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Serum Potassium Impaction in Children with Gastroenteritis at Emergency Department

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Abstract: Gastroenteritis is one of the most common gastrointestinal system diseases and is associated with substantial morbidity and mortality…

A viral pathogen is a common cause in children, but other pathogens, like bacteria, parasites may be causes…

The cornerstone of treatment are oral rehydration solution (ORS), IV – fluid therapy, correction of electrolytes disturbances, especially (hypokalemia)that is associated with more hospital – time admission and complications, like generalized weakness and lethargy, paralytic ileus…

So the aim of a study is to estimate the prevalence of hypokalemia in children between (1 – 5 years old) who are suffered from acute gastroenteritis and their complications…

It's a prospective clinical study, enrolled (153 patients) from 15th / January / 2023 till 30th / December/ 2023 at Al- Khansaa Teaching Hospital / Mosul city / Iraq…

And is included patients between 1 – 5 years old who are suffering from gastroenteritis and admitted to ER department for less than 24 hours, then to Pediatric – Medical ward and their serum potassium level less than 3.5 mmol / L...

My excluding criteria were children out of a range of age - group, diarrhea for more than 1 week duration, bloody – diarrhea, parenteral diarrhea, like (pneumonia, UTI), any nutritional diseases, like marasmus, glycogen storage diseases….etc. and any congenital – GIT system anomalies …

I was depending on the proper history taking from a relative to a patient, serial - physical examination on the included patient at ER – department and Pediatric – Medical Ward, serial serum potassium level measurements with proper follow up for any complications that are occurred due to a hypokalemia…

A total of 153 patients, with 93 male and 60 female (ratio 1.2 : 1) and a majority of them were mature – born children from urban areas…

61 patients were complicated with hypokalemia and 92 are not, of those are complicated with a hypokalemia were 21 with mild degree, 23 with a moderate degree and 17 with a severe one…

According to their complaints, were 61 with a diarrhea only and 27 with a vomiting only, and 65 with both..

According to a degree of dehydration, were 72 with a moderate dehydration, and 79 with a severe one…

Regarding the UOP, were 11 with a good UOP, 79 with a poor UOP, 63 with a fair UOP…

Finally, regarding the complications, were 10 with a generalized weakness and 8 with a paralytic ileus…..

Keywords: Gastroenteritis, diarrhea, vomiting, ORS, serum – potassium level, hypokalemia, generalized weakness, and paralytic ileus.

INTRODUCTION

Hypokalemia is defined as a serum potassium level below 3.5 mEq/L (3.5 mmol/L). It is classified as mild (3–3.5 mmol/L), moderate (2.5–3 mmol/L), or severe (<2.5 mmol/L). In children, the most common cause of hypokalemia is diarrhea [1].

The clinical features of hypokalemia primarily involve the muscles, gastrointestinal tract, and cardiovascular system. Mild to moderate hypokalemia typically presents with generalized weakness, while severe hypokalemia can lead to paralytic ileus due to delayed gastrointestinal motility [2].

While many causes of hypokalemia are evident from the patient's history, a thorough assessment should include dietary habits, gastrointestinal losses, and medication use. Concurrent electrolyte imbalances can provide important diagnostic clues. For instance, hypokalemia with metabolic acidosis is often seen in diarrhea or renal tubular acidosis, whereas hypokalemia with metabolic alkalosis suggests vomiting, nasogastric losses, aldosterone excess, or diuretic use [3].

Serum potassium levels may not always reflect intracellular potassium status. This discrepancy is particularly common in conditions such as diabetic ketoacidosis, where metabolic acidosis and insulin deficiency lead to extracellular potassium shifts. During treatment, potassium moves back into cells, potentially masking total body potassium depletion and necessitating further supplementation to correct hypokalemia [4].

In cases of transcellular potassium shifts, such as hypokalemic periodic paralysis, the potassium deficit is typically smaller. However, supplementation must be administered cautiously due to the risk of rebound hyperkalemia. Notably, thyrotoxic periodic paralysis responds well to propranolol, which helps correct both weakness and hypokalemia. Patients with ongoing potassium losses require both deficit correction and continued replacement to prevent further depletion [5, 6].

