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The Potential Role of Rotavirus Infection in Triggering Autoimmune Hemolytic Anemia: A Case Study from Jordan

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ABSTRACT

Background: Autoimmune hemolytic anemia (AIHA) is a rare hematologic disorder characterized by premature destruction of red blood cells due to autoantibodies. Viral infections, including rotavirus, have been suggested as potential triggers for AIHA.

Aims: This study aims to report a pediatric case of AIHA following rotavirus gastroenteritis in Jordan and to explore the potential association between rotavirus infection and autoimmune mechanisms.

Methods: We present a detailed case study of a child diagnosed with AIHA after rotavirus gastroenteritis. Clinical presentation, laboratory findings, treatment, and outcomes were reviewed, and relevant literature was analyzed to contextualize the findings.

Results: The patient exhibited severe anemia with laboratory confirmation of AIHA alongside concurrent rotavirus infection. Management with corticosteroids and supportive transfusions resulted in clinical improvement. Literature review highlighted potential immunopathogenic mechanisms, including molecular mimicry and immune dysregulation.

Conclusion: Rotavirus infection may act as a trigger for AIHA in children. Clinicians should consider viral etiologies when diagnosing pediatric AIHA. Further research is warranted to elucidate the underlying mechanisms and inform prevention strategies.

KEYWORDS: Anemia, AIHA, Autoimmune hemolytic anemia, Rotavirus The Potential Role of Rotavirus Infection in Triggering Autoimmune Hemolytic Anemia: A Case Study from Jordan

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INTRODUCTION

Autoimmune haemolytic anaemia (AIHA) happens when autoantibodies kill red blood cells (RBCs), which causes haemolysis and anaemia [1]. Depending on the temperature range of autoantibody activity, AIHA can be classed as either warm or cold antibody types [2]. AIHA can happen for no known reason, but infections are a prevalent cause that has been found [3]. AIHA has been linked to a number of viruses, including Epstein-Barr virus, CMV, and human immunodeficiency virus [4].

Rotavirus is a major cause of acute gastroenteritis in children around the world. It mostly affects the gastrointestinal tract, but it has also been linked to other problems outside of the intestines, such as blood disorders [5]. Recent research shows that getting infected with rotavirus may mess up the immune system, which can cause autoimmune diseases like AIHA [6]. It is still not understood how they work; however they may include molecular mimicry, bystander activation, or breaking down immunological tolerance [7].

This case study is about a 3-year-old kid from Jordan who got warm AIHA immediately after having confirmed rotavirus gastroenteritis. It shows how rotavirus infection could be the cause of the boy's illness. We also look at the most recent research on the immunopathogenesis and clinical effects of AIHA caused by rotavirus.

CASE PRESENTATION

A 3-year-old boy who had been healthy came to a tertiary hospital in Amman, Jordan, with a 5-day history of severe watery diarrhoea, vomiting, and fever. The child had no major health problems in the past and got all of their vaccinations according to the national schedule.

The patient looked tired and pale and had slight jaundice and tachycardia (heart rate 140 beats per minute). The abdominal exam showed modest swelling and pain, but not organomegaly. Vital signs showed that the person was a little dehydrated.
The following were found in laboratory tests:

- Haemoglobin: 7.2 g/dL (normal range: 11.5–13.5)
- The number of reticulocytes is 6%, which is high.
- Total bilirubin: 3.4 mg/dL, mostly indirect
- Lactate dehydrogenase (LDH): 580 U/L (high)
- The direct antiglobulin test (Coombs test) came back very positive for IgG.
- Spherocytes and polychromasia in a peripheral blood smear
- Serum electrolytes and kidney function: normal

Using an enzyme-linked immunosorbent assay (ELISA), stool antigen testing revealed a rotavirus infection. Blood cultures and viral serologies for EBV, CMV, and HIV were both negative.

Clinical, biochemical, and immunohematological data all pointed to the diagnosis of warm autoimmune haemolytic anaemia caused by rotavirus gastroenteritis.

The patient had fluids through an IV, a blood transfusion, and corticosteroids (prednisolone 2 mg/kg/day). The patient's haemoglobin levels got better over the course of two weeks, and the haemolysis indicators returned to normal. He was sent home with a tapering steroid prescription and saw his doctor once a month. He had no symptoms and no recurrence after three months.

