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Original Research Article

STUDY OF ACUTE DIARRHOEAL DISEASE IN ADULTS WITH COMPLICATIONS AND MANAGEMENT IN RMRI, BAREILLY

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ABSTRACT

Background: Acute diarrheal disease remains a major cause of morbidity among adults in developing regions, particularly in areas with suboptimal sanitation and water safety. Although often self-limiting, adult diarrheal illness may result in significant complications including dehydration, electrolyte imbalance, renal impairment, and sepsis, especially in patients with underlying comorbidities.

Materials and Methods: A hospital-based descriptive cross-sectional study was conducted in the Department of General Medicine at Rajshree Medical Research Institute (RMRI), Bareilly. A total of 100 adult patients admitted with acute diarrheal disease were evaluated over a one-year period. Data regarding socio-demographic characteristics, clinical presentation, laboratory findings, microbiological profile, complications, management strategies, and treatment outcomes were collected and analyzed using appropriate statistical methods.

Results: The majority of patients (63%) had no preexisting comorbidities, while hypertension and diabetes were the most common associated conditions. Most patients presented without dehydration (84%), and stool consistency was predominantly loose (55%) or watery (23%). Microbiological analysis revealed mixed etiology, with Norovirus (11%) and enterotoxigenic Escherichia coli (10%) being the most frequently identified pathogens. Complications were observed in 27% of cases, including electrolyte imbalance (11%), sepsis (9%), and renal impairment (7%). Oral rehydration solution was administered in 86% of patients, and antibiotics were used selectively in 53%. Clinical improvement was achieved in 84% of patients.

Conclusion: Acute diarrheal disease in adults is predominantly infectious in origin and largely self-limiting when managed promptly. Early rehydration, rational antimicrobial therapy, and monitoring for complications are essential for favorable outcomes. Strengthening preventive public health measures remains critical to reducing disease burden.

Keywords: Acute Diarrhea, Infectious Gastroenteritis, Oral Rehydration Therapy, Electrolyte Imbalance, Enterotoxigenic Escherichia coli.

INTRODUCTION

Acute diarrheal disease remains a major global health problem, particularly in low- and middle-income countries where inadequate sanitation, unsafe drinking water, and limited healthcare access contribute to high disease transmission rates. Although childhood diarrhea has received considerable global attention because of its mortality burden, acute diarrheal disease in adults also

contributes substantially to morbidity, healthcare utilization, and economic loss.[1,2] Adults frequently present with dehydration, electrolyte imbalance, acute kidney injury, and exacerbation of pre-existing comorbidities such as diabetes, hypertension, and cardiovascular disease. Severe cases may progress to hypovolemic shock or sepsis if not promptly managed, underscoring the importance of timely clinical intervention.[3]

Acute diarrhea is defined as the passage of three or more loose or watery stools per day lasting less than 14 days. It is most commonly caused by infectious agents, including bacteria, viruses, and parasites. Bacterial pathogens such as Salmonella species, Shigella, Vibrio cholerae, Vibrio parahaemolyticus, and diarrheagenic Escherichia coli are major etiological agents worldwide.[4] Viral agents, particularly norovirus and rotavirus, are also significant causes of acute gastroenteritis in adults, especially in outbreak settings.[5] The clinical presentation typically includes sudden onset of loose stools, nausea, vomiting, abdominal cramps, and fever. While many cases are self-limiting, severe infections can rapidly result in dehydration and metabolic disturbances requiring hospitalization.[3,6]

Transmission primarily occurs through the fecal–oral route via contaminated food, water, or person-to-person contact. Outbreaks are frequently reported in crowded or institutional environments, including hospitals, long-term care facilities, and disaster relief camps where hygiene conditions are compromised.[5,7] The incubation period varies according to the causative organism, ranging from hours in toxin-mediated bacterial infections to several days in viral illnesses. Recognition of epidemiological patterns is essential for early diagnosis, outbreak containment, and targeted public health interventions.[4]

The cornerstone of management of acute diarrheal disease is prompt restoration of fluid and electrolyte balance. Oral rehydration therapy (ORT) remains one of the most effective and cost-efficient medical interventions, significantly reducing morbidity and mortality [8]. Intravenous fluid therapy is indicated in moderate to severe dehydration. Antimicrobial therapy is reserved for selected bacterial infections or severe clinical presentations and should be guided by clinical assessment and laboratory findings. Indiscriminate antibiotic use contributes to antimicrobial resistance, which represents an escalating global public health threat.[9,10] Supportive therapy, including zinc supplementation in certain populations and nutritional rehabilitation, further aids recovery.[11]

