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A Single 24 hour Recall is inaccurate in Assessing Exclusive Breast Feeding among Infants under six months of age, Butajira, Ethiopia.

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Contents

LIST OF FIGURE

LIST OF TABLES

LIST OF ANNEX

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LIST OF ABBREVIATION

AAU	Addis Ababa University
EBF	Exclusive Breast Feeding
EDHS	Ethiopian Demographic and Health Survey
FFQ	Food Frequency Questionnaire
HDSS	Health and Demographic Surveillance
MF	Mixed Feeding
PBF	Predominant Breast Feeding
PPV	Positive Predictive Value
NPV	Negative Predictive Value
SNNPR	Southern Nations, Nationalities and Peoples' Region
WHO	World Health Organization

SUMMARY

Background: Indicators are developed to measure the feeding practice of a child. WHO has developed an indicator to asses exclusive breast feeding which is obtained by using single 24 hour recall. Single 24 hour recall only captures the current status. A single day dietary history may be misleading in determining a usual intake of an infant if there is a day to day variation in the feeding pattern, and this might lead to an over estimation and misclassification.

Objective: To assess how accurate a single 24 hour dietary recall, multiple 24 hours recall and recall since birth is as compared to 7 repeated 24 hour recall in assessing exclusive breastfeeding among infants less than 6 months, Butajira, Ethiopia.

Method: Community based cross sectional study was conducted from March to April 2016. A total of 422infant mother pairsless than 6 months who resides in Butajira were selected by simple random sampling method. Data on duration of EBF was collected by using a single 24 hour recall, multiple 24 hour recall and recall since birth.Mcnemar's test was done to asses if there was a significant difference in rate of EBF. P-value less than 0.05 was considered to indicate a statistically significant difference in proportion. Sensitivity, specificity, positive predictive value and negative predictive value were computed by using 7 repeated 24 hour recall as a reference.

Result: exclusive breast feeding rate varied across different methods.The highest prevalence 76.7% was obtained by single 24 hour recall. 7 repeated 24 hour recall and recall since birth resulted in EBF rate of 53.2% and 50.2% respectively. Single 24 hour recall overestimates EBF prevalence by 23.54%;by increasing the number of recall we can decrease the degree of overestimation significantly. Taking seven repeated 24 hour recall as a gold standard, single 24 hour recall was observed to have the lowest specificity of 49.7% and positive predictive value of 69.3%. An increase in specificity as high as 94.8% was observed by increasing the number of observation days. Recall since birth was found to have a high specificity 93.8% and positive predictive value 94.2.

Conclusion: Single 24 hour recall overestimated EBF prevalence and had the lowest specificity. By increasing observation days we can improve accuracy of estimates of EBF. Recall since birth presented estimates of EBF that is close to reality. The use of recall since birth could be a feasible alternative to assess EBF practice.

1. INTRODUCTION

1.1 Back ground

Optimal breast feeding is an ideal way of providing food for an infant needed for healthy growth and development(1). Optimal breastfeeding practice include exclusive breastfeeding for the first six months of life, followed by breast milk and complementary foods from about six months of age on, and continued breastfeeding for at least two years of age and beyond, while receiving appropriate complementary foods(2).

As a global public health recommendation, infants should be exclusively breastfed for the first six months of life (3). According to WHO definition Exclusive breast feeding means, the infant has received only breast milk from his/her mother or a wet nurse, or expressed breast milk, and no other liquids or solids with the exception of drops or syrups consisting of vitamins, mineral supplements or medicine(4).

Exclusive breast feeding is a corner stone in reducing child morbidity and mortality(5). As of 2011 the number of child death attributed to suboptimal breast feeding was shown to be 11.6%(6). Breast feeding has a significant impact in improving child survival because of its role in providing ideal nourishment containing all the necessary nutrients, antibodies, hormones and antioxidants(7). As a result of this infants who are exclusively breast fed have a much lower risk of developing infections than those who are not breast fed.

There are sets of definitions and indicators developed by WHO to assess breast feeding status in a population. Among these indicators, WHO defines the indicator of EBF as “the proportion of infants aged less than 6 months given only breast milk in the past 24 h”. This particular indicator assess the feeding history of the infant only in the immediate past 24 hours, thus for instance the EBF rate of an infant less than 2 months of age is defined as the proportion of infants currently less than 2 months old exclusively breast feed in the prior 24 hours(8).

By using the above indicator the global prevalence of EBF was found to be 36% according to 2007-2014 report by WHO(9). In the same report the total prevalence of EBF in Africa wasfound to be 36%(9). And according to 2011 EDHS, 52% of Ethiopian mothers exclusively breast fed their children less than six month of age(10).

1.2 Statement of the problem

Feeding practice is a strong predictor of nutritional status and health of a child. Indicators are developed to measure the feeding practice of a child for a number of reasons including international comparison of the adequacy of infant feeding, for research linking infant and child feeding to determinants, for advocacy and monitoring and evaluation of interventions designed to change feeding practice(11).

In order to identify the prevalence of EBF WHO has developed an indicator, which is conducted by asking mother infant pair age 0-5.9 months what they fed the infant the day before the survey(12). Those who said "nothing but breast milk" will be divided by the total number of infant which gives the proportion of infant being exclusively breastfed.

The data using this indicator can only report rates at each month of age, thus the indicator describes whether children under 6 months of age are currently being exclusively breastfed at the time that the survey is taken; which indirectly means it describes the prevalence of EBF rather than duration of EBF(13). Since 24 hour recall only captures the current status it tends to over-estimate EBF prevalence than a more direct indicator of duration would imply. And this will lead to a data of inadequate precision especially for studies relating feeding pattern to infant morbidity and mortality(14).

A single day dietary history may be misleading in determining a usual intake of an infant if there is a day to day variation in the feeding pattern failing to represent the entire feeding history(15). Hence a current status indicator might misclassify an infant as exclusively breast fed where in fact the entire feeding history might indicate otherwise(16). The main problem with misclassification is the fact that it contributes highly to a wrong belief that EBF has been achieved, which in turn might minimizes the needed effort towards improving EBF practice(17).

Even though 24 hour recall is the most commonly and widely used indicator, its ability in providing accurate information on infant feeding pattern should be evaluated, but there is lack of research conducted in Ethiopia that evaluate the adequacy of 24 hour recall in determining EBF prevalence accurately. Hence the accuracy of a point in time data in estimating the true prevalence of EBF in Ethiopia still remains unchecked.

1.3 Rationale of the study

A proper understanding and interpretation of survey result on breast feeding is very important for health care providers to understand the true status ofEBF so that they can deliver service related with feeding practice accordingly. So it would be useful to have a tool that gives the most accurate information. The 24 hour recall approach is a widely used approach and the basis for classifying infants into EBF category. But this tool may be inadequate and misleading to represent the entire feeding history.

This study argued that the single 24 hour recall may act as a source of variation in the rate of EBF as a result it has a role in showing the degree of overestimation in EBF ratewhen single 24 hour recall is used. It also has a role in showing if there is decrement in overestimation by increasing number of recall. Furthermore finding from this research could serve as a base line to explore other methods for measuring EBF with a greater accuracy in indicating the actual figure.

2. LITERATURE REVIEW

2.1 Breast feeding

Breast feeding is an ideal way of providing food for an infant that are needed for a healthy growth and development not only this but it has also an emotional role on both the mother and child health(1).

Breast milk contains all the essential nutrients, health enhancing antibody and enzymes which helps stimulate infant's immune system(18). It contains all the important nutrients like vitamin A, vitamin C, vitamin D, iron and zinc which can easily be absorbed by the infant(19). It also has an anti-infective property and a protective effect against the two leading cause of infant mortality- diarrhea and acute respiratory tract infection. On top of that it helps prevent other diseases like pneumonia, allergies, asthma and gastrointestinal infections(20). Studies have also suggested that breast feeding helps in neurological development of an infant as well.

WHO categorize breastfeeding practice into different class among these one is: Exclusive breastfeeding where the infant has received only breast milk from his/her mother or a wet nurse, or expressed breast milk, and no other liquids or solids with the exception of drops or syrups consisting of vitamins, mineral supplements or medicine. The second category is predominant breastfeeding where the infant predominant source of nourishment has been breast milk, however the infant may also has received water and water based drinks. The other is Mixed and/or complemented breastfeeding where a child has received both breast milk and solid or semi-solid foo as well(21).

As a global recommendation infant should be exclusively breastfed for the first six month of life and there is an increased risk of morbidity and mortality due to deviation from the recommended practice(22).But despite these benefits the rate of EBF remained low in developing countries, where only 24-32% of infants are being exclusively breast fed at 6 months on average(23). And this fact causes developing countries to bear more than 99% of the burden of suboptimal breast feeding(23). More than three quarter of the burden associated with suboptimal breast feeding is due to non- exclusive breast feeding in the first six months of life(24). This suboptimal breast feeding accounts for 45% of neonatal infectious death, 30% of diarrheal death and 18% of acute respiratory death in children under 5 years of age(23).

2.2 Breast feeding initiation and duration rate

According to WHO report the prevalence of EBF is 36% both globally and in Africa, 40% in eastern Mediterranean and 29% in western pacific. Among the countries with lowest estimate than the standard measure of EBF averaged over the first six months are United Kingdom, Greece, Finland, and Norway are mentioned. Countries with higher prevalence of EBF include Rwanda, Peru, Cambodia, and also Nepal(9).

