





Rotavirus infection and relationship between blood groups

 ¹Erdal SARI
 ¹Özlem ERDEDE
 ¹Nihan UYGUR KÜLCÜ
 ²Eda SÜNNETÇİ SİLİSTRE

¹Department of Pediatrics, University of Health Sciences, Türkiye. Zeynep Kamil Maternity and Children's Training and Research Hospital, İstanbul, Türkiye

²Department of Pediatrics, Kozyatağı Acıbadem Hospital, İstanbul, Türkiye

ORCID ID

ES : 0000-0002-9967-1669
ÖE : 0000-0002-5490-5361
NUK : 0000-0001-8771-5292
ESS : 0000-0003-0450-0152



ABSTRACT

Objective: Rotavirus is currently one of the most common causes of acute gastroenteritis and dehydration in children worldwide. There are some clinical studies about the relationship between rotavirus gastroenteritis and histo-blood group antigens in different centers of the world, and results have been obtained. In this study, we aimed to explore the association of rotavirus gastroenteritis with histo-blood group antigens in children, if any present.

Material and Methods: This retrospective study included 208 patients. The rotavirus test was positive in stool examination of 208 cases included in the study. In the control group, 241 newborn babies born in the hospital delivery room between January 1, 2010, and December 31, 2011, were included in the study. The blood groups of the cases were recorded by checking their medical records.

Results: This study was conducted by looking at the blood group of 449 cases, 208 patient groups, and 241 control groups. It was determined that 90 of 208 cases were blood type A (43.3%). Statistically, it was determined that the patients and control groups having A blood group did not have a relationship with the prevalence of rotavirus gastroenteritis ($p>0.05$).

Conclusion: Rotavirus-induced gastroenteritis is still an important public health problem worldwide, especially in the first 3 years of age. In our study, in rotavirus-positive gastroenteritis, blood group A was found to be the highest with 43.3%, but no significant difference was shown when compared with the control group ($p>0.05$). While a significant relationship has been shown with the blood group in Rotavirus-induced gastroenteritis, there are also studies showing the opposite. Our study, including 208 cases, shows that rotavirus infection is not related to the blood group.

Keywords: Blood group, gastroenteritis, rotavirus.

Cite this article as: Sarı E, Erdede Ö, Külcü NU, Sünnetçi Silistre E. Rotavirus infection and relationship between blood groups. Zeynep Kamil Med J 2023;54(2):93–96.

Received: April 26, 2021 **Revised:** November 07, 2022 **Accepted:** November 09, 2022 **Online:** June 09, 2023

Correspondence: Erdal SARI, MD. Türkiye Sağlık Bilimleri Üniversitesi, Zeynep Kamil Kadın ve Çocuk Hastalıkları Eğitim ve Araştırma Hastanesi, Çocuk Sağlığı ve Hastalıkları Kliniği, İstanbul, Türkiye.

Tel: +90 216 391 06 80 **e-mail:** erdalsari@gmail.com

Zeynep Kamil Medical Journal published by Kare Publishing. Zeynep Kamil Tıp Dergisi, Kare Yayıncılık tarafından basılmıştır.

OPEN ACCESS This is an open access article under the CC BY-NC license (<http://creativecommons.org/licenses/by-nc/4.0/>).

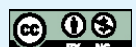


Table 1: Distribution of the blood group (patients and control group)

	Patients		Outpatients		Hospitalized		Control group	
	n	%	n	%	n	%	n	%
A blood group	90	43.3	63	41.7	27	47.3	108	44.8
B blood group	29	13.9	21	13.9	8	14	35	14.5
AB blood group	20	9.8	16	10.5	4	7	19	7.8
O blood group	69	33.1	51	33.7	18	31.5	79	32.7
Total	208	100	151	100	57	100	241	100

INTRODUCTION

Rotavirus is children's one of the most common causes of acute gastroenteritis and dehydration worldwide. Some clinical studies about the relationship between rotavirus gastroenteritis and histo-blood group antigens in different centers of the world and different results have been obtained.

