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Rotavirus Gastroenteritis among Children Under five years of age in Gaza, Palestine.

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ABSTRACT

Background: *Rotavirus belongs to the Reoviridae family, a group of segmented double stranded Ribonucleic acid viruses. The virus is a major cause of gastroenteritis and diarrhea in infants and young children worldwide. Rotaviral gastroenteritis may result in mortality for populations at risk such as infants, the elderly and immune compromised patients.*

Objective: *This study aims to evaluate occurrence of rotavirus among under five years children with acute gastroenteritis attending Nasser complex and European Gaza Governmental Hospitals, Palestine during august 2018.*

Methods*: Cross sectional design used in this study, Fecal samples from 100 children with ages ranging from less than 1 month to 5 years, living in the south Gaza, who presented with acute gastroenteritis and diarrhea episodes, were analyzed. sufficient quantity of faces (1-2 grams or milliliters for liquid sample one per each subject) is collected as soon as the children were admitted to the hospital by the help of their parents in clean and dry containers (no preservatives or transport media are used). The samples was been tested immediately using an immune chromatography-based diagnostic kit. The study was conducted during the peak diarrheal season August of the year 2018.*

Results*: Rotavirus was detected in 35% of the fecal specimens examined, and most of positive tested patients (86%) were under 24 months old, the infection rates was increase with the decreasing of the age. Children infected with rotavirus were more likely to be watery stool 65.7%, fever 60%, vomiting 82.8% and dehydration 68.6%.*

***Conclusions**: The findings of this study demonstrated that Percentage of positive samples among children younger than 5 years still nearly the same or slightly higher than that have been detected in Gaza since 2006. Reflect that no effectiveness of vaccine in reducing morbidity or infection.*

Keywords: Rotavirus, Gastroenteritis, Gaza, Palestine.

Introduction

Acute gastroenteritis is considered as one of the leading causes of illness and death in children under the age of 5 years (Youssef et al**.,**2000). It's characterized by acute onset of diarrhea, which is not accompanied by nausea, vomiting, fever, abdominal pain, and dehydration. Acute gastroenteritis is prevalent worldwide and associated with high rates of morbidity and mortality in developing countries (Fruhwirth et al**.,**2001). Acute gastroenteritis and diarrhea are common and costly problems that cause significant morbidity and mortality in children worldwide. In Palestine, diarrhea is one of the major causes of outpatient visits and hospitalizations (Abu Elamreen et al. ,2006& World Health Organization,2009). Viral infections cause about 70% of diarrhea in children, where rotavirus remain the most commonly pathogen (Barnes etal.,1998). Rotaviruses are an icosahedral 76.5 nanometer, double-shelled RNA virus of the family *Reoviridae*, a family of double-stranded segmented RNA genome viruses (Pesavento et al., 2006).

A appropriate and quick diagnosis of rotavirus infection in acute diarrheal cases will help to choose the suitable treatment and stop the needless use of antibiotics (DhiMan et al., 2015).After the introduction of the vaccines, there has been a marked reduction in the incidence of viral diarrhea especially in Europe, Australia and the United States of America (Grimwood et al., 2007). The effectiveness of the application of vaccine in the Gaza strip is not evaluated yet.

Worldwide epidemiology of rotaviruses ranged from 9.35% in Brazil with prevalence rates 11.12% in the pre-vaccine to 5.07% in the post-vaccine period, 25% in Africa, 25.6% in Tirupati India, 40% among inpatients and 23% among outpatients in Eastern Mediterranean region, and 46.4% in the eastern India(Badur et al**.,** 2015, Sarangi et al., 2015, Assis et al., 2013, Waggie et al., 2010 & Malek et al., 2010), In Gaza strip, Palestine before the admission of rotavirus vaccination the prevalence was 28% (Abu Elamreen et al., 2006).

To our knowledge, this is the first report on the occurrence of rotavirus infection among children of Gaza after the application of vaccines.

2. Materials and Methods

2.1 Study population and period

During August 2018, one hundred stool samples were randomly collected from children under the age of 5 years with acute gastroenteritis attending the two largest hospitals in the south of Gaza (Nasser complex hospital and Gaza European Hospital), A consent form about the study has been obtained from the parents of the children.

2.2 Samples collection and biochemical test

Sufficient quantity of feces (1-2 grams or millimeters of liquid sample) were collected in clean and dry containers as soon as the children were admitted to the hospital by the help of their parents, no preservatives or transport media were used.

