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A RESRARCH STUDY TO ASSESS THE CLINICAL COMPLICATIONS AND FEATURES OF ROTAVIRUS GASTROENTERITIS AMONG CHILDREN

[1]Dr. Komal Nizam, [2]Dr Muhammad Usman Khan, [3]Dr Qurrat ul Aen Zafar

[1]Services Hospital Lahore, [2]Shaikh Khalifa Bin Zayed Al-Nahyan Medical and Dental College, Lahore, [3]DHQ Hospital, Jhang.

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Abstract:

Background: *Rotavirus is one of the major viruses causing an onset of acute gastroenteritis among children and it is also correlated with neurological complications such as encephalopathy and seizures.*

Objective: *This research aims to investigate the complications and presentation of rotavirus versus non-rotavirus gastroenteritis.*

Methods: *This retrospective, hospital-based and case-control study was carried out at Jinnah Hospital, Lahore (October 2017 to August 2018). The research included children from one month to sixteen years of age who were diagnosed with acute gastroenteritis. These children were evaluated for stool virology and PCR confirmed rotavirus presence. These patients were matched for presentation month, gender and age with negative rotavirus gastroenteritis.*

Results: *Research sample consisted of 116 children among which cases were 50 and controls were 66. Children diagnosed with the presence of rotavirus gastroenteritis also presented metabolic acidosis (pH 7.30 versus 7.37 pH) P-Value = 0.011 and fever (P-Value = 0.005; 74% vs 46%) which also required hospitalization than non-rotavirus gastroenteritis children (P-Value = 0.019; 93% vs 73%). Neurological complications were mostly repeated extraintestinal indices, but there was no significant difference between rotavirus negative and positive gastroenteritis children RPG versus RNG (P-Value = 0.24; 24% vs 15%). Encephalopathy occurred in three children (6%) with rotavirus infection.*

Conclusion: *Rotavirus tends to cause more severe and longer disease than other viral pathogens. Milder neurological signs and seizures are common and related to multiple pathogens; whereas, only rotavirus gastroenteritis diagnosed children presented Encephalopathy.*

Keywords: *Seizures, Rotavirus, Disease, Pathogen, Encephalopathy and Gastroenteritis.*

Corresponding author:

Dr. Komal Nizam,

Services Hospital Lahore.

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INTRODUCTION:

Rotavirus is one of the major viruses causing an onset of acute gastroenteritis among children and it is also correlated with neurological complications such as encephalopathy and seizures [1]. The annual rotavirus-associated gastroenteritis burden is twenty-five million outpatient visits, 180,000 deaths and 2 million hospitalizations among children of under five years of age [2]. Majority of the infections are acquired through the community but rotavirus is another major cause of nosocomial diarrhoea which is mostly reported among infants of under six months of age [3]. Moreover, rotavirus is not limited to intestine only [4]. Neurologic manifestations such as febrile or afebrile convulsions, encephalopathy, meningoencephalitis and cyberelites are also among common extraintestinal complications [5]. A systematic review was carried out in eight different countries which reported reduced hospitalization (49 ± 89%) because of rotavirus and reduced hospitalization (17 ± 55%) because of gastroenteritis after vaccination of children of under five years of age [6]. The rotavirus gastroenteritis burden is well known but the complications associated with rotavirus are less known. This research aims to investigate the complications and presentation of rotavirus versus non-rotavirus gastroenteritis.

METHODS:

This retrospective, hospital-based and case-control study was carried out at Jinnah Hospital, Lahore (October 2017 to August 2018). The research included children from one month to sixteen years of age who were diagnosed with acute gastroenteritis. These children were evaluated for stool virology and PCR confirmed rotavirus presence. These patients were matched for presentation month, gender and age with negative rotavirus gastroenteritis. The diagnostic test utilized two triplex PCR respectively targeting the genotype I & 2 of rotavirus & norovirus and one focused on the adenovirus, astrovirus and sap-virus [07]. Children with acute gastroenteritis among which PCR confirmed rotavirus were cases; whereas, non-PCR rotavirus cases with acute gastroenteritis were controls. Acute gastroenteritis refers to three episodes of loose stools or a forceful act of vomiting occurring in the timeframe of twenty-four hours which can lead to acute gastroenteritis [08].

Data were extracted from medical notes of the patients through computerized data system with clinical features and associated complications. Encephalopathy refers to an altered level of lethargy, consciousness or personality change which lasted for more than twenty-four hours. Statistical analysis was carried out through Fisher's exact test, Student t-test and Mann-Whitney test. Patient's informed consent and ethical approval were also taken before the commencement of research.

