AJEHS
African Journal of Environmental Health Sciences
Volume 3, July, 2016
ISSN: 2476-8030
pp 97-105

Diarrhea and Associated Risk Factors in Under-Five In Rural Naze Community, Owerri North Local Government Area, State, Nigeria

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Keywords:
Diarrhea, Prevalence, Under Five, Risk Factors, Behavioral Change.

Abstract
Diarrhea remains a major cause of morbidity and mortality in children under five years in sub-Sahara Africa, Nigeria inclusive. The purpose of this study was to assess the frequency of diarrhea and associated risk factors in rural community of Naze. Data were collected using WHO check list for diarrhea diseases. Data were analyzed using descriptive statistics and SPSS Version, 21. Twenty two percent (22%) out of 212 subjects studied had diarrhea. The level of association was dealt using p-value and odds ratio. The result showed Exclusive breast feeding (Yes=reference group and No, OR=1.46, p-value= 0.334), Hand washing practice (Good = reference group and Poor, OR=1.12, p-value= 0.749), Weight (0-5kg, p-value=0.03, 6-11kg, reference group, 12-17kg, OR=0.248, p-value=0.000, 18-23kg, OR=0.238, p-value=0.057, =24kg, p-value= 0.02), Age (0-12 months =reference group,13-24 months, OR= 0.38, p-value= 0.0304, 25-36 months, OR=0.44, p-value=0.0730, 37-48 months, OR=0.171, p-value= 0.0003), Family size (1-5=reference group, 6-10, OR= 0.47, p-value=0.0244) and Maternal highest level of education (no formal education, p-value= 0.081, (primary education= reference group, secondary education, OR= 2.10, p-value=0.114, tertiary education, OR=2.28, p-value= 0.077) were associated with diarrhea prevalence in children under five years in Naze community. The occurrence of diarrhea was positively associated with exclusive breast feeding, hand washing practices, weight, age, family size and maternal educational status. There is need for health education on the control and prevention of diarrhea in under-5 children.

Introduction

Diarrhea is the second leading cause of death in children under five years (WHO, 2013).It is both a preventable and treatable *disease that has plagued mankind throughout history; often decimating population faster than war.* About 2,195 children die daily of diarrhea, that is like losing nearly 32 school buses full of children each day (Liu *et al.,* 2012). It kills more than Acquired Immuno-Deficiency Syndrome (AIDS), Malaria and Measles combined (Liu *et al,*

2012). About 760,000 under five die every year from diarrhea (WHO, 2013) with a disproportionally high morbidity and mortality rates found in the Sub-Sahara Africa where children experience average three episodes of diarrhea every year. Each episode deprives the child of the nutrition necessary for growth. It can have a detrimental impact on childhood growth and cognitive development (WHO, 2013).

In 2010, about 54% of diarrhea deaths occurred in Sub-Saharan Africa with Nigeria having the highest prevalence rate of 18.8%, which is above the average of the 16%. Diarrhea alone accounts for more than 16% of estimated 150,000 annual under-five deaths in Nigeria (NPC, 2013; UNICEF, 2013). This is because most places in developing countries, Nigeria inclusive are still afflicted by poverty and sanitation problem. Ignorance, cultural beliefs and socioeconomic factors like mothers' level of education further increases the risk of the disease. The failure to exclusively breastfeed young infants to 6 months and the introduction of liquids and solid foods at the early age of life increase the risk of diarrheal disease and are an important cause of infant and young child morbidity and mortality in Africa (Shikur & Dessalegn, 2014). Rotavirus has also been implicated as the leading cause of acute diarrhea. It causes about 40% of hospitalizations for diarrhea in under fives (WHO, 2008) but about 88% of diarrhea-associated deaths are attributable to unsafe water, inadequate sanitation, and insufficient hygiene (UNICEF, 2006). Dehydration from loss of fluid and electrolytes in diarrheal stool are also among the major causes of death.

Though proven life saving interventions like the wide spread use of oral rehydration therapy (ORT) brought substantial reduction in annual diarrheal deaths, morbidity in contrast has not shown such decline. About 2.5 billion cases of under-five diarrhea occur annually and estimates suggest that overall incidence has remained relatively stable over the past two decades (Boschi-Pinto, Lanata and Black, 2009).

