

Acute gastroenteritis in the Central Health Region. Belize. 2019-2023

Gastroenteritis aguda en la Región Central de Salud. Belice. 2019-2023

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ABSTRACT

Introduction: Acute gastroenteritis is one of the most frequent pathologies of significant morbidity and mortality worldwide. It can occur at any age but its incidence is higher in infants. It represents one of the main reasons for consultation in Health facilities in Belize. This article aims to characterize patients diagnosed with acute gastroenteritis according to epidemiological and microbiological variables. **Methods:** A retrospective descriptive approach was conducted including all patients diagnosed with acute gastroenteritis in the Central Health Region of Belize, from 2019 to 2023. Data was obtained from the Belize Health Information System. **Results:** Acute gastroenteritis was the second reason for medical attention among communicable diseases, accounting 10 485 cases in the study period. The most affected age group was 1 to 4 years old (1 708 cases), with no differences in terms of sex. The largest number of patients were treated in outpatient and emergency consultations, with only 4% requiring admission. Matron Roberts Polyclinic II and Cleopatra White Polyclinic were the facilities that diagnosed the largest number of cases. The most frequently identified germs in 1 306 patients studied were *Escherichia coli*, *Staphylococcus sp.* and *Proteus mirabilis*. **Conclusions:** Acute gastroenteritis remains as one of the most common communicable diseases, being more frequent in children from 1 to 4 years old. Only few patients developed complications or required admission. Microbiological studies proved to be useful to identify *E. coli* as the most common bacterial agent causing gastroenteritis in our sample.

Keywords: Communicable diseases; Diarrhea; Gastroenteritis; Causal agents; Germs; Risk factors; Incidence

RESUMEN

Introducción: La gastroenteritis aguda es una de las patologías más frecuentes y de mayor morbilidad y mortalidad a nivel mundial. Puede presentarse a cualquier edad, pero su incidencia es mayor en lactantes. Representa uno de los principales motivos de consulta en las instituciones de salud de Belice. Este artículo tiene como objetivo caracterizar a los pacientes con diagnóstico de gastroenteritis aguda según variables epidemiológicas y microbiológicas. **Métodos:** Se realizó un estudio descriptivo retrospectivo que incluyó a todos los pacientes con diagnóstico de gastroenteritis aguda en la Región Central de Salud de Belice, de 2019 a 2023. Los datos se obtuvieron del Sistema de Información de Salud de Belice. **Resultados:** La gastroenteritis aguda fue el segundo motivo de atención médica entre las enfermedades transmisibles, con 10 485 casos en el período de estudio. El grupo de edad más afectado fue el de 1 a 4 años (1 708 casos), sin diferencias en cuanto al sexo. El mayor número de pacientes fueron atendidos en consultas externas y de urgencias, y solo el 4 % requirió ingreso. Las Clínicas Matron Roberts II y Cleopatra White fueron los centros que diagnosticaron el mayor número de casos. Los gérmenes identificados con mayor frecuencia en 1 306 pacientes estudiados fueron *Escherichia coli*, *Staphylococcus sp.* y *Proteus mirabilis*. **Conclusiones:** La gastroenteritis aguda continúa siendo una de las enfermedades transmisibles más comunes; fue más frecuente en niños de 1 a 4 años. Sólo unos pocos pacientes desarrollaron complicaciones o requirieron ingreso. Los estudios microbiológicos demostraron ser útiles para identificar a *E. coli* como el agente bacteriano más común causante de gastroenteritis en nuestra muestra.

Palabras clave: Enfermedades trasmisibles; Diarrea; Gastroenteritis; Agente causal; Gérmenes; Factores de riesgo; Incidencia

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INTRODUCCIÓN

Gastroenteritis is defined as an inflammation of the gastric and intestinal mucosa and is one of the most frequent pathologies of significant morbidity and mortality worldwide; it can occur at any age, but its incidence is higher in infants. It represents one of the main reasons for consultation both in primary and emergency care, out-of-hospital and hospital services.¹⁻³

According to its etiology, gastroenteritis is classified as infectious (caused by viruses, bacteria, protozoa or helminths) and non-infectious (due to malnutrition, medication, endocrine cause, among others).¹

Diarrhea is usually accompanied by a more or less significant loss of weight and an abnormal loss of water and electrolytes. Its incidence and complications are more frequent in the first two years of life, due to the coexistence of a series of associated factors such as immaturity of digestive functions, local and general immunological immaturity, metabolic, hepatic or renal immaturity, high nutritional needs, poor adaptation to the environment and hydroelectrolyte lability.³