The fresh diarrheal fecal specimen was transferred immediately within one hour to the university college of Science and Technology laboratories for macroscopically, microscopically and serology testing. Rotavirus antigen was detected by rotaStick one-step test kit **(**Novamed Ltd, Jerusalem), according to manufacturer's instructions, in brief, a little sample (50mg) is picked up from fecal specimen and put into the testing tube with buffer solution. The content of a test tube was then mixed vigorously to suspend the specimen, the dipstick test strip was placed vertically into the sample tube and removed after 10 seconds or when the fluid had reached the middle of the test area of the dipstick, results were reported after 10 minutes, a red color band is an indication for the presence of rotavirus.

For parasitological examination samples were microscopy and macroscopy tested for the presence of parasites, worms, blood and mucus.

2.3 Questionnaire interview

A face-to-face questionnaire was filled for each child containing information such as age, gender, residence, clinical data, fever, vomiting, and dehydration rate, type of diarrhea and previous hospitalization, parent's education level and employment. .

3. Data analysis

The data was collected and analyzed using the statistical package for social sciences (SPSS Version 22.0) . Differences in proportions were assessed by chi-square test, p-value ≤ 0.05

4. Results

During August 2018, One hundred samples (55 male and 45 female) were collected from children under the age of 5 years suffering from particularly diarrhea, Sixty five samples were collected from Nasser Medical Complex and thirty-five samples from European Gaza Hospital.

The mean age of the patients was 14.28 month, standard deviation ±12.9 months, the minimum age was less than 1 month where the maximum age was 60 months. The distribution of samples according to age groups indicated that (86%) of diarrhea was observed in the age ≤ 24 months, (57%) of the infected cases was Infants ≤ 12 months and (29%) of the infected cases was 12 to 24 months. Rotavirus antigen was detected in (35% of the tested samples, no statistically significant difference was found between rotavirus results and age groups (p=0.11) **(Table1).**

Table 1: distribution of rotavirus results.

Rotavirus	Age by months					Total
	1 - <12	12 - <24	24 - <36	36 - <48	48 - < 60	
Positive	21	7	3	1	3	35
Negative	36	22	0	3	4	65
Total	57	29	3	4	7	100
P value = 0.111						

Stool samples were tested for parasitic infection, and the results show that (74%) were negative for parasitic infections, (19%) were positive for *Entamoeba histolytica* only and (1%) were positive for *Giardia lamblia*, (6%) mixed infections was found between *Entamoeba histolytica* and rotavirus **(table2).**

Table 2 : serological and Parasitological examination results

Test results	Percent
Negative	(45%)
Rotavirus positive	(29%)
Entameba histolytica	(19%)
Rotavirus and *Entameba histolytica*	(6%)
Giardia lamblia	(1%)
Total	(100%)

Relationship between Rotavirus, patient's age and sex

Although there was a slightly increased in males attending the hospitals due to acute diarrhea (55%) Than females (45%) no statistically significant difference was found (P value = 0.3). on the other hand Although most of the affected children were less than one year no statistically significant difference was found among different ages (P = 0.111) **(table 3,1).**

Table 3: Distribution tested cases according to sex

Rota result	Patient sex		Total
	Male	Female	
Positive	21	14	35
Negative	34	31	65
Total	55	45	100
P value= 0.3			

Relationship between rotavirus and parents education and mother employee:

No statistically significant difference was found between education level of both parents with rotavirus infections, also no statistically significant difference was found between mother employee with rotavirus infections (p =0.20 and 0.3 respectively**)(table 4,5)**.

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Tables 4 : Cross tabulation between rotavirus and fathers and Mothers education level

Father	Rota Result	Education level of fathers				Total
		Primary school	Preparatory school	Secondary school	University	
	Positive	4	7	17	7	35
	Negative	5	9	27	24	65
	Total	9	16	44	31	100
	P value=0.33					
Mother	Rota Result	Education level of mothers				Total
		Primary school	Preparatory school	Secondary school	University	
	Positive	2	2	17	14	35
	Negative	1	5	25	34	65
	Total	3	7	42	48	100
	P value=0.43					

Tables 5 : cross tabulation between rotavirus and mothers Jobs

Rota result	Mothers jobs		Total
	Housewife	Working	
Positive	34	1	35
Negative	64	1	65
Total	98	2	100
P value =0.580			

Relationship between rotavirus and Vomiting , Fever , Dehydration and Types of diarrhea :

there were no statistically significant difference with vomiting, fever and dehydration of patients, on the other hands a statistically significant difference was found between rotavirus infection and type of stool were most of positive rotavirus patients have watery diarrheal stool

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(table 6, 7,,8,9). T**ables 6 : Cross tabulation between rotavirus and vomiting**

Rota result	Vomiting		Total
	yes	No	
Positive	29	6	35
Negative	48	17	65
Total	77	23	100
P value = 0.222			

