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Magnitude of Diarrhea in Breast-Fed Versus Formula-Fed Baby

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Abstract

An observational cross-sectional study was carried out in the Department of Pediatrics, Burdwan medical college and hospital, Burdwan from 1st september 2018 to 30 th April 2020. Total 200 children, aged 1 to 24 months having diarrhea attending in and out patient department was enrolled in this study. Data was collected by face to face interview using a structured close ended questionnaire information regarding demographic data; containing detailed feeding history and information of diarrhea.Study was conducted after the approval of the institutional ethics committee and by getting due consent from the care givers.

The exclusive breast-feeding children has lower incidence of frequent attacks of diarrhea (25%) when compared to exclusive formula feeding (71.4%) and both formula and breast feeding (59.5%) children. Only 20 % of children among exclusively breast fed had their first attack of diarrhea with in first 6 months of life when compared to 80 % (65%+15%) of children with non-exclusive breast feeding (breast feed plus formula feed and exclusive formula feeding)

Based on this study it is clear that children who is exclusively breast feeding have lower incidence of diarrhea when compared to children with non-exclusive breast feeding (breast feed plus formula feed and exclusive formula feed)

Keywords: Breast feeding, Breast milk, Formula feed, Education, Occupation

INTRODUCTION

Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants[1] . Breast milk promotes sensory and cognitive development, and protects the infant against infectious and chronic diseases[2]. Exclusive breastfeeding reduces infant mortality due to common childhood illnesses such as diarrhea, and helps for a quicker recovery during illness[3].Breast milk contains all nutrients as well as antibodies especially Immunoglobulin A (IgA) and protects baby from infections including diarrheal diseases[4]. WHO has recommended, infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health? Breast milk substitutes (such as commercial infant formulas and cow's milk) are considered nutritionally acceptable for few infants, but there is greater risk of developing a number of infections including diarrhea[5]. Breast milk substitutes andother baby foods as well as bottles, teats and utensil are attributable to contamination causing diarrheal diseases in infants who are not exclusively breastfed[6].

Rationale of this study:

Many studies have been conducted previously on the magnitude of diarrhea in breast fed, in comparison with the formula fed babies but the predisposing and the relating factors which causes diarrhea in these

babies have not been dealt properly. With this in mind the present study was planned to assess the magnitude of diaarhea in the breast fed and the formula fed babies in relation to the occupation of the parents, educational qualification of the parents, type of housing they live in, water supply and sanitary facilities which may directly pre-dispose to diarrhea.

Review of literature:

The human baby, like the offsprings of other mammals,is born with a readymade food supply of its own and therefore breast feeding is natural and instinctive. The milk of different animals is uniquely species specific and its composition is adapted to the needs of the baby. The lowest protein content of human milk is in keeping with the slowest rate of growth of human infant.[7]

AbdulbariBener et al. study on exclusive breast feeding and prevention of diarrheal diseases showed more than half of the infants (59.3%) were exclusively breastfed; the risk for presenting diarrhea was higher in formula fed (48.7%) and partially breastfed children (37.3%) when compared to exclusively breast fed (32.5%)[8].

Black RE et al. study[9] on Maternal and child under nutrition showed, the relative risk for prevalence of diarrhea was more in predominant and partial breastfeeding (1.26 and 3.04 respectively) as compared to exclusive breastfeeding.

World Health Organization (WHO) recommends exclusive breast feeding for first six months of life and continuation of breast feeding for two years or beyond[10,11].

Laura M Lamberti et al.[12] study on breastfeeding and the risk for diarrhea morbidity and mortality showed excess risk of diarrhea in non-exclusively breast fed 0-5 months aged infants; relative risk of diarrheal incidence was 1.26, 1.68, and 2.65 in predominant, partial, and non-breastfed group children respectively.

RISK OF NOT BREAST FEEDING LEADING TO DIARRHEA: RELATIVE RISKS OR ODDS RATIOS AND 95% CONFIDENCE INTERVALS.

	DIARRHEAL MORBIDITY	DIARRHEAL MORTALITY
NO BREAST FEEDING (0-5 MONTHS)	RR = 2.7 (1.7-4.1) compared with exclusive breastfeeding	RR = 10.5 (2.8-39.6) compared with exclusive breastfeeding
NO BREAST FEEDING (6-23 MONTHS)	RR = 1.3 (1.1-1.6) compared with any breastfeeding	RR = 2.2 (1.1-4.2) compared with any Breastfeeding

AIMS AND OBJECTIVES

AIM:The present study has been planned with the aim to study the magnitude of diarrhea in breast fed versus formula fed babies.

OBJECTIVE:

PRIMARY OBJECTIVE: This present study is to find out the magnitude of diarrhea in breast fed babies in comparison with the formula fed babies taking in to account the parameters like age group, sex, sanitation, water supply, type of residence they live in, father's educational qualification (and) occupation and mother's educational qualification (and) occupation.

METHODOLOGY

STUDY TYPE:An observational type of descriptive epidemiological study.

STUDY DESIGN-Hospitalbased observational cross-sectional study.

STUDY SETTING AND TIMELINES-

- PREPARATORY PHASE-1st September 2018 to 15thOctober 2018.

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- DATA COLLECTION PHASE-1st January 2019 to 31stDecember 2019.
- DATA ANALYSIS PHASE-1st January 2020 to 30th April 2020.
- REPORT WRITING PHASE-1st May 2020 to 31st August 2020.

PLACE OF STUDY-Paediatric indoor ward and paediatric outpatient department, Department of Paediatrics, Burdwan medical college and hospital, Burdwan .

PERIOD OF STUDY-1st September 2018 to 31st August 2020.

STUDY POPULATION-Children, aged 1 to 24 months having diarrhea, attending the department of pediatrics, BMCH, both in and out patient, who met the inclusion criteria.

SAMPLE SIZE - **200** children under 2 years of age and more than 1 month of age. Samples will be selected by random sampling method.

INCLUSION CRITERIA- Children, aged 1 to 24 months, having diarrhea ie; watery stools (type 6 and 7 stools in Bristol stool chart) for more than 3 episodes per day were included in the study.

EXCLUSION CRITERIA-

1) Children aged less than 1 month or more than 24 months

2) Children with less than three episodes of loose stools per day.

3) Children whose mother refused to give consent for the study.

4) Severely dehydrated and seriously ill-children.

STUDY VARIABLES:

Socio-epidemiological data (age,sex,district,religion), data regarding the feeding information, number of diarrheal attacks, age of first occurrence of diarrhea, formula feeding utensils, water supply, type of residence, education of parents and occupation of parents.

DESCRIPTION OF THE VARIABLES:

AGE:Age was calculated in completed years as in record book.

GENDER:Mentioned as male and female

RELIGION:Religion was recorded as Hinduism, Islam and Christianity

CASTE:Mentioned as general, scheduled caste and scheduled tribe.

WATER SUPPLY: Mentioned as tube well and tap water.

RESIDENCE: Mentioned as urban, rural and urban-slum.

SANITATION: Mentioned as pucca , water-seal , katcha and open air.

