Rotavirus Infection in Infants and Young Children in Makkah, Saudi Arabia

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Abstract

Objective: To determine the prevalence of rotavirus in infants and young children in Makkah, Saudi Arabia.

Methods: A population-based prevalence study was done in randomly selected infants and young children suffering from acute diarrhoea. Faecal specimens were collected from 479 patients. A latex agglutination test was used for rotavirus detection. All positive and 10 negative samples for rotavirus by latex agglutination were also tested by enzyme-linked immunosorbent assay (ELISA).

Results: Rotavirus was detected in 48 (10%) patients using latex agglutination test. ELISA detected 46/48 positive samples. Ten samples that tested negative with latex test were also negative with ELISA. Infection with rotavirus was more frequent among infants and children < 2 years old, with a maximum incidence among children 0-12 months. Rotavirus infection was 3.1% in Saudi nationals, compared to 6.9% in other nationalities.

Conclusion: In this study the prevalence rate of 10% was low compared to other studies done in different regions of Saudi Arabia. This low rate could be due to the geographical location of Makkah with very hot and dry summer, and mild winter and almost no rain throughout the year (JPMA 55:231;2005).

Introduction

Rotavirus, a member of the family Reoviridae, can be classified into serogroup A-G, and most human infections are caused by serogroup A. The rotavirus is a leading cause of severe diarrhoeal disease in infants and young children worldwide. Globally, each year, rotavirus causes approximately 111 million episodes of gastroenteritis requiring only home care, 25 million clinic visits, 2 million hospitalizations, and 352,000-592,000 deaths in children under five years of age.1 In developing world, rotavirus is the most frequently detected pathogen in children with severe gastroenteritis under two years of age.2-4 In developed countries, rotavirus has also been detected in 35-50% of infants and young children hospitalized with acute diarrhoea.1,5-6

Studies on rotavirus gastroenteritis have also been reported from various countries of Arabian Peninsula showed that rotavirus was a causative agent in 21-40.2% of the cases of infantile gastro-enteritis.7-10 Although, few studies reported from Saudi Arabia indicating a varied prevalence (16-46%) of rotavirus infection in infants and children suffering from gastroenteritis 11-17, no data to our knowledge, on this subject, is available from Makkah Al-Mukarramah. Therefore, the current study was aimed to determine the relative importance of rotavirus as a causative agent of gastroenteritis in infants and young children in this area.

Materials and Methods

This study was carried out for one year from January - December 2003. Faecal specimens were collected from the paediatric units of Willadah Hospital, Hera Hospital, Al-Rafie Hospital and Al-Noor Specialist Hospital in Makkah.

Children <5 years of age with a history of acute diarrhoea of 72 hours or less duration were included in the study. Children who had received any antibiotic antibiotic
or antiparasitic or antiparasitic drug within last ten days were excluded. A standard questionnaire was used to record patient's history and clinical findings.

An informed consent was obtained from the parent (either mother or father) of the child before inclusion in the study. The parents were informed about the procedure, making certain that he/she was fully competent of understanding the procedure carried out to obtain the specimen from the child.

From each case at least 5ml or 5g of faeces was collected in a clean, sterile container, and labelled accordingly. Samples in an icebox were transported within two hours of collection to virology laboratory, Department of Medical Microbiology, Umm Al-Qura University, where these were processed for rotavirus detection.

All faecal samples were tested with commercially available Rotavirus latex agglutination kit (Rotagen; BIOKIT, SA, Barcelona-Spain). The tests were performed following manufacturer's instructions. Briefly, faecal samples were prepared by adding 0.2ml/0.2g of faeces to 2.0 ml of dilution buffer in centrifuge tubes. After thorough mixing by vortex, tubes were incubated at room temperature for 5-10 minutes. Samples were then centrifuged at 1000 g for 10 minutes and supernatant was separated. 50µl of supernatant from each sample was mixed with rotavirus latex reagent and observed for agglutination after mixing and rotating the slide for 2 minutes on a rotator set at 60-80 rpm. A clear agglutination was considered positive for rotavirus. Positive and negative controls were performed with each batch of the tests.

All positive samples and ten negative samples for rotavirus by latex agglutination were also tested by Enzyme-linked Immuno-sorbent Assay (ELISA) using rotavirus kit (IDEIA™ Rotavirus) following manufacturer's instructions.

Results

A total of 479 children of both sex under 5 years of age suffering from acute diarrhoea were studied. Majority of the cases were from Willadah Hospital (36.4%) followed by Hera Hospital (26%), Al-Noor Specialist Hospital (25%) and Al-Rafie Hospital (12.6%) of Makkah.

