



## ORIGINAL ARTICLE



# PREVALENCE OF ROTAVIRUS INFECTION IN CHILDREN WITH ACUTE WATERY DIARRHOEA IN CALABAR, NIGERIA

Tobechi Ihembu Nwachukwu, Kelechi Uhegbu<sup>2,3</sup>, Joanah Ikobah<sup>2,3</sup>, Imaobong Saturday Etuk<sup>2,3</sup>, Leo Muoneke<sup>3</sup>, Anne Ebri Asuquo<sup>2</sup>

1. Department of Medical Laboratory Science, University of Calabar

2. Department of Paediatrics, University of Calabar, Calabar

3. Department of Paediatrics, University of Calabar Teaching Hospital, Calabar

**DR TOBECHI IHEMBU NWACHUKWU;** DEPARTMENT OF MEDICAL LABORATORY SCIENCE, UNIVERSITY OF CALABAR, [tobechinwachukwu@gmail.com](mailto:tobechinwachukwu@gmail.com), 08106636359.

**DR LEO MUONEKE;** DEPARTMENT OF PAEDIATRICS, FACULTY OF MEDICINE, UNIVERSITY OF CALABAR, [leostanlymuoneke@yahoo.com](mailto:leostanlymuoneke@yahoo.com) 09098145385

**DR KELECHI UHEGBU;** DEPARTMENT OF PAEDIATRICS, FACULTY OF MEDICINE, UNIVERSITY OF CALABAR, [kelechi4u2001@gmail.com](mailto:kelechi4u2001@gmail.com), 08174859149, 09080952423.

**PROF ANNE EBRI ASUQUO;** DEPARTMENT OF MEDICAL LABORATORY SCIENCE, UNIVERSITY OF CALABAR, [anneasuquo@gmail.com](mailto:anneasuquo@gmail.com), 08035511032

**DR JOANAH IKOB AH;** DEPARTMENT OF PAEDIATRICS, FACULTY OF MEDICINE, UNIVERSITY OF CALABAR, [ikobah.joan@gmail.com](mailto:ikobah.joan@gmail.com), 08037273640.

**CORRESPONDING AUTHOR; PROF IMAOBONG SATURDAY ETUK;** DEPARTMENT OF PAEDIATRICS, FACULTY OF MEDICINE, UNIVERSITY OF CALABAR, [etukimaobong2244@gmail.com](mailto:etukimaobong2244@gmail.com), 07064633409.

**PROF IMAOBONG SATURDAY ETUK;** DEPARTMENT OF PAEDIATRICS, FACULTY OF MEDICINE, UNIVERSITY OF CALABAR, [etukimaobong2244@gmail.com](mailto:etukimaobong2244@gmail.com), 07064633409.

## ABSTRACT

**Background:** Diarrhoeal disease is the second leading cause of death in under-5 children with Rotavirus being the commonest causative organism. This study evaluated the prevalence of rotavirus in diarrhoeal stools of children presenting with acute watery diarrhoea to the University of Calabar Teaching Hospital.

**Methodology:** This was a cross sectional study and 115 children aged less than five years were randomly selected into the study. Stools were collected in universal containers and rectal swabs were also collected from participants who could not provide stool sample. Rotavirus assay was performed using Prospect Rotavirus micro plate Assay method.

**Results:** Of the 115 diarrheal stool samples examined, 51 (44.3%) were positive for rotavirus. The commonest age group affected were less than 12 months (37.%) and the least in 25-60 months

(29.4%). There was no significant difference in the prevalence of rotavirus diarrhoea in the different age groups ( $p > 0.05$ ). Among the study population, 15 were exclusively breastfed, of which two (13.3%) were positive for rotavirus, 31 were bottle (formula) fed of which 25 (80.6%) were positive for rotavirus. Sixty-nine of the children were fed with family diet and 24 (34.8%) had rotavirus diarrhoea. There was significant ( $p < 0.05$ ) high rate of rotavirus diarrhea among children fed with formula (80.6%) compared to children fed with family diet (34.8%) and lowest in exclusively breastfed infants (13.4%).

**Conclusion:** This study demonstrates the importance of rotavirus organism as a cause of acute diarrhoea among children in Calabar and the relationship of the disease with the mode of feeding. **Keywords:** Rotavirus, infection, diarrhea, Calabar

## INTRODUCTION

Diarrhoea is a common childhood disease worldwide especially in under-5 children. The morbidity and mortality risks increase in developing countries (Africa and Southeast Asia) according to the WHO report.<sup>1</sup> It is the second leading cause of under-5 mortality and morbidity after pneumonia.<sup>1,2</sup> Rotavirus is one of the major pathogens responsible for yearly 111 million episodes of diarrhea and over 400,000 deaths among under-5 children globally.<sup>3</sup>