EDUCATIONAL STATUS of PARENTS: It was noted as:

Illiterate: Cannot read and write

Non-formal literate: Have not done any schooling but can read and write

Primary: Class I-IV

Middle school: Class V-VIII

Secondary: Class IX-X

Higher Secondary: Class XI-XII

College Level: Have gone to college but have not completed graduation

Graduate: Have completed graduation

PARENTS' OCCUPATION:

Occupation of the parents was categorised as per Modified kuppuswamy socio-economic status scale for occupational category:

1. Skilled worker- Skilled employee is one who is capable of working independently and efficiently and turning out accurate results. He must be capable of reading and working on simple circuits and process, if necessary, e.g. heavy motor vehicle driver, accountant, cashier, store keeper, head clerk, farmer etc.

2. Semi-skilled worker- Semi-skilled employee is one who has sufficient knowledge of the particular trade or above to do respective work with the help of simple tools and machines e.g. sorter/checker, light motor vehicle drivers

3. Unskilled Worker-Unskilled employee is one who possesses no special training and whose work involves the performance of simple duties which require the exercise of little or no independent judgement or

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previous experience although a familiarity with the occupational environment is necessary e.g. loader, unloader, puda maker chowkider

4. Unemployed-Currently retired and not employed in any job at present.

5. Professional- Professional Employee is the one who is involved in decision making, formulatingpolicies, execution of policies. E.g. Medical officers,Engineers.

STUDY TOOLS:Pre-designed and pre-tested structured close ended questionnaire containing information regarding demographic data; detailed feeding history and information of diarrhea

STUDY TECHNIQUES:

1) Face to Face interview using a structured close ended questionnaire containing information regarding demographic data; detailed feeding history and information of diarrhea.

2) Clinical examination of the patient.

DATA COLLECTION: Data was collected by using the questionnairewith prior permission of the care givers by getting informed written consent from them.

STATISTICAL ANALYSIS:

Collected data was entered in Microsoft excel work sheet and was double checked for accuracy. Data was then analyzed using Student's t, Chi-square and repeat measurement tests. Statistical analysis was carried out using SPSS software, version 11.5.

Data is presented in the form of diagrams and tables. Bar and Pie diagrams was used for discrete/categorical data. Categorical data is expressed in proportions. Continuous data and dispersion of data, was expressed in mean values and S.D respectively .

OUTCOME VARIABLES:

The magnitude of diarrhea in children is studied in relation to the

1) age group

2) type of feeding (breast feeding or formula feeding or both)

3) type of feeding utensil used

4) type of water supply

5) type of sanitation

6) type of residence

7) educational qualification of the parents

8) Occupation of the parents

ETHICAL CLEARANCE**:**

At first, the proposal was submitted for ethical clearance to institutional ethics committee of our college.

Data collection was initiated only after receiving the ethical clearance certificate. Informed written consent was taken from caregivers of each children.

Strict privacy and confidentiality was maintained throughout the study. Identity of participants will not be disclosed.

OBSERVATION ANDRESULTS

Age of the population ranges from 1 month to 23 months. Mean age was 10.98 months with standard deviation of ± 5.49 months. Demography of the study population is depicted in the figures.

Figure 14 shows, single attack of diarrhea occurred in 75 (75%),

32 (40.5%) and 6 (28.6%) children in exclusively breast fed, breast fed plus formula fed and exclusively formula fed group respectively.

Frequent (≥2) attacks of diarrhea occurred in 25 (25%), 47 (59.5%) and 15 (71.4%) children in exclusively breast fed, breast fed plus formula fed and exclusively formula fed group respectively (p value .000).

Table 1 shows, patients who developed first attack of diarrhea by 6 months of age were 8 (20%) from exclusive breast fed, 26 (65%) from breast fed plus formula fed and 6 (15%) from exclusive formula fed group. Patients who developed diarrhea by 7 to 12 months of age are 37 (46.25%), 34 (42.5%) and 9 (11.25%) from exclusive breast fed,

breast fed plus formula fed and exclusive formula fed groups respectively. 80 patients developed diarrhea by 13 to 24 months of age; among them 55 (68.75%), 19 (23.75%) and 6 (7.5%) were from exclusively breast fed, breast fed plus formula fed and exclusive formula fed groups respectively (pvalue .000).

Table 2 shows, the children of illiterate mother had more frequent diarrheal attacks (65%) than other

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literate mothers. Two or more diarrheal attacks are seen in 60 % of children with nonformal literate mothers, 45% of children with mothers of primary school education, 43.75% of children with mothers of middle school education, 40.3 % of children with mothers having high school education, 30% of children with mothers having higher secondary education and 1% of children with mothers who have attended college. But educational levels did not consistently influence the occurrence and frequency of diarrheal attack on the study population (p value .02).

Table 3 shows, 42.5% of children who have tube well as the source of water supply had frequent diarrheal attacks when compared to 50% of children with frequent diarrheal attacks with tap water as the water supply. There is no significant influence of source of water on diarrheal attack and frequency in different groups of patients (pvalue .407).

Table 4 shows, 47.7%, 38.7% , 62.5% of children living in urban , rural , urban slum respectively had frequent diarrheal attacks. Residence of the patients did not influence the frequency of diarrheal attacks (p value 0.084).

Table 5 shows, 62% of formula feeding children who use Bottle as the formula feeding utensil had frequent diarrheal attacks when compared to 62.5 % of formula feeding children who use cup and spoon as the formula feeding utensil and having frequent diarrheal attacks. There is no significant influence of feeding utensil and the frequency of diarrheal attacks in this study.

DISCUSSION

Design and setting of the study:Breast milk is the ideal food for an infant's first six months of life. Colostrum and breast milk contains an abundant amount of IgA2 and other antibodies that can help the baby to resist infections. Breastfeeding has many health benefits for both the mothers and infants. In addition to providing ideal nourishment, breastfeeding provides infants with protection from many infections, including diarrheal diseases.

Breastfeeding can also reduce the severity, duration, and negative nutritional consequences of diarrhea. On the other hand, use of formulas including infant formula is associated with increased health risks such as acute gastroenteritis, otitis media, severe lower respiratory tract infections, atopic dermatitis, asthma and obesity. The infant's intestine is not properly ready to digest non-human milk and this may often result in diarrhea, intestinal bleeding and malnutrition.

Many studies have been conducted previously on the magnitude of

diarrhea in breast fed, in comparison with the formula fed babies but the predisposing and the relating factors which causes diarrhea in these babies have not been dealt properly. With this in mind the present study was planned to assess the magnitude of diaarhea in the breast fed and the formula fed babies in relation to the occupation of the parents, educational qualification of the parents, type of housing they live in, water supply, feeding utensil and sanitary facilities which may directly pre-dispose to diarrhea.

Description of the study population:

A total of 200 children with diarrhea were included in the study conducted over the period of 1 year and 7 months from 1stseptember 2018 to 30 th April 2020. Subjects were included only after getting the informed consent and details were recorded as per attached proforma.

