



INCIDENCE OF ADENOVIRUS AND ROTAVIRUS AMONG INTERNALLY DISPLACED CHILDREN IN IBAKA, AKWA IBOM STATE, NIGERIA.

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ABSTRACT

Acute diarrhoea in children under 5 years is a major cause of morbidity worldwide and mortality in developing countries. Recent estimates show that 516,000 deaths in children less than five years of age is attributed to adenovirus and rotaviruses caused diarrhoea annually, with 138,000 occurring in sub-Saharan Africa. Rotaviruses have been identified as one of the most frequent causes of infantile diarrhoea second only to adenovirus. This study was conducted to determine the prevalence rate of adenovirus and rotavirus and to establish the sex-specific relatedness of the viruses causing diarrhoea in Akwa Ibom State community in Nigeria. A total of 200 stool samples (182 diarrheic and 18 non-diarrheic) were collected from young children under 5 years from January to June 2017. Samples were obtained from general hospitals visit in randomly selected three senatorial districts in Akwa Ibom State. The samples were screened using commercially available Adenovirus/Rotavirus Antigen Rapid test using Enzyme Linked Immunosorbent Assay methods (ELISA). A total of 200 subjects were screened for adenovirus and rotavirus antibodies, 83 (41.5%) were significant to the antibodies of the two viruses, 49 (24.5%) and 34 (17%) were positive to Rotavirus and adenovirus respectively. Female subjects were 113 (56.5%) with positive results of 42 (37.2%) and Male 87 (43.5%) with a positive results of 41 (47.1%). Children are constantly exposed to pets both at home and in school which carries these viruses. Among the 83 positive cases 49 (59.0%) and 34 (40.9%) were positive to rotavirus and adenovirus antibodies respectively. Children under 36 to 48 months shows high prevalence of 23 (11.5%) and 24 (12.0%) rate followed by 60 and 24 months with 18 (9.00%) and 13 (6.5%) positive and low occurrence among 0-12 months subjects with 5 (2.5%) cases, this is due to the current practice of exclusive breast feeding by nursing mothers, the high percentage of infection is as a result of environmental climate, mother immune system mix feeding and inadequate balanced diet taken in by the nursing mothers. In this study, Akwa Ibom State three senatorial districts were significantly associated with adenovirus and rotavirus diarrheic infection. These include identifying the target population for adenovirus and rotavirus vaccination, educating parents on how to identify and recognize the signs of dehydration and other symptoms of viral gastroenteritis.

KEYWORDS : Adenovirus, Rotavirus, Diarrheic Children, IDPs. Ibaka.

INTRODUCTION

Acute diarrhea can be particularly detrimental to children, every day killing 2200 infants and children worldwide (Steele *et al*, 1998). *Adenovirus* and *Rotavirus* infections among under-5-year-old children are a common cause of childhood gastroenteritis, especially in those countries which has not launched a vaccination program on both viruses. The initial symptoms associated with *Adenovirus* and *Rotavirus* infection include watery diarrhea and vomiting, which sometimes aggravates resulting in severe dehydration requiring hospitalization.

Rotavirus and *Adenovirus* infection also causes 527000 deaths annually among children up to 5 years of age worldwide and most of these deaths occur in the developing countries. *Adenovirus* and *Rotavirus* can be detected in high concentrations in the stool of children suffering from gastroenteritis (1012 viruses/gram). Control measures such as improved sanitation is not effective in preventing this disease (Tate *et al*, 2012).

Several studies performed in the Middle East showed that approximately 40% of hospitalized patients suffering from gastroenteritis were infected with *Rotavirus* and *Adenovirus*. (Bhuta 2011) In Iran, data collected from different geographical regions revealed that the proportion of *Adenovirus* and *Rotavirus* infection among children with gastroenteritis ranges from 11.6% to 64.67% (Bhuta 2011).

Rotavirus is a virus that infects the bowels, causing a severe inflammation of the stomach and bowels (gastroenteritis). Rotavirus is the most common cause of severe diarrhea among infants and children throughout the world and causes the death of about 500,000 children worldwide annually. The name rotavirus comes from the characteristic wheel-like appearance of the virus when viewed by electron microscopy (the name rotavirus is derived from the Latin *rota*, meaning "wheel") (Kahn *et al*, 2012). Rotaviruses are non-enveloped RNA viruses belonging to the Reoviridae family. Adenoviruses are a family of DNA viruses that are important cause of febrile illnesses in young children, they account for about 10% to 22% of acute causes of diarrhea in infant, and it is the second pathogen of diarrhea after *Rotavirus*.

decrease the medical and other costs associated with the hospital stay and clinic visits, (WHO 2011). However the epidemiology of *Adenovirus* and *Rotavirus* is an important element for making decision for such vaccination. Recent studies have estimated that ~65,000 children die each year of adenovirus and rotavirus infection in the 22 countries of the Eastern Mediterranean Region (EMR), as geopolitically defined by the WHO and from Pakistan to Morocco (WHO 2011). In this region, mortality remains high, especially in countries with the lowest per capita income, such as Pakistan, Afghanistan, Sudan, Yemen, and Somalia.