When we come to our country it has been shown that problem of malnutrition in Ethiopia begins primarily in the first 12 months of life mainly due to sub optimal breast feeding(7). This suboptimal breastfeeding contributes to 1.4million (12%) of under-five death(24). The ministry of health of Ethiopia has tried to improve breast feeding practice by implementing, monitoring and evaluating a comprehensive national strategy on infant and young child feeding practice, but the prevalence of breast feeding practice in Ethiopia remained to be low(7). According to the 2011 EDHS 52% of infants started breast feeding within one hour of birth, and 27% of children are given pre-lacteal feeds within the first three days of life(10). The 2011 EDHS data showed that EBF is not widely practiced in Ethiopia where only 52% of infants are being exclusively breast fed. This rate tends to decrease as the age of the infants increases, the rate sharply decreases from 70% in the age group of 0-1 month to 55% in the age group of 2-3 months and further to 32% for infants aged 2-5 months.These rates also tend to vary across region, Amhara having the highest prevalence followed by Tigray and SNNP(10).

According to a study conducted in 3 zone GamoGofa, Hadiya and Dawro of SNNPR it was found that EBF was not widely practiced and introduction of water, milk, thin gruels and other food at 3 or 4 month was found to be a customary practice(25). Other prevalence study conducted in Sidama district and Halaba special woreda found the prevalence of EBF to range from 56-70.5%. The prevalence also tends to decrease as the age of the infant increase from 78.2% in 0-1 month age group to 71.6% in 2-3month infant and finally to 68.4% in the infant aged 4-5months(26, 27).

2.3 Measurement of breastfeeding

Feeding practice is a strong predictor of nutritional status and health of a child. And it is useful to measure their feeding practice for a number of reasons including international comparison of the adequacy of infant feeding, for research linking infant and child feeding to determinants, for

advocacy and monitoring and evaluation of interventions designed to change feeding practice(11). WHO has therefore developed sets of indicator to be applied in assessing feeding practices. These indicators are developed in order to have common sets of measurement that will help in assessing breast feeding practice and the progress made in promotional progress(8).

Core breast feeding indicators developed by WHO includes (8)

1.Early initiation of breast feeding: this is proportion of children born in the last 24 months who were put to the breast within one hour of birth(8).

2. Exclusive breast feeding less than six months: this is a proportion of infant 0-5.9 months of age who are fed exclusively with breast milk(8).

3. Continued breast feeding at 1 year: this is proportion of children 12-15 month of age who are fed with breast milk(8).

According to WHO EBF definition is based on 24 hour dietary recall method.This indicator is designed for an infant less than 6 month of age.The advantages of the 24-hour recall method are that it requires a small number of questions in order to report against many indicators important for policy and practice, the analysis and interpretation of the data is straightforward, and recall error is significantly reduced, but it may be less representative of the usual practice(28).

There is a potential inadequacy in using single 24 hour recall method to represent the entire feeding history(15). Studies conducted using different methods to assess EBF practice showed discrepancies in the prevalence of EBF. The main explanation for the observed discrepancies between methods was that infant feeding practice varies widely within short period of time. As a result single 24 hour recall fails to detect the true fluidity in feeding practice during early infancy and rapid changes occurring when mothers move in and out of certain practices(15).

2.4Comparison between 24 hour dietary recall and dietary recall since birth

An important point to take into consideration when collecting data on feeding practice through recall is time frame used,accuracy and representativeness of the information.There are different studies conducted using point in time data and recall since birth. A point in time data has an advantage in that it avoids error made due to recall bias which is conducted according to the

WHO recommendation.Result from these studies identified a considerable difference between 24 hour dietary recall and dietary recall since birth(29-33).

The results obtained from the analysis of "current status" data based on a single 24- hour recording of infant feeding and the analysis of data 'since birth' showed differences in the exclusive breastfeeding rate of more than 40 percentage points at both 2 and 4 months of age (92% versus 51% at 2 months and 73% versus 30% at 4 months) and of 9 percentage points at 6 months (11% versus 1.8%). Similarly other studies showed the prevalence of EBF was over estimated by 18-28% when using single 24 hour dietary recall. The single 24-hour data thus clearly overestimates the prevalence of exclusive breastfeeding compared to data since birth(17, 29, 30).

Among other studies conducted questioning validity of 24 hour recall one was conducted by comparing single 24 hour recall with dietary recall since birth. This study hasfound the difference between the two methods to be 51% at 1 months of age and 78% at 2 months of age. Another study comparing short term recalls obtained by single 24 hour recall and week recall with recall since birth at 6 weeks and 12 weeks has showed a specificity of 85% for non EBF when recall since birth was compared to the frequent short term recall(31, 32).

Another study conducted in Matale district, Sri Lanka by using three different methods, which is data since birth (prospectively assessing breast feeding practice every two month), event calendar (retrospectively evaluating breast feeding practice at the completion of 9month) and mother reported data which was also retrospective (age at which EBF was discontinued also assessed at the completion of 9month). According to this study the sensitivity of the three methods was 100% but the prevalence of EBF varies for the three methods, where the proportion of infant being exclusively breast fed was 23.9% when using data since birth, 77.7% when using mother reported data and 41.3% when using event calendar method(34).

A study conducted in rural Uganda comparing prevalence between 24 hour recall and recall since birth have noted difference in EBF prevalence at various age group of the infants with the latter prevalence being higher at all ages of the infant’s life. This study has also observed variability in EBF prevalence among different age group. EBF is almost uniform in the first 2 months of age at about 39%, highest between 2 and 3 months of age and only 13% between 5 and 6 months(35).

Similarly a study conducted in Quetzaltenango, Guatemalahas tried to compare prevalence of EBF obtained by single 24 hour recall and recall since birth and they have concluded that the rated of EBF and PBF feeding varied greatly according to the dietary assessment method used. The prevalence of EBF was 56% obtained by 24 hour recall VS. 9% obtained by recall since birth making the degree of discrepancy between the two methods to be 47% (36).

2.5 Comparison between 24 hour dietary recall (cross sectional) and longitudinal study

The importance of the degree of variation in the rate of EBF when using different methods depends on whether the data are used for research purpose, monitoring feeding practice or practical feeding recommendation(28). But it is always important to have a valid and consistent data. And there has been a debate on the different methods of EBF indicator it was said that there is no one best indicator that will provide an accurate and complete data. The decision on which is the best indicator will depend on the purpose of the data being collected and the objective of the research because a point in time data tends to over-estimate while a longitudinal data tends to bring the data closer to the true value(28).

There are different studies conducted to evaluate the level of discrepancy between a point in time data and longitudinal data, a large discrepancy was found between the two methods, and it was suggested that the frequency of EBF could be overestimated by >25% among 1-4-mo-old infants (31.3% - 5.7%) and by >16% among 5-8-mo-old infants (17.4% - 1.0%) when single-day studies are used to describe infant feeding practices, but the most important difference observed was 40% at both 2 and 4 months of age when the two methods were used (34, 37).

A prospective study was conducted in Gampaha, Sri Lanka among 500 babies. In this study babies were followed up to 2, 4 and 6 months and at each follow up feeding practice of the baby for the previous two month was conducted by asking what additional food or drink was given other than breast milk for the infant. This study tried to compare the result from the research with DHS conducted in Sri Lanka where the data was collected by using the 24 hour recall method, and it showed that assessing EBF rate through a cross sectional study is subjected to errors(38).

Another longitudinal observational study conducted in rural health district of Hlabisa, South Africa comparing three different methods, i.e. 48 hour recall, weekly recall up to 16 weeks and

six month recall. Finding from this study indicated that data from 48 hour recallas compared to weekly recall regarding EBF status showed low specificity (65% at 2 weeks, 74% at 4 week and 77% at 6 weeks of age) and poor positive predictive value (48% at 2 weeks, 47% at 4 weeks and 33% at 6 weeks of age). Data from six month recall was found to be equally poor(39).

2.6 Accuracy of maternal recall in assessing EBF

several studies have been conducted in order to assess whether maternal recall could provide an accurate estimates of breast feeding practice. Among these studies one is conducted by comparing EBF rate obtained initially by prospective data collection in the first year of life with recall history obtained 20 years after postpartum. The result of this study has suggested that recorded and recalled breastfeeding duration was strongly correlated. So they concluded that mothers fairly accurately recalled how long they breastfed their child even 20 years later(40).

Another similar study tried to compare data collected for 6 month postpartum with interview conducted 12 to 18 months postpartum. The result of this study suggest that retrospective data based on maternal recall up to 18 months in the past can be used with confidence. It was also observed as the length of recall increase there was a small increase in the mean difference between recalled and standard practice obtained by data collected in the first six months of life(41).

Another study was conducted to validate mother's memory about breastfeeding and sucking habits in the first months of their children life. Regular follow up every three month for the first two years of the study and every six months for the last year was done. This has served as control observation and finally data on past event was obtained. The result from this paper has revealed that there was no difference between prior and current recall about breastfeeding duration in months(42).

A systematic review was conducted assessing the validity and reliability of maternal recall. According to their review of existing data they have concluded that maternal recall will provide accurate estimates of initiation and duration of breast feeding especially when the duration of recall is relatively short ($\leq$ 3years)(43).

On the contrary other studies have suggested maternal recall was inaccurate in assessing exclusive breast feeding duration. A study done with the aim of comparing prospective data on

breast feeding obtained monthly up to six months of life with maternal report of Breast feeding 2 years after postpartum have indicated that only 30.1% of the mothers recalled correctly. And it has been suggested that longitudinally collected data are likely to yield different information from retrospective data, so they have recommended the data to be collected longitudinally when possible to avoid inaccuracy(44).

Another study conducted in U.S.A assessing accuracy of recall of age of winning. In this study infants were followed every 3 weeks up to 12 weeks postpartum and recall of age of winning was obtained at 6 months and 1-3.5 years later. This study has observed statistically significant but modest overestimation for both 6months and 1-3.5 years recall(45).

A study conducted to assess accuracy of maternal recall by comparing data initially obtained prospectively with data recalled 34-50 years later retrospectively, have showed a considerable misclassification in breast feeding durationrecalled after 34-50 years later (46).