Causes of Hypokalemia in Pediatric Gastroenteritis

Pediatric gastroenteritis has many complications, but the most common are electrolyte disturbances, mainly hypokalemia, which can lead to generalized weakness and paralytic ileus. Hypokalemia is caused by:

1. **Intracellular Shift**:

- Metabolic alkalosis
- Beta-adrenergic agonists (insulin, albuterol, theophylline, caffeine, epinephrine)
- Hyperthyroidism
- Barium
- Treatment of hyperglycemia

2. **Enhanced Loss**:

- Corticosteroids
- Magnesium
- Renal replacement therapy
- Hemodialysis
- Continuous renal replacement

3. **Decreased Intake/Gastrointestinal Loss**:

- Vomiting
- Diarrhea
- Nasogastric suction

4. **Insufficient Intake of Potassium**:

- Alcohol
- Eating disorders

5. **Loss in Urine**:

- Cushing syndrome
- Bartter syndrome
- Hypomagnesemia
- Diabetic ketoacidosis (DKA)
- Antimicrobial agents
- Diuretics [7, 8]

Diarrhea: Definition and Impact

Diarrhea is defined as a change in usual bowel habits with the passage of three or more stools daily or at least 200 g of stool daily. It is a symptom that may vary from a mild presentation requiring supportive measures to overwhelming dehydration resulting in septic shock or death. The evaluation entails a systematic approach that restricts the diagnostic considerations and directs testing and management [1]. Diarrhea usually lasts a few days and may cause dehydration due to fluid loss, leading to decreased urination, changes in skin color, increased heart rate, and decreased responsiveness [9].

Diarrhea remains a major global health concern, despite improvements in healthcare. The World Health Organization (WHO) reports more than 1.7 billion annual cases of diarrhea, with 760,000 child deaths each year. In the United States, there are around 179 million cases of acute diarrheal disease annually, leading to over 900,000 hospitalizations. While children in developing nations face the highest risk, 83% of diarrhea-related deaths in high-income countries occur in adults aged 65 and older [10].

In 2004, an estimated 2.5 billion diarrhea cases were recorded worldwide, resulting in 1.5 million deaths in children under five. Most fatalities occurred in South Asia and Africa. Although this marks a decline from 4.5 million deaths in 1980, diarrhea remains the second leading cause of death (16%) in young children, after pneumonia (17%) [10]. Diarrhea is classified by duration: acute (lasting up to 14 days), persistent (exceeding 14 days), and chronic (continuing for 30 days or more) [11].

Diarrheal illnesses are categorized as infectious or noninfectious. Infectious causes, responsible for 85% of cases, include viruses (70%), bacteria (24%), and parasites (6%). The remaining cases stem from noninfectious factors [11]. Four key pathological mechanisms impair intestinal absorption:

1. **Secretory Diarrhea**:

- Triggered by pathogens releasing cytotoxins that increase intestinal permeability, leading to excessive fluid and electrolyte loss. This is the most common cause of emergency department visits. Noninfectious causes include medications, endocrine disorders, and tumors.

2. **Inflammatory Diarrhea (Dysentery)**:

- Results from mucosal damage, causing the release of water, blood, mucus, and proteins. Invasive bacteria or parasites are typical infectious agents, while noninfectious causes include chemotherapy, radiation, inflammatory bowel disease, and autoimmune disorders. Clinical findings often include systemic symptoms, fecal leukocytes, and erythrocytes.

3. **Osmotic Diarrhea**:

- Occurs when poorly absorbed solutes draw water into the intestinal lumen. Causes include osmotic laxatives and carbohydrate malabsorption.

4. **Steatorrhea**:

- Caused by unabsorbed fats in maldigestion or malabsorption syndromes, leading to osmotic effects [12].

Etiology and Clinical Presentation

Acute gastroenteritis is often linked to poor personal and environmental hygiene, unsanitary conditions, and a weakened immune system. Contaminated food—such as undercooked meals, improperly stored food, or raw ingredients—also plays a significant role. Inadequate reheating not only fails to eliminate bacteria but can also promote bacterial growth, increasing the ingested bacterial load. While reheating may kill some bacteria, heat-stable toxins like staphylococcal exotoxin remain active [12].

Red flags indicating severe gastroenteritis include a deteriorating or severely ill patient, altered mental status (e.g., irritability or lethargy), sunken eyes, tachycardia, tachypnea, and poor skin turgor [13]. Emergency clinicians should prioritize assessing vital signs and examining the skin for petechiae or purpura, particularly on the extremities, as these may suggest sepsis or disseminated intravascular coagulation (DIC). Additional signs of dehydration include dry mucous membranes, reduced skin elasticity, and decreased urine output [14]. In infants, key indicators of dehydration include measurable weight loss, absence of tears, low urine production, and a sunken fontanel [15].