Baseline characteristics of children involved:In our study, the age of the population ranges from 1 month to 23 months with mean age of 10.98 ± 5.49 months. 20 % population were under 6 months. Out of 200 children 68% (136) were males and 32% (64) were females. 50% children (100) were exclusively breast fed , 11% (21) were exclusively formula fed and 39% (79) were both breast fed and formula fed.

In our study, we found that half (50%) of the study population were exclusively breastfed and single attack of diarrhea occurred in all children (as per inclusion criteria). But frequent (two or more) attack of diarrhea occurred mostly in non-exclusive breast fed children; in breast fed plus formula fed children 47 (59.5%), exclusively formula fed 15 (71.4%) and exclusively breast fed 25 (25%).

AbdulbariBener et al. study on exclusive breast feeding and prevention of diarrheal diseases showed more than half of the infants (59.3%) were exclusively breastfed; the risk for presenting diarrhea was higher in formula fed (48.7%) and partially breastfed children (37.3%) when compared to exclusively breast fed (32.5%).

Black RE et al. study on Maternal and child under nutrition showed, the relative risk for prevalence of

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diarrhea was more in predominant and partial breastfeeding (1.26 and 3.04 respectively) as compared to exclusive breastfeeding.

World Health Organization (WHO) recommends exclusive breast feeding for first six months of life and continuation of breast feeding for two years or beyond. We found 40 patients developed first attack of diarrhea by 6 months of age, of whom most children were from non-exclusively breast fed group; there were breast fed plus formula fed children 26 (65%), exclusively formula fed 6 (15%) and exclusively breast fed only 8 (20%). This finding reflects exclusive breastfeeding has influence on prevention of early occurrence of diarrhea. On the other hand, patients who developed first attack of diarrhea by 7-12 months and 13-24 months of age mostly were from exclusively breast fed group (46.25%, and 68.75%) respectively)

indicating later occurrence of diarrhea in exclusively breast fed children than non- exclusively breast fed one. Our finding correctly supports current WHO recommendation on breast feeding.

Laura M Lamberti et al. study on breastfeeding and the risk for diarrhea morbidity and mortality showed excess risk of diarrhea in non-exclusively breast fed 0-5 months aged infants; relative risk of diarrheal incidence was 1.26, 1.68, and 2.65 in predominant, partial, and non-breastfed group children respectively. Similarly, the estimated relative risk of incident diarrhea was elevated when comparing non-breastfed to breastfed 6-11 months aged infants.

We have observed the relationship of diarrheal incidence with other demographic parameters also. But residence, water supply, sanitation and parent's educational level had no significant influence on incidence and frequency of diarrhea.

CONCLUSION

Breast feeding reduces

1) incidence of diarrhea,

2) prevents frequent attack of diarrhea and

3) prevents early occurrence of diarrhea in under two children.

Residence, water supply, sanitation and parent's educational status may not have significant influence on incidence of diarrhea.

Recommendation:

1) Exclusive breast feeding for first six months of life and continuation of breast feeding for two years or beyond

2) Exclusive formula feeding should be avoided in children less than 6 months.

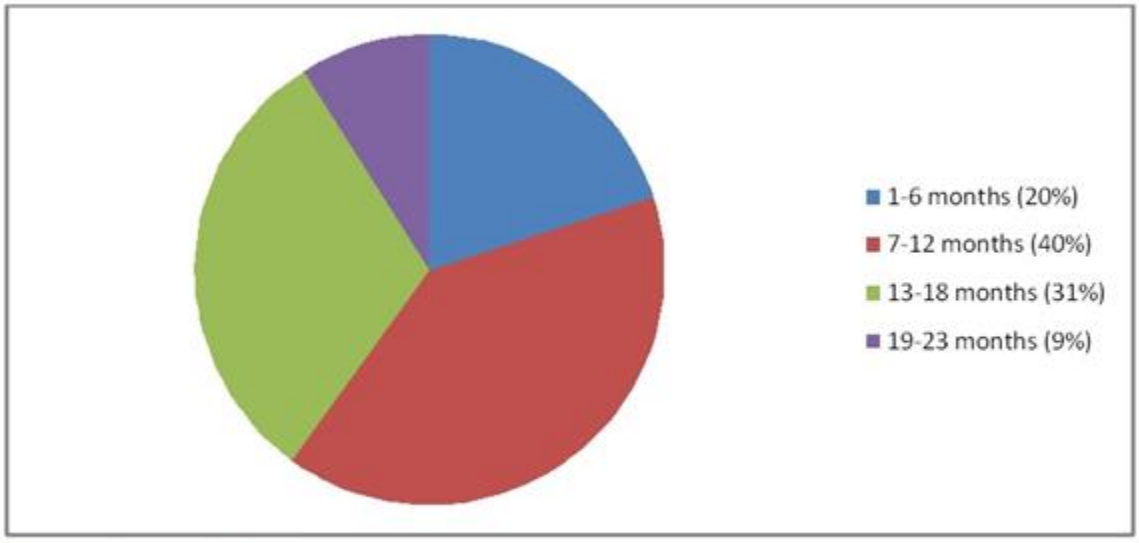

FIG 1 : AGE DISTRIBUTION

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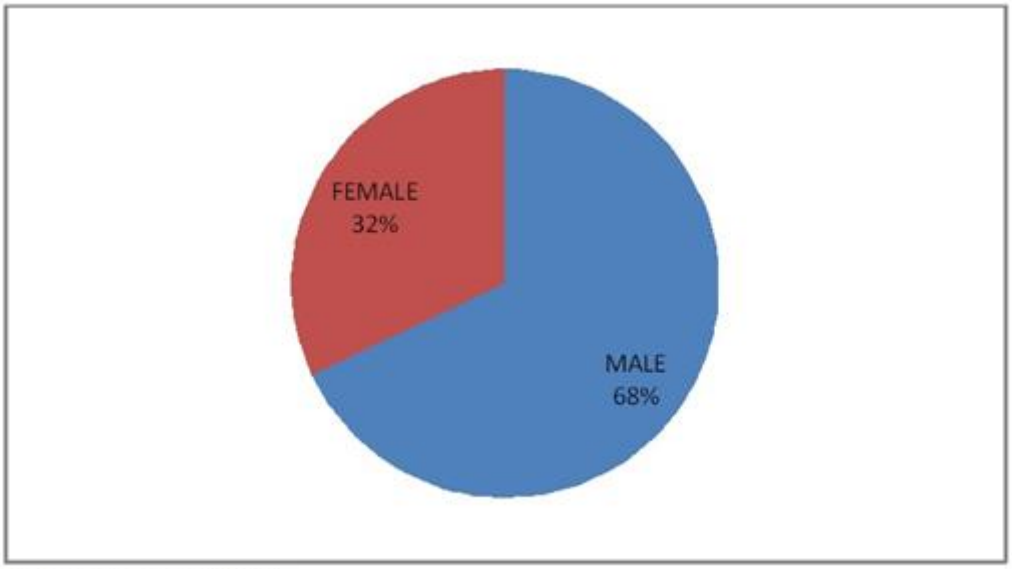