3. OBJECTIVE

3.1 General objective:

- To determine how accurate a single 24 hour recall, multiple 24 hour recall and recall since birth isas compared to 7 repeated 24 hour recalls in assessing exclusive breast feeding among infants 0-5.9 month, Butajira, Ethiopia.

3.2 Specific objective:

- To estimate the degree of discrepancy betweensingle 24 hour dietary recall and 7 repeated 24 hour recall in assessing exclusive breast feeding.
- To estimate the degree of discrepancy between multiple 24 hours dietary recall and 7 repeated 24 hour recall in assessing exclusive breast feeding.
- To estimate the degree of discrepancy between recall since birth and 7 repeated 24 hour recall in assessing exclusive breast feeding.

4. METHODOLOGY

4.1 Study area and study period

The study was conducted in the Health and Demographic Surveillance (HDSS) Site for School of Public Health, Addis Ababa University located in butajira. Butajira is a town and separate woreda in south central Ethiopia located at the base of the zebidar massif in the gurage zone of the southern nations, nationalities and peoples' region (Gurage Zone). And the DSS site is in Meskane and Mareko district which is located 130 km south of Addis Ababa and 50 km west of Zway town in the rift valley 8.20 north latitude and 38.50 east longitudes with an estimated size of 797 km2.

The DSS area covers 10 kebeles of which 9 are rural and 1 is urban with an estimated total population of 76,350. Meskanworedaconsists six of thekebeles namely Dirama, ShersheraBido, Bati, Dobena, MisrakMeskan and Wurib, whereas MarekoWoreda consists of Hope and MekakelegnaJareDemekakebele. Dobena and Yeteker are the other two kebeles from Silite Zone and the Tenth kebele is Kebele 04 from Butajira Town. Gurage is the main ethnic group, Islam is the main religion having two-thirds of the people following the religion, followed by Orthodox Christianity. Guragigna is the major language but Amharic, the national language, is also widely spoken in the area, and is an important written language.

Data collection took place from March 15 2016 to April 30 2016 by trained data collectors who had long term experience.

4.2 Study design

Community based cross sectional study was conducted among infants less than 6 months in Butajira Ethiopia.

4.3 Population

4.3.1 Source population

All infant mother pair aged less than 6 months who resides in Butajiraduring the study period was the source population.

4.3.2 Study population

Randomly selected infant mother pair aged less than 6 months who resides in Butajira during the study period.

4.3.3Inclusion criteria

All mother infant pair less than 6 months of age for whom sampling frame was available

4.3.4 Exclusion criteria

A mother who passed away or unavailable to breast fed her child.

A mother with a known mental illness who were unable to respond to the interview

4.4 Sample size determination

The sample size was calculated using single population proportion by Epi Info window version 7statistical software based on the following assumptions: the prevalence of exclusive breast feeding as 52% from 2011 EDHS, desired degree of precision as 5% and 95% of confidence interval.

Sample size determination was as followed

$n= Z^2\alpha/2\ p(1-p)/d^2$

Z= the standard score corresponding 95% confidence level

P= prevalence of exclusive breast feeding

D= margin of sampling error

n= number of sample

Using the above formula and contingency of 10% for non-respondent the final sample size was 422.

- In this study comparison of prevalence across three different methods was done. So sample size using double proportion formula was used in order to acquire a sample adequate enough to detect this variability. This formula was applied for the three methods.

  1. Comparing prevalence of single 24 hour recall and 7 repeated 24 hour recall
  2. Comparing prevalence of multiple 24 hour recall (by taking three days in average) and 7 repeated 24 hour recalls
  3. Comparing prevalence of recall since birth and 7 repeated 24 hour recalls.

- Further comparison was made between prevalence of exclusive breast feeding obtained by the three different methods at different age (at2,4 and 6 month) therefore sample size was also calculated by two proportion formula by using prevalence of EBF at 2, 4 and 6 months from 2011 EDHS.

Sample size calculation using two proportions was based on the following formula

$$n=\frac{\{z\,\alpha/2\sqrt{\left(1+\frac{1}{r}\right)p(1-p)}+Z\beta\sqrt{P1(1-P1)+\frac{P2(1-P2)}{r}}\}^2}{(p1-p2)^2}$$

The following assumptions were used

P1= prevalence of EBF in group one

P2= prevalence of EBF in group two

Zα/2= standard score corresponding 95% confidence interval (1.96)

Zβ=standard score corresponding 80% power (0.84)

r= ratio between group one and group two as 1, 10% non-respondent rate was added to obtain the total sample size

Objectives	Assumption	$Z_{\alpha/2}$ of 1-β (power)	$Z_{\alpha/2}$ of 95% CI	P_1	P_2	Ratio	n_1	n_{Total}
Comparing single 24 hour recall with 7days recall	25% variability between the two methods(37)	0.84	1.96	52% (10)	27% (10)	1:1	59	130
Comparing 3days recall with 7days recall	15% variability between the two methods	0.84	1.96	50%	35%	1:1	170	374
Comparing recall since birth with 7days recall	15% variability between the two methods	0.84	1.96	50%	35%	1:1	170	374
Comparing rate at 2 and 4 months	25% variability between the two age group	0.84	1.96	70% (10)	55% (10)	1:1	163	359
Comparing rate at 4 and 6 months	23% variability between the two age group	0.84	1.96	55% (10)	32% (10)	1:1	72	158
Comparing rate at 2 and 6 months	38% variability between the two age group	0.84	1.96	70% (10)	32% (10)	1:1	26	57

- Since sample size from single proportion is greater than the sample size obtained from two population proportion formula, a total sample size of 422 was taken as the final sample needed to meet the objective.

4.5 Sampling procedures

All the 10 kebeles were included to obtain the desired sample size. Initially sampling frame containing list of mother infant pair less than 6 months along with their date of birth and house number was obtained from the Butajira site. This sampling frame was obtained for a total of 623 mother infant pair. By using this sampling frame simple random sampling technique was used to select a total of 422 samples from the kebeles.

4.6 Data collection procedure

4.6.1 Data collection instrument

A structured questionnaire for the socioeconomic and demographic part was adopted from EDHS and for assessing exclusive breast feeding practice a structured questionnaire developed by WHO was adopted. Additional question containing 21 common lists of food/ fluid was developed to assess the feeding practice. Pretest was conducted on 5% of sample volunteer from the study. These volunteers were not included in the actual data collection. Based on the result from the pretest some modification was done to improve understandability of the questionnaire. Certain fluid common to that area, which previously was not in the questionnaire, was also added.

4.6.2 Data collectors

Data collectors were initially recruited. Training was given for the data collectors by the primary investigator for two days.

4.6.3 Data collection procedure

A face to face interview was conducted by the trained data collectors. The data collection took place for seven consecutive days.

During the first day of interviewinformation on infant characteristics (age and sex), maternal demographic and socioeconomic characteristics (age, educational status, marital status, occupation, and income) was collected. The child dietary intake including early initiation of breast feeding, pre-lacteal feed was assessed.

Data on EBF practice was collected by using three methods. A single 24 hour recall, multiple 24 hour recall and recall since birth. 24 hour recall was asked according to WHO's recommendation. This 24 hour dietary recall was asked for 7 consecutive days. Data obtained from the last day of 24 hour dietary recall served us a point in time data. Finally at the last day of the interview mother's recall of duration of EBF was documented by asking when if ever she first introduced food/fluid in the infant's diet by using an itemized check list consisting of common complementary foods. Whichever food/fluid was introduced first was taken as the time the infant has moved out of EBF category.

4.7 Study variables

- ✓ Socio-demographic variables- infant's age, infant sex, maternal educational status, maternal occupational status, socioeconomic characteristics (wealth).
- ✓ Exclusive breast feeding prevalence obtained by single 24 hour recall
- ✓ Exclusive breast feeding prevalence obtained by multiple 24 hour recall,
- ✓ Exclusive breast feeding prevalence obtained by recall since birth.

4.8 Standard definition

- Exclusive breastfeeding: the infant has received only breast milk from his/her mother or a wet nurse, or expressed breast milk, and no other liquids or solids with the exception of drops or syrups consisting of vitamins, mineral supplements or medicine.
- Predominant breastfeeding: the infant predominant source of nourishment has been breast milk, however the infant may also has received water and water based drinks.
- Mixed and/or complemented breastfeeding: a child has received both breast milk and solid or semi-solid foo as well.
- Pre-lacteal feed- any food except mother's milk provided to a newborn before initiating breastfeeding.
- Early initiation of breast feeding- infant was put to the breast within one hour of birth.
- Sensitivity- the test's ability to identify infant who are exclusively breastfed.
- Specificity- the test's ability to identify infant who are not exclusively breastfed.
- Positive predictive value- the test's ability to correctly identify infants who are truly being exclusively breastfed.

4.9 Data analysis procedure

The collected data was checked for its completeness and entered to EPI dataand was exported to STATA statistical software.

Socio-economic status was assessed by constructing an index by the use of PCA. The following domain went into the model.

1. Characteristics of the house including floor, wall, roof, type of toilet facility, source of water
2. Ownership of fixed assets like television, mobile, phone, refrigerator, clock, bed.
3. Main source of fuel for cooking
4. Ownership of agricultural land.
5. Ownership of animal including goat, chicken, sheep, donkey, ox, cow. Cut off points were given for five equal groups and quintiles representing the poorest to the richest.

The analysis of breast feeding pattern was constructed as follows.

1. Data obtained from single 24 hour recall at 2, 4 and 6 month

2. Data obtained from multiple 24 hour recall at 2, 4 and 6 month.The data interpretation from this method was further be divided across day, which is EBF rate when using 2, 3, 4, 5, 6 and 7 days separately.

3. Data obtained from recall since birth at 2, 4 and 6 month.

The last day of 24 hour recall was taken as a single 24 hour recall data. And the prevalence of single 24 hour recall was obtained by adding all of the foods/drinks that the child might receive in the past 24 hour.If the sum of this list is zero infants were classified as being exclusively breastfed but if this sum is different from zero, they were classified as being non exclusively breastfed.