Among the children with diarrhoea, 62% were under two years of age and remaining 38% between 2-5 years. Male to female ratio was 1.2:1. Rotavirus was identified in 48 (10%) of the total cases studied. Out of these 48 patients infected with rotavirus, 30 (6.3%) were male and 18 (3.7%) female.

Age related prevalence of rotavirus was 4.6% (about 50% of total positive samples) in children below one year of age. The remaining 5.4% positive cases were among age group 2-5 years, with a high prevalence of 2.1% in age group 55-60 months (Table).

Ethnic distribution of diarrhoeal cases indicated 214 (44.7%) to be Saudi national and 265 (55.3%) belonged to other nationalities. Out of 214 Saudi patients, 15 (3.1%) and out of 265 non-Saudi patients 33 (6.9%) were positive for rotavirus infection, respectively.

In this study rotavirus was detected using latex agglutination technique. Forty-eight positive and 10 negative samples by latex agglutination were also tested using ELISA. Results of 10 negative samples by both methods were similar whereas, ELISA method detected 46 positive samples out of 48 positive by latex agglutination. The possibilities of this varied result is addressed in discussion section.

Discussion

The routine diagnosis of rotavirus is based on rapid detection of group A antigen in faeces, generally by latex agglutination or enzyme immunoassay.

This study included cases of acute diarrhoea with rotavirus infection in children below 5 years of age. 62% of the cases were under 2 years of age. Similar studies have been conducted both in developing3-4,11,15 and developed world5,18

The results of this study suggest that rotavirus infection is an important pathogen of acute diarrhoea in infants and children, as the patients were from major government hospitals referred from the entire community of Makkah. Thus the sample examined can be considered representative of diarrhea occurring in the area.

The findings of this study show that rotavirus is most common among children below two years of age, with a maximum incidence in infants 0-12 months old. This is consistent with a number of studies carried out in Saudi Arabia12-15 and other developing3-4,19 and developed countries.5,18 However, in some studies rotavirus infection was more common in children aged 6 months to 2 years and much less in infants below 6 months.20,21

Similarly rotavirus was also found to be an important causative agent of viral gastroenteritis among children in some physician-based studies carried out in the community of France and Netherlands.22-23 A recent physician based study from France24 also reported that group A rotavirus is the second most frequent causative agent after calcivirus infecting the children of age group 0-3 years, (about 25 and 29% of the cases, respectively). This emphasizes an important role of rotavirus infection in both hospital and community based gastroenteritis specially, among children.

The rate of rotavirus infection in this study was low
common among children below two years of age, with a maximum incidence in infants 0-12 months old. This is consistent with a number of studies carried out in Saudi Arabia and other developing countries. However, in some studies rotavirus infection was more common in children aged 6 months to 2 years and much less in infants below 6 months.

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The rate of rotavirus infection in this study was low (10%) compared to other studies conducted in Saudi Arabia and its neighbouring countries in which rotavirus infection rate ranges between 19-46%.

This low rate could be due to the geographical location of Makkah with very hot and dry summer, and mild winter and almost no rain throughout the year.

The specificities and sensitivities of laboratory tests used in this study indicate that both ELISA and latex agglutination appear to be equally specific for rotavirus detection, whereas, latex agglutination was found to be more sensitive compared to ELISA as it detected rotavirus in 48 samples compared to 46 by ELISA.

It is a proven fact that ELISA is more sensitive than latex agglutination test. However, in our study 2 samples were latex positive but ELISA negative, this may be due to false positive latex tests as ELISA is more sensitive, or that because of the subjectivity of the reader since latex is read by naked eye. It is very important when reading latex tests to compare with positive and negative controls.

The other reason could be that the testing samples with latex after high-speed centrifugation affects results and may be a possible cause of false positive results. Therefore all the new generation latex tests now on market use a filtration process of the stool samples.

This preliminary finding of rotavirus infection as an important cause of diarrhea in infants and young children in Makkah demonstrates the need for additional studies of longer duration to determine the seasonal variation of rotavirus infection and prevalent serotypes and subgroups of rotavirus affecting the diarrheal children in this area.

Acknowledgements

This research was supported by a grant from Umm-Al Qura University, Saudi Arabia. We thank Mr. Zaki Saeed Rabhan, Mr. Ahmad Mohammad Al-Majrashi and Mr. Meshal Hamed Al-Malki for helping in carrying out this work.

References