Countries with a higher per capita income have fewer deaths, but the burden of severe rotavirus disease is reflected in the many hospitalizations and clinic visits among children <5 years of age that incur substantial economic costs (WHO 2011). In addition to these estimates of regional morbidity based on global models, limited information is available on the disease burden of rotavirus for individual countries of the region. Accurate projections of the benefits of a vaccine program will require reliable, current data on the disease burden for each country. These data will allow policy makers to make informed decisions about the need for rotavirus vaccines and are vital to increase knowledge and awareness of the disease among physicians and the community.

Although, several studies related to *Adenovirus* and *Rotavirus* infection have been conducted in Nigeria, precise data for making accurate prediction of the benefits associated with a preventive program required for policy making is not available (Banerjee *et al*, 2006).

Aims of the Study

1. To determine the prevalence of *Adenovirus* and *Rotavirus* in under five children.
2. To identify the possible risk factors associated with *Adenovirus* and *Rotavirus* infection.
3. To determine the age-specific distribution of fever, diarrhea and headache of *adenovirus/Rotavirus*.
4. To determine the gender specific distribution of fever, diarrhea and headache of *adenovirus/Rotavirus*

MATERIALS AND METHODS**The study design.**

The implementation of universal vaccination program worldwide can

A cross sectional study was carried out among children presenting to either the outpatient Unit or admitted with diarrhea at primary HealthCare facilities in Ibaka seaport community, Nigeria .

Study Area/Population

The research work was carried out in Eket Senatorial District, Akwa Ibom State. The analysis was carried out at Microbiology Laboratory, Akwa Ibom State University, main campus, from January to June 2019. Verbal consent was obtained from parent or guardian before inclusion in the study, interviewing of the parents and guardian of the children on the type of feeding, source of drinking water and the hygiene conduction of the children environment, and geographical location of children.

INCLUSION CRITERIA.

The inclusion criteria consisted of all children within 0 to 5 years with or without acute diarrhea. Acute diarrhea was considered as passage of loose watery stools or an increased frequency of stools.

EXCLUSION CRITERIA.

The exclusion criteria consisted of children with dysentery, diarrhea more than 14 days, or diarrhea developing after hospitalization due to any other causes.

Ethical consideration.

The ethical clearance for this research was granted by the research and ethical committee, Ministry of health, Akwa Ibom State. Before the collection of the samples, information regarding the study was explained to the parents of the participating children orally and written consent for participation in the study obtained.

Sample Collection

A total of eighty (200) stool specimens were collected (5mls or 5g) randomly from children between 0-5 years of age, in Eket Senatorial District, the stool samples were collected using a sterile wide mouth universal containers and labeled accordingly. The samples were transported to the laboratory with minimum delay to avoid death of enteric pathogens (Cheesbrough, 2002; Tam *et al.*, 2008).

Specimen Preparation:

The kits are designed for qualitative detection of Rotavirus/ Adenovirus antigens in the specimen through antigen antibody reaction with high degree of specificity and immune chromatography analysis. The membrane was immobilized with rotavirus antibodies-specific on the test well ®, adenovirus antibodies-specific on the test well (A) and corresponding antibodies on the control well ©. The stool specimen was brought to room temperature and 1g or 1ml depending on the consistency of the specimen was added aseptically into the test diluents, and vigorously shaken to homogenize the stool suspension. Procedures were followed according to the manufacturer recommendation. The Elisa kit used for the detection of rotavirus/adenovirus was prepared and manufactured by Zhuhai Encode Medical Engineering Co., Ltd. China.

Result Interpretation

During testing, the diluted stool sample is added to the sample well (S) of the cassette and reacts with anti-rotavirus/adenovirus antibodies conjugated to colored particles and precoated onto the sample pad of the test. The mixture migrates through the membrane by capillary action and interacts with reagents on the membrane. The rotavirus or adenovirus is positive, a colored bands is form at test well (R) or (A), if both a colored bands is form at well R and A. no matter if the rotavirus/adenovirus antigen exist or not, red band will appear in control well (C) it serves as a procedural control.

Invalid Result

The control band or both the control band and the test band were not seen leading to an invalid result which may be as a result of following the direction correctly or expired kits, such specimens were retested using a new test kit, such specimens were retested using a new test kit.

RESULTS

Table 1: Prevalence of adenovirus and rotavirus among under 5 years children in Akwa Ibom State, Nigeria.

