Research Article

Endocrinology, Metabolism and Nutrition

Prevalence and Determinants of Diarrhoea Disease amongst Under-Five Children Attending Immunization Clinic in a Secondary Health Facility in Benin City

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ABSTRACT

Introduction: Diarrhoea is a major public health challenge in low and middle-income countries. It is the second leading cause of mortality in children under the age of five. It is also recognized that exposure to diarrhoea pathogens in developing countries is associated with such factors as quality and quantity of water, availability of toilet facilities, housing conditions, level of education, household economic status, place of residence, feeding practices, and the general sanitary conditions (personal or domestic hygiene) around the house. These factors are still prevalent in many Nigerian communities. This study therefore sought to determine the prevalence of diarrhoea and risk factors among under-five children seen at immunisation clinic of a secondary hospital in Nigeria.

Methodology: This was a cross-sectional study of 210 mothers attending well-baby clinic of a multi-specialist secondary health facility in Benin-City, South-South, Nigeria. Information relating to socio-demographics and occurrence of diarrhoea in their wards was obtained using ore-tested questionnaire. Data obtained were tabulated and analyzed using IBM SPSS version 21. Chi-square was used to determine the relationship between qualitative variables the statistical significance was set at P<0.05.

Result: Prevalence of diarrhoea was 38.6% with a mean number of episodes per year of 2.14. Prevalence of dysentery was 4.3%. There was significant association between age, nutritional status, source of water and the occurrence of diarrhoea (P values of 0.04, 0.038 & 0.02 respectively).

Conclusion: This study shows a high prevalence of diarrhoea amongst under-5 children in our environment.

Keywords
Diarrhoea, Dehydration, Under-Five Children, Immunization.

Introduction
Diarrhoea is a major public health challenge in low and middle-income countries. It is the second leading cause of mortality in children under the age of five [1]. It is estimated that under-five children experience an average 2.6 episodes of diarrhoea every year [1] and more than 1.5 million children die each year due to diarrhoea globally [2]. Children with diarrhoea may develop complications including varying degree of renal impairment, electrolyte disturbance, acid-base disturbance, septicaemia and death from dehydration if untreated. In Nigeria about one in five children, under five years report at least one episode of diarrhoea per year [3]. Amongst children below five years old, diarrhoea accounts for over 16% of deaths, estimated at 150,000 annually [3]. Diarrhoea episodes may occur as primary presenting complaints or as comorbidity accompanying other acute presentations. Nwaneri and colleagues (2014) in Benin City found that about 33.5% of children under-fives presenting with malaria have diarrhoea-associated diarrhoea.

Epidemiological studies report that children six months to 12 months and those with low maternal educational background and

have higher odds of developing diarrhoea than their peers [4,5]. It is also recognized that exposure to diarrhoea pathogens in developing countries is associated with such factors as quality and quantity of water, availability of toilet facilities, housing conditions, level of education, household economic status, place of residence, feeding practices, and the general sanitary conditions (personal or domestic hygiene) around the house [1,5-7]. Socioeconomic factors may directly and indirectly affect environmental, behavioural, nutritional, and demographic characteristics of a child [4,6]. These factors are still prevalent in many Nigerian communities. In addition, exclusive breast feeding, appropriate complementary feeding and immunization rates, which are known to reduce the incidence of diarrhoea in children, are below acceptable targets in Nigeria [8].

Despite several interventions to address the challenges of diarrhoea disease in sub-Saharan Africa, mortality rates are still unacceptably high. Nigeria remains a major contributor to diarrhoea death globally [9]. The African CDC report of 2014 noted that diarrhoea accounted for 16% of under-five deaths (estimated at 150,000 annually) in Nigeria [3]. Although recent data suggest a downward trend, the prevalence of diarrhoea and diarrhoea-related death is still very high [3].

Understanding the factors driving the high prevalence of diarrhoea in children iscritical to design implementation programs for reducing its burden. This study therefore sought to determine the prevalence of diarrhoea and risk factors among under-five children seen at immunisation clinic of a secondary hospital in Nigeria.