WHO case definition for a suspected case of diarrhoea of rotavirus aetiology (DORA) is any child aged 0-59 months admitted for treatment of acute watery gastroenteritis to a sentinel hospital conducting surveillance excluding children with bloody diarrhea and children transferred from another hospital.<sup>3,4</sup> A confirmed case is a suspected case in whose stool the presence of rotavirus is demonstrated by means of an enzyme immunoassay.<sup>3,4</sup>

Worldwide, nearly 453,000 children less than 5 years of age each year develop diarrhoea due to rotavirus. Besides high mortality, rotavirus infection annually results in an estimated 457,000 — 884,000 hospitalizations and 2 million outpatient visits in children less than 5 years of age. In several studies, rotavirus diarrhea, contributes an estimated 39% of hospitalized under-5 childhood deaths, especially in resource poor settings.<sup>3,4,5,6</sup>

The burden of several rotavirus illness and deaths falls heavily on children in low and middle - income countries. More than 80% of rotavirus related deaths are estimated to occur in lower income countries of Asia and sub-Saharan Africa.<sup>5,6,7,8</sup>

In view of the plan to introduce the rotavirus vaccine into the National Programme of Immunization (NPI) schedule, a pre-vaccine documentation of rotavirus disease burden is necessary to determine vaccine impact.

This study sought to determine the prevalence of diarrhea of rotavirus aetiology (DORA) in children attending University of Calabar Teaching

Hospital, Calabar.

## MATERIALS AND METHODS

**Study Area:** The study was carried out in University of Calabar Teaching Hospital, Calabar. Calabar is the capital city of Cross River State, Nigeria.

**Study Population:** Children not more than five years of age attending University of Calabar Teaching Hospital, Calabar.

**Ethical approval and informed consent:** These were obtained from the ethical and research committee of the University of Calabar Teaching Hospital and parents respectively before enrollment of participants.

**Questionnaire:** A structured questionnaire was completed by parents/guardians of participants. Data obtained included socio-demographic characteristics, vaccination and feeding history of participants.

**Processing of stool specimens:** Macroscopy was performed on stool samples to check for colour, blood, mucus, pus, worms. Stool specimens were assayed for rotavirus.

**Method of Rotavirus Assay:** Stool sample were collected in a universal containers. Rectal swabs were also collected from some patients and 10% suspension of faeces was prepared. Rotavirus Assay was performed using Prospect Rotavirus Microplate Assay Method (Oxoid, Basingstoke, UK).

**Principle of the Test:** Prospect Rotavirus test utilizes a polyclonal antibody in a solid phase sandwich enzyme immunoassay to detect group specific antigen present in Group A rotaviruses.

**Quality control:** At least one positive and negative control was included each time the test was performed. The Negative control value or mean of the negative control values was less than 0.150 absorbance units. The positive control value was greater than 0.500 absorbance units.

## RESULTS

A total of 115 children who presented with diarrhea were assayed for diarrhea of rotavirus aetiology (DORA). Of the 115 diarrhoeic children, 40 (34.8%) were males while 75 (65.2%) were females. See table 1. Among these participants, 51 were diagnosed with DORA giving a prevalence rate of 44.3%.

The prevalence of DORA was higher among the female participants 46.7% than the males 40%, but this difference was not statistically significant (P-value > 0.05). see Fig 1.

There was a high prevalence of DORA among children younger than 2 years of age, ages 0-12 months 19 (37.2%) and 13- 24months 17(33.3%). However, there was no significant difference of DORA among these age groups (P-value >0.05). See Table 2

As shown in the figure 2 below, 2 (3.9%) out 15 who were exclusively breastfed were DORA positive. Twenty five (49.0%) out 31 Bottle (formula) fed were positive and 24 (47.1%) out 69 who were fed with adult food were DORA positive. Children who were exclusively breast fed had a significantly lower DORA prevalence rate compared to children who were fed with adult food and those who were bottle (formula) fed (P-value <0.05).

Table 1: Demography of study participants enrolled in the study

Age (Months)	Dis. recorded (%)	Gender	
		Male – No (%)	Female – No (%)
0-12	32 (27.8)	9 (28.1)	23 (71.9)
13-24	32 (27.8)	22 (34.4)	21 (65.6)
25-36	18 (15.7)	6 (33.3)	12 (66.7)
37-48	14 (12.2)	6 (42.9)	8 (57.1)
49-60	19 (16.5)	8 (42.1)	11 (57.9)
Total	115 (100)	40 (34.8)	75 (65.2)

