

## Prevalence of Rotavirus among Children with Acute Gastroenteritis in Gadarif Hospital, Eastern Sudan

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### Abstract

**Background:** Rotavirus is the most common cause of acute gastroenteritis and severe dehydration among children of less than five years. The aim of this study was to determine the prevalence of rotavirus infection among children under-five years hospitalized with acute diarrhea, Gadarif state eastern Sudan.

**Methods:** This was a cross sectional hospital based study conducted at Gadarif pediatrics teaching hospital from 1st June to 31st December 2018, to study the prevalence rate in 40 patients referring to a pediatric hospital.

**Results:** Rotavirus was detected by ELISA in 40 (27.8%) of the 144 stool samples. 26 (65%) were male and 14 (35%) were female (Figure 1), with male to female ratio of 1.9:1. Most of the patients 17 (42.5%) with rotavirus were in the age group 5 - 12 (Figure 2) months. 21 (52.5%) patients lived in rural area while 19 (47.5%) patients lived in urban area. The common symptom of rotavirus gastroenteritis was diarrhea in all study subjects. Severe dehydration was present only in 4 (10%). 35 (87.5) of study patients were discharged with no complications.

**Conclusion and Recommendation:** In this study, the prevalence rate was 27.8% this percentage may not reflect the true prevalence among Sudanese children in Gadarif state, so other surveillance study is recommended.

**Keywords:** Acute Gastroenteritis; Diarrhea; Rotavirus Infection; Gadarif; Sudan

### Introduction

Rotavirus-associated gastroenteritis (RVGE) remains a public health problem worldwide. The majority of severe morbidity and mortality occurs in infants in low-income countries particularly in sub-Saharan Africa [1]. Globally, Tate, *et al.* [2] estimated that rotavirus caused 528,000 deaths among children < 5 years of age in 2000, decreasing to 215,000 deaths in 2013; sub-Saharan Africa accounted for

about 47% and 56% of deaths in 2000 and 2013, respectively [2].

Rotavirus is the major cause of acute gastroenteritis and severe dehydrating diarrhea in young children [3]. Moreover, approximately 40% of hospitalizations for diarrheal illness that occur among children under 5 years of age in developing countries are due to rotavirus [4].

Rotaviruses invade and replicate in the differentiated absorptive columnar epithelium cells of the small intestinal. The result is partial disruption of the intestinal mucosa, with loss of microvilli and decrease in the villus/crypt ratio [5]. The secretory crypt cells proliferate extensively to compensate, leading to substantial fluid and electrolyte secretion into the gut. The damage also leads to reduced expression of certain digestive enzymes [6]. The jejunum is the main expresser of lactase phlorizin hydrolase (LCT), which is a disaccharidase that facilitates absorption of lactose. Lactase is usually the first affected disaccharidase, because of its distal location on the villus. The immature epithelial cells that replace the disrupted mucosa are often lactase deficient, leading to secondary lactose deficiency and lactose malabsorption [7].

### Aim of the Study

The data on rotavirus among Sudanese children are important for health planners and clinicians. The aim of this study was to assess the prevalence of rotavirus among children with acute gastroenteritis in Gadarif teaching hospital in eastern Sudan.

### Methods

This was a cross sectional hospital based study conducted at Gadarif pediatrics teaching hospital from 1<sup>st</sup> June to 31<sup>st</sup> December 2018. 2856 children were presented to pediatric hospital during the study period. 144 children aged less than 5 years suffering from diarrhea admitted in pediatric hospital. 40 of them had rotavirus gastroenteritis confirmed by Enzyme-Linked Immunosorbent Assay (ELISA) were enrolled in this study. The study was approved by the ethics committees of Faculty of Medicine and Health Sciences, Gadarif University, Sudan. Informed consent was obtained from their parents.

### Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences, version 20 (SPSS Inc., Chicago, ILL, USA).

### Results

A total of 44/144 children with watery diarrhea were enrolled in this study.

Demographic, clinical and laboratory data of the patients was shown in table 1.