FIG 2 : SEX DISTRIBUTION

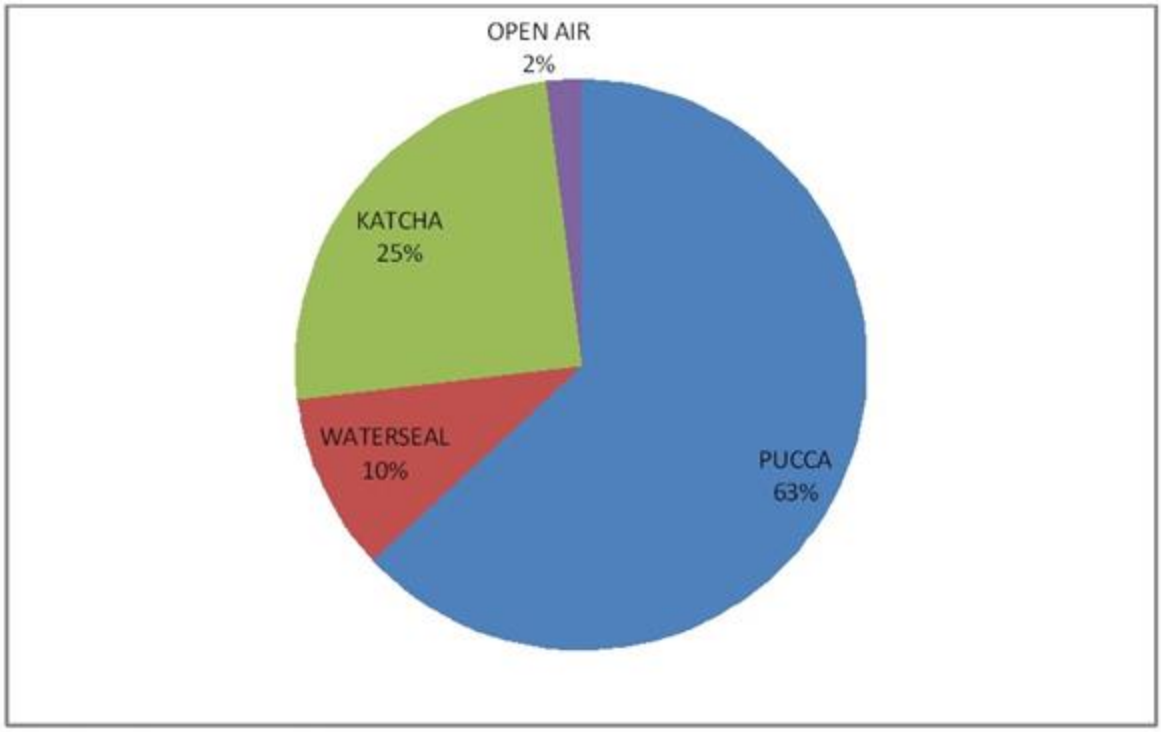

FIG 3 : DISTRIBUTION OF HOUSING

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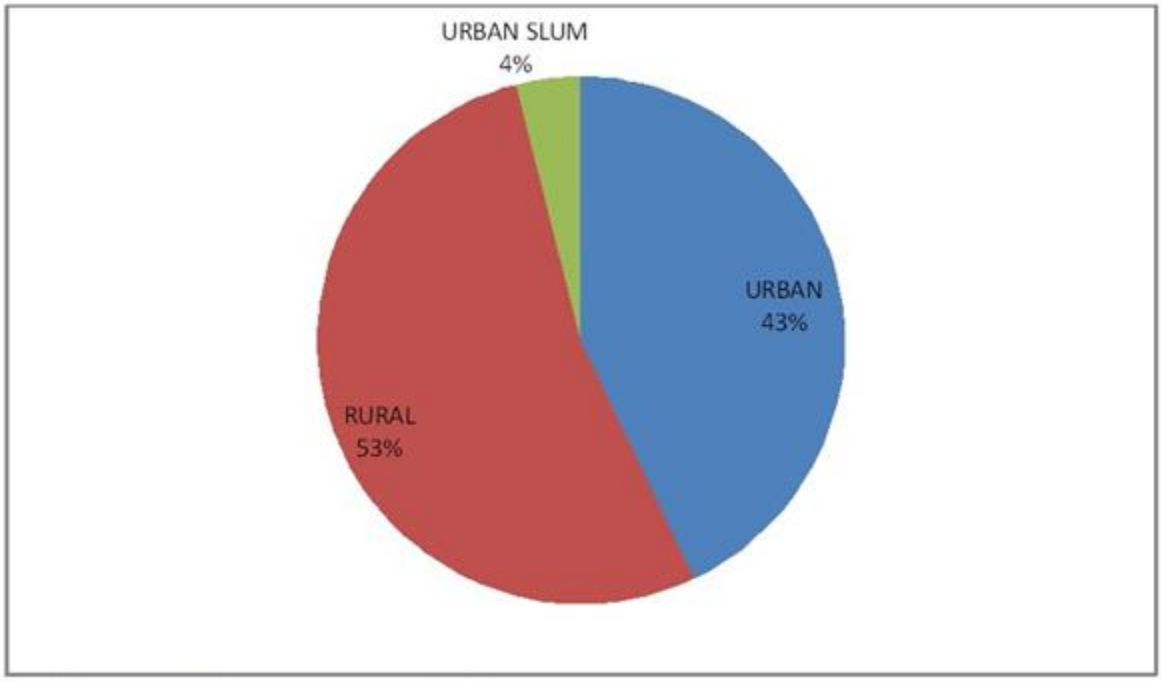

