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SERO-EPIDEMIOLOGY OF *ROTA*VIRUS GASTROENTERITIS IN CHILDREN IN ILORIN, KWARA STATE

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ABSTRACT

Rotavirus is responsible for the most severe dehydrating diarrhea among young children due to gastroenteritis. In this study, we aimed to ascertain the occurrence of childhood gastroenteritis caused by *Rotavirus* among infants and young children who are younger than 5 years of age in Ilorin, Kwara State and determined the risk factors posing the challenges to be susceptible to diarrhea associated with *rotavirus* in Ilorin, Kwara State. Diarrhea stool samples were collected from children who passed watery stools, who met predetermined inclusion criteria and who presented at the study hospitals Viz: General Hospital and Specialist Hospital Alagbado and Children Specialist Hospital, Igboro. All within Kwara State either on outpatient care basis or those admitted into the pediatric ward. Sample of stool harbouring rotavirus antigens was detected by commercial *Rotavirus IgM ELISA kit* to target recent infections among the participants. Out of three hundred (300) stool samples that were collected from children suffering from acute diarrhea, a total number of eighty-six (86) were found to be Rotavirus positive (28.7 %) and two hundred and fourteen (214) were found to be negative (71.3%). The age group 3-5 years, showed the highest prevalence rate which is in line with some research findings that attribute this age range with certain feeding habits and cultural practices, predisposing them to gastroenteritis. It is therefore advised that parents and guardian alike should ensure that special care is given to children, with emphasis on their feeding habits and sanitation.

Keywords: *Rotavirus*, gastroenteritis, children, diarrhea.

INTRODUCTION

Rotavirus is a non-enveloped double stranded RNA viruses belonging to Reoviridae, *Rotavirus* is one of them, other members of this family include orthoreoviruses, obiviruses, aquareoviruses etc. (Mertens 2005). Infants and young children are often affected by diarrhea caused by rotavirus infections. There are about 128,500 deaths associated with Rotavirus worldwide each year, with 70 % of cases occurring in Sub-Saharan Africa (Jonesteller et al., 2017). Approximately 258 million gastroenteritis cases are

caused by *rotavirus* each year (Troeger et al., 2018) and about 24 million cases require medical attention. In 2013, there were 215,000 deaths associated with *rotavirus*, compared to 528,000 in 2000 (range, 465,000-591,000), 75 % of which occurred in Africa and Asia. Nigeria accounted for 14 % and India 22 % of the total (Tate et al., 2013). Bishop et al. (1973) observed small particles of *rotavirus* in thin sections of duodenal mucosa observed with electron micrographs and later found in stool samples of children suffering from diarrhea. (Felwitt et al., 1978) infections

occasioned by *rotavirus* resulted in the modification of the architecture of the intestinal epithelial cells resulting in recurrent vomiting, fever, Lethargy, dehydration, hypovolemia, diarrhea and eventual death in the infected untreated infants (Udeani et al., 2018). Excessive loss of fluid results in dehydration as well as significant alteration of the serum electrolyte concentrations. These are the most severe clinical findings among the infected children. *Rotavirus* often remains within the intestines being constantly shed off in stools but some research put forth evidence of their spread to the bloodstream of the infected children (Blutt et al., 2007). Evidence suggestive of *Rotavirus* infection in other body sites other than the intestines such as the respiratory tract, lymphatics, urinary tract, nervous system as well as the liver has been published (Bishop 1996). The fecal oral route of *Rotavirus* transmission is the most successful amongst others. According to Fagbami et al., (1987) it was reported that Oyo State had the first documented cases of rotavirus infection in Nigeria. Other build up research also established the presence of the pathogen in fecal samples of age under 5 children in Ibadan, with several other studies that have been conducted in the South West region of the Nation. Yet, there is dearth of information on the current sero-prevalence of human rotavirus infection in Kwara state. Due to its relatively high cost and clinical spectrum that is similar to other gastroenteritis, *Rotavirus* infections are not routinely diagnosed in most Nigerian hospitals. In addition, certain environmental, climatic, sanitary, and behavioral factors are associated with *Rotavirus* infections. Hospitals could serve as a conduit for *rotavirus* infection, causing nosocomial transmission of the virus. It is therefore very essential that a long-lasting solution be introduced into the society via research as well as assisting health policy makers to implement strategies in coping *rotavirus* infection. This is a retrospective study

which involved the collection and analysis of stool samples obtained from consented participants younger than 5 years, presenting with diarrhea at the department of Pediatrics within the study sites viz: General Hospital and Specialist Hospital Alagbado, Ilorin and Children Specialist Hospital Centre Igboro Ilorin Kwara State.

