



Breastfeeding and Association with Diarrhoeal Diseases: A Tale of two Councils in South-Eastern Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Authors ECA and SAN designed the study. Authors UCA, KMCO and KGE wrote the protocol. Authors SAN, KMCO and KGE did literature searches and review. Author IRN collected the data from the respondents. Data analyses were performed by authors UCA and ECA. Author UCA wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Background: Diarrhoeal diseases remain the second global leading cause of infant mortality accounting more than the combined effects of AIDS, Measles, and Malaria. It remains the leading cause of under-5 mortality, in poor underdeveloped regions. The protective effects of good breastfeeding practices among infants against diarrhoeal diseases are well known, but its practice among nursing mothers remains a subject of concern.

Aim: This study aimed to determine the prevalence of diarrhoeal diseases and its association with

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breastfeeding amongst breastfeeding infants attending Primary Healthcare Centres (PHC) in two area councils in South-Eastern Nigeria.

Study Design: Descriptive cross-sectional study.

Place and Duration of Study: Selected Primary Healthcare Centres in two area councils- Nnewi-North and Nnewi-South in Anambra State of Nigeria between June and August, 2014.

Methods: Multi-staged sampling technique was applied in selecting the Health Centres and study participants. The mothers were interviewed using pretested self-administered questionnaire. Data analysis was done using STATA statistical software version 13 and the level of significance was determined at a p-value of less than 0.05.

Results: The prevalence of diarrhoeal diseases among the infants was 27%. Above half (55.0%) was within the 0-3 months age bracket, while 23.8%, 21.8% and 33.33% of exclusively, predominantly, and mixed fed infants respectively had diarrhoea. Following adjustment for maternal education and past history of diarrhoea, babies not on any form of breastfeeding were three-folds (OR: 2.93, 95%CI: 1.02-8.40) more likely than their breastfeeding counterparts to develop diarrhoeal disease. Similarly, exclusively breastfed babies were 73% (OR: 0.27, 95%CI: 0.09-0.86); and those predominantly-breastfed: 78% (OR: 0.22, 95%CI: 0.06-0.77) less likely to develop diarrhoeal diseases.

Conclusion: Exclusive breastfeeding and healthy breastfeeding and weaning practices should be encouraged amongst mothers in developing countries as a good protective measure against diarrhoeal diseases among infants.

Keywords: Breastfeeding; infants; diarrhoeal disease.

1. INTRODUCTION

Diarrhoeal diseases remain the second leading global cause of infant mortality, more than AIDS, Measles, and Malaria combined. [1,2] With over 1.731 billion cases reported in 2010, [3] the World Health Organisation (WHO) showed that it still remains the leading cause of under-5 mortality, with about 800,000 dying yearly. Diarrhoeal disease is the passage of loose stool in amounts considered inappropriate for the age of the child [1,3]. The resulting dehydration in infants is the major driving force for morbidity and mortality [2].

Together, Sub-Saharan Africa and Asia contribute to about 60% of the global number of cases and burden. Africa is daily plagued with about 2,000 deaths daily from diarrhoeal diseases. In Nigeria, her most populous nation, it accounts for over 16% of child deaths and an estimated 150,000 under-5 mortality annually [1,4-6].

Breastfeeding, a practice as old as man, has been proved over time to be the ideal food for the healthy growth and development of infants. Exclusive breastfeeding (EBF) for the first six months of life has been shown to reduce the incidence of diarrhoeal diseases [1,7-9]. Studies have shown that exclusively breast-fed infants have fewer incidences of diarrhoeal diseases compared to mixed or complementary forms of

breastfeeding [7,8,10-13]. The major predictors of diarrhoeal diseases are poor nutritional status, rural settlement, higher parity of mothers, feeding of semisolid feeds, mother's level of education [8,14].

Similarly, it has been shown that the occurrence of diarrhoeal diseases increases shortly after EBF following the introduction of other foods [7,12,15,16]. Compared to non-breastfed infant, there was an almost three-fold increase (Relative Risk= 2.65) among infants of 0-5 months of age [14]. The benefits of EBF extend beyond reduction in the occurrence of diarrhoeal diseases to lower risk of sepsis, [15] and acute respiratory infection [11].

Little is however known of the association between diarrhoeal disease and breastfeeding in infants aged 0-12 months in a heterogeneous population in a semi-urban commercial area. Also, no local studies have been carried out in these councils to determine the impact of breastfeeding on child health and survival. In a bid to present an evidence-based prevalence of diarrhoeal diseases and its association with breastfeeding practice so as to impact local policy and practice, this study was conceptualised. We aimed to determine the prevalence of diarrhoeal diseases among breastfed infants in Nnewi-North and Nnewi-South Local Government Areas and its association with exclusive and other forms of breastfeeding.

