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(RESEARCH ARTICLE)

The burden of diarrhea in children's hospitalization prior and post rotavirus vaccination

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Abstract

Diarrhea is the passage of excessively liquid or frequent stools with increased water content. Acute diarrhea is defined as the abrupt onset of 3 or more loose stools per day and lasts no longer than 14 days. The most common causes of acute diarrhea in children are viral infection, rotaviruses the most common. Although often considered a benign disease, acute gastroenteritis is a major cause of morbidity and mortality in children around the world, responsible for 1.34 million deaths annually in children younger than 5 years, which account for 15% of all child deaths. The introduction and free access of Rotarix since 2019 in Albania had an enormous impact in morbidity and hospitalization due to gastroenteritis in children.

Keywords: Gastroenteritis; Rotavirus; Vaccine; Children; Hospitalization

1. Introduction

Diarrhea is considered the passage of excessively liquid or frequent stools with increased water content. The patterns of stooling in young children vary widely, consequently diarrhea is a result of a change from the norm. Equilibrium of fluid balance in humans depends on the secretion and reabsorption of fluid and electrolytes in the intestinal tract. Diarrhea is the reversal of the normal absorptive status of water and electrolyte absorption to secretion. The increased water content in the stools, above the normal value of approximately 10 mL/kg/d in the infant and young child, is due to an imbalance in the physiology of the small and large intestinal processes involved in the absorption of ions, organic substrates, and water. The 2 primary mechanisms responsible for acute gastroenteritis are; damage to the villous brush border of the intestine, causing malabsorption of intestinal contents and leading to an osmotic diarrhea, and the release of toxins that bind to specific enterocyte receptors and cause the release of chloride ions into the intestinal lumen, leading to secretory diarrhea [1].

Acute diarrhea is defined as the abrupt onset of 3 or more loose stools per day and lasts no longer than 14 days [2]. Acute diarrhea in children is usually caused by infection of the small and/or large intestine, although other disorders may cause diarrhea, including malabsorption syndrome and enteropathies. Enteric pathogens adhere to or invade the epithelium, a number of them produce enterotoxins or cytotoxins. Furthermore, these pathogens trigger release of cytokines attracting inflammatory cells, which contribute to the activated secretion by inducing the release of agents such as prostaglandins or platelet-activating factor. Features of secretory diarrhea include a high purging rate, a lack of response to fasting, and a normal stool ion gap, indicating that nutrient absorption is intact. The term "acute

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gastroenteritis" is commonly used synonymously with "acute diarrhea," however, the term gastroenteritis implies inflammation of both the stomach and the small intestine.

The most common causes of acute diarrhea in children are viral infection, with rotaviruses and noroviruses being most common. Viral infections damage small bowel enterocytes and cause low grade fever and watery diarrhea without blood. The most common age for viral infection is between 6 months and 2 years, and the way of transmission is by the fecal-oral or respiratory route. Bacterial pathogens include C*ampylobacter jejuni, Salmonella, Escherichia coli and Shigella dysenteriae.* Children with bacterial gastroenteritis are more likely to have high fever and may have blood and white blood cells in the stool. Bacterial pathogens occasionally spread systemically, especially in young children [3, 4]. These pathogens are spread by person-to-person route or ingestion of contaminated food and drink. The least common group of infectious diarrheas are the intestinal parasites; protozoa and helminths. Giardia intestinalis is the most common intestinal parasite. Giardia species are closely related to sanitation and are endemic in areas with poor sanitation. In developing countries, water borne and food-borne outbreaks are common, and the disease is an important cause of morbidity [5, 6].

This study aims to measure the prevalence of children hospitalized with the diagnosis “Acute gastroenteritis”, estimate the role of gastroenteritis in children morbidity prior and post rotavirus vaccination in Albania. Rotavirus vaccine was introduced in 2019 in Albania.

2. Method and Material

This is a retrospective study. In it are included 5820 children, aged 0-14 years old, hospitalized with the diagnosis Gastroenteritis acute, in the General Pediatric Ward at the University Hospital Center “Mother Tereza” in Tirana, Albania during an eleven-year period 2014-2024. Data were extracted from the clinical records.