There may not be documented evidences, but visits to the Primary Health Centers in Naze community has shown that a high burden of diarrhea still persist yet community based studies focusing on prevalence of diarrhea in children under five years in Nigeria are circumscribe. Hence the purpose of this well scoped study is to determine the prevalence of diarrhea and the associated risk factors in children under-five years in Naze community in Owerri North Local Government Area in Imo State, Nigeria.

Materials and Methods

Questionnaires designed to explore risk factors associated with diarrhea were used. Mechanical weighing scale Model BR9011 was used to measure children's weight**.** A cross sectional community based study was carried on September (raining season) 2015. The study area was Naze community in Owerri North Local Government Area in Imo State, Nigeria. Naze is made up of six villages with similar characteristics and it is inhabited mainly by Igbo speaking people. They study comprised 212 children under five years. The minimum sample size required for this study was obtained using:

n = $\mathbf{Z^2 * P(1 - P)/ r^2}$

Z= Z- score taken to be 1.96 at 95% confidence limit.

P= prevalence rate of diarrhea in children under five years in Nigeria estimated to be 10% (0.1) (Charyeva *et al.,* 2015)

r; is the margin error of estimation taken to be 5% (0.05).

n= $\mathbf{(1.96)^2 x\, 0.1\,(1 - 0.1) / 0.05^2}$

n= 138 persons.

Considering 5% loss due to follow-up.
5/100 x 138 = 7 persons.
Minimum sample size needed is 138 + 7 = 145 person and so a sample size of 212 was chosen which is above the minimum.

Simple random sampling technique was used to choose 1 out of the 6 villages and systematic random sampling was used in selecting 212 households with at least one child under the age of five years. For households having more than one of such children, the index child was sizes selected using a lottery method. 212 questionnaires were

given out with 100% return rate. Data was analyzed using Descriptive statistics and SPSS Version 21. The level of association was dealt with using Odds Ratios and p-values (p-value ≤0.05 was significant). Ethical clearance was obtained from department of Public Health, Federal University of Technology, Owerri ethical review committee, from the Prime Minister of Naze community and during data collection informed consent was obtained from each study respondents after explanation of what they were take part in the research and any involvement was after their complete consent.

Results

Socioeconomic Characteristics of Mothers/Caregivers

Majority of the mothers/caregivers (74.5%) were between 25-34years. 43.4% attained tertiary education, 40.6% attained secondary education, 13.2 % attained primary level while only 2.8 % had no formal education.210 of them were married and 2 were single.

Table 1: Socioeconomic Characteristics of Mothers/Caregivers

Variables	Frequency (n=212)	Percent (%)
Educational Status		
No Formal Education	6	2.8
Primary School	28	13.2
Secondary School	86	40.6
Tertiary Education	92	43.4
Age (Years)		
15-24	16	7.5
25-34	158	74.5
=35	38	17.9
Marital Status		
Single	2	0.9
Married	210	99.1
Family Size		
1-5	98	46.2
6-10	114	53.8
=11	--	--
Occupation		
Business Women/Traders	114	53.8
Nurse	8	3.8
Housewife	14	6.6
Teachers/Civil Servants	46	21.7
Tailors	10	4.7
Hairdressers	2	0.9
Students	12	5.7
Bankers	2	0.9
Laboratory Scientist	4	1.9

Socio-Demographic Characteristics of under-five children

About 29.2% of the children were between 37-48 months old, 24.5% were 0-12 months and were 13-24 months while 21.7% were 25-36 months old. 52.8% were female while 47.2% were male. 6.6% weighed 0-5kg, 32.1% weighed 6-11kg, 50.9% weighed 12-17kg, and 6.6% weighed 18-23kg while the remaining 3% weighed 24kg.

Table 2: Socio-Demographic Characteristics of Children

Variables	Frequency (n=212)	Percent (%)
Age (Months)		
0-12	52	24.5
13-24	52	24.5
25-36	46	21.7
37-48	62	29.2
Sex		
Male	100	47.2
Female	112	52.8
Body Weight		
0-5	14	6.6
6-11	68	32.1
12-17	108	50.9
18-23	14	6.6
=24	8	3.8

Behavioral Characteristics of Mothers/Caregivers

Some 63.2% of the mothers/caregivers had good hand washing, 27.4% practiced exclusive breastfeeding, and 18.4% always reheat food before it is given to children. Those still breast feeding were excluded in this aspect.