FIG 4 : DISTRIBUTION OF AREA OF RESIDENCE

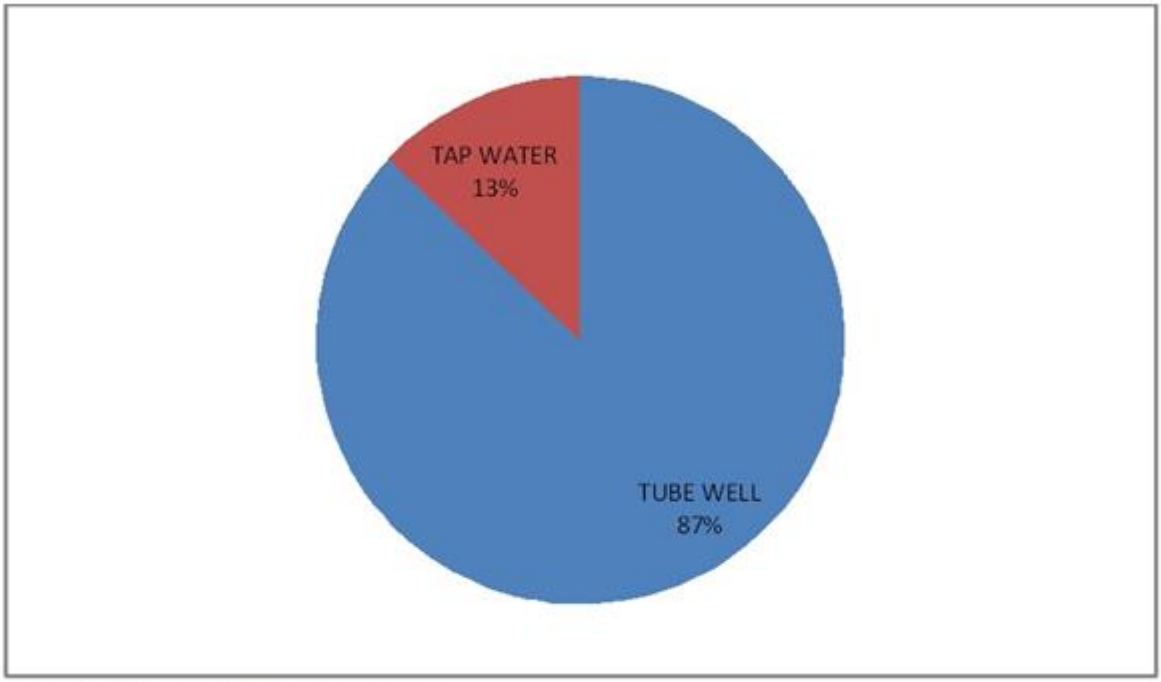

FIG 5 : DISTRIBUTION OF WATER SUPPLY

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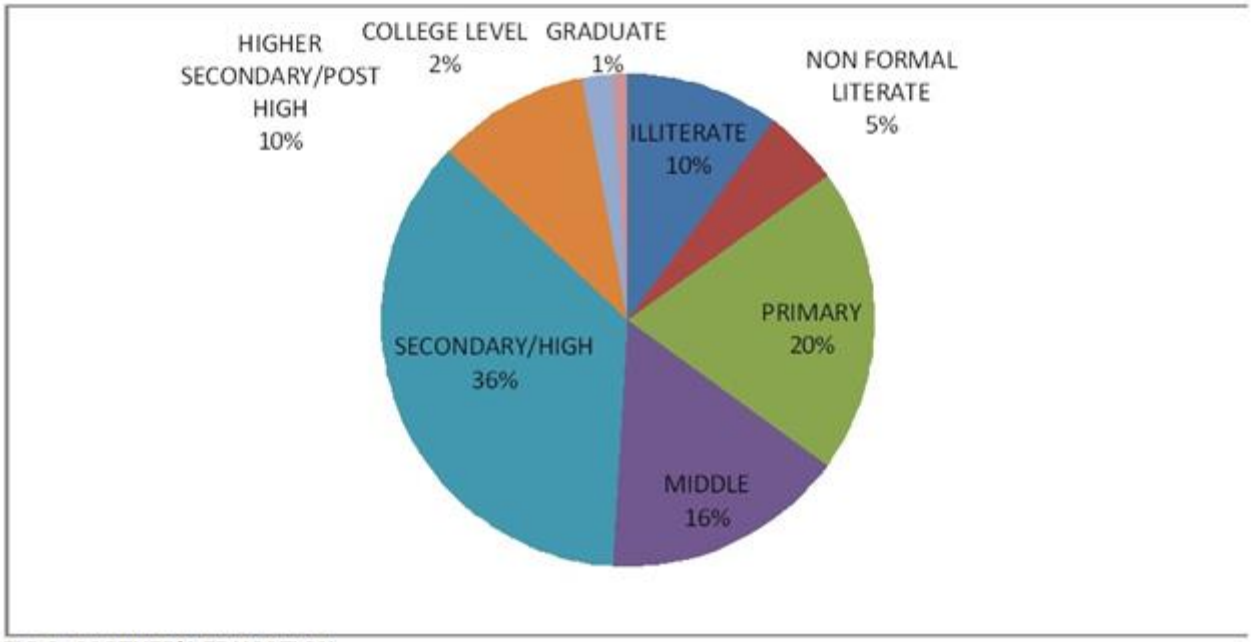