2. METHODS

2.1 Setting

This study was conducted in Primary Health Centres (PHCs) in the two Area Councils (Nnewi-North and Nnewi-South). Nnewi is the second largest town in Anambra State, South-Eastern Nigeria, spanning over 1,076.9 square miles (2,789 km²). It is made up of nearly 2.5 million residents (24/25). It is a commercial urban centre with more than 70% of its inhabitants as traders. It has many PHCs and a tertiary health institution- Nnamdi Azikiwe University Teaching Hospital which serves the entire state.

2.2 Study Design/Sample Size

The study employed a cross-sectional descriptive study design, using interviewer-administered questionnaires. Multi-stage sampling technique was used to select the respondents. Based on the national prevalence of 8.17% of diarrhoeal disease in under-5s, [17] the study was powered to 0.9 and the sample size of 200 was calculated to detect a true prevalence of 7.83% and above at 5% two-sided significance level.

2.3 Study Participants

The study participants were mothers or carers of infants aged 0 to 12 months who presented to the PHCs and gave consent to participate in the study. Infants who were HIV positive; immunosuppressed; with any history of diarrhoea due to malabsorption, irritable bowel diseases or food allergies; and those with any chronic medical condition were excluded.

2.4 Study Instrument

The study instrument was a pre-tested semi-structured questionnaire which was developed by the researchers based on existing literature on the subject. This was pretested among a similar population at the Teaching Hospital. Observed lapses were addressed to ensure both internal and external validity.

We obtained information on participants' demography; parents' age, level of education and occupation; breastfeeding patterns and practices; frequency of diarrhoea; and other comorbidities (see appendix).

2.5 Data Analysis

Data from the questionnaires were entered into the STATA statistical software version 13 [18],

which was also used in performing all the analysis. Frequency tables and cross-tabulations were computed, while the level of statistical significance was based on a p-value level of less than 0.05. Chi-square analysis was used to test the association between breastfeeding, its covariates, and occurrence of diarrhoeal disease. To test for the predictors of diarrhoeal diseases, bivariate analysis was used to determine the significant predictors at a significance level of 0.05. Mantel-Haenszel's estimates of the odds ratio was computed after adjusting for significant confounders and the results were presented as adjusted Odds Ratio (aOR) with 95% Confidence Interval (CI).

2.6 Ethical Consideration

Ethical approval was granted by the Research and Ethics Committee of the Nnamdi Azikiwe University Teaching Hospital, Nnewi, Anambra State, Nigeria through the Department of Community Medicine of the institution. Informed consent was obtained from all the respondents after the aim of the study was individually explained to them. They were assured of the anonymity of their identity and the confidentiality of their responses. Participants were assured that their participation in the study was voluntary and they were free to withdraw at any point in the study.

3. RESULTS

3.1 Participants' Characteristics

The socio-demographic characteristics of the participants are shown in Table 1. Only mothers or carers of 200 infants were interviewed, with a response rate of 100%. A slightly higher proportion of infants (50.5%) were females. Similarly, majority (55.0%) was aged between 0 and 3 months while most (38.6%) of their mothers were aged between 26 and 30 years. More than a fifth (21.0%) of the mothers was educated up to the tertiary level, while 56% were civil servants.

The prevalence of diarrhoeal disease among the study population was 27%. Majority (92.0%) of the infants were currently being breastfed. Exclusive breastfeeding (EBF) (43.5%) was the commonest mode of feeding, followed by predominant feeding (42.4%). A greater proportion (57.5%) of the infants stopped EBF after 6 months, while 6.5% are currently on the family diet. At the time of the interview, 54 (27.0%) of these infants have had diarrhea while

45 (22.5%) have had diarrhea in the last two months.

3.2 Univariate Analysis

Table 2 shows the summary of the univariate analysis. There was no statistically significant difference in the association between the occurrence of diarrhoea and age ($p=0.319$), sex ($p=0.148$), parents' age and occupation, and area where domiciled ($p=0.422$). Both maternal education ($p=0.006$) and a history of previous diarrhoeal disease in the infants ($p<0.0001$) showed significant association with diarrhoea in the children.

3.3 Diarrhoeal Disease and Breastfeeding

In Table 3, the unadjusted and adjusted odds of the association between diarrhoeal

diseases and breastfeeding, including sub-analysis is shown. In the unadjusted model, the odds of diarrhoeal disease were 5 times (OR: 5.30, 95%CI: 1.76-15.95) increased in babies who were not currently breastfed compared to those on breastfeeding; but following adjustment for maternal education and past history of diarrhoea, this reduced to three-folds.