METHODOLOGY

A sample of diarrhea stool was collected from diarrheic children less than 5 years old who were referred to the study hospitals. An informed consent form was signed by the parents and the medical ethics committee approved the collection of the samples. Using sterile commercial stool containers, samples were collected aseptically with patient identification and timestamps done by the care-givers or the hospital staff from each child with instructions on proper method of collection. The stool samples were then transported under ice to the *Rotavirus* Laboratory in University of Ilorin Teaching Hospital, Kwara State where the stool samples were analyzed using Enzyme linked immunosorbent assay (ELISA) techniques to demonstrate the presence of *Rotavirus* Antigens in the stool samples. A total number of three hundred (300) stool samples were collected from diarrheal infants. Enzyme Linked Immunosorbent Assay (ELISA) method was used in this study.

RESULTS

A total number of three hundred (300) stool samples were collected from children suffering from diarrhea. Enzyme Linked Immunosorbent Assay (ELISA) method was used to determine the presence or absence of Rota virus associated gastroenteritis. In Table 1, the prevalence of *Rotavirus* among the participants is shown.

TABLE 1: Prevalence of *Rotavirus* among the participants

Serology	Frequency	Percentage (%)
Positive	86	28.7
Negative	214	71.3
Total	300	100%

Table 2 shows descriptive analysis of Age distribution of *Rotavirus* among the study participants. Majority of the *Rotavirus* positive participants were within 3-5 years (29.1 %) follow by 0-2 years (28.2%) with mean age 2.61 ± 1.51 years. There was no statistical significance association of age between *Rotavirus* positive and *Rotavirus* negative at p-value < 0.05 (chi-square test).

TABLE 2: Age distribution of *Rotavirus* among children in Ilorin

Age (years)	Total No.	Positive (%)	Negative (%)
0-2	142	40 (28.2)	51(71.8)
3-5	158	46 (29.1)	56(70.9)
Total	300	86 (28.7)	214 (71.3)

Table 3 shows descriptive analysis of Gender distribution of *Rotavirus* among the study participants. Most of positive participant in this study are males 54(32.5 %) in which 112 (67.5 %) are negative. Positive female participants were 32(23.9 %) while the negative were 102 (76.1 %).

TABLE 3: Gender distribution of *Rotavirus* among children in Ilorin

Gender	Total No.	Positive (%)	Negative (%)
Male	166	54 (32.5)	112(67.5)
Female	134	32 (23.9)	102(76.1)
Total	300	86 (28.7)	214 (71.3)

Table 4 shows descriptive analysis of distribution of *Rotavirus* based on location of residence among the study participants. Majority of positive participant resides in rural area (41.8 %), followed by semi urban (25.5 %) and then urban area (16.7 %). There was statistical

significance association of location of residence, between *Rotavirus* positive and *Rotavirus* negative participants.

TABLE 4: Distribution of *Rotavirus* among children in Ilorin based on location of residence

Location Residence	Total No.	Positive (%)	Negative (%)
Urban	96	16(16.7)	80(83.3)
Semi Urban	94	24 (25.5)	70(74.5)
Rural	110	46(41.8)	64(58.2)
Total	300	86(28.7)	214 (71.3)

Table 5 shows descriptive analysis of distribution of *Rotavirus* based on educational status of Parent/Guardian among the study participants. Majority of positive participants' parents/guardians had Primary level of education (40 %) followed by Secondary level (29.6 %) and the lowest is Tertiary level (15.2 %). There was statistical significance association of education of parent/guardian between *Rotavirus* positive and *Rotavirus* negative.

TABLE 5: Distribution of *Rotavirus* among children in Ilorin based on educational status of parent/guardian

Education Parent/Guardian	Total No.	Positive (%)	Negative (%)
Primary	100	40 (40)	60 (60)
Secondary	108	32 (29.6)	76(70.4)
Tertiary	92	14 (15.2)	78 (84.8)
Total	300	86 (28.7)	214(71.3)

In table 6, drug using participants among *Rotavirus* positive are 28 (23.3 %) while those that are not using drugs are 58 (32.2%). Also, the participants using drug among *Rotavirus* negative were 92 (76.7 %) while those that were not using drugs were 122 (67.8 %). Most got their drinkable water from borehole (36). Eight participants had blood in stool and fourteen had mucous in stool. Majority of the *Rotavirus* positive participants are out patients (84). There was statistical significance association of source of drinking water, blood in stool, mucous in

stool between *Rotavirus* positive and *Rotavirus* negative statistically).