FIG 6 : MOTHER'S EDUCATION

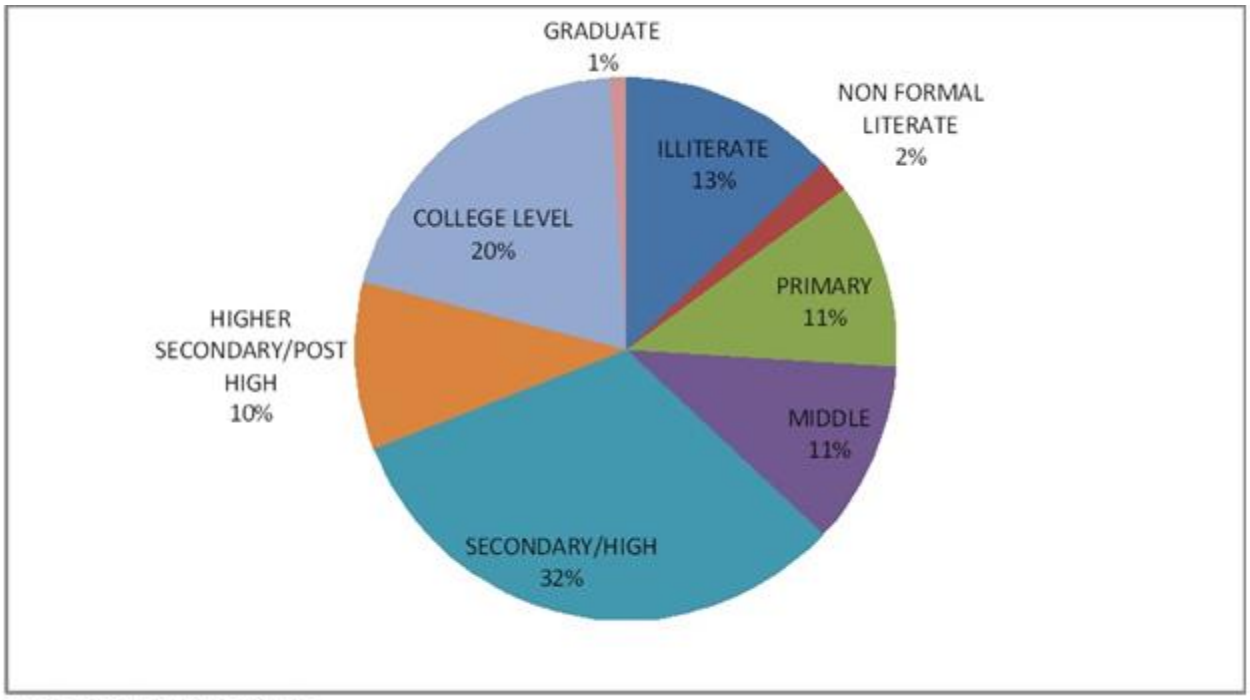

FIG 7 : FATHER'S EDUCATION

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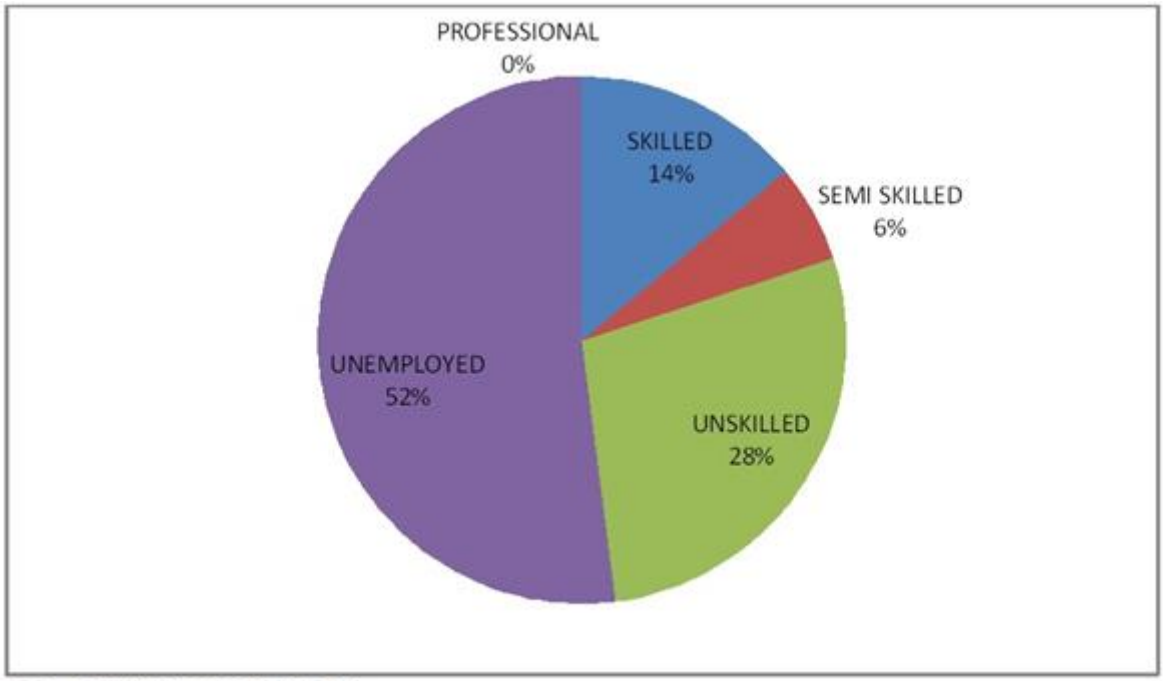

FIG 8 : MOTHER'S OCCUPATION

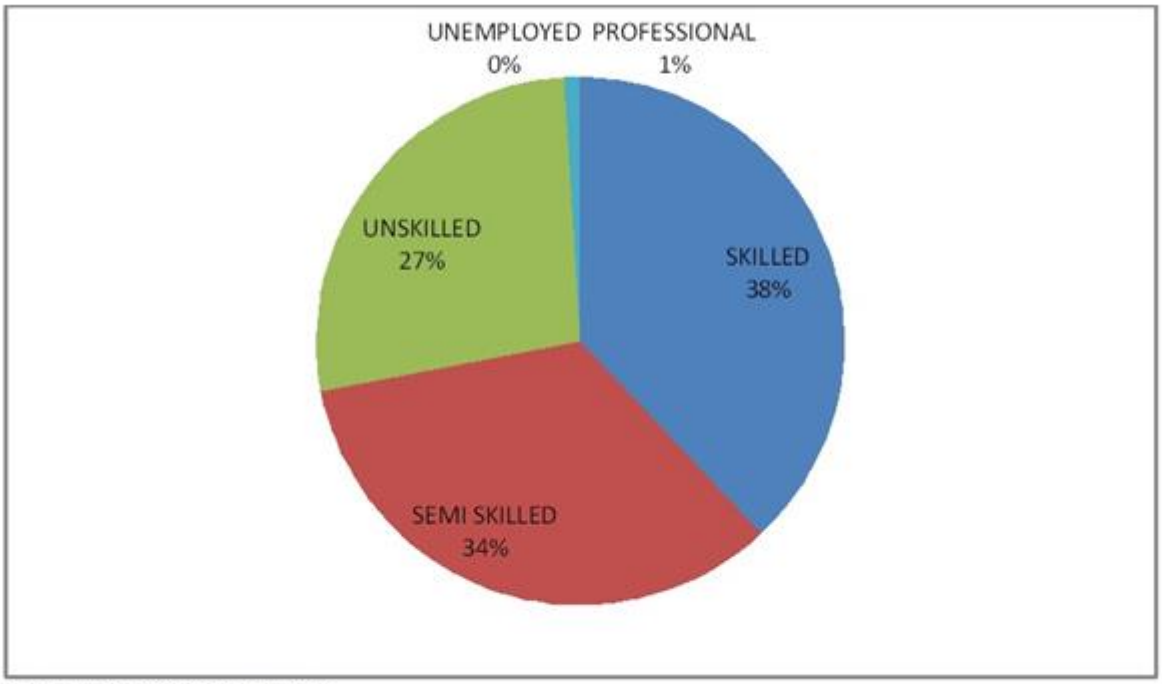

FIG 9 : FATHER'S OCCUPATION

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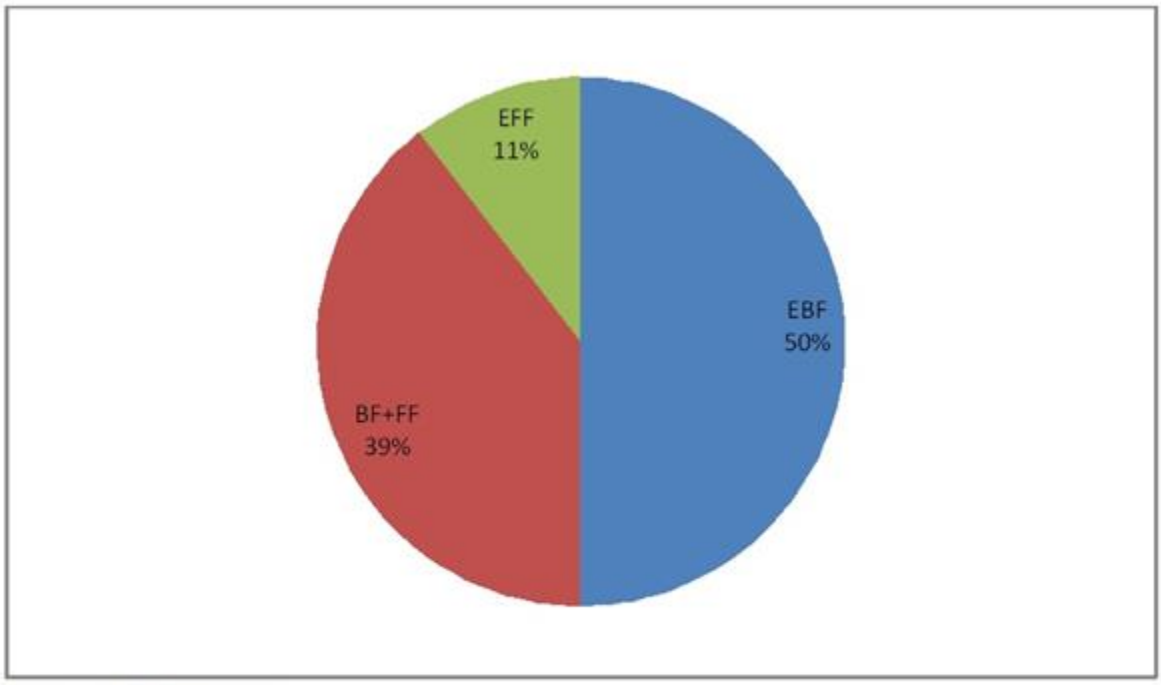