Details of the studies	
<b>Gender</b>	
Male	63.9% (n 92)
Female	36.1% (n 52)
<b>Age (month)</b>	
< 5 Mon	16.7% (n 24)
5 - 12 Mon	43.5% (n 62)
> 12 Mon	40.2% (n 58)
<b>Residence</b>	
Rural areas	52.8% (n 76)
Urban areas	47.2% (n 68)
<b>Clinical symptoms</b>	
Diarrhea	100% (n 144)
Vomiting	41% (n 59)
Fever	59% (n 85)
<b>Rota vaccination status</b>	
Vaccinated	53.5% (n 77)
Not vaccinated	46.5% (n 67)

**Table 1:** Demographic and clinical data of the of participants (N = 144).

Rotavirus was detected by ELISA in 40 (27.8%) of the 144 stool samples. 26 (65%) were male and 14 (35%) were female (Figure 1), with male to female ratio of 1.9:1.

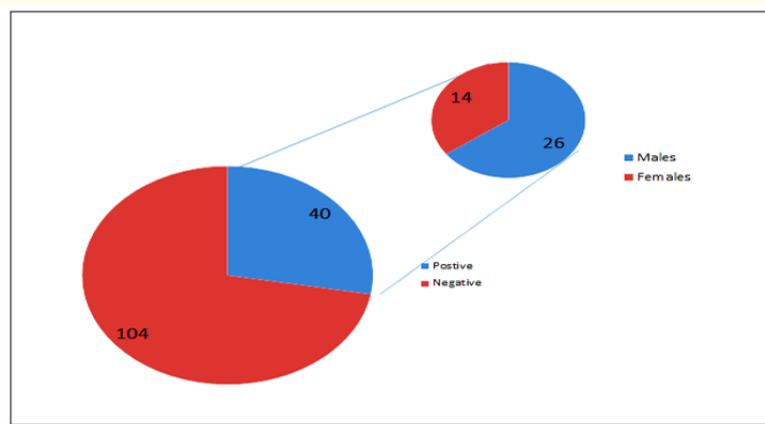


Figure 1: Prevalence of rotavirus and distribution of patients with RV infection according to gender.

Most of the patients 17 (42.5%) with rotavirus were in the age group 5 - 12 month (Figure 2). 21 (52.5%) patients lived in rural area while 19 (47.5%) patients lived in urban area.

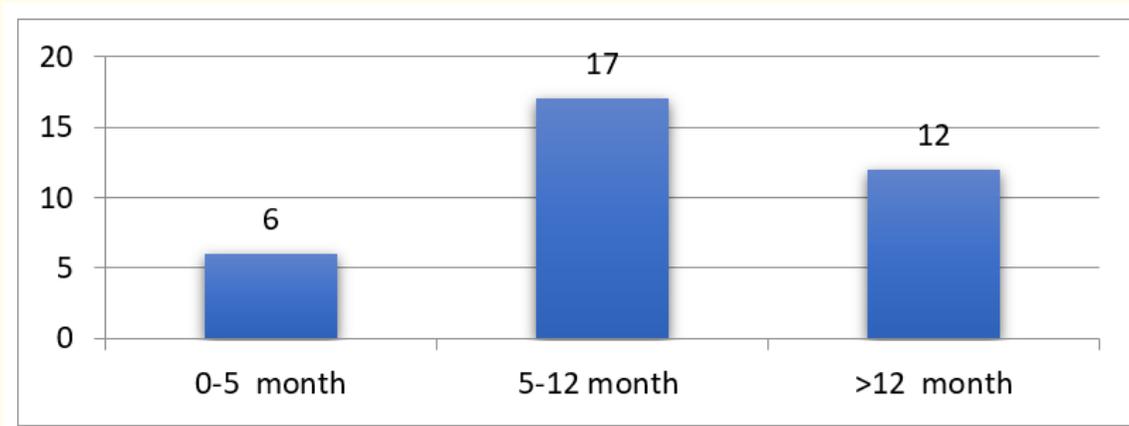


Figure 2: Distribution of patients with +ve rotavirus gastroenteritis in age group.