RESULTS:

The research sample consisted of 116 children among which cases were 50 and controls were 66. Children diagnosed with the presence of rotavirus gastroenteritis also presented metabolic acidosis (pH 7.30 versus 7.37 pH) P-Value = 0.011 and fever (P-Value = 0.005; 74% vs 46%) which also required hospitalization than non-rotavirus gastroenteritis children (P-Value = 0.019; 93% vs 73%). Neurological complications were mostly repeated extraintestinal indices, but there was no significant difference between rotavirus negative and positive gastroenteritis children RPG versus RNG (P-Value = 0.24; 24% vs 15%). Encephalopathy occurred in three children (6%) with rotavirus infection. Detailed clinical presentation, baseline features, laboratory variables, extraintestinal co-infections and complications are shown in the given tables.

Table – I: Baseline Features

Variable	Rotavirus Positive Gastroenteritis (50)		Rotavirus Negative Gastroenteritis (66)		P value
	Mean/ Number	SD/ Percentage	Mean/ Number	SD/ Percentage	
Age at admission (Mean ± SD)	24	21	25	29	
Female	22	44	33	50	
Community acquired	41	82	60	91	0.17
Underlying chronic medical condition	15	30	23	35	0.69
Hospitalized	38	93	44	73	0.019
Excluding hospital-acquired disease	41	82	60	91	

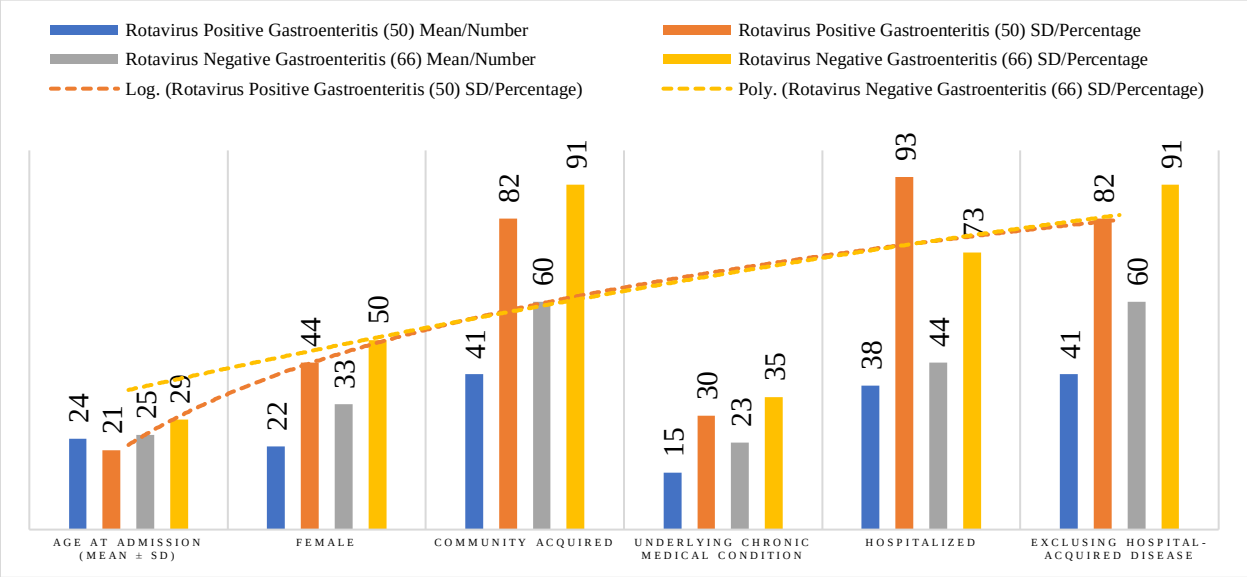


Table – II: Clinical presentation

Variable	Rotavirus Positive Gastroenteritis (50)		Rotavirus Negative Gastroenteritis (66)		P-Value
	Mean/ Number	SD/ Percentage	Mean/ Number	SD/ Percentage	
Diarrhoea	43	86	62	95	0.2
Vomiting	37	74	39	60	0.12
Fever	37	74	30	46	0.005
Fever, ^{o}C (Mean ± SD)	38.4	1	37.8	1.1	0.009
Total illness days (Mean ± SD)	4.6	2	5.3	4	0.33
Need for Readmission within 28 days	3	6	0	0	0.07
Dehydration	21	44	16	26	0.07
Received IV fluids	25	50	24	36	0.18