Table 7 : Cross tabulation between rotavirus and Fever

Rota result	Fever present		Total
	yes	No	
Positive	21	14	35
Negative	43	22	65
Total	64	36	100
P value = 0.345			

Table 8: cross tabulation between rotavirus and dehydration

Rota result	Dehydration		Total
	yes	No	
Positive	24	11	35
Negative	36	29	65
Total	60	40	100
P value = 0.142			

Table 9: Cross tabulation between rotavirus and types of diarrhea

Rota result	types of diarrhea			Total
	mucoid	Watery	Others	
Positive	12	23	0	35
Negative	40	22	3	65
Total	52	45	3	100
P value =0.004				

5. Discusion

Rotavirus was detected in (35%) of the fecal specimens collected from children of < 5 years of age with acute diarrhea, using an immune-chromatographic assay, this percentage was higher than detected previously in Gaza in 2006 (28%) before application of vaccine, this explain by that vaccine may decrease severity and mortality, but not morbidity. and that in Middle East and North Africa (34%) and Less than in Eastern Mediterranean region (40%) for in patients (Zaraket et al., 2017, Malek et al., 2010 & Abu Elamreen et al., 2006). The low or high rates of rotavirus infections presented by different investigators can be explained by several factors including, the study population, the incidence rate of the virus in different environments, the living conditions and standards of the study group, and the season on which the study was conducted.

Out of the 100 diarrheal patients enrolled in the study, (86%) of patients were less than 24 months of age, this finding is consistent with previous study in Gaza (84%)(Abu Elamreen et al., 2006).

The children enrolled in this study were divided into five age groups, (86%) of all cases of rotavirus occurred in children <24months, which is in agreement with many other studies in Gaza (90%), in Middle East and North Africa (MENA) Region (40%) , in Iraq (67.1%), and in India (69%) (Zaraket et al., 2017, Sarangi et al., 2015, AL-Khafaji et al., 2013 & Abu Elamreen et al., 2006).

Decreasing rates of rotavirus infection was observed with the increasing of age due to protective immunity accepted by children during previous infection with rotavirus, this finding was mentioned by other authors in Gaza, in Georgia, and in Thailand (Abu Elamreen et al., 2006, Jiang et al., 2002& Maneekarn et al., 2000). Fifty-five percent of male and forty-five percent of female cases of acute diarrhea were examined in this study. Slightly more males were admitted to the hospital due to diarrhea, rotavirus prevalence was higher in male cases 38.2% than in females 31.1%, this disagree with study in Gaza where female higher than male , and India were males to females ratio was approximately equal(John et al., 2014 & Abu Elamreen et al., 2006).

Although Children infected with rotavirus were more likely to have watery stool (65.7%), fever (60%), vomiting (82.9%) and dehydration (86.6%) these clinical symptoms have no statistically significant with rotavirus infections, on the other hands there was statistically significant relation between rotavirus infection and type of stool where most of positive rotavirus patients have watery stool, this was in agreement with a number of studies in Gaza, Italy, Argentina and Vietnam (Abu Elamreen et al., 2006, Cuestas et al., 2005, Nguyen et al., 2004 & Cascio et al., 2001) .

Our results showed no statistically significant relation between rotavirus infection and parents education or mother jobs this disagree with other studies in Uganda, and Baghdad that show significant association between rotavirus infection with education level of mothers (Hussein et al., 2015 & Nakawesi et al., 2010) **.**

Also the current study showed that no effect of vaccine application on the percentage of positive samples with rotavirus in children less than 5 years that attended to hospitals with acute gastroenteritis this explain by that vaccine may decrease severity and mortality, but not morbidity, this finding disagree with other studies in Brazil that indicated reduction in prevalence rate from (11.12%) to (5.07%) after application of vaccine, in Latin America there was a reduce risk of any severity with rotavirus related gastroenteritis by (65%) and in systemic review Efficacy against severe rotavirus diarrhea ranged from (90.6%) in the developed region to (88.4%) in Eastern/ South-eastern Asia, (79.6%) in Latin America and the Caribbean, (50.0%) in Southern Asia and (46.1%) in sub-Saharan Africa (, Velázquez et al., 2017, Lamberti., 2015& Assis et al., 2013).

6. Conclusions

Percentage of positive samples among children younger than 5 years still nearly the same or slightly higher than that have been detected in Gaza since 2006. Reflect that no effectiveness of vaccine in reducing morbidity or infection.

7. Recommondations

Other studies needed to evaluate the affectivity of it against mortality and severity factors like degree of dehydration, fever, vomiting, duration and electrolytes values, and PH that may help in determination of severity.

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