According to studies carried out by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF), in the Region of the Americas, one in three deaths of children under two years old is caused by gastrointestinal diseases, mainly infectious and nutritional disorders. In recent years, attention has focused on the causes of diarrhea, particularly those of infectious origin, caused by parasites, bacteria (mainly *Escherichia coli*, *Vibrio cholerae*, and *Salmonella* and *Shigella* species) or viruses (rotavirus), for the possibilities of taking preventive measures.^{3,4}

Microorganisms can cause diarrhea by a secretory mechanism (bacterial toxins, viruses) or inflammatory (enteroinvasive bacteria, *Entamoeba histolytica*, etc.).⁵ Bacterial toxins can be classified as cytotoxic (*Vibrio*, enterotoxigenic *E. coli*, etc.), whose mechanism of action is based on increased intestinal secretion of water and electrolytes or cytotoxic (*Shigella*, enterohemorrhagic *E. coli*, etc), which induce secretion by direct damage to the enterocyte. Diarrhea can sometimes be osmotic in relation to a malabsorption of disaccharides as a result of involvement of the intestinal villi (*Giardia lamblia*, virus).

The disease can lead to complications, some frequent and others not, generally corresponding to two large groups:

- induced by the loss of water and electrolytes in the diarrheal process,
- induced by the germs that cause the diarrheal disease.

The first group refers to acute dehydration, which is usually part of the clinical picture of diarrhea itself and represents the most frequent complication, as well as acid-base imbalances, commonly associated with dehydration. Other complications such as kidney failure, intracranial hemorrhages, heart rhythm disorders with electrocardiographic abnormalities, cerebral edema, paralytic ileus, and intussusception, often occur in severe cases of the disease.⁶

The second group corresponds to complications due to the dissemination of the causative germs to other organs, and are almost always bacterial in nature. These inflammatory processes can occur at any level, including intestinal perforation, peritonitis, pyelonephritis, bronchopneumonia and meningoencephalitis, as a result of septicemia, which can induce septic shock. One especially related to *Shigella* is hemolytic uremic syndrome.⁵ Finally, an important complication is malnutrition, mostly affecting newborns and low-weight infants.

The form of acquisition is usually by person-to-person contagion or by ingestion of contaminated food or water. Almost half of the episodes happen in the context of an epidemic outbreak, most of which are self-limited processes in days, not requiring a specific diagnostic study. A special situation is traveler's diarrhea, which can affect about 40% of tourists from the Western world who travel to developing countries.⁷

This research aims to characterize the epidemiological, causal and characteristic variables of complications of acute gastroenteritis in patients treated in the Central Health Region (CHR) of Belize, in the period 2019 - 2023, taking into account the high number of cases seen in the different clinics and at the Karl Heusner Memorial Hospital.

METHODS

A descriptive retrospective study was conducted on patients diagnosed with acute gastroenteritis, between January 1, 2019, and December 31, 2023, in the CHR of Belize.

The universe of the study consisted of all patients diagnosed with acute gastroenteritis in institutions under the management of the CHR and recorded in the Belize Health Information System. (BHIS).

The inclusion criterion was: patient evaluated with a diagnosis of acute gastroenteritis between January 1, 2019, and December 31, 2023. Patients without complete records in the Belize Health Information System were excluded.

Patient information was extracted from the BHIS using an Excel template automatically connected to the system, where the following variables were recorded and processed:



institution generating the medical consultation, age, sex, admission date, presence of complications, and etiological identification of different enteropathogens.

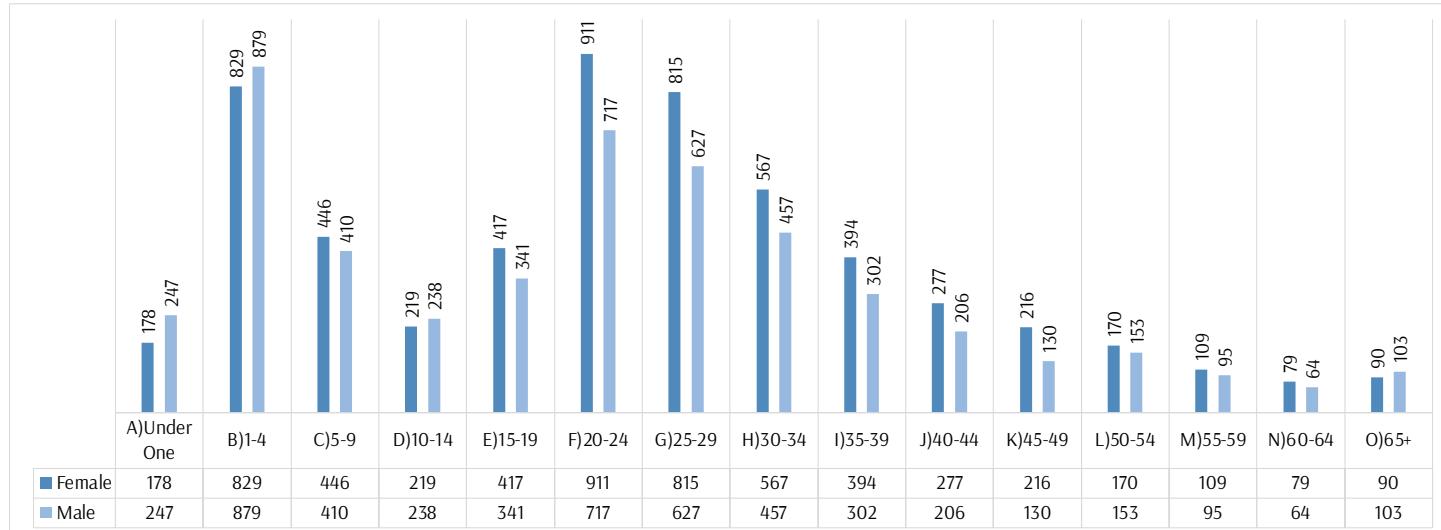
Absolute and relative frequencies were used as summary measures, and within the measures of central tendency (MCT), the mean or average was used. Tables and graphs were used to facilitate the analysis of the main research results.