Compared to those not on breastfeeding, exclusively breastfed babies were 73% (OR: 0.27, 95%CI: 0.09-0.86), predominantly-fed: 78% (OR: 0.22, 95%CI: 0.06-0.77) less likely to develop diarrhoeal diseases in the adjusted model. However, this association was not statistically significant in babies on mixed feeding (OR: 0.45, 95%CI: 0.12-1.70). Similar associations were shown in their current diets (Table 3).

Table 1. Baseline characteristics of study participants

Demographic factor	Frequency	Percentage (%)
Child's sex		
Female	101	50.5
Male	99	49.5
Childs age (Months)		
0-3	110	55.0
4-6	43	21.5
7-9	30	15.0
10-12	17	8.5
Mothers age (Years)		
<20	19	9.5
20-25	59	29.5
26-30	77	38.5
31-35	26	13.0
36-40	15	7.5
>40	4	2.0
Mothers highest level of education		
No Formal Education	2	1.0
Primary Education	23	11.5
Secondary Education	133	66.5
Tertiary Education	42	21.0
Mothers occupation		
Housewife	60	30
Trader	74	37
Civil Servant	53	56
Artisan	5	26.5
Others	8	2.5
Fathers age (Years)		
<20	1	0.5
20-25	14	7.5
26-30	43	21.5
31-35	67	33.5
36-40	41	20.5
>40	34	17

Demographic factor	Frequency	Percentage (%)
Fathers level of education		
No Formal Education	4	2
Primary Education	40	20
Secondary Education	129	64
Tertiary Education	27	13
Fathers occupation		
Trader	111	55.5
Civil Servant	27	13.5
Artisan	44	22.0
Others	18	9.0
Currently being breastfed		
Yes	184	92.0
No	16	8.0
Mode of breastfeeding (n=184)		
Exclusive	80	43.5
Breast + Water (predominant)	78	42.4
Breast + artificial milk (mixed)	26	14.1
When exclusive was stopped (n=80)		
0-3 months	2	2.5
4-6 months	32	40.0
>6 months	46	57.5
Breastfeeding stopped (n=16)		
0-3 months	3	18.8
4-6 months	3	18.8
After 6 months	4	25.0
No breastfeeding at all	6	37.5
Current feeds		
Breast milk alone	83	41.5
Breast + feeds	37	18.5
Pap only	9	4.5
Pap + milk	58	29.0
Family diet	13	6.5
Currently having diarrhoea		
Yes	54	27.0
No	146	73.0
Past history of diarrhoea		
Yes	45	22.5
No	15	77.5
Local council		
Nnewi North	100	50.0
Nnewi South	82	41.0
Others	18	9.0

4. DISCUSSION

Our study showed high literacy rate amongst nursing mothers in this semi-urban area with slightly above half, employed in the civil service. Most (81%) of these mothers were within the reproductive age bracket of 20 and 35. These demographic findings were in line with the reports of the national survey of this commercial town with a thriving civil service predominated by females [19].

We reported that a high proportion of the infants were being breastfed but on various modes. EBF practice was low (52.3%), in contrast to the World Health Organisation's (WHO) recommendations. [20] The reason behind this is almost half of the mothers work in the civil service and do not have a maternity leave period beyond three months. This makes them unable to sustain EBF beyond this period. In Jordanian and Qatar cities with similar demography, EBF practice was also reportedly low [8,16].

Table 2. Test of Association between diarrhoeal diseases and the covariates and unadjusted odds

