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Frequency of Rotavirus infections among Iraqi Children

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Presented by:

Ahmed Shamel Abass

Supervised by:

Dr. Areej Atiyah Hussein

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الاهداء

الاهداء اولا الى وجه الله تعالى...

في جميع مراحل الحياة يوجد اناس يستحقون منا الشكر والتقدير
واولى الناس بالشكر والدي الذي جرح الكاس فع ارنا ليستقيني
قطرة حبه و والدي التي وضعتني على طريق الحياة وكان لها
فضل كبير في نجاحي والى جميع من وقفوا بجاني وساعدوني...
الى جميع اساتذتي الكرام بوجه عام والى الاستاذ الدكتور اريج
عطيه حسين المشرف على البحث بوجه خاص والذي كان له دور
كبير في اعطائي المعلومات القيمة.....

اهدي لكم بحث تخرجي واتمنى ان يحوز رضاكم

Frequency of Rotavirus infections among Iraqi Children

Ahmed Shamel¹ and Areej Atiyah Hussein²

1, 2 University of Diyala- College of Medicine

Abstract

Background: Rotavirus is still the main cause of diarrhea in children. The World Health Organization has indicated that more than half a million children under the age of five face death because of contracting rotavirus, and most of them are from poor countries. Adults seem to be less frequently affected by rotaviruses most likely due to partial immunity resulting from prior infections.

Objective: To determine the infection rate of rotavirus among children in our population.

Results: Stool sample were used to rotavirus detection among children in different age groups using immunological techniques such as latex agglutination test, immune chromatography (Rapid test) and enzyme linked immunosorbent assay (ELISA) or molecular methods such as polymerase chain reaction (PCR) and real time-polymerase chain reaction (RT-PCR) and the rates varying between 18-57% in different Iraqi cites depend on sociodemographic and clinical characteristics.

Conclusions: Rotavirus infection still major public health problem in our population and the rates diverse from one area to another according to many factors.

Introduction

Approximately 500,000 children under 5 years of age die annually secondary to diarrhea with rotavirus as the leading cause. It is estimated that 200,000 people die annually secondary to rotavirus infection. Severe dehydration is responsible for death in rotavirus infections [1]. Males are twice as likely to be admitted to hospital as females [2]. In temperate areas, rotavirus infections occur primarily in the winter, but in the tropics, they occur throughout the year probably due to seasonal changes in temperature and humidity [3].

Rotavirus is the leading single cause of severe diarrhea among infants and children [4]. They are members of the Reoviridae family and contain a genome consisting of 11 segments of double stranded RNA (dsRNA) enclosed in a triple layered capsid [5]. The outer layer of rotaviruses is composed of two proteins, VP7 and VP4, encoded by RNA segments 9 and 4, respectively. Those proteins elicit neutralizing antibody responses and form the basis of the current classification of group A rotaviruses into G (VP7) and P (VP4) types, where G stands for glycoprotein and P for protease sensitive protein [6]. There are seven groups of this virus, referred to as A-G. Rotavirus A, which accounts for more than 90% of rotavirus gastroenteritis in human, is endemic worldwide [7].

Rotavirus is transmitted by the faeco-oral route. It infects cells lining the small intestine and the rotavirus non- structural protein 4 (NSP4) was proposed to function as an exotoxin, which induces gastroenteritis, leading to severe diarrhea and sometimes death through dehydration [8]. Outbreaks of rotavirus A diarrhea are common among hospitalized infants, young children and elderly people in nursing homes [9]. However, with each infection, immunity develops, and subsequent infection is less severe [10].

Rotavirus has an incubation period varying from 1 to 3 days, after which symptoms appear abruptly with varying presentations. Symptoms congruent with infection are almost identical to other gastrointestinal infections; however, rotavirus infections tend to be more severe. Fever, diarrhea, and vomiting are the most common presenting symptoms. There is variability seen amongst infected patients ranging from short term, mild diarrhea to severe diarrhea with fever and vomiting. Symptoms are most severe in patients whose first infection occurs after 3 months of age. Infants most commonly present with mild symptoms and have a lower likelihood of severe infection. Some infants, however, have been found to present with necrotizing enterocolitis [11].

