

# Clinical Features of Acute Gastroenteritis in Children at University of Nigeria Teaching Hospital, Ituku-Ozalla, Enugu

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## Abstract

**Background:** Acute gastroenteritis (AGE) is a major cause of morbidity and mortality in children world-wide with the highest incidence in the developing countries. The persistence and effect of this condition require a study of the features and characteristics of the disease especially, within any (each) locality in order to offer possible control solutions. **Aim:** To determine, the clinical and social characteristics associated with AGE among children seen in the University of Nigeria Teaching Hospital, Enugu. **Subjects and Methods:** A hospital-based population study in which children admitted in the children emergency room of the University of Nigeria Teaching Hospital whose parents/caregivers gave their consent were enrolled, over a 7 month period. Appropriate statistical tools: Chi-square, *t*-tests, correlation and logistic regression were used to determine significant values and associations. **Results:** A total of 76 children with AGE were enrolled; 69.7% (53/76) were males. The mean age of the subjects was 11.3 (6.6) months. Majority 94.7%, (72/76) of cases of AGE occurred in children less than 24 months, with children 6-11 months contributing the highest percentage 42%, (32/76). The study population was predominantly urban dwellers; 78.9%, (60/76, *P* = 0.40) and water cistern constituted 77.6% (58/76) of waste disposal method. Those who had potable water supply were 23.7%, (18/76, *P* = 0.30) and 19.7% of the children were exclusively breast fed. Fever and vomiting were the commonest associated symptoms, occurring in 82.9% (63/76) and 73.7% (56/76) of the subjects respectively. A good percentage of the subjects 64.5%, (49/76) had ORS before presentation. **Conclusion:** AGE is more common in older infants among those who were not exclusively breast-fed and the severity was unrelated to place of domicile and waste disposal habits.

**Keywords:** Enugu, Gastroenteritis, Older infants

## Introduction

Acute gastroenteritis (AGE) manifests as diarrhea and/or vomiting,<sup>[1]</sup> and fever occasionally.<sup>[2]</sup> Acute infective gastroenteritis is a major global health problem,<sup>[3]</sup> causing about 2 million deaths annually among children under 5 years of age.<sup>[2-4]</sup> The greatest burden of AGE is in the developing countries, because of poor sanitation, lack of safe drinking

water, and un-salutary sanitary habits.<sup>[4]</sup> Several studies in Nigeria showed that diarrheal disease is one of the three most common causes of morbidity and mortality among children admitted in hospitals.<sup>[5,6]</sup> Ibeziako in Enugu and Abhulimhen-Iyoha in Benin,<sup>[5,6]</sup> documented diarrheal disease as one of the first three prevalent causes of morbidity and mortality in pediatrics ward. These studies have shown little if any change in the effect of diarrhea in children in Nigeria.

Is this due to the socio-economic conditions, health practices of the population in the country? Or is it due to the failure to address the situation as identified by these studies?

The study, which was an observational descriptive hospital-based study, sought to identify the clinical features of childhood diarrheas and health practices of the caregivers

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among the population of children admitted in University of Nigeria Teaching Hospital Enugu. The findings although showed some significant inferences, which could help to define possible interventions to improve child survival. However, due to the small sample size enrolled, further research with a larger population will further validate the outcome of the current study.

## Subjects and Methods

### Study area

This study was carried out in the University of Nigeria Teaching Hospital, (UNTH), Ituku-Ozalla in Enugu State. Ethical approval was sought from Health Research and Ethics Committee of UNTH, Enugu before commencing the study.

### Methods

The children with AGE, who met the inclusion criteria, and whose caregivers gave informed consent, were enrolled. The children admitted in the emergency room were those with moderate to severe disease, which constitute 32% of total number of cases with diarrhea per annum. One in every 6 children was enrolled and was stratified into three different age groups; 0-12 months (infants), 13-36 months (pre-nursery), 37-60 months (nursery school age). This stratification was done to relate the probable severity of the disease to the children's feeding and the health related practices.

History of diarrhea alone or with vomiting, other clinical symptoms as well as the basic demographic characteristics such as age, sex, place of domicile, were obtained from each child's caregiver/parent. Furthermore, information such as waste disposal methods, sources of drinking water, prior use of oral rehydration solution (ORS) and medications were obtained. Physical examination of children was conducted to determine the associated clinical features such as pyrexia, low volume pulse, tachycardia, and state of hydration. Stool samples were collected and sent to the laboratory for analysis. Thereafter, management/treatment was instituted on each participant as determined by the clinical diagnosis.