FIG 10 :TYPE OF FEEDING

(EBF- exclusive breast feeding, BF+FF - breast feed +formula feed, EFF- exclusive formula feeding)

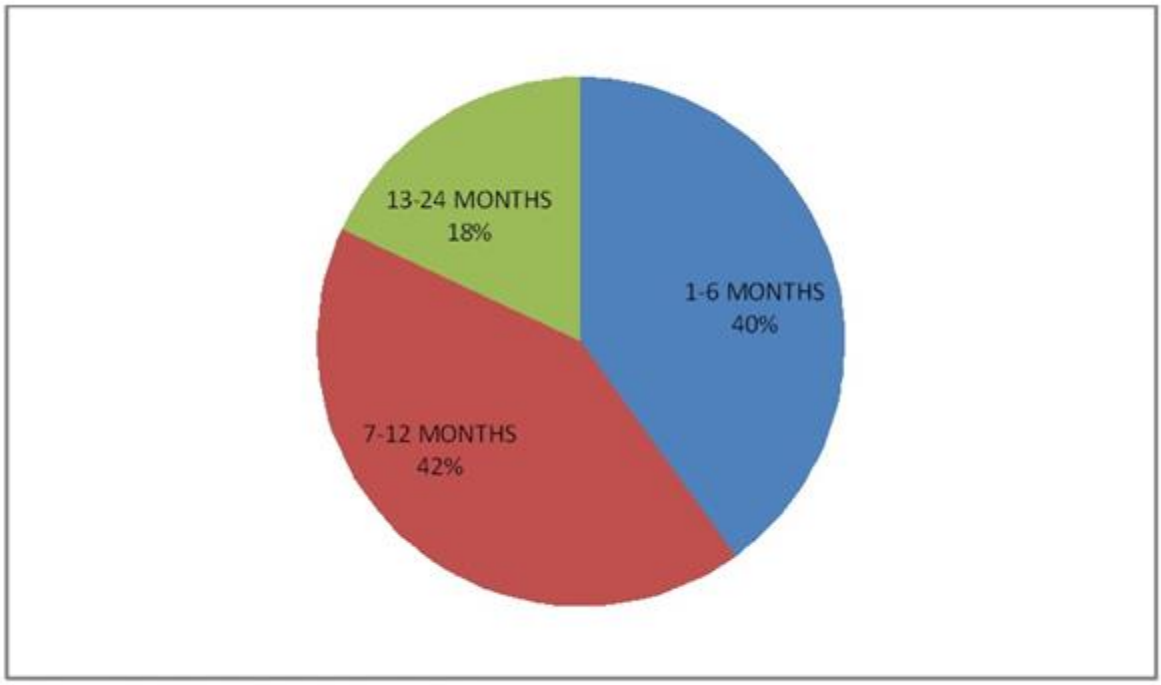

FIG 11 : FIRST OCCURRENCE OF DIARRHEA

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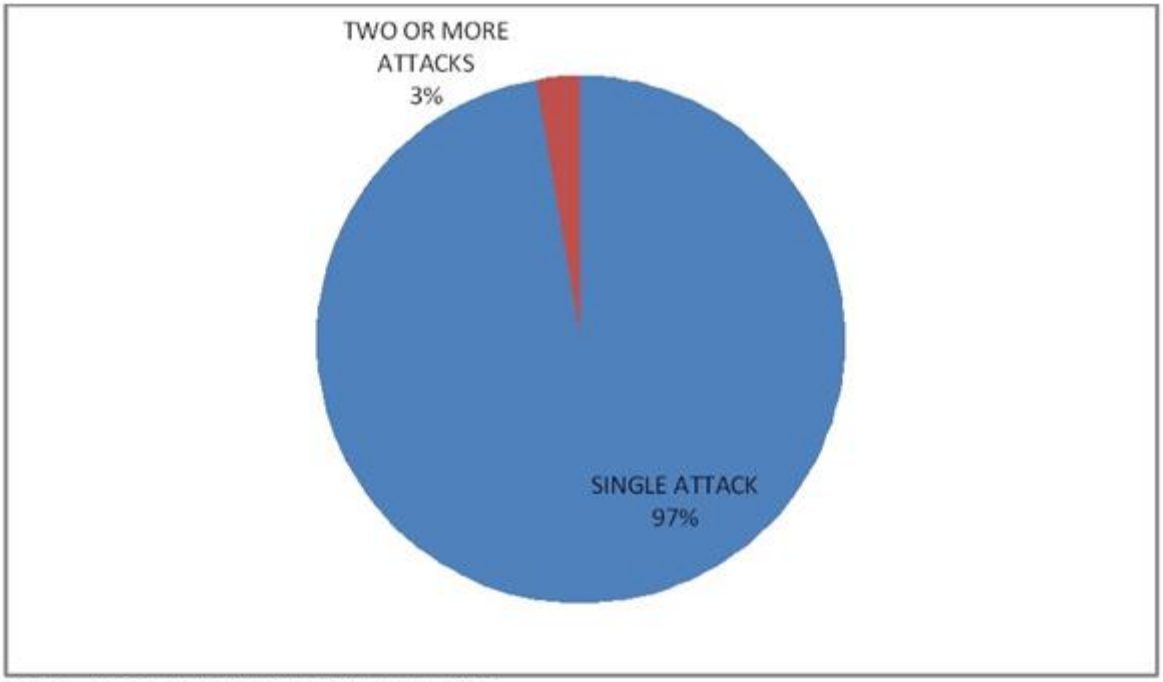