Methodology
Study design
This study was a cross-sectional hospital-based study.

Study location
The study was conducted amongst mothers whose children were receiving routine immunization at the well-baby clinic of Edo Specialist Hospital, Benin City, Edo State, Nigeria. Edo Specialist hospital is a secondary health facility that offers specialist care in areas of paediatrics, Obstetrics and gynaecology, Internal medicine, and a few specialties in surgery. The well babies' clinic runs once a week, and is under the supervision of a consultant paediatrician with assistance from nurses and community health workers. Routine immunizations are given as covered in the National Programme of Immunization schedule (NPI) [10]. The period of the study was between December 2021, and May 2022.

Sample size determination
Sample size was calculated using the formula for determining prevalence, with a population prevalence (from a previous study) of 14.27% and a degree of freedom set at 0.05 [11,12].

Study population
A total of 210 mothers were thus recruited for the study. All consenting mothers with children aged less than five years were recruited consecutively until sample size was achieved. Mothers were administered pre-tested questionnaires to assess information on the number of times their children have had diarrhoea, and other details relevant to the study.

Study Variables
The dependant variable of the study was the occurrence of acute diarrhoea. Independent variables included socioeconomic and demographic characteristics such as maternal age, age of child, housing condition, birth order, and maternal education. Environmental factors were: the sewage disposal, types of water source and hand washing practices. Socio-economic class was defined using the father's occupation and mother's level of education as described by Olusanya et al. [13].

Data Collection Methods
Data were collected from the study population using a pre- tested structured questionnaire through face to face interviews.

Data Quality Assurance
Properly designed and pre-tested questionnaire was used. Interviewers and data clerks were trained and closely supervised during data collection and entry.

Data Analysis
All the data obtained were tabulated and analysed using International Business Machine Corporation Statistical Package for Scientific Solutions (IBM SPSS version 21; Chicago, IL, USA). Categorical data like sex of child, social class, marital status and religion were presented in frequency and percentages. Bivariate analysis was using the chi squared test was done to estimate the association between the dependent variable and independent variables. Statistical significance was set at p values less than 0.05.

Ethical Approval
The ethical approval and clearance for this research study was obtained from the Ethical Clearance Committee of the Edo State Ministry of Health, Benin City.

All the necessary explanation about the purpose of the study and its procedures was explained with the assurance of confidentiality. Both written and verbal consent from the study participants was also secured.

Result
The mean age of the children was 21.3 (±15.3) months ranging from 1 to 59 months. There were 110 males and 100 females giving a male to female ratio of 1.1:1 Ninety-eight (46.7) of the children studies were first born to their parents. The average age of the mothers was 31.8 (±5.4) years Most mothers were married (191, 91.0%);from the upper- (91, 43.3%)and middle socio-economic class (86, 41.0%) and were Christians (198, 94.3%).

Table 1: Demographic characteristics of study participants and their mothers.

Factors	Frequency	Percentage
Sex of child		
Male	110	52.4
Female	100	47.6
Age group (Years)		
<12 months	69	32.9
12-24 months	67	31.9
>2 years	74	35.2
Birth Order		
First child	98	46.7
Second child	56	26.7
Third child	32	15.2
Others	24	11.4
Social Class		
Upper	91	43.3
Middle	86	41.0
Lower	33	15.7
Mothers Age		
< 25 years	17	8.1
25 – 35 years	128	61.0
> 35 years	65	31.0
Marital status of mother		
Married	191	91.0
Unmarried	19	9.0
Religion		
Christianity	198	94.3
Muslim	12	5.7

Anthropometric characteristics

Most of the children studies had normal height or length. However, about one-tenth of them were severely stunted (Figure 1). Similarly, most children had normal BMI (140,), but 16% were severely thin and 21% were obese. The distribution of the study subjects based on BMI is shown in figure 2.
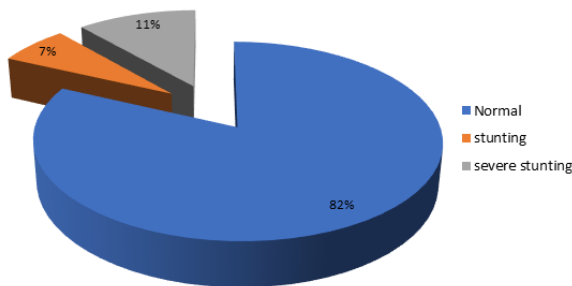