During the course of the research, there was no direct interaction with the patients. The authors outline results faithful to the obtained statistics.

RESULTS

Acute gastroenteric disease (AGD) was the second cause of medical care among communicable diseases in the CHR in the period evaluated. A total of 10 485 reported cases of AGD were assessed through the BHIS, as shown in Table 1.

AGD affected all age groups, being more frequent in the ages between 1 and 4 years (1 708 cases), followed by the groups of 20 to 24 years and 25 to 29 years (Graph 1). Males prevailed over females in all age groups, except from those between 1 and 4 years old.



Graph 1. AGD by age group and sex. CHR. Belize. 2019-2023.

Source: BHIS

location and the number of health providers that integrate them, contributed to this fact. Both clinics are also the ones that provide the highest number of diagnoses in all the diseases subject to surveillance described in the disease classifier of the BHIS.

A total of 1 306 patients were selected for microbiological study, to isolate a probable causative germ. They represented 12% of all AGD cases, leaving a significant number of patients without investigation.

In graph 2, the microorganisms isolated by the Central

Table 1. Top 10 Communicable diseases. CHR. Belize. 2019-2023.

Diseases	Number of patients
Acute respiratory infections	46 657
Gastroenteritis	10 485
Conjunctivitis	2 568
All vaginal infections	2 158
Scabies	1 318
Human Influenza	1 250
Trichomonas	571
Foodborne Illness	469
Pelvic Inflammatory Diseases	399
Unspecified STIs	323

Source: BHIS

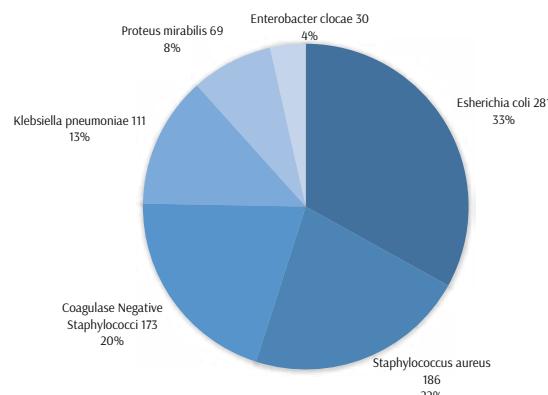
Table 2 shows the number of AGD cases diagnosed by health institutions. Matron Roberts Polyclinic II and Cleopatra White Polyclinic were the facilities that diagnosed the largest number of AGD in the evaluation period. Their geographical

Laboratory in the period evaluated are shown. The most frequently identified germs were *Escherichia coli* (33%), *Staphylococcus aureus* and coagulase negative staphylococci (22% and 20%, respectively) and *Proteus mirabilis* (8%).

Table 2. AGD according to the diagnostic institution. Central Region. Belize. 2019-2023

Health institutions	Years					
	2019	2020	2021	2022	2023	Total
Matron Roberts Health Center	793	474	491	625	841	3224
Cleopatra White Health Center	688	359	314	71	956	2388
Karl Heusner Memorial Hospital	996	425	197	155	182	1955
San Pedro Polyclinic	402	135	135	108	383	1163
Ladyville Health Center	196	117	147	146	313	919
Port Loyola Health Center	164	96	75	40	112	487
Caye Caulker Health Center	115	16	17	32	112	292
Hattieville Health Center	41	12	1	3		57
Total	3395	1634	1377	1180	2899	10485

Source: BHIS

**Graph 2.** Results of microbiological studies of AGI. CHR. 2019-2023.

Source: BHIS

Only 133 cases (1.2%) in the five years of the study, required hospitalization due to complications related to the disease. The highest number of hospitalized cases occurred in the ages of 1 to 4 years, under 1 year old and over 60 years old. However, the latter age group contributed to 86% of mortality from AGDs in the period evaluated, being dehydration and acid-base imbalances the demise cause.

