

Incidence of Rota Virus Gastroenteritis among Vaccinated and Non-vaccinated Children Less Than Two Years Old in Ramadi City, Iraq

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ABSTRACT

Background: Acute gastroenteritis is a major cause of health problem among children in undeveloped countries, where the rotavirus is the most widely recognized etiology.

Objectives: This study aimed to find out the incidence of rotavirus in diarrheal children less than two years of age in both vaccinated and non-vaccinated children with rotavirus vaccine. Also to determine some risk factors associated with this disease.

Materials and methods: A cross-sectional study was conducted for 6 months, from the first of June 2018 to the first of December 2018. Six hundred child less than two years old with acute gastroenteritis was included in the study. Stool tests were sent to the lab for identification of rotavirus antigen using the ELISA technique in the stool. Stool samples belong to 300 cases of vaccinated children with the rota vaccine and the other 300 cases belong to non-vaccinated children. A questionnaire data form regarding age, gender, maternal education, residence and type of feeding was taken from each infected child.

Results: Out of a total of 600 stool samples of children with acute gastroenteritis, rotavirus was detected in 192 (32%) samples. Among 300 non-vaccinated patients, 123 (41%) were rotavirus positive, and among other 300 vaccinated patients 69 (23%) were rotavirus positive. The majority of cases were reported in the age group 6-12 months. Bottle-feeding and mothers of the low educational level were found to increase the incidence of rotavirus infection.

Conclusion: Incidence of rotavirus gastroenteritis was predominant in diarrheal children. Vaccination with the rotavirus vaccine decreases the rotavirus gastroenteritis in diarrheal children.

Keywords: Rotavirus; Diarrhea; Incidence; Children; Vaccine.

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INTRODUCTION

Diarrhea represents kill around 760, 000 children under five every year. Diarrheal death and illness are a worldwide issue, however, it is particularly common in developing countries [1]. Around the world, rotavirus is evaluated to cause over 111 million instances of gastroenteritis every year in children younger than five years. Of these, 18 million cases are considered serious, with around 500,000 passages for each year [2]. Rotavirus transmission happens through contact with contami-

nated stool. The typical method for a transmission includes ingesting food or water defiled with the virus. The incubation period of the rotavirus around two days [3]. Rotavirus infection is a mild to severe disease, clinically the child developed vomiting, watery diarrhea and mild fever lasting from four to eight days. Dehydration is more typical in rotavirus infections than in those brought about by bacterial pathogens, and it is the most widely recognized reason for death identified with rotavirus disease [4]. Rotavirus detection in stool samples of children suffering from gastroenteritis can be assessed by different laboratory methods such as enzyme-linked immunosorbent assay, latex agglutination, electron microscopy, and molecular methods [5]. A live, oral, pentavalent rotavirus vaccine given as a 3 portion, the arrangement at 2, 4, and 6 months of age. The first dose should be given in age between

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6 and 12 weeks, with the 3 vaccines completed at the age of 32 weeks. Studies from several developed countries show greater than 90% protection against severe rotavirus disease. Studies from developing countries show 50–60% protection from the severe disease [6].

This study aimed to find out the incidence of rotavirus gastroenteritis among vaccinated with rota vaccine and non-vaccinated diarrheal children. In addition to showing demographic data like age and gender with some predisposing factor that may play a role in the development of rota gastroenteritis like bottle-feeding, and mothers of low educational level in Ramadi city, west of Iraq.

MATERIALS AND METHODS

A cross-sectional observational study was done on children less than 2 years-old who visited the outpatient clinic or emergency department in Al-Ramadi Maternity and Children Teaching Hospital in Ramadi city, Iraq. Those children presented with acute diarrhea (the passage of three or more loose or liquid stools per day) during 6 months period from the first of June 2018 to the first of December 2018. Three hundred cases that were vaccinated by oral rotavirus and other 300 cases not vaccinated were included in the current study. While children two-years-old or more, those with recurrent and chronic diarrhea, premature, and immune-compromised children, and those who didn't want to participate in the study were excluded from the present study.

The study approved by the scientific committee of the hospital. Informed consent was taken from the parents or caregiver after giving them a full explanation about the purpose of the study.

A questionnaire data form regarding age, gender, residence, type of feeding during the last three months of infection, maternal education and vaccinating with rotavirus vaccine were taken from each child. The age groups were classified into 3 groups, <6, 6–12, and 13– <24 months.

Stool tests were gathered from patients and sent to the lab to be examined for rotavirus by the fecal rotavirus antigen ELISA Kit manufactured by Epitope Diagnostics, Inc. San Diego, CA 92121, USA. Stool specimens collected into a fecal sample collection container or tube or cup. Minimum 0.1 mL liquid stool sample is required. The specimen stored at 2–8°C for up to 3 days and frozen condition (–20°C) for longer storage.

Statistical analysis of the data was carried out by using IBM SPSS Statistics version 22. The results were presented in tables. Chi-square test for qualitative data to compare means of the incidence of rotavirus infection among each of vaccinated and non-vaccinated diarrheal children and P-value level <0.05 had been considered significant throughout the study.

RESULTS

Out of 600 stool tests of all patients experiencing from diarrhea, 192 (32%) were found to have rotavirus gastroenteritis. The incidence of rotavirus gastroenteritis among non-vaccinated children with the rotavirus vaccine was (41%) while it was (23%) among vaccinated children. The difference of rotavirus infection among vaccinated and non-vaccinated children was significant Table 1.