3. Results

Data revealed that the number of children hospitalized with gastroenteritis acute, inflicted a sudden fall in the years 2020-2024. The number of children hospitalized with gastroenteritis acute prior to rotavirus, in 2014-2019 resulted considerably higher. (Figure 1)

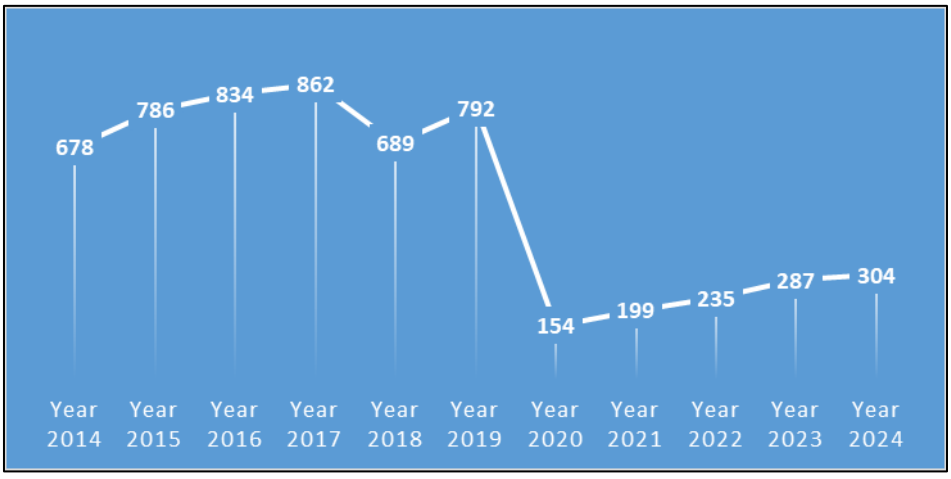

Figure 1 Prevalence of hospitalized gastroenteritis

This drop, of gastroenteritis in hospitalized children after rotavirus vaccination, was also reflected in the burden of gastroenteritis in children morbidity. Gastroenteritis counted approximately 30% in all children’ hospitalization during 2014-2019. After rotavirus vaccination this percentage fell to 14% during 2020-2024. (Figure 2)

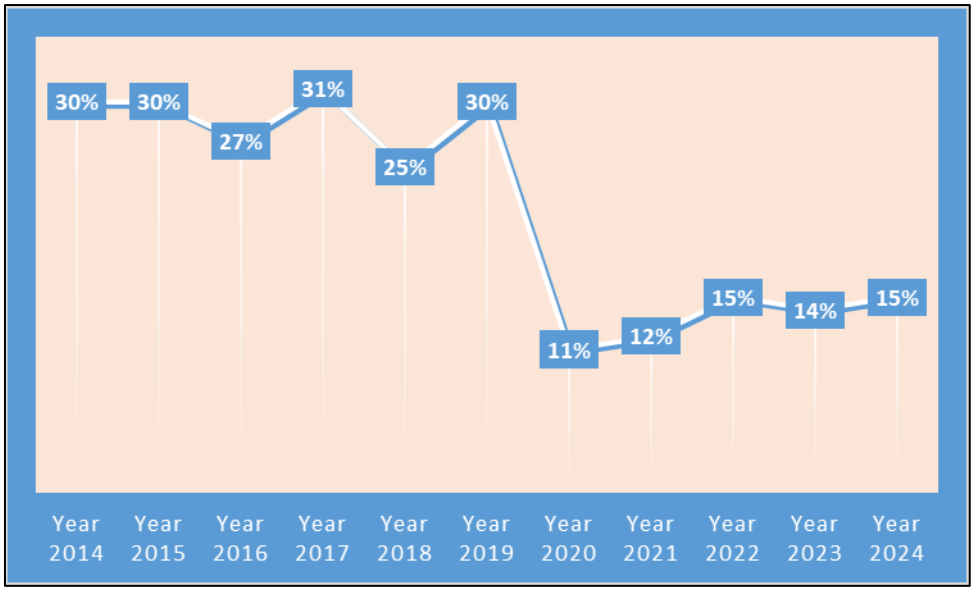

Figure 2 Burden of gastroenteritis in children' morbidity

Infants resulted the most affected age-group with 43% of cases, followed by the age group 2-5 years with 33% and with the lowest number children 5-14 years with 24% of cases. (Figure 3)