Table 3: Behavioral Characteristics of Mothers/Caregivers

Variables	Frequency	Percent (%)
Exclusive Brest Feeding		
Yes	58	**27.4**
No	134	63.2
Hand Washing Practices		
Very Good		
Good	134	63.2
Poor	78	36.8
Very Poor		
Reheating Food Before It Is Eaten		
Very Good		
Good	173	81.6
Poor	39	18.4
Very Poor		

Household Characteristics and Environmental Exposures

Most of the households (69.8%) obtained drinking water from the Borehole. Regarding toilet facility, 84.9% of them used Water system and 15.1% used Pit Latrine. 75% of mothers/caregivers disposed their of children's feces in the Toilet, 19.3% disposed it in the Waste Bin and 5.7% disposed it in the Bush. Their knowledge on ways to prevent diarrhea was also assessed and just 14.6% had very good knowledge.

Table 4: Households Characteristics and Environmental Exposures

Variable	Frequency (n=212)	Percent (%)
Source of Drinking Water		
Borehole	148	69.8
Tap	20	9.4
Boiled Water	42	19.8
Treated Water	2	0.9
Toilet Facilities		
Water System	180	84.9
Pit Latrine	32	15.1
Disposal Od Child's Feces		
Toilet	159	75
Dust Bin	12	5.7
Knowledge of ways to prevent Diarrhea		
Very Good	31	14.6
Good	91	42.9
Poor	66	31.1
Very Poor	24	11.3

Output of the Risk Factors Assessment

The odds of having diarrhea was found to be approximately 1.5 times (OR= 1.46) higher for the non-exclusive breastfeeding group compared to the exclusive breastfeeding group. However, the p-value = 0.334 is not significant. The odds was found to be approximately 1 time (OR =1.12) higher in the group with poor hand washing practice compared to the group with good hand washing practice. The odds showed no association and the p-value that is greater than 0.05 (p-value = 0.749) and so could not establish hand washing as a significant risk factor. Weight of the child was therefore established as a significant risk factor of diarrhea in this study. 60.9% of children who had diarrhea weighed 6-11kg, making it the peek prevalence weight for this study. Using6-11kg as reference group, the odds for diarrhea was found as 75% (that is 1-0.248 x 100) lower (p-value = 0.000) in the children of 12-17kg weight, 76% (that is 1-0.238) significantly

Table 5: Output for the Assessment of Risk Factors of Diarrhea in Under Five Children in Naze Community, 2015.

DIARRHEA Risk Factors	**YES Freq**	**(%)**	**NO Freq**	**(%)**	**OR**	**P value**	**Chi sq (df)**
Exclusive breast feeding							
Yes	10	17.2	48	82.8	Reference comparison group		
No	36	23.4	118	76.6	1.46	0.334	0.933 (1)
Hand washing practice							
Very good	--	--	--	--			
Good	30	22.4	104	77.6	Reference comparison group		
Poor	16	20.5	62	79.5	1.12	0.749	0.102 (1)
Very poor	--	--	--	--			
Weight (KG)							
0-5	--	---	14	100	-	0.03	8.754
6-11	28	41.2	40	58.8	Reference comparison group		
12-17	16	14.8	92	85.2	0.248	0.000	15.47 (1)
18-23	2	14.3	12	85.7	0.238	0.057	3.62 (1)
=24	--	--	8	100		0.02	5.22 (1)
Age (Months)							
0-12	20	38.5	32	61.5	Reference comparison group		
13-24	10	19.2	42	80.8	0.38	0.0304	4.68 (1)
25-36	10	21.7	36	78.3	0.44	0.0730	3.21 (1)
37-48	6	9.7	56	90.3	0.171	0.0003	13.31 (1)
Family Size							
1-5	28	40	70	60	Reference comparison group		
6-10	18	15.8	96	84.2	0.47	0.0244	5.07 (1)
Educational Status							
No formal education	--		6	100	-	0.081	3.04 (1)
Primary education	10	35.7	18	64.3	Reference comparison group		
Secondary education	18	20.9	68	79.1	2.10	0.114	2.49 (1)
Tertiary education	18	19.6	74	80.4	2.28	0.077	3.13 (1)

lower in children 18-23kg (though p=0.057 was not significant). None of those who weighed 0-5kg and ≥ had diarrhea but the p-value of 0.03 for 0-5kg and 0.02 for≥ 24kg is significant. Diarrhea was most prevalent in children 0-12 months (43.5%) and every other age grade had lower odds for having diarrhea. The odd was 53% (1- 0.47) significantly lower at 5% for children whose family size was 6-10 (OR=0.47, p-value= 0.0244) when compared to those whose family size was 1-5 persons. Using children whose mothers attained primary education as the reference group, It was found out those attained secondary and tertiary education were 2 times at odds of having diarrhea ((OR=2.10, p-value= 0.114) (OR=2.28, p-value=0.077)) respectively.