DISCUSSION

Diarrheal disease represents the third leading cause of death in children under 5 years of age, accounting 443,832 deaths each year. Diarrhea can last for several days leading to severe dehydration, which is, in most cases, the main cause of death from diarrhea. Other causes, such as septicemic bacterial infections, are now likely to be responsible for an increasing proportion of diarrhea-related deaths. Malnourished or immunocompromised children, as well as people living with HIV, are at the highest risk of life-threatening diarrheal diseases.⁸

AGDs represented the second cause of medical attention among communicable diseases in the CHR, only preceded by acute respiratory infections.

The condition affected all age groups, being more frequent in the ages between 1 and 4 years. Similar results were found by Ávila-Ochoa, et al⁹ in a clinical epidemiological characterization of rotavirus infection, carried out in a Pediatric Hospital in Havana, Cuba.

There were no differences in terms of the epidemiological variable sex in the incidence of the disease, in accordance with what has been observed in other studies.^{9,10}

The causes of gastroenteritis can be viral, bacterial or parasitic, and its incidence varies according to the socioeconomic and demographic situation of each country, with rotavirus and norovirus being the main etiologies worldwide.¹¹ Although most cases have a viral origin, it is difficult to know it with certainty initially from clinical data. The etiology can be suspected based on some clinical data but there are no specific signs pointing the etiology. That is why diagnostic tools should be used in cases of dysentery, moderate to severe acute diarrhea, or in those patients with persistent symptoms lasting more than 7 days.¹² These groups of patients are more prompted to have inflammatory diarrhea that could be bacterial or parasitic and consequently require targeted treatment.

Currently, there are several techniques available to determine the etiology, and decide the most appropriate management. Over the last few decades, different combinations of techniques such as coproscopics, cultures, specific antigens, or PCR have been used to detect the causative germ.^{13,14}

In the literature search, we did not find any studies that described the frequency of enteropathogens diagnosed by molecular studies and their relationship with clinical or paraclinical findings.

Another element provided by this research was the detection of *Escherichia coli* as the most common causative agent of acute gastroenteritis in patients who were tested. Contaminated food or drinking water and lack of hygiene are the most likely risk factors for this infection, based on the epidemiological chain and the microbiological characteristics of the agent.^{7,13} This information is of great value in our research because it differs from what has been reported in the international literature where 75 - 90% of diarrhea is of viral cause: rotavirus (most frequent agent), norovirus, astrovirus and adenovirus and only between 10 and 20% are caused by bacterial agents.^{15,16}

Despite AGDs are mostly clinically diagnosed, the use of microbiological testing is very useful from the epidemiological point of view, since it makes possible to build a microbiological map that allows not only to manage isolated cases or outbreaks, but also to structure community education campaigns, giving the population tools for the identification, care and prevention of these diseases. This finding constitutes one of the keys in this investigation and shows a weaknesses in the medical care process, because even the necessary resources in the laboratories being available, a large amount of patients were not tested trying to assess the etiology.

Siciliano V, et al⁷ recommend that specific diagnostic investigation can be reserved for patients with severe dehydration, more severe illness, persistent fever, bloody stools, immunosuppression, and for cases of suspected nosocomial infection or outbreak.

Therapeutic options in patients with AGD include oral rehydration, early refeeding, antidiarrheal medications, antibiotics, probiotics, and zinc supplementation. Oral rehydration is the first step in treating AGD. Early refeeding is important since it decreases intestinal permeability caused by infections and decreases the illness duration, leading to improved nutritional outcomes.¹⁷

As a result of the improper use of diagnostic tools, antimicrobials may be irrationally used or not implemented in patients who need them. Empiric antibiotic therapy is recommended for travelers' diarrhea since the likelihood of bacterial etiology is very high and surpasses the possible side effects of antibiotics.^{13,18} Empiric antibiotics including metronidazole are not recommended without a laboratory confirmation of the etiology.

CONCLUSIONS

The most affected age group was 1 to 4 years old, with no differences in terms of sex. Admissions are not common in patients diagnosed with gastroenteritis. The most frequent microorganism detected in laboratory studies was *E. coli*.

Empirical antibiotic therapy should not be systematically used in patients with AGD, since most of the cases are of viral nature. Negative consequences of antibiotics misuse include disturbances in intestinal microbiota and drugs resistance.

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Disclosure

The authors have nothing to disclaim.

Authorship

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- María del Carmen Lozada Concepción: Conceptualization, investigation, methodology, project management, supervision, writing-review and edition.