The abdominal exam helps rule out conditions that mimic gastroenteritis, such as small bowel obstruction, ischemic bowel, appendicitis, or colitis. Hyperactive bowel sounds are common in acute gastroenteritis, whereas localized tenderness, rebound tenderness, guarding, abdominal distension, or rigidity may indicate a surgical abdomen [16, 17].

Viral infections account for approximately 70% of gastroenteritis cases, while bacterial and parasitic causes represent 15–20% and 10–15%, respectively. Initial symptoms alone rarely pinpoint the exact pathogen. Vomiting with upper respiratory symptoms suggests a viral cause, whereas sudden, severe vomiting may indicate bacterial toxins. Fever, bloody stools, abdominal pain, or colitis are more likely with invasive bacterial infections [18, 19].

Diagnostic Considerations

Most cases of acute diarrhea do not require extensive testing. However, severe symptoms—such as abnormal vital signs, comorbidities, or signs of systemic illness—warrant further evaluation. High-risk features include fever, dehydration, bloody or mucoid stools, frequent large-volume diarrhea, peritoneal signs, or underlying conditions like immunosuppression or chronic gastrointestinal disease. In such cases, additional diagnostic workup is necessary to guide treatment [18, 19].

Blood Tests:

- Leukemoid reactions, though reported in Clostridioides difficile infections, are not reliably detected by a single white blood cell (WBC) count, limiting its diagnostic utility.
- Eosinophilia may suggest parasitic infections with extra-intestinal migration phases.
- Hemoglobin levels help screen for anemia due to blood loss.

- Platelet counts and coagulation studies can clarify the cause of gastrointestinal bleeding.
- A basic metabolic panel assessing electrolytes (especially sodium and potassium) and the blood urea nitrogen/creatinine ratio is valuable in suspected hypovolemia or after severe diarrhea.
- Liver function tests—including AST, ALT, and coagulation times—are warranted in cases of jaundice or signs of liver disease.
- Additional tests, such as lipase (for epigastric pain with vomiting) or lactate (for dehydration, sepsis, or mesenteric ischemia), may be useful in specific clinical scenarios [18, 19, 20].

Fecal Testing Limitations:

- Fecal leukocyte analysis lacks sensitivity and specificity for determining antibiotic necessity, as both infectious and noninfectious diarrheal illnesses may show red or white blood cells.
- Fecal calprotectin and lactoferrin, though moderately sensitive for bacterial diarrhea (83% and 75%, respectively), do not guide emergency department (ED) management decisions. These markers are not recommended for routine use in ED evaluations [18, 19, 20].

Targeted Stool Testing:

- The C. difficile toxin assay is indicated for immunocompromised patients, those with recent antibiotic use or hospitalization, or prolonged severe diarrhea (>6 episodes/day). Symptoms often arise during or after antibiotic therapy.
- Testing for Escherichia coli O157:H7 is recommended during outbreaks, in endemic areas, or if hemolytic-uremic syndrome is suspected.
- Routine stool cultures for Salmonella, Campylobacter, and Shigella are generally unnecessary in the ED due to low sensitivity and delayed results but may be considered for toxic-appearing or immunocompromised hospitalized patients.
- Stool ova and parasite exams are reserved for chronic diarrhea, travel-related exposures (e.g., Giardia, Cryptosporidium), daycare contacts, or HIV-infected individuals [18, 19, 20].

Imaging Considerations:

- Plain abdominal radiographs are seldom needed but may assist in diagnosing paralytic ileus in cases of abdominal distention secondary to hypokalemia.
- Computed tomography (CT) scans provide further confirmation when warranted [18, 19, 20].

In patients with diarrhea who are hemodynamically unstable, prompt IV fluid resuscitation is essential while the underlying cause is being investigated. Key laboratory tests include serum creatinine (to evaluate renal function), electrolytes (Na^+ and K^+), and lactate (to assess organ perfusion). However, for stable patients with no signs of toxicity, extensive diagnostic workup is unnecessary, as treatment remains supportive and the condition is typically self-limiting (19, 20). Most children with mild dehydration can be discharged without an oral fluid trial, provided they receive proper guidance and follow-up. For rehydration, small, frequent doses of oral rehydration solution (ORS) should be given, aiming for 10-20 mL/kg over one hour. However, persistent gastrointestinal losses (such as severe vomiting or diarrhea) reduce the likelihood of successful home management. In such cases, early nasogastric tube (NGT) rehydration may be considered. NGT rehydration is both safe and effective for moderately dehydrated children, even with vomiting (25 mL/kg/hr for 4 hours). Vomiting often subsides once NGT fluids are initiated; if it persists, ondansetron can be administered, and NG fluids may be temporarily paused (19, 20). IV rehydration is reserved for severe dehydration, failed NGT rehydration, or certain comorbidities (e.g., short gut syndrome or prior gastrointestinal surgery). Initial fluid boluses of 20 mL/kg normal saline should be repeated until shock resolves. Monitoring should include Na^+, K^+, and glucose levels at baseline and at least every 24 hours (more frequently in high-risk patients).