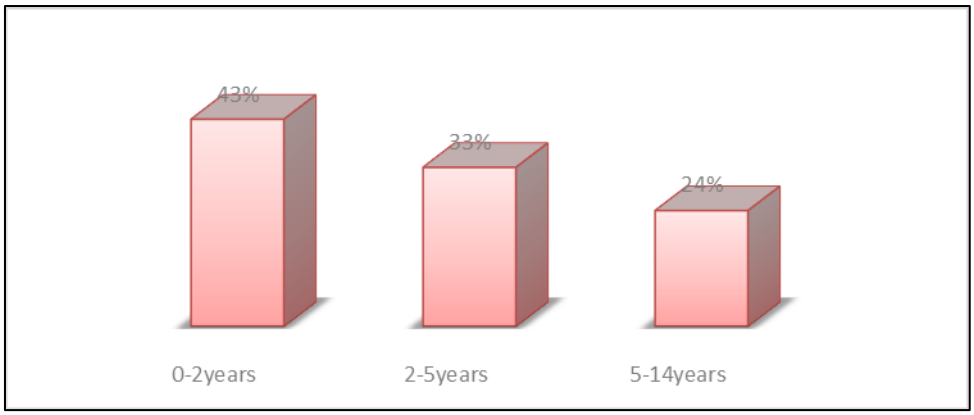

Figure 3 Age distribution of hospitalized gastroenteritis cases

Data revealed that during the years 2020-2024 the number of cases of children hospitalized with the diagnosis gastroenteritis acute decline in all seasons, however the most affected was the number of cases in winter and spring, as the rotavirus has a seasonal distribution spring in temperate climates, peaking in cold months of winter and spring. (Figure 4)

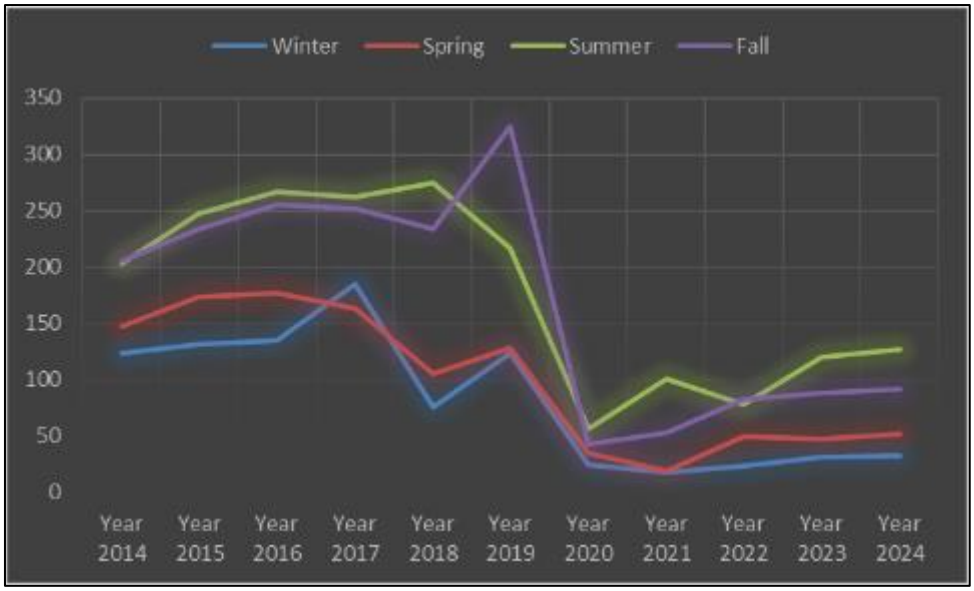

Figure 4 Seasonal distribution of hospitalized gastroenteritis cases during 2014-2024

4. Discussion

Diarrhea and Gastroenteritis are one of the most clinical conditions in young children. According to international statistics, children younger than 5 years have an estimated 1.7 billion episodes of diarrhea each year, leading to 124 million clinic visits, 9 million hospitalizations, and 1.34 million deaths, with more than 98% of these deaths occurring in the developing world [7, 8, 9,10]

Although often considered a benign disease, acute gastroenteritis is a major cause of morbidity and mortality in children around the world, responsible for 1.34 million deaths annually in children younger than 5 years, which account for 15% of all child deaths [7].

