

Assessment of Acute Gastroenteritis in Children Under Five Years of Age by Vesikari Score; A Comparative Analysis of the Efficacy of the Rota-Virus Vaccine

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ABSTRACT

Objective: To assess the severity of acute gastroenteritis by Vesikari score in children under five years of age and compare the severity in children vaccinated for Rotavirus with those who have not been vaccinated.

Study Design: Comparative Prospective study.

Place and Duration of Study: Paediatrics Department, Pak Emirates Military Hospital, and Combined Military Hospital, Rawalpindi Pakistan, from Oct 2019 to Oct 2020.

Methodology: Children aged 1-5 years presenting with acute gastroenteritis to the Outpatient Department were included in the study. Vesikari scoring was carried out in all of them at the presentation time. They were divided into two groups based on their Rotavirus vaccination status. The presence of hyponatremia, hypoglycemia, duration of admission and severity of Vesikari score were compared in both groups.

Results: Out of 250 children presenting with acute gastroenteritis, 135(54%) patients were male and 115(46%) were female. The mean age of the patients was 3.144±2.75 years. 165(66%) were vaccinated for Rotavirus, while 85(34%) were not vaccinated. Based on the Vesikari score, 154(61.6%) had mild, 70(28%) had moderate and 26(10.4%) had severe illness. Hyponatremia, hypoglycemia, longer duration of admission and severe forms of illness were found significantly more in the non-vaccinated group (p -value<0.05).

Conclusion: Vesikari score revealed that many children with acute gastroenteritis had moderate to severe illness. Children not vaccinated with the Rotavirus had more chances of having severe illness.

Keywords: Acute gastroenteritis; Rotavirus vaccination; Vesikari score.

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INTRODUCTION

Acute gastroenteritis is one of the most common clinical conditions encountered by paediatricians in emergency departments and outpatient departments worldwide.¹ Statistics have not been different in our part of the world, and it has not only been the commonest cause of presentation to health care facilities but also one of the leading causes of mortality and morbidity in children.^{2,3} Various strategies have been studied and practised to prevent this potentially dangerous condition, including using the Rotavirus vaccine.⁴ Vesikari worked on this principle and developed a scale incorporating various clinical characteristics of acute gastroenteritis in children, classifying the illness into mild, moderate and severe.⁵ This scoring gives the clinician a fair idea about the severity of the illness at the time of assessment. It is used widely in clinical practice and validated in various studies across the globe.⁶ The severity of acute gastroenteritis in children based on the Vesikari score

has been assessed in various studies and correlated with various factors.⁷⁻⁹ There is a huge burden of diarrheal illnesses among the pediatric age group population in Pakistan, taking the lives of thousands of children each year.² Though the Rotavirus vaccine has been part of EPI for quite some time, it has been seen in clinical practice that many children are still not getting it for various reasons. A recent study has been published comprising data generated from 93 randomly selected outpatient centres assessing the severity of acute gastroenteritis among children using Vesikari scoring.¹⁰ Still, it needs more local data regarding the comparison of severity of illness between vaccinated and non-vaccinated children. Therefore, we planned this study to assess the severity of acute gastroenteritis by Vesikari score in children under five years of age and compare the severity in children vaccinated for the Rotavirus with those not vaccinated.

METHODOLOGY

The comparative prospective study was conducted at the Paediatrics Department of Pak Emirates Military Hospital, and Combined Military Hospital, Rawalpindi Pakistan, from October 2019 to October

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2020 after formal ethical approval (via letter number A/28/EC/244/2021). The sample size was calculated using the WHO sample size calculator by keeping the population proportion of moderate to severe acute gastroenteritis in children as 82%.¹¹ Non-probability consecutive sampling technique was used to gather the sample for this study.

Inclusion Criteria: Children of either gender, aged 1-5 years presenting with acute gastroenteritis were included in the study.

Exclusion Criteria: The study did not include patients with altered sensorium or blood in stools or gastroenteritis secondary to any other medical or surgical condition. Patients already put on antibiotics by the general physician or parents were also excluded from the study. Children with an unclear diagnosis or any haematological, metabolic or neoplastic conditions or those with learning disabilities or cerebral palsy were also excluded from the study. Those who had any contraindication for Rotavirus vaccination and were not vaccinated for this reason were also not included in the study.

Formal consent from the parents of the children was taken. After initial assessment and immediate management, routine blood investigations (full blood count, stool routine examination, serum electrolytes and blood sugar random) were sent for all the patients. Rotavirus vaccination status was asked from the parents of all the study participants and checked from the EPI card as well. Vesikari score was calculated for each child by resident paediatrics. Duration of admission was recorded for all the participants, along with the presence of electrolyte or other biochemical abnormalities at the time of presentation. The severity of acute gastroenteritis, presence of hypoglycemia, hyponatremia and duration of admission were compared in patients with and without the Rotavirus vaccine.