Venous blood gases provide rapid results. Severely ill patients may require a septic workup or surgical consultation. Maintenance fluids should consist of 5% dextrose in 0.9% saline, with KCl (20 mmol/L) added if serum potassium is <3 mmol/L or oral supplements given (21, 22). Hypokalemic patients with ongoing losses require both deficit correction and ongoing replacement. Due to the risk of hyperkalemia, IV potassium must be administered cautiously, while oral potassium is safer but slower-acting. Liquid potassium formulations are often unpalatable, whereas microencapsulated or wax matrix forms are gentler on the stomach (dose: 2-4 mEq/kg/day, max 120-140 mEq/day in divided doses). IV potassium (0.5-1 mEq/kg over 1 hour) should be used judiciously. Potassium chloride is the standard for supplementation, but alternative forms (e.g., potassium acetate or citrate) may be needed in acidosis or hypophosphatemia. In volume-depleted metabolic alkalosis with hypokalemia, adequate NaCl infusion helps reduce renal potassium losses. Additionally, coexisting hypomagnesemia should be addressed, as it can contribute to hypokalemia. Most hereditary tubular disorders respond well to disease-specific treatments (23, 24, 25, 26).

METHADOLOGY:

A prospective clinical trial was conducted at Al-Khansaa Teaching Hospital in Mosul, Iraq, enrolling 153 patients from January 15, 2023, to December 30, 2023. The study focused on children aged 1 to 5 years presenting with acute gastroenteritis and hypokalemia (serum potassium <3.5 mmol/L). Patients were initially assessed in the emergency department (ER) and subsequently followed up in the pediatric medical ward until discharge. Exclusion criteria included prolonged diarrhea (lasting >1 week), bloody diarrhea, parenteral diarrhea (e.g., due to pneumonia or urinary tract infections), nutritional disorders (e.g., marasmus, glycogen storage diseases), and congenital gastrointestinal abnormalities.

Upon ER admission, acute gastroenteritis was diagnosed based on clinical history (diarrhea, vomiting, or both), physical examination (assessing skin turgor, mucous membranes, tear production, and urine output), and laboratory investigations (complete blood count, renal function tests, random blood sugar, and electrolyte levels, including sodium, potassium, and chloride). Rehydration therapy, either via oral rehydration solution (ORS) or intravenous fluids, was initiated as needed. Patients requiring hospitalization were admitted to the pediatric ward, where their potassium levels were monitored daily. The study recorded the first observed complications, which included generalized weakness or a combination of generalized weakness and paralytic ileus, until discharge.

Generalized weakness was assessed through patient history (fatigability, reduced physical activity) and serial physical examinations (evaluating muscle tone, gait, and reflexes). Paralytic ileus was diagnosed based on clinical symptoms (reduced bowel movements, vomiting), physical findings (abdominal distension, diminished bowel sounds), and imaging studies (abdominal X-ray or CT scan when necessary). This systematic approach ensured accurate monitoring and management of hypokalemia-related complications in pediatric patients with acute gastroenteritis.

In the data collection process, initial verbal consent was obtained from the parents before including their children in the study. Following this, a structured questionnaire was administered to gather the necessary information. This approach ensured that participation was voluntary and based on informed agreement, while the questionnaire facilitated systematic data collection. The method prioritized ethical considerations by securing parental approval before proceeding with the research.