FIG 12: FREQUENCY OF DIARRHEAL ATTACKS

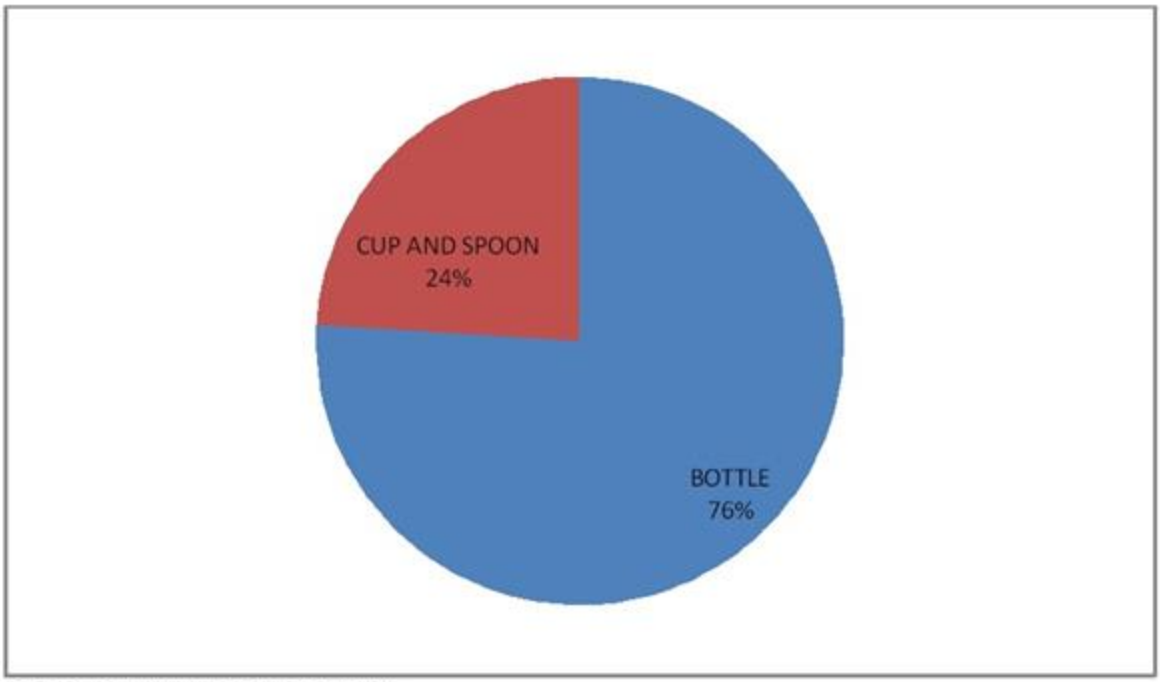

FIG 13 : FORMULA FEEDING UTENSIL

FIGURES:

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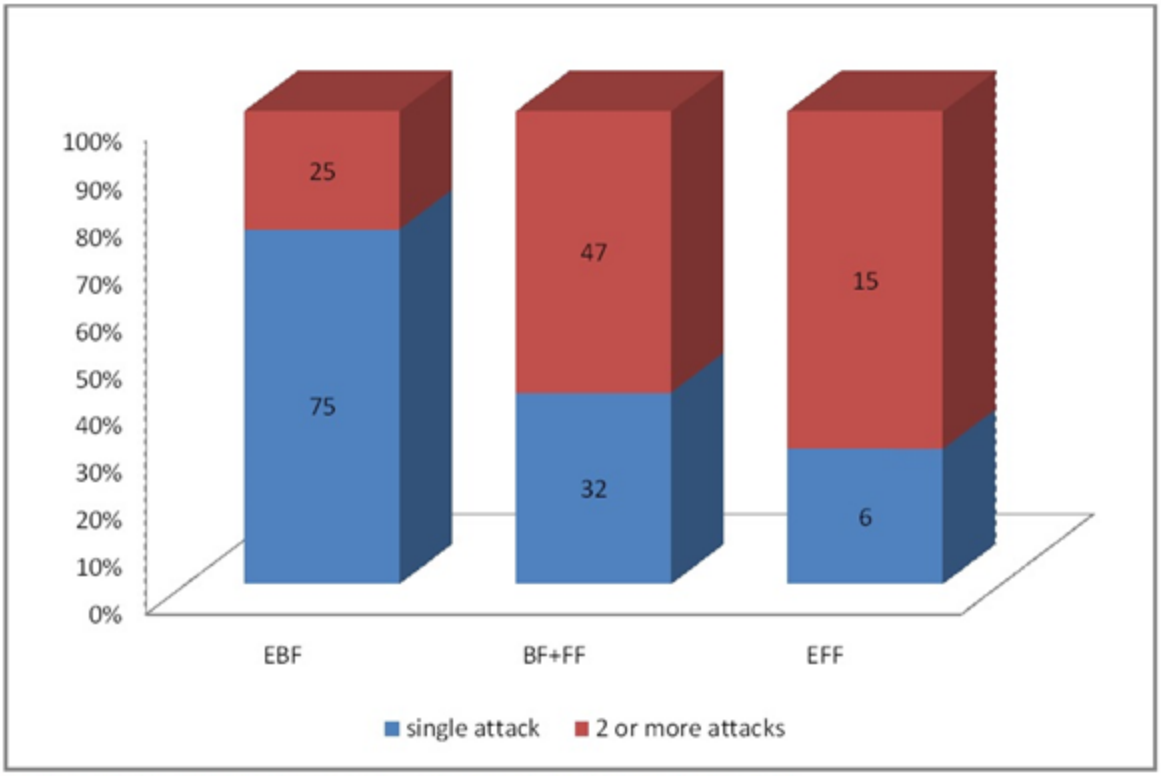

Fig 14 : Relationship between feeding and the number of diarrheal attacks.

TABLES:

Table 1: Type of feeding versus age of first occurrence of diarrhea.

AGE OF FIRST OCCURENCE		FEEDING		TOTAL
	EBF	BF +FF	EFF	
1-6 MONTHS	8(20%)	26(65%)	6(15%)	40
7-12 MONTHS	37(46.25%)	34(42.5%)	9(11.25%)	80
13-24 MONTHS	55(68.75%)	19(23.75%)	6(7.5%)	80
TOTAL	100	79	21	200

Table 2: Relation between mother's education and the frequency of diarrheal attacks.

MOTHER'S EDUCATION	**SINGLE ATTACK**	**2 OR MORE ATTACKS**	**TOTAL**
ILLITERATE	7 (35%)	13 (65%)	20

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NONFORMAL LITERATE	4 (40%)	6 (60%)	10
PRIMARY	22 (55%)	18 (45%)	40
MIDDLE	18 (56.25%)	14 (43.75%)	32
HIGH	43 (59.7%)	29 (40.3%)	72
HIGHER SECONDARY	14 (70%)	6 (30%)	20
COLLEGE LEVEL	3 (75%)	1 (25%)	4
GRADUATE	2 (100%)	0	2
TOTAL	113	87	200

Table 3: Relation between water supply and frequency of diarrheal attacks.

WATER SUPPLY	SINGLE ATTACK	2 OR MORE ATTACKS	TOTAL
TUBE WELL	100 (57.5%)	74 (42.5%)	174
TAP WATER	13 (50%)	13 (50%)	26
TOTAL	113	87	200

Table 4: Relation between residence and the frequency of diarrheal attacks .

RESIDENCE	SINGLE ATTACK	2 OR MORE ATTACKS	TOTAL
URBAN	45 (52.3%)	41 (47.7%)	86
RURAL	65 (61.3%)	41 (38.7%)	106
URBAN SLUM	3 (37.5%)	5 (62.5%)	8
TOTAL	113	87	200

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Table 5: Relation between formula feeding utensil and the frequency of diarrheal attacks.

FEEDING UTENSIL	SINGLE ATTACK	2 OR MORE ATTACKS	TOTAL
BOTTLE	29 (38%)	47 (62%)	76
CUP AND SPOON	9 (37.5%)	15 (62.5%)	24
TOTAL	38	62	100

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