Many studies reported an association between the histo-blood group and rotavirus gastroenteritis.

Rotavirus continues to be the most common cause of gastroenteritis in children and infants all over the World.^[1] Rotavirus does not discriminate between gender and race in transmission rate.^[2] Rotavirus-associated gastroenteritis continues to be a serious public health problem, especially in developing and underdeveloped countries.^[1] Rotavirus, apart from the fecal-oral transmission, can also cause gastroenteritis by transmitting through droplets. Rotavirus is a double-stranded segmented RNA virus from the Reoviridae family. The incubation period is about 1–4 days.^[3] Rotavirus infection, especially in infancy, is of grave importance in our country, where vaccination is not as widely used, as all over the World, considering the number of hospital admissions, hospitalizations, and even deaths.^[4] Many studies have reported a relationship between ABO blood groups and diseases. Diseases associated with blood group antigens, some types of cancer, heart diseases, and bleeding and coagulation disorders.^[5–7]

Blood group antigens are found in other tissues besides blood cells such as in saliva, mucosal epithelium, intestinal epithelium, and even breast milk.^[8–10]

In our study, including 208 cases, we aimed to investigate whether there is a relationship between blood groups of cases with Rotavirus-induced gastroenteritis, which has a significant rate in hospital admissions or whether it affects hospitalization in two critical pediatric hospitals in İstanbul.

MATERIAL AND METHODS

This study was planned as a retrospective case–control study. Between January 2010 and December 2011, the medical records of 208 patients who applied to two pediatric emergency clinics and were diagnosed with Rotavirus antigen-positive gastroenteritis

were reviewed. The Rotavirus test was positive in stool examination of cases included in the study. In the control group, 241 newborn babies born in the hospital delivery room between January 1, 2010, and December 31, 2011, were included in the study. The blood groups of the cases were recorded from the file information. Age, gender, history of admission, examination findings, and length of hospital stay of the cases included in the study were recorded. Those with immunodeficiency, primary bowel disease, underlying chronic disease that impairs intestinal absorption, and those who received Rotavirus vaccine were excluded from the study. The patients who were hospitalized with a newly diagnosed chronic illness during their hospitalization developed secondary infections and complications were excluded from the study. Those with other viral or bacterial infections in addition to Rotavirus infection and with pathogenic bacteria in stool culture were not included in the study.

Ethics committee approval for the study was obtained from the Ethics Committee with decision no: 50 dated March 3, 2021. Statistical analyses (median, min, max, Etc.) of the obtained results were made in SPSS version 22.0 software (IBM SPSS Statistics, IBM Corporation, Armonk, NY, USA). Mann–Whitney U test was used for group comparisons. For all analyses, the results were evaluated at a significance level of $p < 0.05$.

RESULTS

This study tested the blood groups of 449 cases, 208 patient groups, and 241 control groups. The blood group distribution of Rotavirus-induced gastroenteritis cases is shown in Table 1. Statistically, it was determined that the patients and control groups having A blood group did not have a relationship with the prevalence of Rotavirus gastroenteritis ($p > 0.05$). The median age of 57 patients who were hospitalized and treated was 7 months old (min: 1-month-old, max: 8 years old), whereas the median age of outpatients was 2 years (min: 1-month-old, max: 11 years). There was a significant difference in ages between hospitalized patients and outpatients ($p < 0.05$). The most petite hospitalized patient was 1 month old. In addition, 27 (47.3%) of the 57 patients who were hospitalized had blood group A, and having A blood group or other blood group was not statistically significant among the hospitalized patients; in other words, there was no relationship between the severity of the disease and the A blood group ($p > 0.05$).