Age range	no.of samples	total positive	RTV	ADV	% positive
< 12	10	05	03	02	2.50
13-24	21	13	07	06	6.50
25-36	56	23	16	07	11.5
37-48	68	24	13	11	12.0
49-60	45	18	10	08	09.0
Total	200	83	49	34	41.5

RTV- Rotavirus, ADV- Adenovirus, %- percentage, No- Number.

Table 2: Sex-specific distribution of adenovirus and rotavirus among under 5years children in Akwa Ibom State, Nigeria.

Gender	no. of samples	total pos.	RTV	ADV	% positive
Female	113	42	23	19	21.0
Male	87	41	26	15	20.5
Total	200	83	49	34	41.5

Table 3: Age-specific distribution of adenovirus and rotavirus among under 5yrs old Children in Akwa Ibom State, Nigeria.

Age (months)	no. of Samples	Adenovirus	Rotavirus	Total positive
0-12	10	02	03	05
13-24	21	06	07	13
25-36	56	07	16	23
37-48	68	11	13	24
48-60	45	08	10	18
Total	200	34	49	83

DISCUSSION AND CONCLUSION

Diarrheal disease is one of the commonest causes of death in children in developing countries and rotavirus/adenovirus has been consistently identified as the commonest pathogen associated with severe diarrhoea. In our study of 200 children presenting with diarrhoea, 41.5%% were found to be positive for adenovirus and rotavirus antibodies in their stool samples, 24.5% and 17% were positive to Rotavirus and adenovirus respectively. A large number of studies conducted in Nigeria regarding adenovirus/rotavirus diarrhoea have been hospital based and have shown positivity of up to 30% (Steele, *et al.* 1988). Cases of diarrhoea attributable to adenovirus and rotavirus in outpatient studies and community setting are much higher. In this study, adenovirus and rotavirus positivity rates varied greatly between different settings - diarrhoea sex, age, symptomatic and asymptomatic infections in the community and nosocomial enteric infections. Female subjects were 113 (56.5%) with positive results of 37.2% and Male 43.5% with a positive results of 47.1%. Children are constantly exposed to pets both at home and in school which carries these viruses. Among the 83 positive cases 59.0% and 40.9% were positive to rotavirus and adenovirus antibodies respectively. In our study, we sampled children less than 5 years, with maximum number of cases in the age group of 36 - 48 months with high prevalence of 11.5% and 12.0% rate followed by 60 and 24 with 9.00% and 6.5% positive and low occurrence among 0-12 months subjects with 2.5% cases, this is due to the current practice of exclusive breast feeding by nursing mothers, the high percentage of infection is as a results of environmental climate, mother immune system mix feeding and inadequate balanced diet taken in by the nursing mothers. In another (Clemens, *et al.* 1993), study on prevalence of adenovirus and rotavirus diarrhoea in two settings in the same geographical region, the occurrence of rotavirus diarrhoea was more among hospitalized children as opposed to the out-patients.

The association between seasonality and adenovirus and rotavirus diarrhoea has not been clear with evidence both for and against it (Tam, *et al.* 2008). In our study, there was no significant association of infection and time of the year, but the maximum percentage of rotavirus positive cases were recorded in the period from January to February (17.8%). Exclusive breast-feeding appeared to protect infants against severe rotavirus diarrhoea in studies, but this per se conferred no overall protection during the first 2 years of life, suggesting that breast-feeding temporarily postponed rather than prevented this outcome (Tate, *et al.* 2012). Bottle feeding was independently associated with adenovirus and rotavirus diarrhoea. Rotavirus and adenovirus were also significantly associated with vomiting, fever and severe dehydration which are similar to data from other studies.

Our study had a few limitations. Isolated rotavirus positivity in a given case of diarrhoea may not necessarily rule out an alternative infection or co-infection. However, a rotavirus prevalence of 25% makes it an important public health issue particularly in view of its significant association with the severe forms of diarrhoea. Rotavirus/adenovirus diarrhoea does not have any specific treatment and repeat infections are common. It has been seen that with good hygiene and sanitation, bacterial and parasitic diarrhoea have declined considerably but there has been less of an impact on rotavirus disease. The predominance of vomiting along with the diarrhoea makes treatment with oral rehydration more difficult. Thus, immunization is possibly an

important preventive strategy towards control of rotavirus infection. However, in view of the reduced efficacy of the vaccine in developing countries, difference in type of native rotavirus/adenovirus strains compared to the vaccine strains and the possibility of co-infection with other enteric pathogens adding to the rotavirus/adenovirus morbidity or mortality.

CONCLUSION:

In this study, Akwa Ibom State three senatorial districts were significantly associated with adenovirus and rotavirus diarrheic infection. This includes identifying the target population for adenovirus and rotavirus vaccination, educating parents on how to identify and recognize the signs of dehydration and other symptoms of viral gastroenteritis.

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