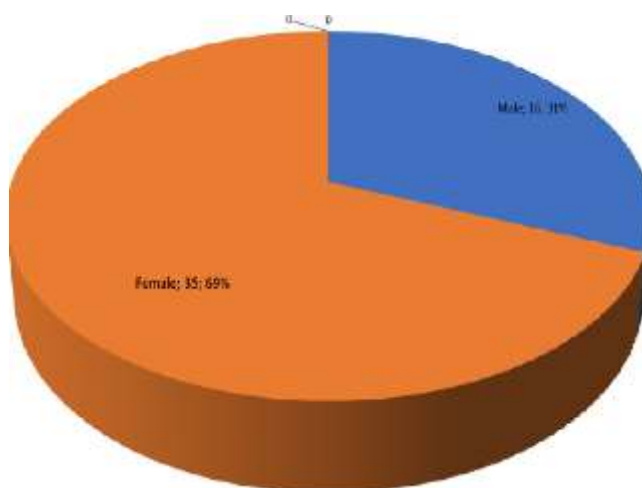


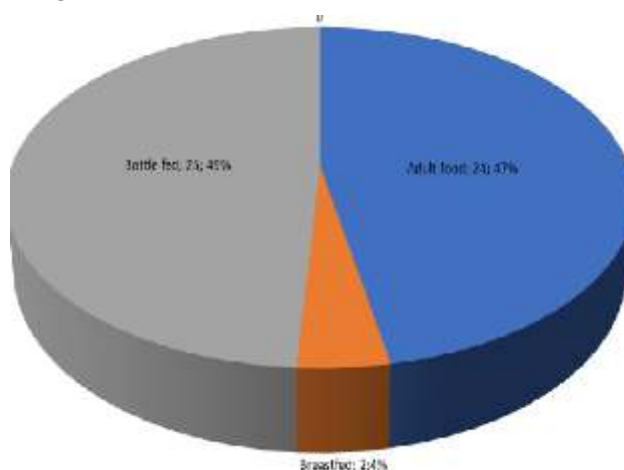
Figure 1: DORA among participants in relation to gender

TABLE 2: PREVALENCE OF DORA IN CHILDREN WITH RESPECT TO AGE

Age Group (Months)	No. enrolled	DORA
0 – 12	32	19 (37.3 %)
13 – 24	32	17 (33.3 %)
25 – 36	18	5 (9.8 %)
37 – 48	14	5(9.8 %)
49 – 60	19	5 (9.8 %)
Total	115	51 (44.3 %)

DORA: Diarrhoea of Rotavirus aetiology

Fig. 2: Feeding category of participants with DORA



## DISCUSSION

This study revealed a prevalence of 44.3% for rotavirus diarrhoea. In addition, this was mostly predominant in children under 24 months, rare in exclusively breast fed children, highly prevalent in bottle (formula) fed and children fed with adult feed. A similar study by Nnukwu et al<sup>6</sup> in Calabar reported a much lower rotavirus prevalence rate of 12.5%<sup>6</sup> and added that exclusively breast-fed children were not infected. Several studies<sup>6,7,8</sup> have demonstrated rotavirus to be one of the major causes of diarrhoea in children. However, WHO<sup>9</sup> estimated 37% prevalence rate of rotavirus in children worldwide every year. The high prevalence rate of diarrhoea due to rotavirus as observed in this current study suggests poor feeding practices as majority were not exclusively breastfed. Also, breast milk is believed to be healthy for children since it provides them with the mother's immunity which aid in combating diseases in the child. This is in accordance with the report of Riccabona et al<sup>10</sup> who suggested that breastfeeding may provide some protection against infections in children including diarrhoea. Udeani et al<sup>11</sup> in Abuja, reported a lower prevalence rate of 25% in children less than 10 months of age. Two separate studies in the Northern part of the Country also reported lower prevalence rates, Mohammed et al<sup>12</sup> 32.2%, and Aliyu et al<sup>5</sup> 31.0%. The former reported no significant relationship between breast feeding and rotavirus infection. Aliyu et al<sup>5</sup> also corroborated a higher prevalence rate in female children. A survey carried out in parts of Nigeria reported a slightly higher rotavirus prevalence rate of 46.0% Tagbo et al<sup>13</sup>. Ndze et al<sup>14</sup>, in Northern Cameroon, reported a similar (to this study) prevalence rate of 42.8%, with children 0-24 months mostly affected. In Cotonou, Benin Republic, a slightly lower prevalence rate of 39.2% was reported Agbla et al.,<sup>4</sup>; children 3-24 months were mostly affected. A Bangladesh study reported a similar prevalence rate of 45.0% Sarker et al.,<sup>8</sup> to the present study. Nigeria, as well as India, was listed among 5 other countries which accounted for more than half of all deaths attributable to rotavirus infection Tete et al.,<sup>15,16</sup>

## CONCLUSION

This study demonstrates a high prevalence of diarrhoea of rotavirus aetiology (DORA). Rotavirus assay should be a primary investigation on all children with acute watery diarrhoea.

Advocacy for exclusive breastfeeding and appropriate complementary feeding practices for infants should be strengthened. The high prevalence of rotavirus disease is also a clarion call for urgent introduction of rotavirus vaccine in the National immunization programme. This study provides pre-vaccine baseline data that will enhance evaluation of the vaccine when incorporated into the national programme.

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