Covariate	Occurrence of Diarrhoea: N (%)		p-value	OR (95%CI)
	Yes	No		
Age (months)				
0-3	24(21.8)	86(78.2)	0.319	1
4-6	15(34.9)	28(65.1)		1.92 (0.88-4.20)
7-9	10(33.3)	20(66.7)		1.79 (0.73-4.37)
10-12	5(29.4)	12(70.6)		1.49 (0.46-4.69)
Sex				
Female	23(22.6)	79(77.5)	0.148	1
Male	31(31.6)	67(68.4)		1.59 (0.84-3.00)
Mothers age				
<20yrs	7(36.8)	12(63.2)	0.238	1
20-25yrs	17(28.8)	42(71.2)		0.69 (0.23-2.08)
26-30yrs	16(20.8)	61(79.2)		0.44 (0.15-1.35)
31-35yrs	10(38.5)	16(61.5)		1.07 (0.31-3.69)
36-40yrs	2(13.3)	13(86.7)		0.26 (0.04-1.68)
>40yrs	2(50.0)	2(50.0)		1.71 (0.18-16.0)
Mothers education				
No Formal Education	1(50.0)	1(50.0)	0.006	1
Primary Education	13(56.5)	10(43.5)		1.30 (0.07-24.9)
Secondary Education	31(23.3)	102(76.7)		0.30 (0.02-5.10)
Tertiary Education	9(21.4)	33(78.6)		0.27 (0.01-5.11)
Mothers occupation				
Housewife	15 (25.0)	45 (75.0)	0.378	1
Trader	17(23.0)	57 (77.0)		0.89 (0.40-1.99)
Civil Servant	16 (30.2)	37 (69.8)		1.30 (0.56-2.98)
Artisan	3 (60.0)	2 (40.0)		4.50 (0.65-31.30)
Others	3 (37.5)	5 (62.5)		1.80 (0.38-8.60)
Fathers' age				
<20yrs	0 (0)	1 (100.0)	0.652	-
20-25yrs	6 (42.9)	8 (57.1)		-
26-30yrs	11 (25.6)	32 (74.4)		-
31-35yrs	17 (25.4)	50 (74.6)		-
36-40yrs	9 (22.0)	32 (78.0)		-
>40yrs	11 (32.4)	23 (67.7)		-
Fathers' education				
No Formal Education	2 (50.0)	2 (50.0)	0.077	1
Primary Education	16 (40.0)	24 (60.0)		0.67 (0.08-5.37)
Secondary Education	32 (24.8)	97 (75.2)		0.33 (0.04-2.48)
Tertiary Education	4 (14.8)	23 (85.2)		0.17 (0.02-1.87)
Fathers occupation				
Trader	24 (21.6)	87 (78.4)	0.191	1
Civil Servant	8 (29.6)	19 (70.4)		1.53 (0.59-3.94)
Artisan	17 (38.6)	27 (61.4)		2.82 (1.06-4.93)
Others	5 (27.8)	13 (72.2)		1.39 (0.45-4.32)
History of diarrhoea				
Yes	30 (66.7)	15 (33.3)	<0.0001	1
No	24 (15.6)	130 (84.4)		0.09 (0.04-0.22)
Local council				
Nnewi North	24 (24.0)	76 (76.0)	0.422	1
Nnewi South	24 (29.3)	58 (70.7)		1.31 (0.67-2.55)

Table 3. Association between breastfeeding and diarrhoeal disease

	Occurrence of diarrhoeal disease		OR(95% CI)	aOR(95% CI)*
	Yes	No		
Currently being breastfed				
Yes	44(23.9)	140 (76.1)	1 (reference)	1 (reference)
No	10 (62.5)	6 (37.5)	5.30 (1.76-15.95) ¹	2.93(1.02-8.40) ²
Mode of breastfeeding (n=184)				
No breastfeeding	10 (62.5)	6 (37.5)	1 (reference)	1 (reference)
Exclusive breastfeeding	19 (23.8)	61 (76.2)	0.21 (0.06-0.70)	0.27 (0.09-0.86)
Breast + Water (predominant)	17 (21.8)	61 (78.2)	0.19 (0.05-0.64)	0.22 (0.06-0.77)
Breast + artificial milk (mixed)	9 (33.3)	18 (66.7)	0.33 (0.08-1.31)	0.45 (0.12-1.70)
Current Feed				
Pap + milk	26 (44.8)	32 (55.2)	1 (reference)	1 (reference)
Breast milk alone	14 (16.9)	69 (83.1)	0.25 (0.11-0.56)	0.26 (0.12-0.59)
Breast + feeds (mixed)	6 (16.2)	31 (83.8)	0.24 (0.08-0.69)	0.29 (0.10-0.88)
Pap only	3 (33.3)	6 (66.7)	0.62 (0.14-2.74)	0.35 (0.05-2.23)
Family diet	5 (38.5)	8 (61.5)	0.77 (0.22-2.66)	0.89 (0.25-3.14)

OR: Odds Ratio, aOR: Adjusted Odds Ratio, *Adjusted for maternal education and past history of diarrhea, ¹p-value = 0.0009, ²p-value: 0.04

The prevalence of diarrhoeal disease amongst the infants was 27%. This was very high compared to a two-week prevalence of 8.1% reported in a study in Western Nigeria, [21] and 2.7% in Jos (North-Central Nigeria) [22]. The impact of the environment, and variations in cultural practices between these regions may partially explain this [23].