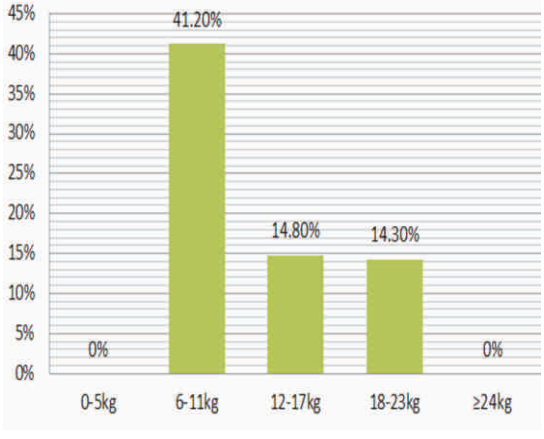

Figure 1: Three months point prevalence of diarrhea in Under-5 by weight in Naze community, 2015.

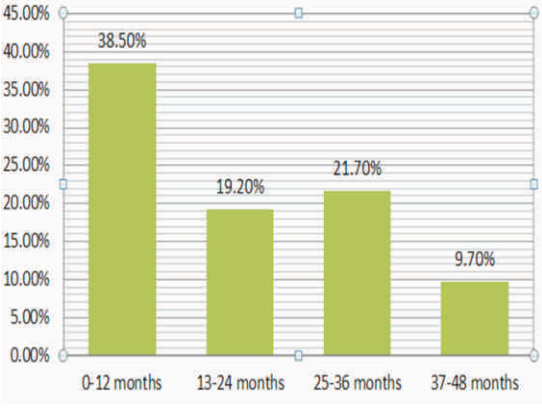

Figure 2: Three months point prevalence of diarrhea in under-5 by age in Naze community, 2015.

Discussion

In this study, the point prevalence of diarrhea in the last three months was 22%. This was higher than the 10% prevalence reported for Nigeria (Charyeva *et al.,* 2015). It is similar with 22.5% reported in the Eastern Ethiopia (Bezatu *et al.,* 2013) but lower than the 36.6% reported in a tertiary institution in Edo State (Paul and Nosakhare, 2015). This could be because this study was a community based study and there could be difference in the characteristics of mothers/caregivers.

The odds of having diarrhea was found to be approximately 1.5 times (OR= 1.46) higher for the non-exclusive breastfeeding group compared to the exclusive breastfeeding group. However, the p-value = 0.334 is not significant indicating that the observed differences in the two groups may have occurred by chance. This is different from the result from the study in Jos where breast feeding was significantly associated with the occurrence of diarrhea (Yilgwan & Okolo, 2012). This difference in the result could be because of the differences in the methodologies used in the studies. The odds was found to be approximately 1 time (OR =1.12) higher in the group with poor hand washing practice compared to the group with good hand washing practice. The odds showed no association and the p-value that is greater than 0.05 (p-value = 0.749) and so could not establish hand washing as a significant risk factor.

The odds for diarrhea disease was found to be approximately 1 times (OR =1.12) higher in the group with poor hand washing practice compared to the group with good hand washing practices which implies no relationship was established between diarrhea morbidity and hand washing practices. This is in contrast with what was reported with a similar study carried out in Eastern Ethiopia (Bezatu *et al.,* 2013) and Jos, Nigeria which

indicated the risk of developing diarrhea was high among children whose mothers had poor hand washing practices especially before feeding (Yilgwan *et al.,* 2005). This difference could be because mothers/caregivers were biased with their answers or due to the problem in reporting because monitoring correct hand washing behavior at critical times can be challenging. Nevertheless, p-value was 0.749, so this could be a chance occurrence.