Prevalence of last 2 days recall was obtained by adding all of the foods/drinks that the child might receive in two consecutive repeated 24 hour recall. . If the sum of this list is zero infants were classified as being exclusively breastfed but if this sum is different from zero, they were classified as being non exclusively breastfed.

Prevalence of last 3 days recall was obtained by adding all of the foods/drinks that the child might receive in three consecutive repeated 24 hour recall. . If the sum of this list is zero infants

were classified as being exclusively breastfed but if this sum is different from zero, they were classified as being non exclusively breastfed.

Prevalence of last 4 days recall was obtained by adding all of the foods/drinks that the child might receive in four consecutive repeated 24 hour recall. . If the sum of this list is zero infants were classified as being exclusively breastfed but if this sum is different from zero, they were classified as being non exclusively breastfed.

Prevalence of last 5 days recall was obtained by adding all of the foods/drinks that the child might receive in five consecutive repeated 24 hour recall. . If the sum of this list is zero infants were classified as being exclusively breastfed but if this sum is different from zero, they were classified as being non exclusively breastfed.

Prevalence of last 6 days recall was obtained by adding all of the foods/drinks that the child might receive in six consecutive repeated 24 hour recall. . If the sum of this list is zero infants were classified as being exclusively breastfed but if this sum is different from zero, they were classified as being non exclusively breastfed.

Prevalence of last 7 days recall was obtained by adding all of the foods/drinks that the child might receive in seven consecutive repeated 24 hour recall. If the sum of this list is zero infants were classified as being exclusively breastfed but if this sum is different from zero, they were classified as being non exclusively breastfed. Data obtained from this served as best comparison method.

Similarly in order to obtain prevalence of EBF by using recall since birth same form of calculation was done by summing all the food/drinks that the child might receive in the recall question which covers the infant whole life up to the day of recall interview. If this sum of this list was zero infants were classified as being exclusively breastfed but if this sum was different from zero they were classified as being nonexclusively breast fed.

Univariate analysis using frequency distribution, measure of central tendency (mean) was done.Mcnemar's test was used in order to assess whether significant difference in proportion exist among the different methods. P-value of less than 0.05 was considered to indicate a statistically significant difference in proportion. Performance of each method in estimating EBF prevalence was compared with 7 repeated 24 hour recallby using sensitivity, specificity, positive

predictive value and negative predictive value. Receiver operating characteristics analysis was done to compare specificity of the different methods. Finally result was presented by using appropriate table, and graph.

4.10Data quality management

Data quality was assured before, during and after data collection process

Before data collection: An objective based and standardized questionnaire by WHO was adopted. The questionnaire was initially in English thentranslated in to Amharicby an individual who have good ability in reading and writing of the two languages.Individuals who are fluent in speaking both Amharic and Guragingna were recruited so that they can serve as a translator if a study participant can't speak Amharic. Training was given for supervisor and data collectors on sampling procedures, techniques of interview and data collection process. Pre testing of questionnaire was undertaken to check the understandability by taking 5% of sample volunteer mother in the community which were not included in the actual data collection.

During data collection: there was a close day to day supervision in the data collection process. The questionnaire was also checked to ensure completeness and consistency each day.

After data collection: the supervisor and the principal investigator together rechecked the completeness and consistency before transferring it into computer software. Non over lapping numerical code was given for each question and the coded data was cleaned and entered into EPi data version 3 prepared templates.

4.11Ethical consideration

The ethical approval for this study was obtained from the research ethical committee of school of public health, Addis Ababa University; permission letter was written for butajira site. Then informed written consent was obtained from the participants, after the necessary explanation about the purpose, procedures, benefits, risks of the study. Privacy issues of the study wereexplained and also their right on decision of participating in the study was respected. All the interviews with subjects were made with strict privacy. After getting informed consent from the respondents the right of the respondents to refuse answer for few or all of the questions was respected.

4.12Dissemination of results

The final report of this study will be submitted to college of health sciences school of public health. It will also be sent to Addis Ababa health bureau. Efforts will also be made to disseminate the result through publication and presentation in scientific conferences.

5. RESULT

5.1. Demographic and socio-economic characteristics of households

A total of 422 infant mother pairs were included in the study; - Complete data was obtained from 410 infant mother pair, yielding a response rate of 97.6%. The socio-demographic characteristics of the study population are shown in Table1. Nearly equal number of male (213) and female (199) infants participated in the study. The mean (SD) age (month) of the infant was 3(±1.43 SD) and ranged from 0 to 6 months. The age distribution of the mothers showed that large proportion (28.5%) belongs to the age group of 25-29.The mean (SD) age (year) of the mother in the study sample was 28.4(±6 SD). The religion distribution showed the majority (76.9%) were Muslim. The distribution of the respondent by educational status revealed that 44.4% of women were illiterate. Occupationally, the majority of the mothers were housewives (82.5%) followed by merchant (9.5%).

Table 1: Demographic and socioeconomic characteristics of the respondents, Butajira, Ethiopia, 2016

Variables	Frequency	Percentage
Infant sex		
Male	213	51.7%
Female	199	48.3%
Infant's age		
0-1	90	21.8%
2-3	144	35%
4-5	178	43.2%
Mother's age		
15-19	7	1.7%
20-24	104	25.8%
25-29	115	28.5%
30-34	105	26.1%
35-39	48	11.9%
40-44	21	5.2%
45-49	3	0.7%
Marital status of the mother		
Married	410	99.5%
Divorced	1	0.2%
Widowed	1	0.2%
Educational status of the mother		
Illiterate	182	44.2%
Read and write	11	2.7%
Primary	173	42%
Secondary	32	7.8%
Higher education	14	3.4%
Employment status		
House wife	340	82.5%
Merchant	39	9.5%
Farmer	14	3.4%
Government employee	9	2.2%
Daily laborer	8	1.9%
Wealth index		
Lowest	83	20.2%
Second	82	19.9%
Middle	83	20.2%
Forth	82	19.9%
Highest	82	19.9%

5.2 Child birth and early breast feeding practice

Table 2 describes child birth and early breastfeeding practice in the sample. Of the total respondents, 280(68%) women delivered the index child at a health facility while the rest 123(29.9%) delivered at home.

About 358(86.9%) of mothers initiated breast feeding within the first one hour of delivery while the rest 54(13.1) mothers initiated breast feeding after one hour of delivery. Majority of the mothers 355(86.2%) gave colostrum to their baby. Pre-lacteal feeding was given to 20(4.9%) of infants. Water based liquids were the most common feeds (36.4%) followed by milk (27.3%).

Table 2: Child birth and early breastfeeding practice, Butajira, Ethiopia, 2016

Variable	Frequency	Percentage
Delivery place		
Health facility	280	68%
Home	123	29.9%
On the way to facility	7	17%
Mode of delivery		
Spontaneous vaginal delivery	386	93.7%
Assisted vaginal delivery	14	3.4%
Caesarian section	10	2.4%
Time to initiate breastfeeding		
Within one hour	358	86.9%
After one hour	54	13.1%
Colostrum feeding		
Yes	355	86.2%
No	55	13.4 %
Pre-lacteal feeding		
Yes	20	4.9%
No	390	94.7%
Type of pre-lacteal fluid		
Water	8	36.4%
Milk	6	27.3%
Sugar water solution	3	13.6%
Tea	2	9.1%

5.4 Exclusive breast feeding practice

Table 3 shows the estimates on Exclusive breast feeding (EBF) practice obtained from single, multiple 24 hour recall and recall since birth. We found that the magnitude of EBF varied across the different methods. The highest EBF prevalence was obtained when EBF was assessed by using single 24 hour recall (76.7%), followed by EBF based on two days observation (66.5%). This magnitude of EBF consistently decreased as the number of days of observation increased. The EBF prevalence based on seven days recall was (53.2%). The estimated rate of EBF practice based on retrospective data (recall since birth) was found to be 50.2%.

Table 3: Exclusive breast feeding (EBF) prevalence using single, multiple 24 hour recall and recall since birth, Butajira, Ethiopia, 2016 (n=412)

Number of days of recall	Frequency	EBF Percent (95% CI)
One day	316	76.7% (72.6-80.8)
Two days	274	66.5% (61.9-71.1)
Three days	257	62.4% (57.7-67.1)
Four days	246	59.7% (55-64.5)
Five days	237	57.5% (52.7-62.3)
Six days	229	55.6% (50.8-60.4)
Seven days	219	53.2% (48.3-58)
Recall since birth	207	50.2% (45.4-55.1)

5.5 Comparison of exclusive breast feeding prevalence between single24 hour recall, multiple 24 hour recall and recall since birth

Table 4 shows the patterns of change in the estimates of EBF prevalence obtained from single, 2days, 3days, 4days, 5days, 6days recall and recall since birth in relation to 7days recall ("golden standard"). The result shows that compared to the EBF estimates obtained from 7 days recall, the EBF estimates from 24 hours recall overestimated EBF magnitude by 23 percentage points (95% CI:19.2,27.8). This difference was found to be statistically significant since the p-value was <0.001. Estimates of EBF prevalence obtained by two days recall overestimated the magnitude by 13 percentage point (95% CI:9.8, 16.9). The difference was also statistically significance since the p-value was<0.001. This degree of overestimation significantly decreased as the number of days of observation increased. Data obtained from recall since birth as compared to 7days recall underestimated EBF magnitude by 2.9 percentage point (95% CI:-5.9, 0.1).

Table 4: Patterns of changes in estimates of EBF prevalence between single 24 hour recall, multiple 24 hour recall and recall since birth by using 7days as reference, Butajira, Ethiopia, 2016.