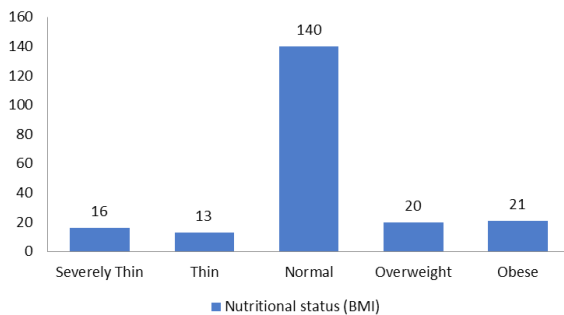**Figure 1:** Distribution of study subject based on height for age.

Figure 2: Distribution of subjects based on body mass index.

A total of 81 (38.6%) subjects had had diarrhoea episodes within the preceding 12 months. Of these numbers 9 (4.3%) had dysentery.
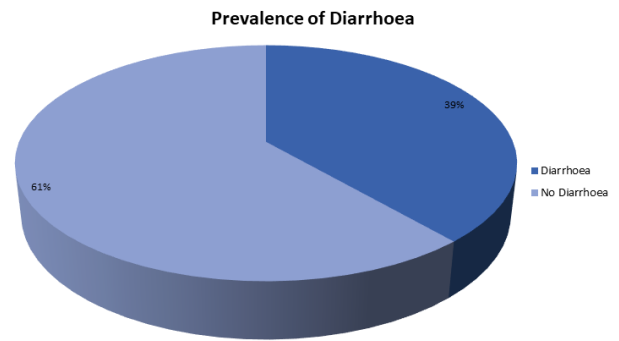

Figure 3: Prevalence of diarrhoea in study population.

Frequency of episodes of diarrhoea episodes in the last 12 months

The mean number of diarrhoea episodes was 2.14 (SD-2.05).….

Table 2: Frequency of episodes of diarrhoea episodes in the last 12 months (n=81).

	Frequency	Percentage
1	45	55.6
2	15	18.5
3	8	9.9
$\geq$ 4	13	15.9
Total	81	100.0

Socio-economic and Nutritional factors associated with diarrhoea in children

There was a significant association between the age of the study subject and the occurrence of diarrhoea. Infants were significantly less likely to have diarrhoea compared to the other 2 groups. Children who were thin and severely thin were more likely to have diarrhoea compared to those with normal BMI or obese children.

Table 3: Socioeconomic and nutritional factors associated with diarrhoea in the study population.

Factors	Diarrhoea		χ^2	ρ-value
	Yes	**No**		
Age				
<12 months	19	52	6.439	**0.040**
12-24 months	30	35		
>24 months	32	42		
Sex				
Male	44	66	0.199	0.656
Female	37	63		
Socioeconomic class				
Upper	35	56	1.345	0.510
Middle	36	50		
Lower	10	23		
Mother's Age				
<25 years	4	13		
25-35 years	50	78	1.878	0.391
> 35 years	27	38		
Marital status of mother				
Married	76	115	1.324	0.250
Unmarried	5	14		

			χ²	P
Nutritional status				
Thin/severely thin	17	12	6.538	**0.038**
Normal	52	88		
Overweight and Obese	12	29		
Height for age				
Normal	71	101	2.941	0.099
Stunted/Severely stunted	10	28		

Table 4: Association between risk factors and diarrhoea in study population.