TABLE 6: Associated risk factors

Variables	Positive (%)	Negative (%)
Administering drugs		
Yes	28 (23.3)	92(76.7)
No	58 (32.2)	122 (67.8)
Source of drinking water		
Tap	10 (14.3)	60 (85.7)
Well	30 (30)	70 (70)
Borehole	36 (31.6)	78 (68.4)
River	10 (62.5)	6 (37.5)
Blood in stool		
Yes	8 (80)	2 (20)
No	78 (26.9)	212 (73.1)
Mucous in stool		
Yes	14 (77.8)	4 (22.2)
No	72 (25.5)	210 (74.5)
Nature of Admission		
In patient	2 (50)	2 (50)
Out patient	84 (28.4)	212 (71.6)

DISCUSSION

Preschoolers are particularly affected by diarrheal diseases in developing countries as documented by (Khuri-Bulos and Al-Khatib, 2006). Other researchers have observed higher prevalence rates of *Rotavirus* associated gastroenteritis in Nigeria, but the difference in this current study may have been due to the time and season in which samples were collected, the storage conditions of samples, or the geography of the area. The African region's *Rotavirus* cases were estimated to range from 39-52 % in a WHO hospital-based surveillance report (Nakawesi et al., 2010). Due to a small sample size, the 28.7 % obtained in this study did not fall within this WHO African region range, regardless of its high value. *Rotaviruses* were detected in all age groups recruited in these study infants under 3 most likely experiences as many as 10 episodes of diarrhea per year. *Rotavirus* is among causes of diarrhea diseases globally, accounting for 134

million episodes/year (Khuri-Bulos and Al- Khatib, 2006). Antigens of *Rotavirus* were found among children under 5 years in Ilorin, Kwara state with a prevalence of 28.7 % in this current study. The result is lower compare to 36.5 % observed in Kano, (Wada-Kura, 2011) and 35.0 % seen in Lagos, Nigeria (Audu et al., 2002). However the prevalence is higher than the 15.6 % (Ozkana, 2007) and 23.8 % (Gutierrez-Gimeno et al., 2006) which had been reported by researchers in Zaria, the 11.0 % (Mohamood and Feachem, 1987) and 13.8 % (Junaid et al., 2011) reported in Jos, 18.0 % in North-western Nigeria, (Aminu et al., 2010) 19.2 % in Benin City (Iyoha and Abiodun, 2015). Among the participants between 3 and 5 years of age, it was shown in this study that there was no relationship between the chronological age of the infant and prevalence of the disease. This is in concordance with the research by Wada-Kura in the year 2011. In another research conducted in Paraguay, Coluchi et al., (2002) reported a significantly higher prevalence of *Rotavirus* associated diarrhea among children with 24 to 35 months. In contrast however, some researchers in Jos and Zaria concluded that higher *Rotavirus* prevalence was observed among infants 2 years and below. Children between the ages of 3 to 5 months are known to be prone to gastroenteritis due to their physical activities and feeding patterns and this may be the reason for the high rotavirus outcomes among this age group in this study. Gender was not found to be directly proportional to the incidence rate of rotavirus infection in this study which is also in line with studies conducted in Nigeria (Pennap and Umoh, 2010; Wada-Kura, 2011) in their research, males had a rate of (32.5 %) than females with a prevalence rate of (23.9%). Junaid et al., (2011) in North central Nigeria demonstrated the association between gender and *Rotavirus* prevalence in their research. There was statistical significance association of

location of Residence ($P=0.01$), education of parent/guardian ($P=0.03$) between *Rotavirus* positive and *Rotavirus* negative at p -value < 0.05 . This disagrees with the observations of Aminu et al., (2010) and Junaid et al., (2011). It was also shown in this study that educational level of the parents and care givers played an important role in the dissemination of the disease. Those residing in rural areas had highest prevalence and least in urban. This shows more educated parents had better knowledge about the prevention of *Rotavirus*, likewise those in urban. Also, there was statistical significance association of source of drinking water ($P=0.04$), bloody stool ($P=0.01$), mucous in stool ($P=0.01$) between *Rotavirus* positive and *Rotavirus* negative at p -value < 0.05 (chi-square test). However, there was no statistical significance association of administering drugs, nature of admission between *Rotavirus* positive and *Rotavirus* negative at p -value < 0.05 . Inability to find any association shows administering drugs and nature of admission in hospital unlikely could be the cause of progressive diarrheal disease among the children in this study.

CONCLUSION

This current study was undertaken in Ilorin, Kwara state observed *Rotavirus* infections in 28.7 % of infants under 5 years who were hospitalized within the study area with diarrhea, mostly in the age range of 3-5 years. Rotavirus is associated with location of residence and educational status of the parent/guardian. Also, *Rotavirus* is not associated with gender. Finally, this study also emphasizes the need to improve the standard of living and sanitation of children less than 5 years of age as they are greatly susceptible to rotavirus gastroenteritis.

AUTHORS CONTRIBUTION

All authors contributed towards the analysis, writing and formatting of the manuscript.

CONFLICT OF INTEREST

There was no conflict of interest encountered in this study.

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