DISCUSSION

Our study could not find a relationship between gastroenteritis due to rotavirus infection and major blood groups (outpatient or hospitalized patients). Rotavirus-induced gastroenteritis is still a significant public health problem worldwide, especially in the first 3 years.^[11] The distribution of major blood groups in the control group was consistent with the population data.^[12,13] In a study conducted by Bekdaş et al.^[14] in 2015, among those with rotavirus-positive gastroenteritis, 50.6% of blood group A was significantly higher than the other rotavirus-negative group ($p=0.047$). In Türkiye, in a study conducted in 2013 by Yazgan et al.,^[15] rotavirus studies examining the relationship between positive cases with blood group A, rotavirus blood group positive cases were found at the highest value (45,2%) but not shown a significant difference compared to the control group ($p>0.05$). The cross-sectional case-control study of 231 rotavirus acute gastroenteritis cases conducted by Elnady et al.^[16] in Egypt reported that rotavirus infection was more common in individuals with A blood group, and dehydration due to rotavirus was more common with having A blood group than in other blood groups. In the study of Perez-Ortín^[17] colleagues among 133 children with Rotavirus infection in Spain, they showed no significant relationship between major blood group antigens and the risk of Rotavirus infection rate. In the study reported by Van Trang et al.^[18] in 2014, they showed that there would be a strong relationship between infection of specific rotavirus genotypes according to the type of major blood group antigens. This study also reported that blood group antigens are a key susceptibility factor for Norovirus and Rotavirus infections in children.

Besides some group antigens being facilitators for rotavirus infection, gastroenteritis agents such as Norovirus, Escherichia coli, and Campylobacter Jejuni may be suitable attachment sites specific to the genotype of the microorganism.^[19] In another study, three different genotypes of rotavirus showed a greater affinity for A blood group antigens.^[20]

In our study, in Rotavirus-positive gastroenteritis, blood group A was found to be the highest with 43.3% ($n=90$). However, no significant difference was shown when compared with the control group ($p>0.05$). While a significant relationship has been shown with the blood group in Rotavirus-induced gastroenteritis, studies show the opposite. In our study, including 208 cases, it is seen that rotavirus infection is not related to the blood group.

The limitation of our study is that viral genotyping of rotaviruses could not be performed.

CONCLUSION

Although studies were associated with major blood group antigens of rotavirus gastroenteritis, we could not find a significant relationship in our study. Since the study was conducted at two different hospitals in two different regions, it may have been caused by the difference in rotavirus genotypes.

Statement

Ethics Committee Approval: The Zeynep Kamil Maternity and Children's Training and Research Hospital Clinical Research Ethics Committee granted approval for this study (date: 03.03.2021, number: 50).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – ES; Design – ES; Supervision – ÖE; Resource – ESS; Materials – ESS; Data Collection and/or Processing – ES, ESS; Analysis and/or Interpretation – ES, ESS; Literature Search – ES; Writing – ES, ÖE; Critical Reviews – NUK.

Conflict of Interest: The authors have no conflict of interest to declare.

Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Tate JE, Burton AH, Boschi-Pinto C, Steele AD, Duque J, Parashar UD, et al. 2008 estimate of worldwide rotavirus-associated mortality in children younger than 5 years before the introduction of universal rotavirus vaccination programmes: A systematic review and meta-analysis. *Lancet Infect Dis* 2012;12:136–41.
2. Newman RD, Grupp-Phelan J, Shay DK, Davis RL. Perinatal risk factors for infant hospitalization with viral gastroenteritis. *Pediatrics* 1999;103:E3.
3. Özdemir M, Demircili ME, Feyzioğlu B, Yavru S, Baysal B. Investigation of acute viral gastroenteritis agents in diarrhaic patient. *Selcuk Med J* 2013;29:127–30.
4. Parashar UD, Hummelman EG, Bresee JS, Miller MA, Glass RI. Global illness and deaths caused by rotavirus disease in children. *Emerg Infect Dis* 2003;9:565–72.
5. Franchini M, Favalaro EJ, Targher G, Lippi G. ABO blood group, hypercoagulability, and cardiovascular and cancer risk. *Crit Rev Clin Lab Sci* 2012;49:137–49.
6. Vogel F. Controversy in human genetics. ABO blood groups and disease. *Am J Hum Genet* 1970;22:464–75.
7. Masoumi JP, Yadegarinia D, Mozoni S. The relationship between ABO blood groups and susceptibility to diarrhea in infants during the first year of life. *Med J Islam Repub Iran* 2003;16:239–43.
8. Henry S, Jovall PA, Ghardashkhani S, Elmgren A, Martinsson T, Larson G, et al. Structural and immunochemical identification of Le(a), Le(b), H type 1, and related glycolipids in small intestinal mucosa of a group O Le(a-b-) nonsecretor. *Glycoconj J* 1997;14:209–23.
9. Marionneau S, Cailleau-Thomas A, Rocher J, Le Moullac-Vaidye B, Ruvoën N, Clément M, et al. ABH and Lewis histo-blood group antigens, a model for the meaning of oligosaccharide diversity in the face of a changing world. *Biochimie* 2001;83:565–73.
10. Le Pendu J. Histo-blood group antigen and human milk oligosaccharides: Genetic polymorphism and risk of infectious diseases. *Adv Exp Med Biol* 2004;554:135–43.
11. Giaquinto C, Van Damme P, Huet F, Gothefors L, Van der Wielen M; REVEAL Study Group. Costs of community-acquired pediatric rotavirus gastroenteritis in 7 European countries: The REVEAL Study. *J Infect Dis* 2007;195(Suppl 1):S36–S44.
12. Dilek İ, Demir C, Bay A, Akdeniz H, Öner A. ABO and Rh blood groups frequency in men and women living in Eastern Turkey. *Int J Hematol Oncol* 2006;16:23–6.
13. Balci YI, Ovet G, Covut I, Goncu F, Yılmaz M. ABO and Rh blood groups frequency in Denizli province. *Int J Hematol Oncol* 2010;32:103–5.
14. Bekdas M, Demircioglu F, Goksugur SB, Kucukbayrak B, Kismet E. Is there a relationship between rotavirus positive gastroenteritis and ABO

- blood groups?: A retrospective cohort study. *Arch Argent Pediatr* [Article in English, Spanish] 2014;112:345–7.
15. Yazgan H, Keleş E, Gebeşçe A, Demirdöven M, Yazgan Z. Blood groups and rotavirus gastroenteritis. *Pediatr Infect Dis J* 2013;32:705–6.
 16. Elnady HG, Abdel Samie OM, Saleh MT, Sherif LS, Abdalmoneam N, Kholoussi NM, et al. ABO blood grouping in Egyptian children with rotavirus gastroenteritis. *Prz Gastroenterol* 2017;12:175–80.
 17. Pérez-Ortín R, Vila-Vicent S, Carmona-Vicente N, Santiso-Bellón C, Rodríguez-Díaz J, Buesa J. Histo-blood group antigens in children with symptomatic rotavirus infection. *Viruses* 2019;11:339.
 18. Van Trang N, Vu HT, Le NT, Huang P, Jiang X, Anh DD. Association between norovirus and rotavirus infection and histo-blood group antigen types in Vietnamese children. *J Clin Microbiol* 2014;52:1366–74.
 19. Colston JM, Francois R, Pisanic N, Peñataro Yori P, McCormick BJJ, Olortegui MP, et al. Effects of child and maternal histo-blood group antigen status on symptomatic and asymptomatic enteric infections in early childhood. *J Infect Dis* 2019;220:151–62.
 20. Liu Y, Huang P, Tan M, Liu Y, Biesiada J, Meller J, et al. Rotavirus VP8*: Phylogeny, host range, and interaction with histo-blood group antigens. *J Virol* 2012;86:9899–910.