This study revealed that gastroenteritis used to be a major cause in children morbidity and hospitalization ranging from 25% to 31% of hospitalization during the years 2014-2019. The year 2020 resulted in a sudden drop in the number of children hospitalized with gastroenteritis and the burden of gastroenteritis in children morbidity, this drop followed even in the consecutive years 2020-2024. The sudden drop of gastroenteritis in children in 2020 might have been partially related to the global outbreak of COVID-19. Strict quarantine and the restrictive measures that followed it, had their effect in preventing the spread of other childhood infections including gastroenteritis. The declining in the prevalence of gastroenteritis' hospitalization in children in 2020 is logically assumed to have occurred due to pandemic. However, on May 2023, the COVID-19 public health emergency ended and the restrictive measures too, but the prevalence of gastroenteritis, despite a slight increase, continues to be considerably lower the previous to 2020.

These findings, through light to a consistent factor, that displays its effect on the considerable decline in the prevalence of gastroenteritis in hospitalized children. In 2019, in Albania was introduced a multivalent rotavirus vaccine in its national immunization program. Consequently, in the following years 2020-2024, there was observed a drastic decline in the number of children hospitalized for gastrointestinal infections. The burden of gastroenteritis, in the general morbidity of children which required hospitalization, inquired a considerable decline too, from approximately 30% to 14% of the whole hospitalizations. The number of gastroenteritis decreased in the whole year, including winter and summer months, but the most considerable fall was in the winter months. These findings state that rotavirus represented a major cause of gastroenteritis in children and was responsible for a great degree of morbidity and hospitalization in children. Rotavirus represents the most important viral pathogen worldwide, responsible for 37% of diarrhea-related deaths in children younger than 5 years [11]. Rotavirus infection follows seasonal variation, with an increased incidence in winter and decreased incidence in summer months, for this reason the number of gastroenteritis was especially declined in winter months after rotavirus vaccination. Similar reduction in gastroenteritis in children have reported even United States of America. In the United States, routine rotavirus vaccination has led to a 60-75% reduction in pediatric rotavirus hospitalization since 2006 [12,13]

Gastroenteritis continuous to be a childhood disease. Most of the children (76%) were younger than 5 years old. Infants (0-2years), constitute the most affected group. The predisposing factors are the immature immune system of the young child and the exposure to the child day-care settings. Despite the high prevalence in children, gastroenteritis is not a severe condition, its severity depends on the degree of fluid loss. The most crucial step in its management is the accurate assessment of the dehydration status. Fortunately, most cases of dehydration in children can be accurately diagnosed by a careful clinical examination and treated with simple, cost-effective measures. Good hygiene is important to prevent spread of infection. This includes careful hand washing, nappy disposal, and preparation and storage of food and drinking water. The major advance in prevention was the development and licensing of two oral rotavirus vaccines, whose safety and efficacy have been confirmed in large scale trials, each involving more than 60 000 children [14,15]. Rotateq (Merck) is a three-dose live human-bovine pentavalent re-assortant vaccine. Rotarix (GSK) is two dose attenuated human (strain G1P) monovalent vaccine. Both vaccines are highly immunogenic. They provide cross protection against common serotypes and decrease rates of severe gastroenteritis, the need for intravenous fluids, and hospital admission. The introduction and free access of Rotarix since 2019 in Albania had an enormous impact in morbidity and hospitalization due to gastroenteritis in children.

5. Conclusion

Gastroenteritis constitutes a mayor health concern in children in the whole world. The use of rotavirus vaccine has resulted in an enormous impact in morbidity and hospitalization due to gastroenteritis. The prevalence and the burden of gastroenteritis in childhood morbidity have inflicted an almost dramatic decline.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of informed consent

Informed Consent was taken from the parents of the hospitalized children, included in the study, for using the data of the medical records, providing anonymity.

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