (YCC) and Pre-ART care points in all health facilities, for early identification of malnourished infants and those at risk for correction.

6.2.2 Recommendation for practice

There is need to create awareness among primary caregivers, about Infant and Young Child Nutrition (IYCN), and Infant Feeding Counselling (IFC) at the eMTCT department, and other inpatient departments, in order to improve the nutritional status of all exposed infants.

There is need to promote positive behavioural change among primary caregivers with regard to, timely introduction of foods and minimum meal frequency , minimum acceptable diets and safe preparation , modifications of foods and overall complementary feeding knowledge, to reduce the high burden of malnutrition among exposed infants, in all health facilities.

6.2.3 Recommendations for further research

There is need to further investigate the major causes of malnutrition in HIV exposed infants, and the relationships between overall infant feeding and nutritional status of exposed infants. The researcher recommends that, a study on complementary feeding practices and nutritional status among non-exposed infants should be conducted for comparative purposes.

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ANNEXES

Annex 1: Consent form

KYAMBOGO UNIVERSITY

FACULTY OF VOCATIONAL STUDIES

DEPARTMENT OF HUMAN NUTRITION

P.O BOX 1, KYAMBOGO

Tel: 041 -285037/285001 Fax: 041 -220464

Website: www. kyu.ac.ug

CONSENT FORM

Dear Mrs./Miss/Mr……

The researcher's name is KASUJJA IBRAHIM, a student at Kyambogo University, pursuing a Bachelor of Science in Human Nutrition & Dietetics.

The researcher is conducting a study on ***'Complementary feeding practices and nutritional status among HIV exposed infants 6-24 months receiving EID/ YCC services at Gombe Hospital, Butambala district'.***

Complementary feeding refers to introduction of solid or semi-solid family foods to infants at 6 months of age until the infant is 24 months old.

The significance of the study will be to foster appropriate complementary feeding practices recommended by the World Health Organisation (2016) in order to reduce the burden of malnutrition among HIV exposed infants who receive EID/ YCC services at Gombe hospital.

During the commencement of the study, the participant [HIV positive mother/caregiver] will be interviewed using a semi-structured questionnaire containing 35 questions and a 24 hour recall.

The respondent [HIV exposed infant] will be assessed using anthropometry in order to determine the nutritional status during the study.

The participants [HIV positive mothers/caregivers] will be purposely selected to participate in a focused group discussion which will be held for about 30 to 45 minutes, the complementary feeding practices of HIV exposed infants receiving EID/YCC services at Gombe hospital will be discussed.

The data concerning participants [HIV exposed infants and HIV positive mothers/caregivers] will be confidential, and the analysed data will not be miss-used at the end of the study. The researcher will respect the respondent's culture, religion, beliefs and norms.

The study will require use of Luganda language for those who are not fluent in speaking English.

Participation in the study is completely voluntary and the participant has a right to accept or decline to participate.

Dear participant,

DO YOU AGREE TO PARTICIPATE IN THIS STUDY

YES ☐

NO ☐

..... ……/……/……

Participant's Signature Date

Thank you very much.

Annex 2: Research Budget

Table 12: Monetary budget.

Item	*Quantity*	*Unit cost (UGX)*	*Total cost (UGX)*
Communication/ Internet services	Over 50hrs	1000/hr	50,000
Research instruments/ questionnaires	130	100	13,000
Transport to and from Gombe		20000*4	80,000
Stationary			
Notebook	1	1000	1,000
Pens	3	300	900
Data collection assistants	2	50000	100,000
Grand Total			244,900

Annex 3: Semi-structured questionnaire

Dear participant, I am **KASUJJA IBRAHIM**, a student at Kyambogo University, pursuing a Bachelor's degree of Science in Human Nutrition & Dietetics.

I am conducting a study on ***'the relationship between Complementary feeding and the nutritional status of HIV exposed infants aged 6-24 months receiving EID/YCC services at Gombe Hospital, Butambala district'.***

Complementary feeding refers to giving infants family foods (solid or semi-solid) starting at 6 months of age up to 2 years of life.

You are advised to circle/ ring, any number for example *1, 2, 3, 4, 5, 6, 7* and so on, in every question in this data collection tool corresponding with your answer.

Respondent ID number.....

Table 13: Semi-structured questionnaire.

SECTION A			
SOCIODEMOGRAPHIC DATA [*of the mother/caregiver*]			
Question No	***Sociodemographic Data***	***Question***	***Entry code***
001	Age	How old are you?	1=15-19 years 2=20-24 years 3=25-49 years 4= more than 49
002	Sex		1=Male 2= Female
003	Marital status	What is your marital status?	1=Married 2=Divorced 3=Single 4= cohabiting
004	Income status	What is your Main source of income?	1=farming 2=Waged labour 3=Business person 4=House wife

			5=Domestic help 6=Unemployed 7=other (specify) …….....
005	Education status	What is your Level of education?	1=Primary 2=Secondary 3=College 4=University
006	Religious status	What is your religion?	1=Traditionalist 2= Catholic 3= Anglican 4= Moslem 5=other, (specify) ……
007	Family size	How many members are in your family?	1= Two 2= Three 3= Four 4=Five to seven 5=eight to ten 6= other, (specify) ……
008	Employment status	Are you employed?	1=Salary employment 2=Unemployed 3=Self employed

Infant's ID no……. Date of birth: ...../...../.....