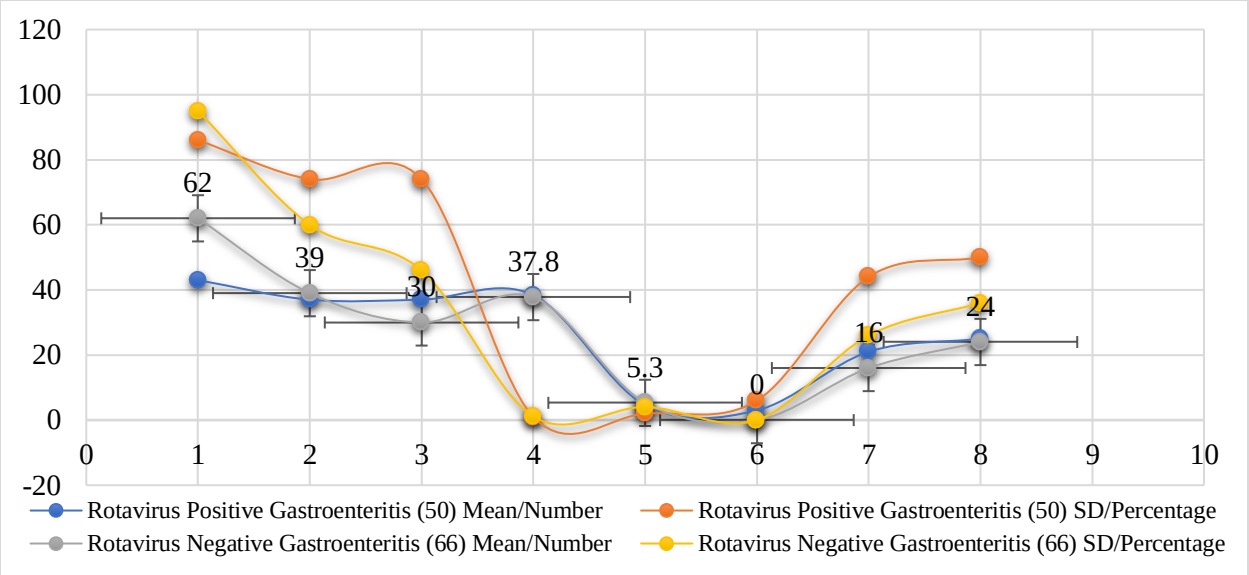


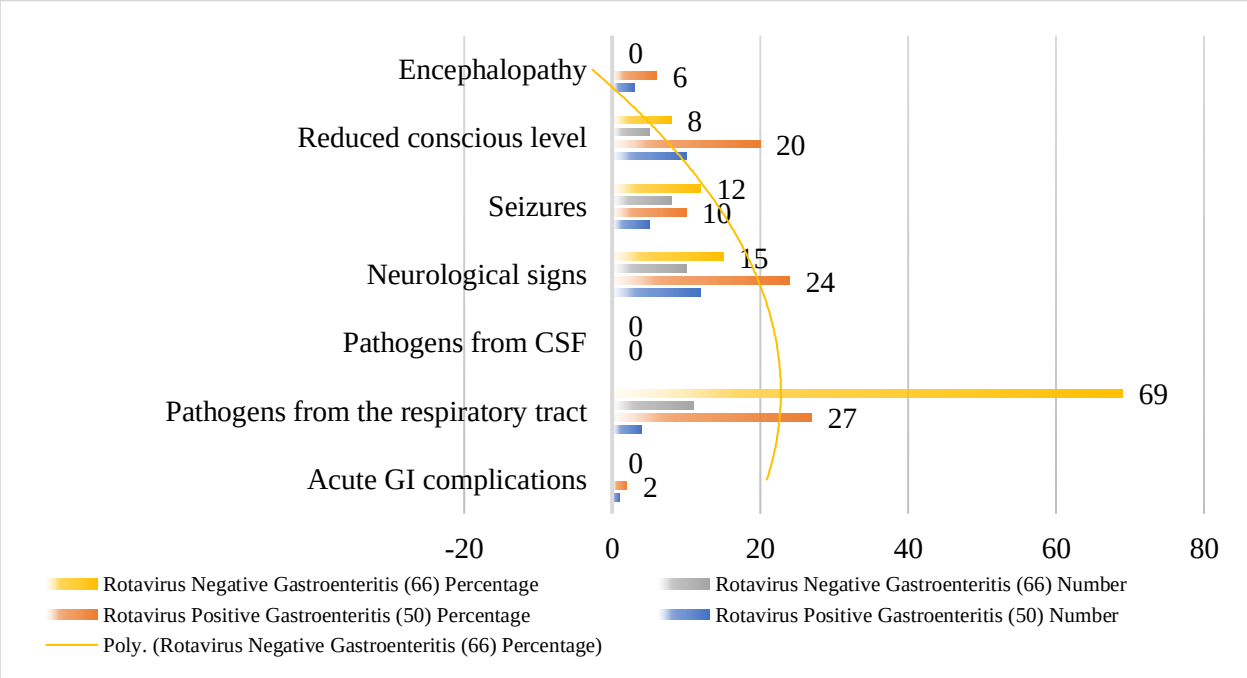
Table – III: Laboratory Variables

Variable	Rotavirus Positive Gastroenteritis (50)		Rotavirus Negative Gastroenteritis (66)		P-Value
	Mean/ Number	SD/ Percentage	Mean/ Number	SD/ Percentage	
pH; mean (SD)	7.3	0.07	7.37	0.06	0.011
Base excess, mmol/L; mean (SD)	8.5	3.7	3.9	3.9	0.003
Bicarbonate, mmol/L; mean (SD)	17	3	21	3	0.001
Sodium, mmol/L; mean (SD)	139	6	138	4	0.87
Potassium, mmol/L; mean (SD)	44	0.6	4.3	0.5	0.4
Creatinine, µmol/L; mean (SD)	39	14	34	13	0.07
Urea, mmol/L; mean (SD)	5.9	3.3	4.2	1.8	0.004
Glucose, mmol/L; mean (SD)	4.6	1.3	5.2	1.2	0.25
ALT, IU/L; mean (SD)	40	22	35	53	0.007
White cell count, 10^9 cells/L; mean (SD)	11.4	7.3	12.9	6.7	0.12
Lymphocytes, 10^9 cells/L; mean (SD)	2.7	2.1	4.4	3.1	0.008
Neutrophils, 10^9 cells/L; mean (SD)	7.5	6.8	6.9	4.9	0.94
Platelets, 10^9 cells/L; mean (SD)	299	117	317	111	0.29
CRP (highest), mg/L; mean (SD)	24	39	43	57	0.11
Abnormal EEG; n (%)	1	33	0	0	1
Abnormal neuroimaging results; n (%)	1	50	0	0	0.4

Table – IV: Extraintestinal co-infections and complications

Variable	Rotavirus Positive Gastroenteritis (50)		Rotavirus Negative Gastroenteritis (66)		P-Value
	Number	Percentage	Number	Percentage	

Acute GI complications	1	2	0	0	0.43
Pathogens from the respiratory tract	4	27	11	69	0.03
Pathogens from CSF	0	0	0	0	1
Neurological signs	12	24	10	15	0.24
Seizures	5	10	8	12	0.78
Reduced conscious level	10	20	5	8	0.06
Encephalopathy	3	6	0	0	0.08



DISCUSSION:

Children diagnosed with rotavirus gastroenteritis frequently presented fever, metabolic acidosis and dehydration in comparison with non-rotavirus gastroenteritis children which were likely to be hospitalized. Febrile and afebrile seizures and reduced transient consciousness were also reported among the majority of the children; whereas, encephalopathy was reported among rotavirus gastroenteritis children. Metabolic acidosis and Dehydration are secondary to loss of fluid were common complications reported among gastroenteritis patients. Outcomes of this research are