Name:

Age:

Sex:

Residence:

Onset of gastroenteritis:

Main complaint (s):

1. Diarrhea:
2. Vomiting:
3. Both diarrhea and vomiting:

Severity of dehydration:

1. Moderate
2. Severe

U.O.P:

1. Good
2. Poor

Educational status of both parents:

1. High educational
2. High school
3. Primary school
4. Illiterate

Serum potassium level at E.R:

Admission at Pediatric – Medical ward:

Serial serum potassium level at Pediatric – Medical ward:

Complication of hypokalemia, if it is occurred:

1. Generalized weakness:
2. Generalized weakness & Paralytic ileus.

The study categorized residence into two groups: urban (within Mosul city) and rural (outside Mosul city). It examined the onset of acute gastroenteritis, defined as lasting less than seven days, and assessed the severity of dehydration. Moderate dehydration was characterized by lethargy, capillary refill time of 2–4 seconds, dry mucous membranes, reduced tear production, elevated heart and respiratory rates, weak pulse, delayed skin recoil, sunken fontanels and eyes, and decreased urine output (UOP). Severe dehydration involved an obtunded patient, capillary refill exceeding four seconds, extremely dry mucous membranes, absent tears, more pronounced tachycardia and tachypnea than in moderate cases, non-palpable pulse, tenting skin, deeply sunken fontanels and eyes, and significantly reduced UOP.

Urine output was classified as poor (less than 0.5 mL/kg/hr) or good (approximately 2 mL/kg/hr). However, in cases where direct measurement was impractical, mothers were questioned about diaper saturation or urinary frequency and volume in toilet-trained children.

Socioeconomic status was evaluated based on several criteria, including parental education and occupation, household income, hygiene practices, housing ownership, and the Gromal index (which considers family size relative to the number of rooms). Additional factors included water sources, sewage disposal methods, and the presence of domestic animals. Families were stratified into good, fair, or poor socioeconomic categories based on these indicators.

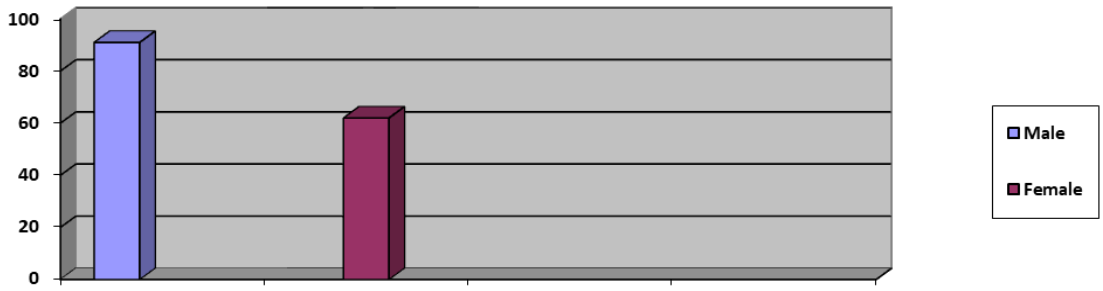
The data were systematically organized into tables and figures, and statistical significance was assessed using the Fisher exact test, which was computed through the chi-square method. Additionally, both the peak age and mean age were determined for further analysis.

RESULTS:

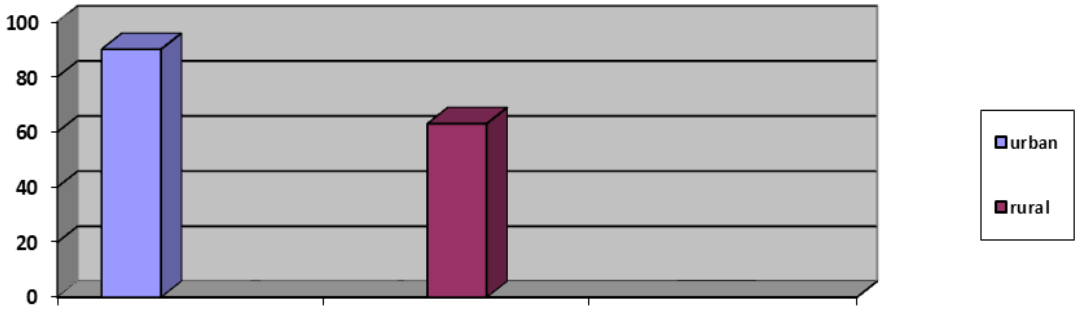
A clinical study was conducted on 153 children aged 1 to 5 years who were admitted to Al-Khansaa Teaching Hospital in Mosul, Iraq, from January 15 to December 30, 2023, with a diagnosis of acute gastroenteritis. The study found that the peak age of affected children was 3 years, with a mean age of 3 ± 1 years, as detailed in the accompanying table.