All data were entered by the designated research personnel, real time, on the case record form and later transcribed into an electronic data using SPSS statistical software for Windows® version 19, 2012 (IBM Inc, Chicago Illinois, USA). Analyses of the variables were performed using SPSS and EpiInfo (version 3.5.4, CDC, Atlanta, USA) software. Variables such as sex, age, were expressed in frequency tables. Significant values of variables; continuous and categorical were determined using *t*-tests and Chi-square tests as appropriate. Spearman correlation co-efficient was used to determine risk associations of the different variables such as; stool frequency, place of domicile, waste disposal and source of drinking water. Significant values were set at  $P \leq 0.05$ , with confidence intervals of 95% where applicable.

## Results

### Baseline characteristics of subjects

Ninety-two children admitted with history of diarrhea/vomiting were recruited from November 2009 to October 2010. However due to infrequent disruption of services in the hospital from August to October 2010 complete data of 16 children (9 males and 7 females: 7 were infants, 8 were pre-nursery and 1 was nursery school age) could not be obtained and were excluded from the analysis. In consequence 76 children were eligible for data analysis, 53 males and 23 females (male: female ratio of 2.3:1). Their mean age was 11.3 (6.6), (95% CI = 9.8-12.9,  $P = 0.001$ ) months with the median age of 9 months (range 2-36 months). Majority, 63.2%, (48/76) of cases of AGE occurred in infants as shown in Table 1. The study population was predominantly urban dwellers; 78.9%, (60/76)  $P = 0.40$  and water cistern constituted, 77.7% (58/76) of waste disposal method, ( $P = 0.70$ , Table 2). Those who had potable water supply were 23.7%, 18/76 ( $P = 0.30$ ). Children on exclusive breast feeding were 16.7%, (15/76) and 80.3% (61/76) were not exclusively breastfed. All the 17 children 0-6 months of age who had diarrhea were not exclusively breast-fed. Among the older infants (7-12 months) more children were not exclusively breast-fed, ( $P < 0.001$ ) [Table 3].

### Clinical features

Fever and vomiting were the most common associated symptoms, occurring in 82.9% (63/70) and 73.7% (56/76)

**Table 1: Age distribution of children with acute gastroenteritis**

Age in months	Frequency	Percent
0-12	48	63.2
13-36	28	36.8
37-60	0	0
Total	76	100.0

**Table 2: Method of waste disposal**

Method of waste disposal	Number	Percentage
Bush	8	10.5
Pit	10	13.2
Water cistern	58	76.3
Total	76	100

$\chi^2=1.92, P=0.70$

**Table 3: Breastfeeding of children**

Age in months	Exclusively breastfed	Not exclusively breastfed
0-6	0	17
7-12	14	17
13-36	1	27
36-60	0	0
Total	15	61

$\chi^2=28.2, df=2, P=0.0001$

of the subjects respectively [Table 4]. The average stool frequency was less than two motions in a day with 30.3% (23/76) of the subjects passing between 6 and 10 motions in a day. Majority of the subjects 68.4% (51/76) had a stool frequency of equal or less than 5 motions in a day. Among the different age groups 14 infants had stool frequency of more than 5 motions per day while 9 children older than 12 months of age had similar stool frequency (RR = 0.99, 95% CI = 0.73-1.35,  $P = 0.84$ ).

Seventy four percent of the subjects had concomitant symptoms of vomiting and diarrhea. The frequency of stooling is unrelated to the vomiting,  $P = 0.60$ . Likelihood ratio = 1.04.

A good percentage of the subjects 64.5% (49/76) had ORS before presentation, and out of this number of children, majority (67.9% 38/76) who was vomiting received ORS. About forty-five percent, 44.7% (34/76) and 21.1% (16/76) were already on anti-microbial and anti-diarrheal respectively before presentation to the hospital. Minority 19.0% (12/76) of those who had fever were on anti-diarrheal medication while 44.4% (28/76) were on anti-microbial.

Half of the children (50% 34/76) had positive malaria parasite in their blood film examination, while 26% (26/76) showed presence of white blood cell in the stool, there was a concordance of 17%.

Using the stool frequency as a mark of the severity of the condition, (analyses were performed to determine the possible association of the place of domicile and waste disposal system of the subjects, non-significant weak correlations were noted (Spearman rho's,  $r = -0.15$ , OR; 0.43 95% CI, 0.07-1.83,  $P = 0.20$  and  $r = 0.09$ ,  $P = 0.2$ , OR; 1.53, 95% CI, 0.43-5.22, respectively). These factors were not strong predictors of severity of diarrhea.