Vesikari score comprises components like duration of diarrhoea and vomiting, number of diarrheal and vomiting episodes, presence and duration of fever, dehydration, and treatment. The total score is 20, and severity was categorised as Vesikari score <7, mild; 7-≤10, moderate; and >10, severe. In the modified score, < 8, mild; 8-≤11, moderate; and >11, severe.¹¹ Hyponatremia was diagnosed if serum sodium levels were lower than 135mmol/L.¹² Hypoglycemia was diagnosed if blood sugar was random at the time of presentation, which was 3.3mmol/L or less.¹³

Statistical Package for Social Sciences (SPSS) version 22.0 was used for the data analysis. Quantitative

variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value of ≤0.05 was considered statistically significant

RESULTS

A total of 250 children presenting with acute gastroenteritis were included in this study. Of them, 135(54%) patients were male and 115(46%) were female. The mean age of the patients was 3.144±2.75 years. 165(66%) were vaccinated for Rotavirus, while 85(34%) were not vaccinated. Based on the Vesikari score, 154(61.6%) had mild, 70(28%) had moderate and 26(10.4%) had severe illness. Table-I summarizes the basic characteristics of the children included in our analysis. Hyponatremia, hypoglycemia, longer duration of admission and severe form of illness were found significantly more in the Non-Vaccinated Group (*p*-value<0.05) as compared to the Group of children who were vaccinated for the Rotavirus (Table-II).

Table-I: Characteristics of Patients with Acute Gastroenteritis included in the study (n=250)

Parameters	n(%)
Age	
Mean Age of patients	3.144±2.75 years
Rota virus Vaccination status	
Group I (Vaccinated)	165(66%)
Group II (Not vaccinated)	85(34%)
Duration of admission	
Mean duration of admission	1.9±1.115 days
Gender	
Male	135(54%)
Female	115(46%)
Severity (Vesikari score)	
Mild	154(61.6%)
Moderate	70(28%)
Severe	26(10.4%)

Table-II: Difference of Study Variables in Vaccinated and Non-Vaccinated Children (n=250)

Factors	Vaccinated	Non-vaccinated	<i>p</i> -value
Hyponatremia			
No	132(80%)	56(65.8%)	0.016
Yes	33(20%)	29(34.2%)	
Hypoglycemia			
No	139(84.2%)	52(61.2%)	<0.001
Yes	26(15.8%)	33(38.8%)	
Duration of admission			
Less than 48 hours	114(69.1%)	42(49.4%)	0.002
More than 48 hours	51(30.9%)	43(50.6%)	
Severity of illness (Vesikari score)			
Mild	106(64.2%)	48(56.4%)	<0.001
Moderate	51(39.1%)	19(22.3%)	
Severe	08(4.8%)	18(21.2%)	

DISCUSSION

Pakistan is a developing country still lacking in various aspects of basic health care infrastructure, which sometimes makes mild diseases such as gastroenteritis potentially life-threatening, especially in vulnerable groups like children. Lapses in the health care system and local health belief model also affect the vaccination procedure, and many children still need to be vaccinated for various infectious illnesses, including the Rotavirus.¹⁴ A real picture of the local Rota virus burden among children suffering from diarrhoea was published by Umair *et al.* in 2014, clearly stating that most children presenting with diarrhoea are positive for the Rotavirus.¹⁵ Limited local data has been available regarding assessing the severity of diarrheal illness based on the Vesikari score and comparison of severity among vaccinated and non-vaccinated children. Therefore, we planned this study to assess the severity of acute gastroenteritis by Vesikari score in children under five years of age and compare the severity in children vaccinated for the Rotavirus with those not vaccinated.

Vesikari *et al.*¹⁶ concluded that Severe Rota virus-related gastroenteritis requiring hospitalization was virtually eliminated in vaccine-eligible children in the three-year follow-up period. Our study results were quite similar as all the manifestations of severe disease on Vesikari score were found significantly less in the group of children vaccinated for the Rotavirus than the non-vaccinated children. Another study revealed that cases requiring intravenous infusion and hospitalization were fewer in the vaccination group than in the non-vaccinated. A severe Vesikari score was less common in the vaccination group than in the non-vaccination group.¹⁷

The effectiveness and impact of the Rotavirus vaccine after four years of follow-up on hospitalization related to Rotavirus acute gastroenteritis were studied by Hemming-Harlo *et al.* in 2017.¹⁸ They came up with the findings that Rota virus-related acute gastroenteritis hospitalizations in children aged <16 years decreased in the two post-National Immunization Program seasons by 79% and 58%, respectively, compared to those in the pre-vaccination seasons. An interesting study from Finland was published in 2014 by Hartwig *et al.*¹⁹ regarding hospital bed occupancy for Rotavirus and all causes of acute gastroenteritis in two Finnish hospitals before and after the vaccination. They revealed that severe illness requiring hospital admission was significantly reduced after

implementing the vaccination program. We studied the severity of acute gastroenteritis on Vesikari score and concluded that severe illness and admission duration were significantly reduced in vaccinated children.

LIMITATIONS OF STUDY

This study had a few limitations. Rotavirus vaccination status was checked from EPI cards or parents of children, which has a chance of recall bias. Patients with less severe disease may not reach tertiary care hospitals and may get managed at home or by general physicians. In our study, participants included all-cause gastroenteritis: stool culture or polymerase chain reaction was not performed on the patients. Therefore, it could not be ascertained that the Rotavirus was the cause of gastroenteritis.

CONCLUSION

Use of the Vesikari score revealed that many children with acute gastroenteritis present with moderate to severe illness. Both biochemical and clinical parameters studied in this analysis showed that children not vaccinated with the Rotavirus had more chances of having severe illness than those vaccinated.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

AR: & QUM: Data acquisition, data analysis, drafting the manuscript, critical review, approval of the final version to be published.

FI: & ANA: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

SM: & SA: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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