similar to the past studies that rotavirus leads to gastroenteritis which is severe and longer than gastroenteritis caused due to various other viral pathogens [09 – 11]. It was striking to note that neurological complications were higher than in previously reported healthy children presented with gastroenteritis. Morooka first time introduced seizures related to viral gastroenteritis back in 1982 [12]. The evidence about the rotavirus association is also well known [13 – 15]. Adenovirus, norovirus and sap-virus also pose their implication as a virus [16]. Non-febrile seizures have been described by CwG (Convulsions with Mild Gastroenteritis) which are linked with gastroenteritis in the absence of electrolyte imbalance and dehydration [17]. Less possibility is present about epilepsy; moreover, longer use of antiepileptic drugs is also not advisable [18]. There is also an association of rotavirus gastroenteritis with febrile seizures. Neurological complications and seizures were higher among rotavirus gastroenteritis affected children than non-rotavirus gastroenteritis affected children. A trend was also found towards encephalopathy which occurred in rotavirus-positive; whereas, no case was reported in rotavirus-negative group. MERS patients presented delirious behaviour, consciousness or seizures disturbance which remained usually for one week after the presence of gastroenteritis symptoms and resolved in the time of ten days [19]. Rotavirus increases the concentration of intracellular calcium. Calcium disruption homeostasis which was induced

by NSP4 has a critical role in the diarrhoea pathogenesis [20].

A recent study suggests a correlation between reduced seizures, rotavirus vaccine, decreased hospital visits and hospitalization [21].

CONCLUSION:

Rotavirus tends to cause more severe and longer disease than other viral pathogens. Milder neurological signs and seizures are common and related to multiple pathogens; whereas, only rotavirus gastroenteritis diagnosed children presented Encephalopathy.

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