Factors	Diarrhoea		χ²	P
	Yes	**No**		
Was the child exclusively breastfed?				
Yes	41	71	0.391	0.532
No	40	58		
Is the child completely immunized?				
Yes	71	112	0.031	0.861
No	10	17		
Has the child received rotavirus vaccine?				
Yes	48	70		
No	33	59	0.504	0.478
Source of drinking water				
Tap water/borehole	41	79		
Bottled/ Sachet water	40	50	2.293	0.130
Is water boiled?				
Yes	14	41		
No	67	88	5.411	**0.020**
Who feeds child?				
Mother	75	123		
Grandmother/others	2	0	2.827	0.264
Self	4	6		
Does child eat left over meals?				
Yes	25	41		
No	56	88	0.019	0.889
Method of sewage disposal				
Pit laterine	0	4		
Water closet	77	122	3.532	0.171
Open dumping	4	3		
Do you wash your hands after using the toilets?				
Yes	77	117		
No	4	12	1.346	0.295

Discussion

This study was a cross-sectional study that assessed the prevalence of diarrhoea disease, as well as its determinants amongst under-five children attending immunization clinic in a secondary health facility in Benin City. The findings of this study showed that about two out of five children under the age of five years had at least one episode of diarrhoea within the last one year. This prevalence is much higher than that reported in Nnewi in which the magnitude of diarrheal disease among children younger than 5 years old was 14.27% [14]. The high prevalence of diarrhoea (38.6%) in our study may be due to factors like low socioeconomic status, poor literacy rate, poor hand washing practices and lack of health awareness among mothers attending secondary health facilities compared to those seen at tertiary facilities. The prevalence is also much higher than what was reported in North West Nigeria and South West Nigeria [15,16]. Regional variation in the prevalence

of diarrhoea disease as well as differences in the age of the subjects might have been responsible for this observation [17]. People's living style, behavioural change, and cultural differences could also contribute notably to observed variations.

The present study showed that the prevalence of diarrhoea was significantly less in infants compared to older children. Similar observation has been made by previous researchers [18,19]. Infants under one year who are still breastfeeding are typically protected from gastrointestinal infections due to passive immunity acquired from breast milk and minimal exposure to gastrointestinal pathogens. Conversely some authors have observed higher prevalence of diarrhea disease in young infants compared to older children [15,20-22]. These studies have attributed higher prevalence in infants to challenges experienced during introduction to complementary feeding. It is likely that the high prevalence of Rotavirus vaccination in our study population might be responsible for the lower prevalence of diarrhoea amongst that age group in this study [23].

In the present study, the nutritional status of under-five children was associated with the occurrence of diarrhea in them. Thin and severely thin children were more likely to have diarrhoea diseases compared to their counterparts with normal BMI. Malnourished children have been shown to be more likely to present with infections of the gastrointestinal tract (including diarrhoea) compared to their normal weight counterparts. Acute malnutrition has been linked with increased frequency and severity as well as longer duration of diarrhea compared to well-nourished children [24-26]. The finding of the present study however, is at variance with an Indonesian observation, which found no association between nutritional status and diarrhoea in children [27].

The availability of home-based drinking water treatment was associated with diarrhoeal morbidity in this study. Children whose families used home based drinking water treatment such as boiling were less likely to report diarrhoea compared to children whose families did not use water treatment method. This finding is in agreement with study in Kenya and Southern Ethiopia. Drinking water, even from an improved source, is not necessarily free of faecal pathogens and safe for health [16]. Collected water may be contaminated during collection, transportation and storage; this may increase the risk of diarrhoeal diseases [28]. Effective household water treatment combined with safe storage can provide significant protection against diarrhoeal diseases in children [21]. Cohen et al. reported a positive correlation between drinking boiled water and reduction in the prevalence of diarrhea [29].

This study has a few limitations. The retrospective design of the study makes it difficult to establish causality and estimate. Since the study depended on parents reported diarrhoea episodes, there could be potential for recall bias. In addition, paediatric HIV infection is associated with diarrhoea and malnutrition and might have been the explanation for the observation in the study. However, the study did not seek to identify children with HIV infection and its contribution to diarrhoea in children.

In conclusion, the study revealed that childhood diarrhoea remains an important health concern in the study area. The factors that were associated with acute childhood diarrhoea in this study were age outside of infancy, undernutrition and lack of home-based water treatment. To minimize the magnitude childhood diarrhoea, the community is also advised to treat drinking water and improved nutrition especially in children beyond infancy.

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