



**INCIDENCE OF ROTAVIRUS INFECTION IN CHILDREN WITH GASTROENTERITIS IN
AKURE, ONDO STATE, NIGERIA**

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ABSTRACT

This study was conducted to determine the incidence of rotavirus infection in children with gastroenteritis in Akure, Ondo State, Nigeria. A total of 125 children with diarrhoea that visited one of the health institutions in the city was recruited for the investigation. Stool samples were obtained and assayed for rotavirus antigens by employing immunochromatographic technique using Rotavirus test kit manufactured by R-biopharm AG, An der Neuen Bergstraße 17, D-64297 Darmstadt Germany. The investigation showed that the percentage of rotavirus infection among children sampled was 24.8%. The highest percentage incidence (31.0%) was observed in children between the age group 0 and 12 months and was detected more in females (30.6%) than the male (21.1%) gender. The source of water being used by their mothers and the level of education of these mothers serve as some of the predisposing factors of rotavirus infection in these children.

Keywords: Gastroenteritis; Rotavirus; Immunochromatography assay; infection; incidence

INTRODUCTION

Rotavirus has been implicated as a cause for gastroenteritis disease since 1973 (Bishop *et al.*, 1973). It is the most common viral agent responsible for acute non-bacterial gastroenteritis in infants and young children in both developed and developing countries (World Health Organisation, 1980). The incidence of rotavirus gastroenteritis may vary considerably from year to year even in the same location. Fluid stool losses may be dramatic, and death from dehydration is common, particularly in developing countries. Rotavirus gastroenteritis occurs in all age groups but is most severe in infants and young children. According to Bernstein (2009), nearly every child in the world would have experienced rotavirus infection at least once by the age of five years.

Rotavirus is a genus of double-stranded RNA virus in the family Reoviridae. There are five

species of this virus, referred to as A, B, C, D, and E (Dennehy, 2000). Rotavirus A is the most common strain and it causes more than 90% of rotavirus infections in humans (Nirwati *et al.*, 2016).

Rotavirus infection is not routinely diagnosed in most Nigerian hospitals probably due to the cost of its diagnosis and the similarity of its clinical spectrum of signs and symptoms to gastroenteritis caused by other organisms that can easily be cultured. Although some epidemiological works have been carried out on rotavirus infection in Nigeria, there is the need to check from time to time the prevalence rate in communities where the infection has been reported and the incidence rate in communities where there is no documented information on

the infection for proper management of the disease.

MATERIALS AND METHODS

Study area

A total number of 125 children with diarrhoeic stool within the age range of 0 to 36 months that were brought to the outpatient Paediatrics' Department or admitted to the children's ward of the Mother and Child Hospital Akure Ondo State, Nigeria was used as case study for the investigation between March and September, 2015.

Collection of stool specimens

Stool specimens were collected into sterile plastic containers from these children and transported immediately in ice pack to the Laboratory for analysis.

Ethical clearance/Questionnaire

Prior to the commencement of the study, ethical clearance was obtained from the Hospital's Ethical Committee after which a standardized questionnaire was administered to the mothers of the infected children whose stool samples were collected for socio-demographic information in order to evaluate the predisposing factors.

Immunochromatographic assay for the detection of rotavirus

The kit

The immunochromatographic assay kit used for this investigation was manufactured by R-biopharm AG, An der Neuen BergstraBe 17, D-64297 Darmstadt Germany.

Procedure for the assay

A disposable dropper was used to add 1 ml of sample diluent into a sample collection tube. Portions of the stool specimen 100µl (about 50 mg) were aspirated from the stool sample using a disposable micropipette and introduced into the tube which contained 1 ml of sample diluent and then homogenised to make a mixture. The homogenised solution was allowed to precipitate for at least 3 minutes until a clear supernatant

was formed from which at least 200µl and at most 500µl was transferred into another clean tube. The test strip was then inserted into the prepared sample to reach the marked line on the strip for 5 minutes. Prior to the assay, all the test devices and samples were allowed to attain a room temperature of 2-8⁰C.

Evaluation and interpretation of the test

If one color red band (test band) and one color blue (control band) are seen it shows that the stool contains rotavirus antigen. However, if the blue control band is missing, the test is invalid and is not evaluated.

RESULTS

The total incidence of rotavirus infection among the 125 children evaluated was found to be 31 (24.8%). The result can be seen in Table 1.

The incidence of rotavirus infection in children examined based on age is presented in Table 2. The highest percentage incidence (31.0%) was observed in children within the age group 0-12 months followed by group 13-24 months (14.3%) while none was observed in group 25-36 months.

Sixteen (21.1%) of the total number of males examined for rotavirus infection were positive for the rotavirus while 15(30.6%) of the females examined were also positive for rotavirus infection as presented in Table 3.

The texture or consistency of stool whether it is watery, semi formed or mucoid stools was used for classifying the stool specimens collected in this study. Watery stool was observed to have the highest percentage incidence of rotavirus infection (33.3%) followed by watery and mucoid stools (22.9%) while the incidence of rotavirus infection was lowest (21.9%) in semi-formed stools examined (Table 4).

The highest incidence of rotavirus infection was observed in the stools of children whose main source of water was well that has control tap while rotavirus was not isolated from stools of children whose water source was river (Table 5).

The rate of occurrence of rotavirus infection was highest in children whose parents' education was up to tertiary level (34.5%) but lowest in children whose parents' education did not exceed secondary school level (19.7%). The result is shown in Table 6.

As shown in Table 7, the children that have unemployed mothers had the highest occurrence of rotavirus infection (39.1%) while the lowest occurrence was observed in the stools of children whose parents are employed (21.6%).