The common symptom of rotavirus gastroenteritis was diarrhea in all study subjects (Table 2). Severe dehydration was present only in 4 (10%). 35 (87.5) of study patients were discharged with no complications, 4 (10%) patients were escaped and 1 (2.5%) patient was referred.

Symptoms	%
Diarrhea	100% (40)
Vomiting	90% (36)
Fever	50% (20)
<b>Dehydration</b>	
Mild	30% (12)
Moderate	50% (20)
severe	10% (4)

**Table 2:** Clinical symptoms of patients with +V rotavirus gastroenteritis (N = 40).

## Discussion

Rotavirus is the leading causes of severe diarrheal disease in infants and young children worldwide [8]. In this study the prevalence of rotaviruses diarrhea in children under five years of age who presented to the hospital was 27.8%. Malek, *et al.* (2010) [9] report that the percentage of rotavirus among gastroenteritis cases ranging from 16% to 61%. This report showed that Rotavirus infection was lowest in Saudi Arabia, Tunisia and Egypt (16 - 23%) and higher in Syria (61%) and Oman (51%) [9]. This variation in the prevalence of rotavirus infection among different areas is probably due to the social habits of the population or environmental variations that may be related to growth of rotavirus pathogens particularly in contaminated water [10]. It could be related to breastfeeding and weaning times among populations in different areas or countries. There is evidence that breastfeeding has a protective role in rotavirus-associated diarrhea [11,12].

The most affected children were those under five years of age [13]. In this study children within the age group 5 - 12 months had the highest rate of rotavirus infection (54%). This was in agreement with previous studies [14-16]. The age group 0 - 5 months had the least rate of rotavirus infection. Older age group may have been exposed previously to rotavirus and acquired some immunity against infection [10].

In the present study the most affected children were male (65%) this was consisted with the previous studies [13,17]. Shams, *et al.* (2020) [18] found that 60% and 40% of the patients were males and females, respectively. The reason for this male predominance cannot easily be explained; it may be due to social factors rather than a higher rate of infection in boys [12].

In this study the prevalence of rotavirus infection was found to be higher in rural area. This finding contrast with other study that found the highest rotavirus cases were from urban (63.04%) while 36.95% cases were from rural areas [19]. The prevalence of rotavirus in rural areas is attributed to a lack of awareness among the rural population regarding hygiene and improper waste disposal, which are considered the significant risk factors for diarrheal diseases in children below five years [19]. Also, insufficient hygiene measures, which include hand washing prior to food preparation and feeding their children, contribute to the higher prevalence rate. Furthermore, environmental issues related to the open defecation impact adversely in the control of rotavirus cases.

Rotavirus is the major agent of severe diarrhea among infants and young children with a high prevalence of morbidity and mortality worldwide [20]. In this study, rotavirus gastroenteritis was characterized by vomiting, diarrhea, fever and dehydration. Diarrhea was particularly prominent. This was in agreement with the result of other study [10]. In China, rotavirus caused severe gastroenteritis among children younger than 5 years. 32.5% of patient had diarrhea [21]. A rotavirus, which is a major cause of serious childhood dehydration gastroenteritis and has been reported to cause approximately a million deaths annually, mostly occurs in developing countries [22]. In

our study, dehydration was observed in all cases, severe dehydration was present only in 4 patients, similar result was found in previous study [19].

The proportion of all rotavirus hospitalizations occur in infants is 43% in Africa and 27% in Europe [23]. In present study hospitalization rates were higher in males than in females, this was in line with other studies [24,25].

35 (87.5%) of study patients were successfully treated and discharged with no complications, 4 (10%) patients were escaped and 1 (2.5%) patient was referred. No deaths were recorded among our patients.

### Conclusion and Recommendation

In this study, the prevalence rate of rotavirus among children under five years of age was 27.8% this percentage may not reflect the true prevalence among Sudanese children, so other surveillance study is recommended.

### Conflict of Interest

The authors declare no potential conflict of interest in this study.

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This study was not funded.

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