There has not been any documented evidence of the relationship between weight of under-five children and diarrhea morbidity in Nigeria and so this study tries to establish an association between them. This is because weight was strongly related to malnutrition which is a major impact as well as risk factor of diarrhea in children under five years. Weight was at the end significantly associated with diarrhea in this study. 60.9% of children who had diarrhea weighed 6-11kg, making it the peek prevalence weight for this study. Using6-11kg as reference group, the odds for diarrhea was found as 75% (that is 1-0.248 x 100) lower (p-value = 0.000) in the children of 12-17kg weight, 76% (that is 1-0.238) significantly lower in children 18-23kg (though p=0.057 was not significant). None of those who weighed 0-5kg and ≥ had diarrhea but the p-value of 0.03 for 0-5kg and 0.02 for≥ 24kg is significant. The peak prevalence of 6-11kg maybe because most children within that weight were also 0-12 months which was the peak age prevalence. Children who were above 0-12 months but still within 6-11kg may have been malnourished and so became vulnerable.

The peak prevalence age for diarrhea was 0-12 months (43.5%) based on this study. The result of using 0-12 months as the reference group showed that children who were between 13-24 months were 62% (1-0.38 x 100) less likely to have diarrhea compared to those 0-12 months and p-value = 0.0304 shows this did not occur by chance. Children 25-36 months had 56% (1-0.44 x 100) lower odds of having diarrhea with an insignificant p-value of 0.0730. Those 37-48 months had 82.9% (1-0.171 x100) significantly lower odds for diarrhea (p-value= 0.0003). This is however different from the study in Owerri at the Federal Medical Centre, which showed diarrhea was prevalent in children between the age of 3-5years (36 – 60 months) than children 0-2yrs (0-24 months) (Ajero et al, 2015). But the results of this study are similar to what was reported in Eastern Ethiopia (Bezatu *et al,* 2013). The peak prevalence of age for diarrhea can be explained by the introduction of contaminated weaning foods (Dewey and Adu-Afahwuah, 2008). In addition, crawling starts within this age bracket and children could also be exposed to playful activities which could make them come in contact with contaminated materials. The risk of diarrhea decreases subsequently after 12 months; this is probably because the children begin to develop immunity to pathogens after repeated exposure.

The odd was 53% (1- 0.47) significantly lower at 5% for children whose family size was 6-10 (OR=0.47, p-value= 0.0244) when compared to those whose family size was 1-5 persons. This was however different from the report of the study in Cameroon to establish the determinants of childhood diarrhea, which showed the risk of having diarrhea increased with family size (Ayuk, Dapi, & Nchang, 2015) and also in agreement with greater family size reported as a risk factor for diarrhea (Lanata & Black, 2008). This is different from the result of this study which showed that those with larger family size had lower odds for diarrhea and it is significant. This difference could be due to the level of interference of other factors that are associated with diarrhea.

Using children whose mothers attained primary education as the reference group, It was found that those who attained secondary

and tertiary education were 2 times at odds of having diarrhea ((OR=2.10, p-value= 0.114) (OR= 2.28, p-value= 0.077)) respectively. None of the children whose mothers had no formal education had diarrhea. This finding is in contrast with what was reported in a Jos were diarrheal episodes were found to have a bivariate association with mothers' educational status (Yilgwan & Okolo, 2012). Study in Turkey showed that the frequency of diarrhea disease decreased significantly with increase in maternal level of education (Ozkan S, Tuzun H, Gorer, 2007). The simple explanation could be that having good education which was associated with better knowledge of diarrhea and its prevention strategies is not a guarantee that one will practice them. Most of the time, some of these highly educated mothers/career maybe too busy with their career and so pay very little attention to their children when compared to their uneducated or not so educated counterparts.

Conclusion

The point prevalence of 22% conclusively reinforces the fact that diarrhea remains an important health concern in communities in Nigeria. Measures to control and prevent diarrhea and its consequences such as effective health education in communities are imperative. There should also be interventions aimed at social and behavior change to target the gaps in practices highlighted by the study.

Household surveys may generally be subject to courtesy-bias. Interviews and the questionnaires captured self-reported information and relied primarily on respondents providing the right information. Misreporting by respondents cannot be ruled out. The missing link between the hand washing practice, maternal level of education and diarrhea prevalence might be related to incomplete reporting. Recall bias may have occurred among respondents and there is the tendency of under or over estimation of the diarrhea due to the individual of respondents regarding diarrhea in their children.

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© *African Journal of Environmental Health Sciences*
Volume 3, July, 2016
ISSN: 2476-8030
pp 97-105