Table 1: Frequency and percentage of rotavirus infection among children with gastroenteritis in Akure metropolis

Rotavirus status	Frequency	Percentage (%)
Positive	31	24.8
Negative	94	75.2
Total	125	100

Table 2: Incidence of rotavirus infection among children based on age

Age (months)	No examined	Rotavirus positive (%)
0-12	84	26 (31.0)
13-24	35	5 (14.3)
25-36	6	0 (0)
Total	125	31 (24.8)

Table 3: Incidence of rotavirus infection among children based on gender

Gender	No examined	Rotavirus positive (%)
Male	76	16 (21.1)
Female	49	15 (30.6)
Total	125	31 (24.8)

Table 4: Incidence of rotavirus infection among children based on stool appearance

Stool appearances	No examined	Rotavirus positive (%)
Watery	27	9 (33.3)
Semi- formed	32	7 (21.9)
Watery and mucoïd	35	8 (22.9)
Semi-formed and mucoïd	31	7 (22.6)
Total	125	31 (24.8)

Table 5: Incidence of rotavirus infection among children based on source of water

Sources of water	No examined	Rotavirus Positive (%)
Well	104	25 (24.0)
Well with control tap	19	6 (31.6)
River	2	0 (0)
Total	125	31(24.8)

Table 6: Incidence of rotavirus infection among children based on parents' educational status

Educational status	No examined	Rotavirus positive (%)
Primary	19	4 (21.1)
Secondary	66	13 (19.7)
Tertiary	34	12 (35.3)
Uneducated	6	2 (33.3)
Total	125	31(24.8)

Table 7: Percentage incidence of rotavirus infection based on parents' employment Status

Status	No examined	Rotavirus positive (%)
Employed	102	22 (21.6)
Unemployed	23	9 (39.1)
Total	125	31 (24.8)

DISCUSSION

In this study, the incidence of rotavirus infection as the cause of gastroenteritis in children between 0- 36 months in Akure, Nigeria was investigated. The percentage incidence of rotavirus infection among children with gastroenteritis in the community sampled was found to be 24.8%. This value was higher than that of the study carried out by Fagbami *et al.*, (1985) who reported 21% in Ibadan, Nigeria and Surajudeen *et al.*, (2011) who observed an incidence of 13.8% in Ile-Ife, another city in Nigeria. It is also higher than the value (22.5%) reported by Philip *et al.*, (2013) in the investigation they carried out in Lagos, Nigeria. This value however was lower than that reported by Valentine *et al.*, (2012) in which the percentage incidence of rotavirus infection was 42.8% among children admitted to hospital due to gastroenteritis in Northern Cameroon.

Most of the infected children in our study were observed to be between the age group 0-12 months (31.0%). This age distribution is comparable to that of previous reports in Ile-Ife, Nigeria (Morris *et al.*, 1986), in India (Cicirello *et al.*, 1994), in Iran (Zarnani *et al.*, 2004) and in Nepal (Jeevan *et al.*, 2011). The lower percentage incidence (14.3%) in the group 13 to 24 months of age and none (0%) in the age brackets of 25-36 months in this study agree with the result of the investigation of Philip *et al.*, (2013) in which they observed a lower percentage incidence in children above 24 months of age. This however goes contrary to the findings of Parashar *et al.*, (1998) where rotavirus infection was not found in children under 3 months of age and the report of Altindis *et al.*, (2004) who reported percentage incidence of 7.14% in the 0-12 months' age bracket. The low vulnerability of the age group (greater than 24 months) to rotavirus infection observed in this study could be explained in line with the submission of Bernstein *et al.*, (2004) that acquisition of rotavirus antibodies from early exposure may lead to protection against subsequent rotavirus infection or the experience of milder forms of the disease. The higher

number of the infection in females (30.6%) than males (21.1%) observed in this study goes contrary to the finding of Bass and Dorsey (2004) that boys were found to be twice susceptible and likely to be admitted to hospitals than girls.

The observation that the socio-demographic data (educational background, occupation, employment status) of the parents of the children examined in this investigation are linked to the status of rotavirus infection is in accordance to what was observed by Surajudeen *et al.*, (2011) in Jos, Nigeria where the educational background and occupation of the parents/guardians of infected children assayed showed that those who had parents that had up to secondary education had the highest incidence of rotavirus infection (5.0%). Another risk factor in this research was the source of water being used. It was observed that the highest incidence (31.6%) was recorded among children whose mothers are using well water that has control tap as source of water while none (0%) was found in children whose mothers use rivers as their source of water.

CONCLUSION

The overall findings of this study showed that the percentage incidence of rotavirus infection as the cause of viral gastroenteritis in children in the community sampled is 24.8%. This study has also provided information on the risk and sociodemographic factors associated with the infection in order to facilitate the development of appropriate strategies for the effective control of the disease. Recommended strategies include; exclusive breast feeding to reduce early exposure of babies to contaminated water and milk formula, inclusion of the vaccine for rotavirus in the ones that are already being administered to babies in order to protect them against the virus. Furthermore, hand washing with soap should be encouraged and when soap is not available, local materials like ashes can be a substitute. Others are the use of appropriate facilities for safe disposal of faecal materials in order to eliminate direct and indirect

contamination of water supplies. It is also recommended that in diagnosing the cause of epidemiological outbreak of gastroenteritis, rotavirus should be one of the organisms to be looked out for in the community sampled. That is, screening for rotavirus antigens in the stool of diarrhoeal children should be made compulsory in order to rule out rotavirus infection even when the stool culture is positive for the growth of bacteria that are associated with gastroenteritis. Such information will provide the scientific basis for the formulation of appropriate control strategies that will yield the desired results in various communities/countries.

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