One hundred and three (54%) of rotavirus cases were boys and 89 (46%) were girls and that the difference between gender was non-significant Table 2.

Table 1. The incidence of rotavirus gastroenteritis in both vaccinated and non-vaccinated children*.

Character	Rotavirus gastroenteritis	Other causes of gastroenteritis	Total
Non-vaccinated children	123 (41%)	177 (59%)	300
Vaccinated children	69 (23%)	231 (77%)	300
Total	192 (32%)	408(68%)	600

* P-value = 0.0049

Table 2. Incidence of rotavirus gastroenteritis in vaccinated and non-vaccinated diarrheal cases among gender*.

Gender	Vaccinated	Non-vaccinated	Total
Male	39	64	103(54%)
Female	30	59	89 (46%)
Total	69	123	192

* P-value = 0.311

Most of the cases were found between 6-12 months, followed by the age of under 6 months. The difference among different age groups was significant Table 3.

The majority of cases in the present study was related to bottle-feeding during the last three months and low maternal education, with a significant difference. Whereas the residence factor demonstrates non-significant difference Table 4.

Table 3. Incidence of Rotavirus gastroenteritis in vaccinated and non-vaccinated diarrheal cases among different age groups*.

Age	Vaccinated	Non-vaccinated	Total
<6 months	22	25	47 (24.5%)
6–12 months	29	77	106 (55.2%)
13– <24 months	18	21	39 (20.3%)
Total	69	123	192 (100%)

* P-value <0.001

Table 4. Incidence of rotavirus gastroenteritis in vaccinated and non-vaccinated cases depending on the type of feeding, residence, and maternal education.

Character	Variables	Number(%)	P-Value
Type of feeding during the last 3 months	Breast-feeding	45 (23%)	<0.001
	Bottle-feeding	147 (77%)	
Residence	Rural	91 (47%)	0.472
	Urban	101 (53%)	
Maternal education	Illiterate and primary school	138 (72%)	<0.001
	High school and college	54 (28%)	

DISCUSSION

Rota infection contaminations are the most well-known reason for cut off gastroenteritis among children around the world [7]. In the present study, the occurrence of gastroenteritis brought about by rotavirus was observed to be (32%) of all cases of diarrhea. Our result was nearly similar to that reported in Erbil Kurdistan (37%) [8], Iran (39.9%) [9], and Jordan (32.5%) [10]. However, a low incidence was reported in Turkey [11] (18.7%) and Kazakhstan [12] (15%).

Regarding rotavirus gastroenteritis among vaccinated and non-vaccinated children, this study reveals that the incidence of infection among vaccinated children drops to about half in comparison to that in non-vaccinated children. Studies in Saudi Arabia showed that the incidence decrease from 38.5% to 13.2% [13] and another study in Senegal [14], the incidence decreased from 42% to 10%. Researches on the rotavirus vaccine done in Africa and Asia demonstrate modest efficacy (50–70%) compared with the high efficacy (85–98%) that was recorded in Latin America, the USA, and Europe [15, 16]. The lower effect of vaccination in our study may be explained by bad storage of vaccine, improper administration to the children and lacking educational programs to the population about the vaccine. Another reason for the lower efficacy of vaccines may be that rotavirus vaccine strains not compatible with strains of rotavirus that cause infection during the present study.

This study showed that boys have a slightly non-significant more rotavirus infection than girls. A similar gender difference found in a Canadian [17] study. Meanwhile, many authors from India [18] and Bangladesh [19] reported that boys are more influenced than girls. Boys may be taken for medical attention more frequently than girls.

In this study, it was seen that most of the patients were between 6–12 months, similar results obtained in Nigeria [20] and Spain [21]. This may result from early exposure to contaminated food or water and the absence of breastfeeding. Lower incidence below 6 months may because of passive immunity gained by the babies from their mothers which fade

in the second half of the first year, furthermore, is a higher rate of breast-feeding in this age group which also protects the infants via the passing of IgA anti-rotavirus antibodies [22]. Infections decline with age as practically all people involved with at least one rotavirus disease by 3-years-old and that circulating rotavirus antibodies remain detectable indefinitely [22].

Bottle-feeding was found to be a significant risk factor for causing rotavirus diarrhea in this study. Researches showed that human milk may have anti-rotavirus immunoglobulin A (IgA) and trypsin inhibitors which constrain rotavirus disease [22, 23]. The present study also found that children of low educated mothers were more exposed to rotavirus gastroenteritis than others. Similar results were obtained in studies in Thailand [24] and the US [25]. The potential causes might be because of the awful sterilization of feeding bottles and bad preparation of milk.

The present study was hospital-based, not population-based. Of course, this doesn't reflect the accurate incidence of rotavirus gastroenteritis in Ramadi city. Therefore, to overcome such shortcoming, a future population-based study is recommended to estimate the incidence of rotavirus diarrhea in vaccinated and non-vaccinated subjects in our city. The second limitation, the study was not studied the economic status of the family because the majority of the mothers either they shy to answer such question or they don't know the monthly salary of their husbands.

CONCLUSION

The incidence of rotavirus gastroenteritis was high among non-vaccinated children aged 6–12 months. The bottle-feeding and low educational level of the mothers were found to increase the incidence of rotavirus infection. Health education should be recommended to mothers at primary health centers about the benefit of breast milk and of the rotavirus vaccine in preventing the disease.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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