Laboratory-confirmed diagnosis is desired, a rotavirus antigen can be found in stool samples using enzyme-linked immunosorbent assay (ELISA) or immunochromatography. The addition of reverse transcription PCR (RT-PCR) assays are more sensitive and allow genotyping of virus isolates and as such, may be indicated in epidemiological studies. Additional methods of detection include electron microscopy, polyacrylamide gel electrophoresis, antigen detection assays, and virus isolation. In most cases, confirmation testing is only indicated if it could potentially cut costs by decreasing hospital stay or avoiding unnecessary procedures [12].

Treatment of rotavirus infection is directed at the relief of symptoms and the treatment and prevention of associated dehydration. Oral rehydration salt solutions should initially be attempted. In adults, codeine, loperamide, and diphenoxylate can be added to help with symptom relief and to control the volume of diarrhea. Bismuth salicylate has also been proven to be beneficial in the treatment of rotavirus symptoms but should only be considered when other infectious agents have been ruled out [12].

Review of Iraqi Studies

Several researchers recorded different infection rates with Rota viruses among Iraqi governorates, such as Al-Zuheiry *et al.*, (2010) who showed that the overall infection rate by rotavirus among 500 patients was 20.3%, and the highest infection rate was among those below 5 years in Baqubah- Diyala province [13]. Hasan (2013) who reported that females had an insignificantly higher infection rate compared to males (22.1% vs. 18.9%) among patients with diarrhea using BioRad-Rota kit in Baqubah - Diyala province [14]. Hussein *et al.*, (2018) who identify 20% (30 out of 160) from children with gastroenteritis admitted to Al-Batool Teaching Hospital for Maternity and Children in Baqubah city using Cer Test one step [15].

Three studies conducted in Baghdad such as study of Abdul Sattar (2012) who reported 11 cases (18.03%) had positive Rotavirus infection among 61 children admitted to Children Welfare Teaching Hospital [16], Musa *et al.*, (2019) who found 21.4% (21 out of 98) among children with acute gastroenteritis in two hospitals which are Children's Protection Teaching Hospital and Al-Alawiya Children's Hospital from October, 2018 till end of January, 2019 using multiplex RT-PCR [17]. Recently Abdulridha (2019) who reported 30.3% among all collected samples [18].

Muneam (2020) found 32% in Ramadi [19] and Abd-Al Fattah *et al.*, (2020) who reported 32.6% of rotavirus group A among 150 children with diarrhea admitted to Maternity and Children Hospital in Ramadi city at Al-Anbar governorate using rapid test [20]. Abood *et al.*, (2013) who found that 42.45% were positive for rotavirus among 384 infants with gastroenteritis were admitted to Maternity and Child Teaching Hospital in three governorates (Addiwaiya, Najaf and Babylon) and two hundred fourteen infants from the attendants of outpatient departments of the hospitals, some primary health care centers and some private clinics using latex agglutination test from June 2010

to April 2012 [21]. Al-Khafaji and Hawraa (2013) who found that 45.76 % (112 out of 236) samples fecal samples from outpatients and hospitalization children with acute gastroenteritis in Babylon governorate using latex agglutination test and ELISA for rotavirus antigen detection [22] and Mutlak *et al.*, (2018) who reported 48% in Babylon City [23].

Several Iraqi studies conducted in North of Iraq, such as Jaff *et al.*, (2016) who detected 22% (22 out of 100) children with gastroenteritis under 5 years old attended Sulaimani Pediatric Hospital using VIKIA test [24], Salih (2009) the incidence of RV infection in was 28.7% among 150 children hospitalized with acute diarrhea referred to Ibn-Al-Atheer pediatric Hospital in Mosul city using Latex agglutination test [25], Zaman *et al.*, (2012) reported 33.3% Rotavirus using immunochromatographic in Kirkuk city-Iraq [26] and Herish *et al.*, (2006) who reported 37% of rotavirus gastroenteritis were found in different study in Iraqi Kurdistan [27].

Numerous Iraqi studies conducted in South of Iraq, such as Hussein and Hassan (2000) who detected 43.3% among patients with acute diarrhea admitted to Basrah Maternity and Children's Hospital [28], Thwiny and Hasoni (2015) reported 40% among children with acute diarrhea in Basrah City [29], Habash and Sawsan (2018) who reveals that 32.5% among 120 children with acute gastroenteritis aged less than 5 years old were admitted to the pediatric wards hospitalized in Basra [30] and Jarullah and Mohammed (2019) revealed that 45% among 100 infants and children under five years of age in Thi-Qar Province south of Iraq for five Months (From November 2017 to March 2018) using RT-qPCR [31].