## Discussion

This study showed that AGE predominantly occurs in children below 2 years of age with the highest prevalence

Table 4: Associated clinical features		
Clinical features	Number of patients	Percentage
Fever	63	82.9
Vomiting	56	73.7
Increased thirst	51	67.1
Sunken eyes	23	30.3
Dry buccal mucosa	23	30.3
Depressed fontanel	15	19.7
Abdominal distension	10	13.2
Decreased urine output	7	9.2
Loss of skin turgor	7	9.2
Abdominal pain	3	3.9
Small volume pulse	2	2.6
Cold extremities	1	1.3

among the infants. This finding showed the similarity with those of other workers.<sup>[1,2,7]</sup> Kazemi, *et al.*<sup>[1]</sup> found 84.2% of children with AGE were under 2 years of age and those 6-12 months were predominantly affected. Huilan, *et al.*<sup>[7]</sup> found 60% to be less than 1 year. Goldman, *et al.*<sup>[8]</sup> however, documented a mean age of 22.4 (14.9) months. In our study, among the infant population those more than 6 months of age were affected more. The incidence of AGE among infants is probably attributable to the possible lack of immunity against common enteral infectious pathogens. In another consideration, the protective effect of breast milk seemed to have been reflected on the number of infants below the age of 6 months with AGE as none who was exclusively breast-fed had diarrhea. Those who were non-exclusively breast-fed and older infants were more affected and may be due to factors such as the feeding practices adopted for them. It is at this age that weaning diets are commenced which may lead to exposure to pathogens. From this study, even those older infants who were exclusively breastfed in the first 6 months of life also had AGE. Modarres *et al.*,<sup>[9]</sup> found the frequency of AGE among breast-fed and bottle-fed children as 19.1% and 48.5% respectively, probably inferring the protective effect of breast milk against infection.

There were predominantly more males than females, as was also documented by Huilan, *et al.*<sup>[7]</sup> who found that 60% of the children with AGE were males. Goldman, *et al.*<sup>[8]</sup> found no gender difference. With the variance in gender relationship to AGE it is difficult to define the possible contribution of gender to the prevalence or severity of the condition. It is expected that given the same environmental factors any evidence of a difference may not be of significance.

Poor sanitation has been implicated as a major risk-factor in the incidence of AGE.<sup>[10]</sup> Our study subjects were mostly urban dwellers and use water cistern method of waste disposal. The high incidence of AGE among the urban dwellers could be due to lack of adequate water supply in the urban area. Whereas, the number of rural dwellers is less than that of urban dwellers the relative proportion with AGE among the rural children is significantly less in comparison. Inefficient water supply leads to increase incidence of faeco-oral transmission of diarrheal pathogens.<sup>[4]</sup> Only 23.7% of the children have access to potable water supply. There was a moderate relationship between the place of domicile and water supply and waste disposal, which may imply that the increase incidence of diarrhea among the urban dwellers may not be translated to their ability to limit diarrhea. It is known that the provision of the most hygienic method of waste disposal alone does not ensure good sanitation; there is still need for adequate water supply for their efficient use.

The most common symptom among the children with diarrhea was fever, which could be interpreted to mean the possibility of infective cause of the cases studied. Although, the study

did not seek out those children with infectious diarrhea, the association of fever could be surmised to be due to infective pathogens. These infections can affect the digestive system primarily or the other organ systems. In the group studied about 28% of subjects had pus cells demonstrated in their feces and a good number have malaria parasites in the peripheral film. The concordance of these two findings is low (17%) and that may suggest the possible co-morbidities in children who have AGE. Furthermore, pertinent is the higher proportion without any of these which may imply other possible causes of which viruses cannot be excluded. Rotavirus has been shown to be a common cause of diarrhea and vomiting in younger children<sup>[1,2,7,10,11]</sup> and the incidence of AGE caused by rotavirus is higher in infancy.<sup>[12]</sup>

Most of the children who were already on anti-microbials had fever. This portrays the common practice of indiscriminate use of antibiotics for any febrile condition in our environment. However, the use of anti-diarrheal agents is low from this study, which shows increasing awareness of the consequences of their usage in children. The use of ORS is very high despite the vomiting and this is encouraging and indicates that many now practice it as one of the child survival strategies.

Ideally, it would have been appropriate to obtain the stool microbiology report, which was not however, possible for all the patients studied due to problems encountered in the processing of the stool samples. Some of the patients were seen in the periods when the samples could not be objectively analyzed and there were no kits and equipment during the period for a viral study. Another limitation to the study was the failure to complete the review of the patients for the latter half of the study due to interruption of the services in the hospital at the time. This could have been of immense help in determining the seasonal occurrence of the disease.

## Conclusions

AGE is more common in infants with the highest incidence in the older infants. Fever and vomiting are the most common associated symptoms. Lack of exclusive breastfeeding and contamination of weaning foods may be risk-factors. Infections may be the primary cause of AGE among the children studied. The places of domicile and waste disposal methods were unrelated and non-predictors of the severity of diarrhea.

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