Number of days of recall	EBF percent (95% CI)	7days recall(95% CI)	% of overestimation/under estimation (95% CI)	Mcnemar's P-value
Single 24 hour recall	76.7% (72.6-80.8)	53.2% (48.3-58)	23.6% (19.2-27.8)	<0.001*
2days recall	66.5% (61.9-71.1)	53.2% (48.3-58)	13.3% (9.8-16.9)	<0.001*
3days recall	62.4% (57.7-67.1)	53.2% (48.3-58)	9.2% (6.2-12.3)	<0.001*
4days recall	59.7% (55-64.5)	53.2% (48.3-58)	6.6% (3.9-9.2)	<0.001*
5days recall	57.5% (52.7-62.3)	53.2% (48.3-58)	4.4% (2.2-6.6)	<0.001*
6days recall	55.6% (50.8-60.4)	53.2% (48.3-58)	2.4% (0.7-4.2)	0.0016*
Recall since birth	50.2% (45.4-55.1)	53.2% (48.3-58)	-2.9% (-5.9-0.1)	0.0455*

* McNemar's test p value <0.05

When examining difference in EBF rate between different age groups the prevalence tends to persistently decrease as age of the infant increase regardless of the method used (table 5). The tendency of the 24 hour recall to overestimate EBF prevalence depends on age group. By taking 7days observation as the best comparison method prevalence of EBF was overestimated by 14.4 percentage point (95% CI;- 6.1-22.8) among 0-1 months old infant, by 25.6 percentage point (95% CI;-17.9-33.5) among 2-3 months old infant and by 26.4 percentage point (95% CI;- 19.4-33.4) among 4-5 months old infant. This overestimation was found to be statistically significant with p-value of <0.001.

We compared the pattern in EBF rate obtained by multiple 24 hour recall with 7 days recall. For the first (0-1months) and second (1-3 months) age group a significant overestimation (P-value <0.05) in EBF estimate was observed up to 4 observation days. For the last age group (4-5months) a significant overestimation (P-value <0.05) was observed up to 6 observation days. Comparing the result obtained from recall since birth with 7days recall, recall since birth underestimated EBF prevalence in all age group but this underestimation was not statistically significant since p-value was >0.05.

Table 5: Patterns of changes in estimate of EBF prevalence using single24 hour recall, multiple 24 hour recall and recall since birth among different age group, butajira, Ethiopia 2016

Age group (0-1 months (n=90)				
	EBF Percent (95% CI)	7days recall	% overestimation (95% CI)	McNemar's P value
Single 24 hr recall	88.9% (82.3-95.5)	74.4% (65.3-83.6)	14.4% (6.1-22.8)	0.0003*
2 days recall	84.4% (76.8-92.1)	74.4% (65.3-83.6)	10% (2.7-17.3)	0.0039*
3 days recall	81.1% (72.9-89.4)	74.4% (65.3-83.6)	6.7% (0.5-12.9)	0.0313*
4 days recall	81.1% (72.9-89.4)	74.4% (65.3-83.6)	6.7% (0.5-12.9)	0.0313*
5 days recall	78.9% (70.3-87.5)	74.4% (65.3-83.6)	4.4% (-0.9-9.8)	0.1250
6 days recall	76.7% (67.8-85.6)	74.4% (65.3-83.6)	2.2% (-1.9-6.3)	0.5
Recall since birth	70% (60.3-79.7)	74.4% (65.3-83.6)	-4.4% (-11.6-2.8)	0.2891
Age group (2-3 months (n=144)				
	EBF Percent (95% CI)	7days recall	% overestimation (95% CI)	McNemar's P value
Single 24 hrrecall	84.% (78-90.1)	58.3% (50.2-66.5)	25.6% (17.9-33.5)	<0.001*
2 days recall	73.6% (66.3-80.9)	58.3% (50.2-66.5)	15.3% (8.7-21.8)	<0.001*
3 days recall	68.1% (60.3-75.8)	58.3% (50.2-66.5)	9.7% (4.2-15.3)	0.0002*
4 days recall	63.9% (55.9-71.3)	58.3% (50.2-66.5)	5.6% (1.1-10)	0.0078*
5 days recall	61.1% (53.1-69.2)	58.3% (50.2-66.5)	2.8% (-0.6-6.2)	0.1250
6 days recall	59.7% (51.2-67.3)	58.3% (50.2-66.5)	1.2% (-1.2-3.9)	0.5
Recall since birth	56.3% (48-64.5)	58.3% (50.2-66.5)	-2.1% (-7.3-3.1)	0.3657
Age group (4-5 months (n=178)				
	[1]EBF Prevalence (95% CI)	7days recall	% overestimation (95% CI)	McNemar's P value
Single 24 hrrecall	64.6% (57.5-71.7)	38.2% (31-45.4)	26.4% (19.4-33.4)	<0.001*
2 days recall	51.7% (44.3-59.1)	38.2% (31-45.4)	13.5% (7.9-19.1)	<0.001*
3 days recall	48.3% (40.9-55.7)	38.2% (31-45.4)	10.1% (5.1-15.1)	<0.001*
4 days recall	45.5% (38.1-52.9)	38.2% (31-45.4)	7.3% (2.9-11.7)	0.0003*
5 days recall	43.8% (36.5-51.2)	38.2% (31-45.4)	5.6% (1.7-9.6)	0.0016*
6 days recall	41.6% (34.3-48.9)	38.2% (31-45.4)	3.4% (0.2-6.6)	0.0313*
RSB	35.4 (28.3-42.5)	38.2% (31-45.4)	-2.8% (-7.8-2.3)	0.2253

5.6 Comparison of sensitivity and specificity of different methods

Exclusive breast feeding prevalence obtained using single 24 hour recall, multiple 24 hour, and recall since birth was compared with the 7days recall. This was done in order to evaluate the performance of the methods in estimating EBF prevalence (table6). Sensitivity is the test ability to identify those who are exclusively breastfed while specificity is the test ability to identify those who are not exclusively breastfed. Positive predictive value is the test's ability to correctly identify infants who are truly being exclusively breastfed. Based on the above definition the Specificity of 24 hour recall tends to increase as the number of observation increases. The lowest specificity (49.7%)and positive predictive value (69.3%) was found by using the single 24 hour recall while the highest specificity (94.8%) and positive predictive value (95.6%) was obtained by using 6 days observation. Recall since birth was found to have specificity of 93.8% and positive predictive value of 94.2%.

Table 6: Sensitivity and specificity of single 24 hour recall, multiple 24 hour recall and recall since birth by using 7days as a reference, Butajira, Ethiopia, 2016.

Test methods	Reference method	Sensitivity (%)	Specificity (%)	[2]PPV (%)	[3]NPV (%)	[4]AUR
Single 24 recall	7days	100 (98.3-100)	49.7 (42.5-57)	69.3 (63.9-74.3)	100 (96.2-100)	0.749 (0.713-0.789)
2days recall	7days	100 (98.3-100)	71.5(64.6-77.8)	79.9 (74.7-84.5)	100 (97.4-100)	0.858 (0.826-0.889)
3days recall	7days	100 (98.3-100)	80.3 (74-85.7)	85.2 (80.3-89.3)	100 (97.6-100)	0.902 (0.873-0.93)
4days recall	7days	100 (98.3-100)	86 (80.3-90.6)	89 (84.4-92.6)	100 (97.8-100)	0.93 (0.906-0.955)
5days recall	7days	100 (98.3-100)	90.7 (85.7-94.4)	92.4 (88.3-95.4)	100 (97.9-100)	0.953 (0.933-0.974)
6days recall	7days	100 (98.3-100)	94.8 (90.7-97.5)	95.6 (92.1-97.9)	100 (98-100)	0.974 (0.958-0.99)
[1]RSB	7days	89 (84.1-92.9)	93.8 (89.4-96.7)	94.2 (90.1-97)	88.3 (83.1-92.4)	0.914 (0.887-0.941)

[1]RSB recall since birth

[2]PPV positive predictive value

[3]NPV Negative predictive value

[4]AUR Area under roc curve

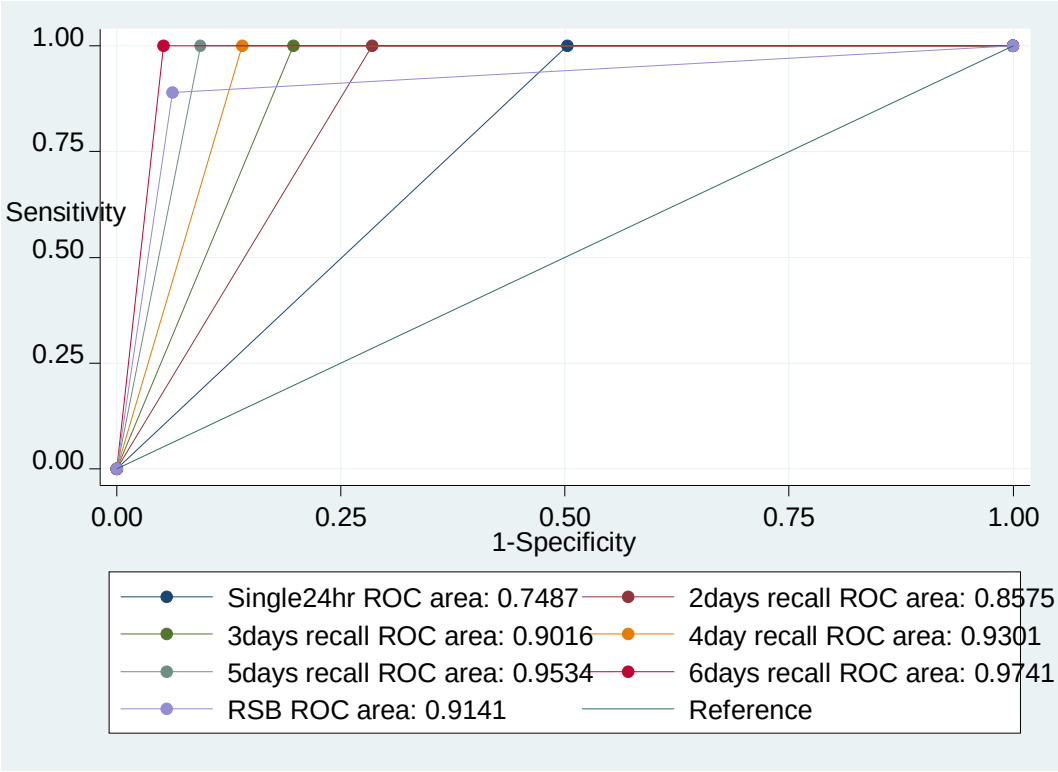

Figure 1: Sensitivity and specificity of multiple 24 hour recall and recall since birth by using 7days observation as a reference.