AGE (YEARS)	Total no	Total %	MALE		FEMALE	
			NO	%	NO	%
1 - 2 years	32	22	21	15	11	7
2 – 3 years	29	18	19	10	10	8
3 – 4 years	71	47	41	27	30	20
4 – 5 years	21	13	12	9	9	4
TOTAL	153	100	93	61	60	39

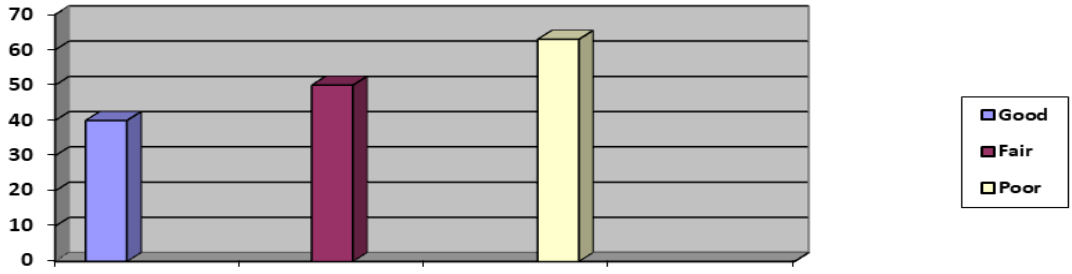
The study included 93 male participants (61%) and 60 female participants (39%), resulting in a male-to-female ratio of 1.2:1, as illustrated in the figure below.

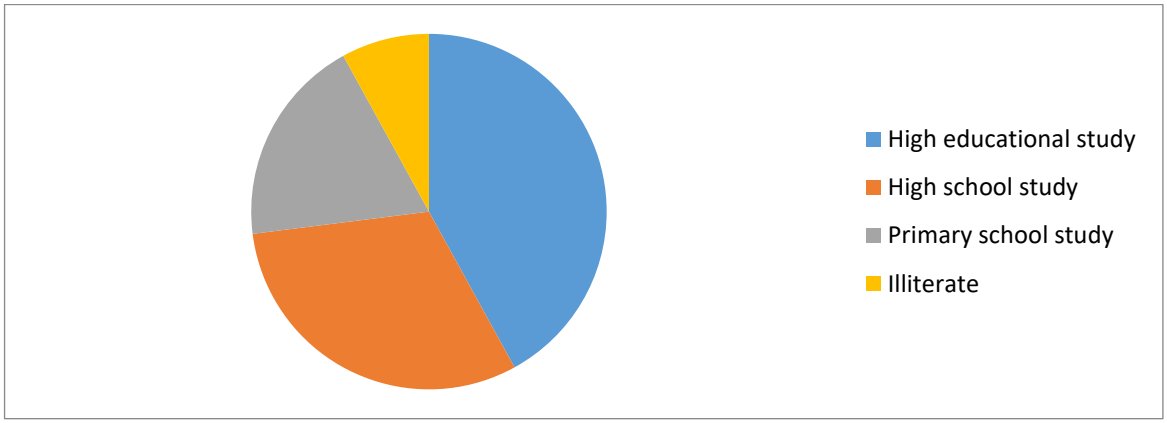


Concerning patient residency, the data reveals that 90 individuals (78%) were from urban regions, while 63 (42%) originated from rural areas, as illustrated in the figure below."



The distribution of gastroenteritis cases varied by socioeconomic status: 26% (40 individuals) were from a high socioeconomic group, 32% (50 individuals) from a moderate group, and 42% (63 individuals) from a low socioeconomic group, as illustrated in the figure.





Concerning parental education levels and the incidence of gastroenteritis, the data revealed that 63 parents (42%) had higher education, 47 (31%) completed high school, 30 (19%) attended primary school, and only 13 (8%) were illiterate, as illustrated in the figure above

The most frequent gastroenteritis symptoms reported were diarrhea and vomiting together, occurring in 65 cases (44%), with a statistically significant p-value of 0.03. Diarrhea alone was observed in 61 cases (39%), showing a p-value of 0.5, which was also significant. In contrast, vomiting alone was less common, appearing in only 27 cases (17%), with a non-significant p-value, as detailed in the accompanying table.

Main complaint	1 – 2 years		2 – 3 years		3 – 4 years		4 – 5 years		Total		P value
	NO	%	NO	%	NO	%	NO	%	NO	%	
Diarrhea	17	27	31	48	11	6	9	65	65	44	0.03***
Vomiting	19	31	21	35	11	18	10	16	61	39	0.5**
Both diarrhea & vomiting	7	26	11	42	5	18	4	14	27	17	0.1*

***= non-significant **= significant ***= most significant**

The study found that 81 participants (53%) had severe dehydration, with a statistically significant P-value of 0.06. In contrast, 72 participants (47%) exhibited moderate dehydration, but the P-value for this group was not statistically significant, as indicated in the table below.