We found no statistically significant association between the occurrence of diarrhoea and age of the infants ($p=0.319$); but a study in Ilorin found that age and type of the household's kitchen were associated with diarrhoeal disease, [24] while two studies reported a greater association with the male sex [21,22]. Additionally, we reported that previous history of diarrhoeal disease and maternal educational level was associated with diarrhoea. Similarly, a study in Jos showed a bivariate association between diarrhoeal episodes and maternal educational status, family type and size [22].

Our study support the hypothesis that human milk has a protective effect against childhood infections like diarrhoea as it showed a three-fold (OR: 2.9; 95%CI: 1.02-8.40) higher odds in developing diarrhoeal disease in infants not currently breastfed, compared to those on any mode of breastfeeding. Studies in Mexico and Jordan reported similar findings in incidence, prevalence and duration of diarrhoeal episodes [9,16]. When compared to non-breastfeeding infants, exclusively breastfed and predominantly-

fed infants were less likely to develop diarrhoea. But we found no association for mixed-feeding. This was similarly reported in Qatar, [8] Scotland, [10] Jordan, [16] Mexico, [16] and other parts of Nigeria [5,12,21,22,24-26].

The main strength of our study is that almost all the respondents were the mothers of the infants. As the primary care givers of these infants, they stand more informed to give validity to information obtained. The high response rate and use of pre-tested questionnaires all added validity to our study. However, our findings should be taken with caution as cross-sectional studies cannot establish a temporal association between an exposure and outcome. Also, recall and reporting bias could have affected our results as diarrhoeal symptoms could have been over exaggerated by the respondents as we noticed in the result of our prevalence. Nonetheless, our study findings are in concordance with the existing literature on the association between diarrhoeal diseases and breastfeeding practices.

5. CONCLUSION

We have presented an evidence of the protective effect of breastfeeding against childhood diseases, especially diarrhoeal diseases. Therefore, exclusive breastfeeding and hygienic breastfeeding and weaning practices should be encouraged amongst mothers in developing countries as a good protective measure against

these childhood-killer diseases. Larger clinical trials will be most suited to further substantiate our findings. Meanwhile, local health authorities are encouraged to leverage on this to formulate policies and programmes that encourage nursing mothers to practise EBF through coordinated health campaigns. Crèches should be established at workplaces to enable breastfeeding working mothers to continue breastfeeding their babies, and not wean them off early due to work pressure. The Nigerian labour laws should be amended to extend the current 3-month maternity leave to a minimum of 6 months (the EBF recommended period). Finally, provision of incentives as free basic education to children who have been certified by health authorities as exclusively breast fed should be encouraged and pursued.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Sample Questionnaire

SECTION A (BIODATA)

i. Childs data

1. Sex: female[] male[]
2. Age:0-3 months[] b) 4-6 months[] ©7-9 months [] (d) 10-12 months []

ii Mother's data

3. Age:<20 years[] (b)20-25 years[] (c) 26-30 years [] (d) 31 -35years[] (e)36-40years[] (f) . 40years[]
4. Highest level of Education (a) no formal Education[] (b) primary education [] (c) secondary education[] (d) tertiary education[]
5. Occupation (a) house wife[] (b) trader[] (c) civil servant[] (d) artisan (e) others

iii. Fathers data

6. Age:<20 years[] (b)20-25 years[] (c) 26-30 years [] (d) 31 -35years[] (e)36-40years[] (f) . 40years[]
7. Highest level of Education (a) no formal Education[] (b) primary education [] (c) secondary education[] (d) tertiary education[]
8. Occupation:(a) trader[] (b) civil servant[] (c) artisan[] (d) others[]

SECTION B

BREAST FEEDING PRACTICES

9. Is the child breastfeeding (a) yes [] (b)no []
10. If yes above, how? (a) exclusive breastfeeding [] (b) breast milk plus water[] (c) breast milk and other artificial milk[]
11. (a) If no above, how long was the child breastfed (a) no breast feeding at all[] (b) 0-3 months[] (c)4-6months[] (d).> 6months[]
12. If the child was exclusively breastfed, when was other feeds started? (a) after 3 months and stopped [] (b) after 6 months and stopped [] (c) after 6 month but continued with other feeds []
13. What is the child presently on?(a) pap fortified with milk [](b) pap only [] (C) family diet (d) breast milk and other complementary feeds (e) breastmilk[]
14. Is the child having diarrhoea? (a) yes[] (b) no []
15. Did the child have diarrhoea in the last two months? (a) yes[] (b) no []
16. Does the child have other illnesses apart from diarrhoea (a) tuberculosis[] (b) HIV/AIDS[] (c) nephrotic syndrome[]

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