The variation in the Rota infection rates among Iraqi cites may be related with fact that they had been take place before the introduction of Rota vaccine to the national immunization schedule in Iraq during 2012. This fact supported in study done by Sadeq *et al.*, (2019) showed that rotavirus vaccine is effective in reducing the severity and duration of infection in 715 patients with

gastroenteritis admitted to Al-Kadhimiyyah Pediatrics Hospital in Baghdad using commercial Kits (Biotec-UK) [32]. The possible explanation of such higher frequency of rotavirus in some vaccinated cities despite the use of the vaccine is the emergence of new genotypes and new strains not included in the vaccine, and this is due to the nature of the genome virus of re-assortment or due to missed Rota vaccine doses especially those who did not receive any dose in some families.

The significantly higher infection rate among patients consuming rivers water for drinking and swimming compared to other sources of water supply is noticeable with most previous studies affirming the importance of contaminated water for transmitting the virus [14]. Several studies have documented the detection of rotavirus from rivers and surface waters using molecular techniques. Contamination of water undoubtedly comes through human and probably animal excreta, and in this regard, it has been documented that one gram of the faeces of infected person contains more than 10 trillion of viral particles, and that only 10-100 viral particles are needed to transmit the infection.

Some study reported higher frequency of rotavirus infection is found among bottle fed due to bottle feeding carries a risk of diarrhea for many reasons such as improper feeding practice, poor sterilization technique and risk of infection, and cow's milk allergy, such as study done by Hasan *et al.*, (2011) who found the effects of bottle feeding (55.30%) on the frequency of anti-rotavirus IgG antibody in both patients and healthy groups were statistically insignificant [33]. Mohamed *et al.*, (2013) who found high frequency of rotavirus in children with acute gastroenteritis under one year with high incidence of Bottle-Feed 22 cases (52.37%) in the Al-Salam hospital and Al-Madana Clinical Laboratory in Mosul City [34]. Al-Saidy (2019) who reported 136 patients (56.67%) were artificially fed among children suffered from diarrhea in Al-Diwaniyah [35]. Fenjan and Basim (2019) found 22 children (48.9%) are fed on bottle feeding in children under five years old in Thi-Qar Province [36].

Other study done by Al-khafagi *et al.*, (2011) who reported that the statistical analysis was highly significant $P < 0.05$ in mixed feeding in comparing with breast feeding in acute infantile diarrhea using rapid chromatography immunoassay for the qualitative detection of rotavirus in human feces specimens [37]. Breastfeeding was found to be associated with a lower incidence of rotavirus gastroenteritis. Breastfed infants whose mothers had high titers of antirotavirus-IgA in breast milk remain less affected by rotavirus compared to those with low titers of anti-RV-IgA. Breast milk also contains bioactive components like lactoferrin, lactadherin, secretory IgA, lymphocytes, oligosaccharides and human milk glycans which have a role in developing the innate immunity in addition to the antimicrobial peptides which are abundant in human milk. Unlike the human ones, bovine lactadherin is not active against Rotavirus infection [38].

Rotavirus infection has been observed to follow a seasonal pattern in our country, where it is associated with cooler temperatures and a drier atmosphere. The seasonal distribution of this infection during the cooler months has been reported before for temperate regions. The prevalence of rotavirus infection peaked in the Autumn season, when temperatures were low, and decreased in summer [21]. Hassan *et al.*, (2016) Who reported that the infection increased in the colder months of the year after perform study on children with acute gastroenteritis under five years old admitted to Basrah General Hospital during study period 2008-2013 [39].

The significantly higher infection rate was reported among parents' patients with the low education and low health education, Ibraheem (2012) who found most of the mothers of the patients were illiterate 78 cases (38.6%) among 202 patients suffering from diarrhea over 6 months period in Children Welfare Teaching hospital in Baghdad [40].

In conclusion. Rotavirus infection still major public health problem in our population and the rates diverse from one area to another according to many factors.

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