Dehydration	1 – 2 years		2 – 3 years		3 – 4 years		4 – 5 years		Total		P value
	NO	%	NO	%	NO	%	NO	%	NO	%	
Moderate	29	35	31	38	11	13	10	14	81	53	0.06**
Severe	30	42	28	38	9	12	6	8	72	47	0.2*

***= non-significant **= significant**

Regarding urine output and dehydration levels, the study found that 70 cases had poor urine output (UOP) along with severe dehydration, showing a statistically significant p-value (0.002). Additionally, 21 cases had poor UOP with moderate dehydration, with a marginally significant p-value (0.06). In contrast, 8 cases exhibited good UOP despite severe dehydration, though this association was not statistically significant. Similarly, 54 cases had good UOP with moderate dehydration, also without statistical significance, as detailed in the table below.

UOP	1 – 2 years		2 – 3 years		3 – 4 years		4 – 5 years		Total		P value
	NO	%	NO	%	NO	%	NO	%	NO	%	
Poor UOP & Severe dehydration	21	31	29	42	11	15	9	12	70	86	0.002***
Poor UOP & Moderate dehydration	6	29	5	23	6	29	4	19	21	24	0.06**
Fair UOP &	3	37		37	1	13		13	8	11	0.2*

Severe dehydration			**3**				**1**				
Fair UOP & Moderate dehydration	**24**	**46**	**16**	**29**	**8**	**14**	**6**	**11**	**54**	**89**	**0.1***

***= non-significant **= significant ***= most significant**

Among the cases studied, hypokalemia occurred in 61 patients (39%), while 92 patients (61%) did not develop hypokalemia.

In cases with dehydration, the distribution of hypokalemia severity was as follows: mild (23%, n=11), moderate (36%, n=17), and severe (41%, n=19). This association was statistically significant (p = 0.01). In contrast, among patients without dehydration, mild hypokalemia was present in 50% (n=7), moderate in 35% (n=5), and severe in 15% (n=2), showing no significant correlation (non-significant p-value). These findings are summarized in the accompanying table.

Degree of Dehydration	**Degree of Hypokalemia**						**Total of Hypokalemia**		**Total of Dehydration**		**P value**
	Mild		**Moderate**		**Severe**						
	NO	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**	
Severe	**11**	**23**	**17**	**36**	**19**	**41**	**47**	**77**	**81**	**53**	**0.01****
Moderate	**7**	**50**	**5**	**35**	**2**	**15**	**14**	**33**	**72**	**47**	**0.8***

***=non-significant **=significant**

The study found that among the complications of hypokalemia, generalized weakness was more common, affecting 51 patients (83%), with a statistically significant p-value of 0.001. In contrast, paralytic ileus occurred in 10 patients (17%), but its p-value of 0.2 indicated it was not statistically significant, as detailed in the table below. These findings highlight the varying clinical impacts of hypokalemia based on age and complication type.

Complication	**1 – 2 years**		**2 – 3 years**		**3 – 4 years**		**4 – 5 years**		**Total**		**P value**
	NO	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**	
Generalized weakness	**21**	**43**	**19**	**37**	**7**	**13**	**4**	**7**	**51**	**83**	**0.001****
Paralytic ileus	**4**	**40**	**3**	**30**	**2**	**20**	**1**	**10**	**10**	**17**	**0.2***

***= non-significant **=significant**

Severe dehydration was observed in 41 patients (80%), with generalized weakness being a significant complication (p-value = 0.001). Additionally, all 10 patients (100%) exhibited both generalized weakness and paralytic ileus, though this association was not statistically significant (p-value = 0.4). Among those with moderate dehydration (10 patients, 20%), generalized weakness was present, but the correlation was not significant (p-value = 0.5). These findings are summarized in the table below.