The sensitivity and specificity of a single 24 hour recall varied across different variables (table 7). Using 7days recall as the reference method the specificity of single 24 hour recall tends to be slightly lower among working mothers as compared to house wives (47.5% vs. 50.3%). The specificity of single 24 hour recall was also slightly lower among mothers with no formal education (48.1 Vs 50.9). Similarly there was variability among different economic classes the lowest specificity 39.4% was found among the highest economic class.

Table 7: Sensitivity and specificity of single24 hour recall by 7days recall as a reference method across different variables, Butajira, Ethiopia, 2016. (n=412)

Variables	Sensitivity (%)	Specificity (%)	[1]PPV (%)	[2]NPV (%)	[3]AUR
Infants Age					
0-1months	100 (94.6-100)	43.5(23.2-65.5)	83.8 (73.8-91.1)	100 (69.2-100)	0.717 (0.614-0.821)
2-3	100 (95.7-100)	38.3 (26.1-51.8)	69.4 (60.4-77.5)	100 (85.2-100)	0.692 (0.63-0.754)
4-5	100 (94.7-100)	57.3 (47.5-66.7)	59.1 (49.6-68.2)	100 (94.3-100)	0.786 (0.74-0.833)
Formal education					
Yes	100 (96.9-100)	50.9 (41.3-60.5)	68 (60.5-74.9)	100 (93.7-100)	0.754 (0.708-0.801)
No	100 (96.4-100)	48.1 (46.9-59.5)	70.81 (62.7-78.1)	100 (91-100)	0.741 (0.686-0.795)
Occupation status					
Working	100 (88.4-100)	47.5 (31.5-63.9)	58.8 (44.2-72.4)	100 (82.4-100)	0.738 (0.659-0.816)
Housewives	100 (98.1-100)	50.3 (42.1-58.6)	71.6 (65.7-77)	100 (95.3-100)	0.752 (0.712-0.792)
Socioeconomic status					
Lowest	100 (91-100)	56.8 (41-71.7)	67.2 (53.7-100)	100 (86.3-100)	0.784 (0.71-0.858)
Second	100 (90.7-100)	47.7 (32.5-63.3)	62.3 (49-74.4)	100 (83.9-100)	0.739 (0.664-0.813)
Middle	100 (91.2-100)	48.8 (33.3-64.5)	64.5 (51.3-76.3)	100 (83.9-100)	0.744 (0.669-0.82)
Forth	100 (93.3-100)	55.2 (35.7-73.6)	80.3(68.7-89.1)	100 (79.4-100)	0.776 (0.684-0.868)
Highest	100 (92.7-100)	39.4 (22.9-57.9)	71 (58.8-81.3)	100 (75.3-100)	0.697 (0.612-0.782)

[1]PPV positive predictive value

[2]NPV Negative predictive value

[3]AUR Area under roc curve

Sensitivity and specificity of multiple 24 hour recall was also conducted across the different age groups (table 8). The specificity in all age group increased as the number of observation days increased. Among the 0-1 age group the specificity increased from 60.9% obtained by 2days to 91.3% obtained by 6days. Similarly in the 2-3 months age group it increased from 63.3% obtained by 2days observation to 96.7% obtained by 6days observation. The improvement in specificity was also observed among infants in the 4-5month age group.

Table 8: Sensitivity and specificity of the different methods by using 7days observation as a reference method across different age groups, Butajira, Ethiopia, 2016

0-1 months (n=90)					
	Sensitivity	**Specificity**	**[1]PPV**	**[2]NPV**	**[3]AUR**
2days recall	100 (94.6-100)	60.9 (38.5-80.3)	88.2 (78.7-94.4)	100 (76.8-100)	0.804 (0.702-0.906)
3days recall	100 (94.6-100)	73.9 (51.6-89.8)	91.8 (83-96.9)	100 (80.5-100)	0.87 (0.778-0.961)
4days recall	100 (94.6-100)	73.9 (51.6-89.8)	91.8 (83-96.9)	100 (80.5-100)	0.87 (0.778-0.961)
5days recall	100 (94.6-100)	82.6 (61.2-95)	94.4 (86.2-98.4)	100 (82.4-100)	0.913 (0.834-0.992)
6days recall	100 (94.6-100)	91.3 (72-98.9)	97.1 (89.9-99.6)	100 (83.9-100)	0.957 (0.898-1)
[4]RSB	91 (81.5-96.6)	91.3 (72-98.9)	96.8 (89-99.6)	77.8 (57.7-91.4)	0.912 (0.844-0.98)
2-3 months (n=144)					
	Sensitivity	**Specificity**	**PPV**	**NPV**	**AUR**
2days recall	100 (95.7-100)	63.3 (49.9-75.4)	79.2 (70.3-86.5)	100 (90.7-100)	0.817 (0.755-0.878)
3days recall	100 (95.7-100)	76.7 (64-86.6)	85.7 (77.2-92)	100 (92.3-100)	0.883 (0.829-0.937)
4days recall	100 (95.7-100)	86.7 (75.4-94.1)	91.3 (93.6-96.2)	100 (93.2-100)	0.933 (0.89-0.977)
5days recall	100 (95.7-100)	93.3 (83.8-98.2)	95.5 (88.8-98.7)	100 (93.6-100)	0.967 (0.935-0.998)
6days recall	100 (95.7-100)	96.7 (88.5-99.6)	97.7 (91.6-99.7)	100 (93.8-100)	0.983 (0.96-1)
RSB	91.7 (83.6-96.6)	93.3 (83.8-98.2)	95.1 (87.8-98.6)	88.9 (78.4-95.4)	0.925 (0.881-0.969)
4-5 months (178)					
	Sensitivity	**Specificity**	**PPV**	**NPV**	**AUR**
2days recall	100 (94.7-100)	78.2 (69.3-85.5)	73.9 (63.7-82.5)	100 (95.8-100)	0.891 (0.852-0.93)
3days recall	100 (94.7-100)	83.6 (75.4-90)	79.1 (69-87.1)	100 (96.1-100)	0.918 (0.883-0.953)
4days recall	100 (94.7-100)	88.2 (80.6-93.6)	84 (74.1-91.2)	100 (96.3-100)	0.941 (0.911-0.971)
5days recall	100 (94.7-100)	90.9 (83.9-95.6)	87.2 (77.7-93.7)	100 (96.4-100)	0.955 (0.928-0.982)
6days recall	100 (94.7-100)	94.5 (88.5-98)	91.9 (83.2-97)	100 (96.5-100)	0.973 (0.951-0.994)
RSB	83.8 (72.9-91.6)	94.5 (88.5-98)	90.5 (80.4-96.4)	90.4 (83.5-95.1)	0.892 (0.843-0.941)

[1]PPV positive predictive value

[2]NPV Negative predictive value

[3]AUR Area under roc curve

[4]RSB recall since birth

6. DISCUSSION

This study was conducted with that aim of estimating by how much the WHO indicator overestimateEBF rate. The study compared results obtained from single 24 hour recall, multiple 24 hour recall and recall since birth at 2, 4 and 6 months. Indeed a large discrepancy in EBF rate was identified between the different methods. The prevalence of exclusive breast feeding was found to be more common (76.7%) when single 24 hour recall is used. This prevalence of EBF lowers to 53.16% and 50.24% when 7days observation and recall since birth was used respectively. This shows that a single 24 hour recall overestimate EBF prevalence by 23.54% as compared to result obtained by 7days observation,This degree of overestimation by 24 hour recall varied across age, an over estimation rate as high as 26.4% is observed among infants in the 4-5 months age group. By using 7days observation as a reference method single 24 hour showed the lowest specificity (49.7%) and positive predictive value (69.3%). Specificity of 94.8% and positive predictive value of 95.6% was obtained by using 6days observation. Recall since birth was also found to have high specificity (93.8%) and high positive predictive value (94.2%).

Our result has showed disagreement in exclusive breast feeding rate when different methods of recall were used. A significant overestimation as high as 23.54% in EBF rate was observed when single 24 hour recall was used as compared to 7days observation. Several previous studies have also showed disagreement between different methods of recall. By comparing single 24 hour recall with a data collected by monthly recall one study have found a 25% overestimation in EBF rate among 1-4month old infant and 16% over estimation among 5-8months old infants(37). Similarly another study comparing 24 hour recall with data obtained by daily record showed an overestimation of 41% at 2 months of age, 43% at 4 months of age and 9.2% at 6 months of age when single 24 hour recall was used(34).

By comparing EBF rate obtained by single 24 hour recall with short recalls obtained at 2, 4 and 6 months, one study concluded that using point in time data to assess EBF rate is subjected to error(38). This observed overestimation is mainly due to a day to day variation in infant's feeding pattern. For instance in our study area there is a culture of giving an infant a plant called "anita" which is believed to help the infant weight gain. This plant is given on Saturday and Wednesday. From our analysis one of the lowest prevalence of EBF is obtained from Sunday's observation 70.39% (indicating recall of Saturday's practice) this is followed by Thursday's

observation 71.36% (indicating recall of Wednesday's practice). These types of cultures and changes in infant feeding are difficult to capture unless there is a continuous assessment of the infant feeding pattern.As indicated in our result by increasing the number of observation days we can increase the possibility of the indicator capturing the day to day variation in infant feeding. By increasing the number of observation to just two days we can decrease the degree of overestimation to 13.34%. If the observation day goes as high as 6days the overestimation will go as low as 2.42%.