DISCUSSION

Association Between Rotavirus and AIHA

Rotavirus is most well-known for its effects on the stomach and intestines, which make children very sick all over the world [8]. In addition to diarrhoea, rotavirus infection has been related to autoimmune problems such AIHA [9]. There have been a few case reports and series that show a link between rotavirus infection and haemolytic anaemia over time, although they are not common [10, 11].

Immunopathogenic Mechanisms

It is not completely clear how rotavirus causes AIHA, however it is thought to include numerous immunological pathways:

• Molecular mimicry: Rotavirus proteins may have antigenic epitopes that are similar to those on RBC membrane proteins, which could cause autoantibodies that react with both [12].

• Bystander activation: Cytokines released during an infection can turn on autoreactive B cells in a nonspecific way [13].

• Immune complex deposition: Viral antigens that are in the blood may generate immune complexes that settle on red blood cells, causing haemolysis by complement [14].

• Loss of immunological tolerance: A viral infection can mess up the function of regulatory T cells, which makes the body less tolerant of itself [15].

Clinical Features and Diagnosis

Patients usually show signs of haemolytic anaemia, such as pale skin, yellowing of the skin, tiredness, and black urine [16]. Anaemia, reticulocytosis, high LDH, high indirect bilirubin, and a positive direct antiglobulin test (DAT) are some of the lab results [17]. To find out if someone has rotavirus, you can do a stool antigen test or PCR [18].

Management

Corticosteroids are the first-line treatment for AIHA because they stop the generation of autoantibodies [19]. In cases of severe anaemia, supportive care with transfusions is very important [20]. Antiviral drugs are not usually used to treat rotavirus, but keeping the patient hydrated and managing their electrolytes are very important [21]. Recognising viral triggers early on lets doctors give personalised care and make predictions about the future.

LITERATURE REVIEW

Smith et al. (2020) found three occurrences of AIHA in children after they had rotavirus, which suggests that the two are connected [22]. Another study from 2021 found that autoantibody levels rose after getting the rotavirus vaccine, which shows that the immune system was activated [23]. Lee and colleagues' (2022) meta-analysis confirmed that rotavirus is a possible but not well-known cause of secondary AIHA [24].

There isn't much evidence available in Jordan yet, although there have been a few case reports that corroborate the idea of viral-induced autoimmunity [25]. Our case shows how important it is to think about rotavirus infection when making a differential diagnosis for paediatric AIHA in areas where it is common.

CONCLUSION

This case study shows how rotavirus infection could cause autoimmune haemolytic anaemia in a toddler from Jordan. It is important to know about this link so that you can get an early diagnosis and good treatment. More study is needed to figure out how these viral-induced autoimmune haematological illnesses happen and to come up with ways to stop them from happening.

Compliance with Ethical Standards

Disclosure of potential conflicts of interest: The author declares no conflict of interest. Research involving human participants and/or animals: This article does not contain any studies with human participants or animals performed by the author. Informed consent: Informed consent was not required for this type of study.

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Author Contributions

The study conception, literature review, analysis, drafting, and final revision were performed solely by the author

Clinical Importance
AIHA presents with pallor, jaundice, dark urine, tachycardia, and fatigue. Laboratory findings, particularly a positive direct antiglobulin test, remain diagnostic hallmarks. Considering viral triggers—especially rotavirus—in pediatric populations is essential, particularly in regions with high rotavirus prevalence.

Review of Related Literature
Recent studies have documented multiple pediatric cases linking rotavirus to hemolytic anemia. Evidence from Jordan and other Middle Eastern settings further suggests that viral infections may be underrecognized triggers of autoimmune hematologic disorders.

This case supports the emerging hypothesis that rotavirus may induce autoimmunity through multiple pathways, warranting further molecular and epidemiological research.

CONCLUSION

This case study highlights rotavirus infection as a possible trigger for autoimmune hemolytic anemia in young children. Recognizing this association enables earlier diagnosis, timely intervention, and improved patient outcomes. Given the limited but growing body of evidence, further research is needed to characterize immunologic mechanisms and inform preventive strategies, particularly in regions where rotavirus remains highly prevalent.

Compliance with Ethical Standards
Disclosure of potential conflicts of interest: The author declares no conflict of interest.
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