Severe dehydration & complications	**1 – 2 years**		**2 – 3 years**		**3 – 4 years**		**4 – 5 years**		**Total**		**P value**
	NO	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**	
Generalized weakness	**18**	**43**	**15**	**36**	**4**	**10.5**	**4**	**10.5**	**41**	**80**	**0.001****
Paralytic ileus	**7**	**70**	**2**	**20**	**1**	**10**	**0**	**0**	**10**	**100**	**0.4***
Moderate dehydration & complications	**1-2 years**		**2 – 3 years**		**3 – 4 years**		**4 – 5 years**		**Total**		**P value**
	NO	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**	**NO**	**%**	

Generalized weakness	**4**	**40**	**3**	**30**	**2**	**20**	**1**	**10**	**10**	**20**	**0.5***
Paralytic ileus	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

***= non-significant **= significant**

DISCUSSION:

The study revealed that The highest incidence of acute gastroenteritis was observed at 3 years of age, with a mean age of 3.15 years, closely aligning with findings by John A (1), who reported a peak age of 2.5 years, and Danial A (2), who noted 2.7 years. However, this contrasts with Weisberg L (10), where the peak age was 2 years, suggesting potential variations in regional epidemiology or healthcare access influencing disease presentation.

The male-to-female ratio was 1.2:1, similar to Corrall C (4) and Schaefer T (13), both reporting 1.4:1, but differing from Begum J (14), who found a higher ratio of 1.8:1. This discrepancy may be attributed to the larger sample size in Begum's study (1051 cases vs. 153 in this study), which could have captured a broader demographic distribution.

Urban areas (78%) had a significantly higher incidence of acute gastroenteritis compared to rural areas (42%), consistent with Mirza S (6). However, this finding opposes Adam D (15), who reported higher rural incidence, possibly due to differences in sanitation, population density, or environmental factors such as urban pollution, which may contribute to increased pathogen transmission in cities.

Regarding socioeconomic status, distribution was 26% good, 32% fair, and 42% poor, matching Aude M (19) but contrasting Lehuhardil A (9), where most patients belonged to higher socioeconomic groups. This difference likely reflects regional economic disparities, as Lehuhardil's study may have been conducted in a more affluent area. Educational status showed 42% with higher education, 31% high school, 19% primary school, and 8% illiteracy, agreeing with Lee W (17) but differing from Hollander J (11), who reported lower parental education levels, possibly due to differing community demographics.

Clinically, diarrhea (39%), vomiting (17%), and both symptoms (44%) were the most common presentations, consistent with John A (1) and Kayleen D (5). However, Begum J (14) found diarrhea to be more dominant, possibly due to variations in causative pathogens (viral vs. bacterial) or differences in healthcare-seeking behavior among populations.

Dehydration severity was severe in 53% and moderate in 47%, aligning with Danial A (2) and Memon Y (18) but contrasting Weisberg L (10), where moderate dehydration was more common. This discrepancy may be due to climatic differences, as this study was conducted in a subtropical region, whereas Weisberg's research was in a colder climate, where fluid loss dynamics might differ.

Urine output was poor in 86% of severe dehydration cases and 24% of moderate cases, agreeing with Miraz S (6) and Corrall C (4) but differing from Geunari F (12), who reported better urine output, possibly due to earlier medical intervention or differences in hydration management protocols.

Hypokalemia was present in 39% of cases, consistent with Kayleen D (5) and Goldman R (7), but slightly differing from Schaefer T (13), who found an equal distribution. This variation may stem from differences in laboratory techniques, sample collection timing, or electrolyte measurement methods. Among hypokalemia cases, severe dehydration was associated with mild (11 cases), moderate (17), and severe (19) hypokalemia, whereas moderate dehydration had mild (7), moderate (5), and severe (2) cases, aligning with John A (1) but differing slightly from Begum J (15), who reported moderate hypokalemia as the most common, possibly due to differing patient age groups or nutritional status.

Regarding complications, 83% had generalized weakness, while 17% had weakness with paralytic ileus, matching Danial A (2) and Amon K (16) but differing slightly from (9), who found equal incidence, possibly due to variations in patient age distribution or severity at presentation.

In severe dehydration, 80% had generalized weakness, and 100% of those with paralytic ileus also had weakness, whereas moderate dehydration cases showed 20% weakness and no ileus, consistent with John A (1) and Danial A (2) but slightly differing from Goldman R (7), possibly due to differences in rehydration strategies or baseline patient health status.

Conclusions :

1. Gastroenteritis is most common in young infants, occurring slightly more often in males than females and more frequently in urban compared to rural regions.
2. Approximately one-third of patients with acute gastroenteritis present with hypokalemia.
3. Oral rehydration solution (ORS) is the best first-line treatment for all forms of gastroenteritis.
4. Patients with moderate to severe dehydration due to gastroenteritis require repeated serum potassium level monitoring.
5. Preventive strategies to reduce the occurrence of gastroenteritis are more impactful than treatment after infection

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