This study evaluated the specificity of a single 24 hour recall, multiple 24 hour recall and recall since birth by using 7days observation as a reference. A point in time data has showed 100% sensitivity in identifying those mothers who were exclusively breast feeding their child. However mothers who were exclusively breastfeeding during the previous 24 hour had not strictly exclusively breastfed over the previous week and this is reflected by the poor positive predictive value 69.3% of the indicator. Single 24 hour recall was also found to have poor specificity (49.7%) as well. Two days recall had a better ability of representing the feeding pattern over the previous week which is indicated by a significant improvement in specificity and positive predictive value of 71.5% and 79.9% respectively.

Study have recommended for a data to be collected longitudinally when possible in order to minimize inaccuracy(44). This is in fact true because longitudinal data cover a longer duration of the infant's life making a room for the indicator to pick any movement in the infant feeding pattern. This is clearly indicated in our result by the improvement in specificity from 49.7% obtained by single 24 hour recall to 71.5% by two days observation to 80.3% by three days observation and this improvement goes on as the number of days of observation increase. In order to obtain a specificity of 94.8% we need to follow a child for at least 6 consecutive days. This suggests that by increasing the number of observation day we can significantly increase the specificity and positive predictive value of the indicator.But this could be costly and time consuming.

We also evaluated whether the specificity of a single 24 hour recall varies across different variables. Poor specificity of single 24 hour recall was observed in all age group (43.5% among 0-1months age group, 38.3% among 2-3 months age group and 57.3% among 4-5 months age group. We also have seen a relatively low specificity of the indicator among working mothers, this is because a mother could exclusively breast fed a child whenever she is at home but tend to

give other foods/drinks if she could not be available to breast fed her child exclusively for 24 hours. The other important finding we observe was low specificity among high socio-economic class, the reason for this might be mothers that are found in the highest socio-economic status tend to mix up additional food/drinks like infant formula milk and cow milk other than breast milk.

One issue raised here is that the test methods are part of the reference method (multiple 24 hour being part of 7days recall) so one might argue that it doesn't deserve to be a reference method. This is partly true and is reflected by lack of variability in sensitivity across days. But taking this as reference has an advantage in helping us simulate weather one day, could represent the entire feeding history by showing us if the last day of the recall was representative of the week's feeding history of the infant. The same logic was applied for comparing multiple 24 hour recall with the reference method.

An infant can be exclusively breastfed for a period and receive other food due to a change in circumstance and then return to exclusive breast feeding(47). This variability can only be detected if the indicator covers a longer duration of the infant's life. In this study an indicator with this capability was recall since birth. This method has resulted in the lowest proportion (50.24%) of infants being exclusively breastfed. Since this methods covers a longer duration of the infant's life it was able to identify 24 mothers who gave food/fluid other than breast milk at some point in time in the infant's life beyond the seven days observation. As a result of this it has led to an under estimation of EBF prevalence by 2.9% as compared to 7days observation. Despite the underestimation this indicator was found to have a high specificity 93.8% and positive predictive value of 94.2%.

One issue that is raised with the use of recall since birth is the potential recall bias. Several previous studies have been conducted in order to address this issue. A study done with the aim of comparing prospective data on breast feeding obtained monthly up to six months of life with maternal report of Breast feeding 2 years after postpartum have indicated that only 30.1% of the mothers recalled breast feeding duration correctly(44). Another study was conducted by comparing prospective data obtained every three week for up to 12 weeks postpartum with recall at 6 months and 1-3.5 year. The result from their study has indicated a statistically significant but modest (18%) overestimation(45). Similarly another study comparing prospective data with

recall after 34-50 years has observed a considerable misclassification in breastfeeding duration(46).

But there were also several studies that have reported a better agreement between maternal recall and prospective data. One of the study have found that information obtained by retrospectives data based on maternal recall can provide accurate estimation of initiation and duration of breastfeeding even 20 year after postpartum(40). A study validating maternal recall revealed that there was no difference between prior and current recall about breast feeding duration(42). A systematic review also suggested that maternal recall can provide an accurate estimation of initiation and duration of breast feeding especially when the recall duration is over a short period(43).

Having said this, the question is whether retrospective cross sectional method can be a feasible alternative to prospective studies for the purpose of feeding behavior with the methodological challenge it generates. Recall bias is unavoidable because it entirely depends on memory but it can be minimized by using short recall duration, by framing the questionnaire to aid accurate recall(48). For instance the use of itemized checklist of common foods/fluids that the infant might receive, rather than asking a direct question of “duration of EBF practice” can aid maternal recall of EBF duration.

From our analysis we have seen that infant feeding pattern vary on a daily basis and that using single 24 hour recall to categorize infant feeding pattern is misleading. This misclassification is especially dangerous because the potential to further improve EBF rate will not be addressed, thereby overlooking opportunities to advance child health. This indicates the need for an indicator as highly specific as possible. We have also seen that EBF prevalence varied according to the type of indicator used and that there is no one best indicator that can correctly identify the infant feeding pattern.

In light of the above finding we suggest the use of single 24 hour recall in assessing EBF prevalence should be reconsidered. Ideally data should be collected prospectively since they can capture the true picture of infant’s feeding pattern. We have seen that by increasing the observation to two days we can significantly improve the specificity by almost 20%. But our concern here is could this be a feasible approach? We have also seen that recall since birth had a

high specificity (93.8) and positive predictive value (94.2). So by taking improved specificity and feasibility into account we can consider the use of recall since birth to assess EBF practice.

7. STRENGTH AND LIMITATION

The strength of this study is the use of itemized check list in order to minimize recall bias during the assessment of recall since birth, the use of randomly selected infants and the use of standardized questionnaire.

There is a limitation to this study that needs to be acknowledged. Conducting 24 hour recall for seven consecutive days may have introduced social desirability bias in this study.

8. CONCLUSION AND RECOMMENDATION

This study compared EBF prevalence by using three different methods. It was observed that the different methods resulted in a significant difference in EBF prevalence. The use of single 24 hour recall in assessing EBF is misleading as it tends to overestimate EBF prevalence. By increasing number of recalls we can significantly lower the degree of overestimation. Using recall since birth to assess EBF has presented a prevalence that is close to reality.

Based on our finding and by taking issue of feasibility into considerationthe use of recall since birth to evaluate EBF prevalence could be a possible alternative to single 24 hour recall.We recommend policy makers to reconsider the use of single 24 hour recall in assessing EBF prevalence. We also recommend other researchers to explore a better indicator by using findings from this research as a base line data.

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Annexes

Annex 1: Subject information sheet

Addis Ababa University

School of public health

My name is …….. I am here on behalf of EseteHabtemariam student of Addis Ababa University School of public health. She is conducting a research on 'Accuracy of a single 24 hour recall and multiple 24 hour recall as compared to recall since birth." In butajira, for the partial fulfillment of master's in public health in Addis Ababa school of public health. She received permission from Addis Ababa university school of public health and the regional health bureau for administrators to conduct this study.

The aim of this study is to determine how accurate a single 24 hour dietary recall and multiple 24 hour recall is as compared to recall since birth.The study will help in providing a base line data for policy makers and other researchers on issues regarding exclusive breastfeeding indicators.It can also have a role in helping you to practice the recommended breastfeeding practice for proper nutritional care of your child.

You are selected randomly to participate in this study because you are a mother with a child age less than 6 months. Your participation is purely based on your willingness.: You have full right either to participate or decline to be a participant in this study. If you choose to take part in the study you may respond to all the questions or you may not answer questions you don't want to, and have the right to stop the interview at any time. You also have the right to choose not to take part in this study. Participating in this study will not have any risk or harm. Whether you are willing to participate, refuse or decide to withdraw later, you will not be subjected to any ill-treatment.

If you agree to participate in the study, you will be asked to answer some questions about yourself, your delivery experience and your breastfeeding practice. The interview will be conducted on seven different days. The first interview with you will take about 20 minutes. The other interview will only take about 10 minutes.

Any information that you provide will be kept confidential, names will not be written or specified and all the questionnaires will be coded for anonymity. No one will have access to the non-coded data except the principal investigator. Only the principal investigator will know the details and she will discard it after completing analysis. The data will not be used for purposes other than the study. Your willingness and active participation is very important for the success of this study.