SECTION B

SOCIODEMOGRAPHIC DATA [*of the infant*]

Question No	***Socio-demographic data [Infant]***	***Question***	***Entry code***
009	Age	How old is your infant?	1=6-8months 2=9-11months 3=12-18months 4=19-24 months
010	Sex		1=Male 2=Female

ANTROPOMERTRY DATA

011	Weight 1	Weight 2	Average Weight
012	Height 1	Height 2	Average height
013	Muac Value 1	Muac 2	Average Muac

ATHROPOMETRIC INDICES

014	Weight-for-Height	**Entry code**
		1=greater than -2 z-score 2=greater or equal to -3 z-score and less than -2 3=less than -3 z-score

015	Weight-for-Age	1=greater than -2 z-score 2=greater or equal to -3 z-score and less than -2 3=less than -3 z-score
016	Height-for-Age	1=greater than -2 z-score 2=greater or equal to -3 z-score and less than -2 3=less than -3 z-score
017	Muac colour	1= green 2=yellow 3= red

SECTION C

COMPLEMENTARY FEEDING PRACTICES

Question No	***Complementary feeding practices***	***Question***	***Entry Code***
018	Initiation to feeds	At what age, did you start giving your infant foods?	1=before 6 months 2=at 6 months 3= between 7-11 months 4= after 12 months 5=I don't know
019	Frequency at 6 months	When the infant made 6 to 8 months, how many times did you give her/ him foods?	1= only one time 2= between 1-2 times 3=between 2-3 times 4=between 3-4 times 5= more than 5 times 6=I don't know
020	Frequency at 9 months	When the infant made 9 to 11 months, how many times did	1= only one time 2= between 1-2 times

		you give her/him foods?	3=between 2-3 times 4=between 3-4 times 5= more than 5 times 6=I don't know
021	Frequency at 12 months	When the infant made 12-24 months, how many times did you give her/him foods?	1= only one time 2= between 1-2 times 3=between 2-3 times 4=between 3-4 times 5= more than 5 times 6=I don't know
022	Caring practice	Who gives care to the infant?	1= biological mother 2= biological father 3= close relative 4= house maid 5= any other member
023	Hygienic practice	Do you (they) make sure that utensil used to feed infant is clean and safe?	1=yes 2=no 3=am not sure
024		If 'yes' to question 23, who do you or they make sure that the utensil is clean?	1=by boiling 2=dipping it in hot water 3=washing it with soap 4= wiping it with cloth 6= I don't care, as long as its present 7= I don't know
025		If 'no' to question 23, why?	1=I have no time 2=I leave child home 3=I don't mind about that 4=I wasn't aware

KNOWLEDGE ASSESSMENT

026	Is it important to exclusively breastfeed the infant?	1=yes 2=no
027	Why is it important to introduce foods other than breast milk at 6 months?	1=it's because of culture 2=due to increase in nutrient requirements 3=I see child put each and every thing in mouth 4= for child to grow well
028	Which food is appropriate to the infant between 6 to 24months?	1=hard foods 2=liquid foods 3= soft foods 4= semi-solid foods 5=all except hard foods 6= I don't know
029	Is it advisable to feed infant, on one food type all year round?	1=yes 2=no 3=I don't know

030. If yes to question 26, why?
…….....

031. If no to question 26, why?
…….....

032. If yes to question 29, why?
.....

033. If no to question 29, why?
…….....

Thank you for your compliance

Annex 4: 24 hour recall

Please mother/ caretaker of the infant aged…….months, ***'now we are going to talk about the different foods your infant (aged 6-24) consumed yesterday from the time the infant wake up , throughout the day, during the night until the infant finally went to sleep'***. I am going to read to you a list of foods and I would like, you to tell me if the infant consumed or did not consume that food yesterday.

Please **NOTE** *that it's* ***foods the infant ate*** and **NOT** you [the mother/caretaker ate]. If foods were mixed with others such as maize porridge with added sugar or milk take all these foods as consumed (maize, sugar and milk) by your infant.

Please do not include any foods used in small amount for seasoning or condiments (like spices, herbs, or fish powder), I will ask you about the foods separately.

[READ **ALL** QUESTIONS AS YOU CIRCLE ONLY **ONE** ANSWER FOR EACH, EITHER YES OR NO]

Table 14: A 24 hour recall with 7 food groups

NO	***ITEMS***	***REPLY***
dd01	Any porridge from cereals or bread, chapatti, doughnuts, and other grain foods.	1= Yes 2= No
dd02	Any white flesh sweet potatoes, Irish potatoes, cassava, yams and any other foods from roots and tubers.	1= Yes 2= No
dd03	Any eggs, cheese, yoghurt, milk and other milk products, or meats and meat products, or dried fish and fish products, mukene, poultry meats.	1= Yes 2= No
dd04	Any yellow flesh sweet potatoes, and other yellow or orange vegetable and root crops, carrots, pumpkins, dodo, and other green leafy vegetables.	1= Yes 2= No
dd05	Any bean, cow peas, soy beans, ground nuts, lentils, and other legume or nut soups and sauces.	1= Yes 2= No
dd06	Any ripe papaya, mangoes, apples, pears, oranges, lemon, guavas, pine apples, passion fruits, and other juices or drinks.	1= Yes 2= No
dd07	Any coffee, teas, fizzy drinks including sodas, any foods containing fat, margarine, or butter.	1=Yes 2= No

Annex 5: Activity plan

Table 15: Scheduled plan of activities

ACTIVITIES	January			February		March		April		May		June		July		August	
WEEKS	**2**	**4**	**6**	**8**	**2**	**4**	**6**	**8**	**2**	**4**	**6**	**8**	**2**	**4**	**6**	**8**
Selection of research topic																
Literature review																
Proposal writing																
Proposal Approval																
Training Research assistants																
Data collection																
Report writing																
Data entry and analysis																
Compilation																
Approval of report																
Submission of report																