Contact details of principal investigator and the person to whom to contact at any time for further explanation:

Name of principal investigator: EseteHabtemariam

Cell phone No - 0923794814

E-mail: esete.f@gmail.com

Annex 2: Informed consent

Based on the understanding of the information I gave you, are you willing to participate in this study? A. Yes B. No

1. If yes, continue the interview. 2. If no, skip to the next participant by writing reasons for his/her refusal.

_____

Informed consent Certified by:

Respondent's signature _____Date_____

Interviewer: Name_____ Signature_____

Questionnaire number_____

Date of interview _____Time started_____Time completed_____

Result of interview:

1. Completed

2. Respondent not available

3. Refused

4. Partially completed

Checked by: Supervisor: Name _____ Signature_____

Annex 3: Questionnaire

Section A: Identification

Questionnaire No _____district _____kebele name _____

House numberRelation of respondent with the child_____ Name of the interviewer _____date of the interview_____ Time started_____ Time finished_____

Section B: Infant Bio Data

No	Question and filter	Coding categories	Skip
201	Name of the baby/ name of the mother		
202	Sex of the infant	Male……..1 Female……...2	
203	Date of birth of the infant		
204	Infants Age in month		

Section C: maternal characteristics, socio economic and demographic characteristics of the house hold

No	Question and filter	Coding categories	Skip
301	In what month and year were you born		
302	Age of the mother in completed year		
303	Marital status of the mother	Married……1 Single……...2 Divorced……..3 Widow…….4	
304	What is your religion?	Orthodox……..1 Catholic……2 Protestant……..3 Muslim…….4 Traditional……....5 Other (specify)…….6	
305	Have you ever attended school?	Yes……..1 No……...2	
306	What is the highest level of	Illiterate……..1 Read and write……2	

	school you attended?	Primary……...3 Secondary……...4 Technical/vocational……..5 Higher (specify)…….6	
307	What is the highest grade/ number of years you completed in your highest level of school attendance?	Grade/number of years	
308	What do you do for a living?(occupational status) NB. more than one answer is possible	Government employee……..1 Private employee……...2 Merchant……...3 Daily laborer…….4 Framer……...5 House wife……6 Other (specify)……..7	
309	What is the main source of drinking water for member of your house holds?	Piped water……..1 Bore hole…….2 Protected well……..3 Unprotected well……...4 Protected spring……5 Unprotected spring……6 lake…….7 river ……...8 pond…….9 other…….10	
310	How long does it take to go there, get water and comeback?	Minutes……/__/__/ Don't know	
311	What kind of toilet facility do members of your household usually use?	functional pour flush toilet……..1 non-functional pour flush……..2 functional pit latrine…….3 non-functional pit latrine…….....4 No facility/bush/field……...5 Other……6	
312	What type of fuel does your household mainly use for cooking?	Electricity……1 Solar……2 Kerosene……..3 Charcoal……...4 Wood……...5 Shrubs/grass……6 Animal dung……....7 Other……8	
313	Main material of the floor?	Sand……1	

		Wood……..2 Cement…….3 Marble……..4 Cane/bamboo……5 Other (specify)……..6	
314	Main material of the roof?	Grass ……1 Wood……2 Corrugated iron/metal ……3 Cement……4 Other(specify)……..5	
315	Main material of the walls?	Wood with mud……1 Wood with grass…….2 Blocks……3 Cement with stone……..4 Bricks…….5 Corrugated iron/metal ……6 Other(specify)……..7	
316	Does your household have? Electricity? A watch/ clock? A radio? A television? A mobile telephone? A refrigerator? A table? A chair? A bed with cotton/sponge/spring mattress? An electric mitad? A kerosene lamp/pressure lamp?	Yes No Electricity?.....1 2 A watch/ clock ?.....1 2 A radio?.....1 2 A television?.....1 2 A mobile telephone?.....1 2 A refrigerator ?.....1 2 A table ?.....1 2 A chair ?.....1 2 A bed with cotton/sponge/spring mattress??.....1 2 An electric mitad.....1 2 A kerosene lamp/pressure lamp?.....1 2	
317	Does any member of this household own	Yes no Car …….1 2 Bicycle….....1 2 Motorcycle ……..1 2 Animal-drawn cart…....1 2	
318	Does any member of this household own any agricultural land?	Yes……..1 No……...2	If no go to 320
319	How many (local units) of agricultural land do members of this household own? Local units_____(specify)		
320	Does this household own any livestock, herds, other farm	Yes……1 No…….2	If no go to 322

	animals, or poultry?		
321	How many of the following animals do this household own? Milk cows, oxen or bulls? Horses, donkeys or mules? Goats? Sheep? Chickens? Beehives?	 Milk cows, oxen…….1 /__/__/ Horses, donkeys or mules…2/__/__/ Goats……..3/__/__/ Sheep…….4 /__/__/ Chicken…….5/__/__/ Beehives……..6 /__/__/	

Section D. child birth and breast feeding practice

Now I'm going to ask you about your pregnancy, child birth and breast feeding experience

No	Question and filter	Coding categories	Skip
401	Where did you give birth to (name)?	Home……1 Health facility……...2 On the way to the health facility……...3	
402	Mode of delivery	Normal……1 Caesarean section……2 Assisted vaginal delivery…..3	
403	Have you ever breast fed (name)?	Yes……..1 No……...2 Don't know…….3	If no go to 406
404	How long after birth did you first put (name) to the breast?	Immediately(less than one hour)……000 Hours……1 /__/__/ Days……..2 /__/__/	
405	Did you give (name) the first yellowish milk?	Yes……..1 No……2	
406	In the first three days after delivery, was (name) given anything to drink other than breast milk?	Yes ……1 No ……...2	If no go to 501
407	What was (name) given to drink?	Milk other than breast milk…1 Plain water……..2 Sugar or glucose water……..3 Sugar-salt-water solution…..4 Fruit juice……..5 Infant formula……6 Tea……7 Honey……..8 Fresh butter……..9 Other (specify) ……10	

Section E. Exclusive breast feeding practice by using 24 hour recall

No	Question and filter	Coding categories	Skip
501	Are you currently breast feeding (name)?	Yes…….1 No……..2 Don't know……3	If no go to 503 If don't know go to 503
502	Was (name) breastfed yesterday during the day or at night?	Yes…….1 No……..2 Don't know……3	If yes go to 504
503	Sometimes babies are fed breast milk in different ways Did (name) consume breast milk by a cup, spoon, or bottle, or has been breastfed by another women yesterday during the day or at night?	Yes…….1 No……..2 Don't know……3	
504	Was (name) given any vitamin drops or other medicines as drops yesterday during the day or at night?	Yes…….1 No……..2 Don't know……3	
505	Was (name) given ORS yesterday during the day or at night	Yes…….1 No……..2 Don't know……3	

No	Question and filter	Coding category		
406	I would like to ask you about some liquids that (name) may have had yesterday during the day or at night Did (name) have any	Yes	No	Don't know
A	Plain water	1	2	3
B	Infant formula	1	2	3
C	Animal milk	1	2	3
D	Juice or juice drinks	1	2	3
E	Yogurt	1	2	3
F	Thin porridge	1	2	3
G	Gruel	1	2	3
H	"Anita ketel"			
I	Any other liquids	1	2	3
407	Did (name) ate any of the food during the day or at night? Whether at home or outside the home?			
A	Porridge, bread, rice, noodles or other foods made from grains	1	2	3
B	Any commercially fortified baby food?	1	2	3
C	Any food made from teff, like injera, kita.	1	2	3
D	Pumpkin, carrots, squash or sweet potatoes that are yellow or orange inside	1	2	3
E	White potatoes, cassava, bulla or any other foods made from roots	1	2	3
F	Any dark green leafy vegetables	1	2	3
G	Ripe mangoes, ripe papayas	1	2	3
H	Any other fruits or vegetables	1	2	3
I	Liver, kidney, heart or other organ meats	1	2	3
J	Any meat, such as beef, pork, lamb, goat, chicken	1	2	3
K	Eggs	1	2	3
L	Any fresh or dried fish or shellfish?	1	2	3

Section F. Exclusive breast feeding practice by using itemized check list

501. Now I would like to ask you, at what point in time in the infants life have you started giving him/her the following foods/drinks.

Food list	Time to start giving additional food	
	Never	Age in month
1. Plain water		
2. Infant formula milk		
3. Animal milk		
4. Tea		
5. Gruel		
6. Ye abeshweha		
7. “Anita ketel”		
8. Yogurt		
9. Fruit juice		
10. Bula		
11. Porridge		
12. Bread		
13. Injera		
14. Kita		
15. Potato, carrot		
16. Any Vegetables		
17. Egg		
18. Meat		
19. Chicken		
20. Fish		
21. Commercially fortified baby foods		

Annex 4: Amharic version of subject information sheet

[illegible]

[illegible]

[illegible] / [illegible] /

[illegible] / [illegible] ____________________________ [illegible]

[illegible]

[illegible]

[illegible]

[illegible] 7 [illegible] 20 [illegible] 10 [illegible]

[illegible]

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Annex 5[illegible] Amharic version of subject informed consent form

<u>[illegible]/[illegible]</u>

[illegible]

1 [illegible]([illegible])
2 [illegible]([illegible])

[illegible]/[illegible]________________________

[illegible]

1. [illegible]
2. [illegible]
3. [illegible]

[illegible]

[illegible]____________________[illegible]_____________________

Annex 6□ Amharic version questionnaire

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202	□□□□ □□	□□.....1 □□□.....2	
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CURRICULUM VITAE

Personal information

Name: EseteHabtemariam

Address: Mob. : +251923794814

Email: esete.f@gmail.com

P.O.Box 3363 A.A Ethiopia

Date of Birth: May 28, 1991

Sex: Female

Marital Status: Single

Nationality: Ethiopian

Educational background

- Graduated from Haramaya university July, 2013
  - HoldingBSc in Public Health
  - Years attended from October 2009 to July 2013 GC.
- Secondary School
  - Bethel MekaneYesus Secondary School (Addis Ababa)
  - Years attended from 2005 to 2009 G.C

Professional Experience

I have worked at Addis Ketema health center as a junior health officer from Nov, 2014 to June, 2014.

I was involved in the

- Adult outpatient department (OPD)
- Integrated management of new born and childhood illness (under 5 OPD)
- Antenatal care (ANC)

Skills

- Interpersonal communication skill and team leading ability
- Data collection, analysis and report writing.
- Excellent presentation skill
- Have Proficiency in verbal and written English and also Amharic

community and professional involvement

- Gender club, in organizing and supporting female students in tutoring and assisting in various ways in Haramaya University.
- Anti-AIDS club as an active participant in awareness creation for the society during my journey in Haramaya University.
- House to house Health information dissemination on topics
    - Family planning
    - HIV/AIDS
    - Sanitation e.t.c

Languages

Languages	Reading	Listening	Speaking
Amharic	Excellent	Excellent	Excellent
English	Excellent	Excellent	Excellent