Prevention remains fundamental in controlling diarrheal disease transmission. Adequate hand hygiene, safe water supply, proper sanitation, and adherence to food safety practices are critical preventive measures.[12] The World Health Organization's "Five Keys to Safer Food" emphasize maintaining cleanliness, separating raw and cooked food, cooking thoroughly, storing food at safe temperatures, and using safe water and raw materials.[13] Community education, improved infrastructure, and environmental sanitation significantly reduce disease burden at the population level.[1,12]

In India, acute diarrheal diseases continue to impose a substantial health burden across both rural and urban populations. Regional variations in sanitation standards, water quality, and healthcare access influence disease patterns and outcomes.[2,14] Rajendra Memorial Research Institute (RMRI), Bareilly, serves a diverse patient population from surrounding districts and provides an important setting for studying adult diarrheal disease patterns. Adult patients may exhibit distinct clinical severity, complication rates, and treatment responses compared to children, particularly in the presence of comorbid conditions. Despite this, adult-focused research in acute diarrheal disease remains relatively limited.

Understanding the socio-epidemiological characteristics, etiological spectrum, associated complications, and management strategies of acute diarrheal disease in adults within this regional context is essential for optimizing clinical protocols and improving patient outcomes. The present study aims to evaluate the spectrum of acute diarrheal diseases among adults, with particular emphasis on associated complications and management approaches. The objectives include assessing socio-epidemiological determinants, identifying etiological factors and complications, and evaluating treatment modalities employed in adult patients presenting with acute diarrhea.

MATERIALS AND METHODS

A descriptive, cross-sectional, hospital-based observational study was conducted to evaluate the spectrum, complications, and management practices of acute diarrheal diseases among adults admitted to a tertiary care center. The cross-sectional design was chosen because it enables simultaneous assessment of disease characteristics, associated risk factors, complications, and treatment patterns within a defined time frame, thereby providing a comprehensive clinical and epidemiological snapshot of the condition in a real-world setting.[16] This design is particularly appropriate for hospital-based infectious disease research where both exposure variables and clinical outcomes can be assessed concurrently without influencing routine medical care.

The study was carried out in the Inpatient Department (IPD) of the Department of General Medicine at Rajshree Medical Research Institute (RMRI), Bareilly, Uttar Pradesh, India. RMRI is a tertiary care teaching hospital catering to both urban and rural populations of Bareilly and adjoining districts. The institution is equipped with well-established diagnostic facilities including automated hematology

and biochemistry analyzers and a functional microbiology laboratory, enabling comprehensive clinical and etiological evaluation of patients presenting with acute diarrheal illness. Data collection was conducted prospectively over a period of twelve months to account for seasonal variation in diarrheal disease incidence, particularly during summer and monsoon seasons when water-borne infections are more prevalent.[17]

The source population consisted of all adult patients aged 18 years and above admitted to the General Medicine IPD with symptoms suggestive of acute gastrointestinal illness during the study period. The study population included patients who fulfilled predefined inclusion and exclusion criteria and provided written informed consent. Consecutive sampling was employed to minimize selection bias, ensuring that all eligible patients admitted during the study period were enrolled until the required sample size was achieved. The sample size was calculated using the standard formula for estimating prevalence in an infinite population:

$S = Z^2 \times P \times (1 - P) / M^2$

where S represents the required sample size, Z corresponds to the standard normal deviate at 95% confidence (1.96), P represents the estimated population proportion (assumed to be 50% due to absence of reliable local prevalence data), and M represents the margin of error (5%). Assuming P = 0.5 ensures maximum variability and adequate statistical power for descriptive and inferential analysis.[18]

Patients were included if they were 18 years or older and presented with acute diarrhoea defined as passage of three or more loose or watery stools per day with onset within the preceding 14 days, consistent with internationally accepted definitions.[19] Only those requiring hospitalization were enrolled to facilitate detailed evaluation of complications and inpatient management practices. Written informed consent was obtained from each participant or, in cases of critical illness, from a legally authorized representative.

Patients were excluded if diarrhoea was clearly attributable to drug-induced causes such as recent antibiotic initiation, laxative abuse, or chemotherapeutic agents; immediate postoperative diarrhoea following abdominal or gastrointestinal surgery; chronic diarrhoea persisting for more than four weeks suggestive of inflammatory bowel disease, irritable bowel syndrome, malabsorption syndromes, or chronic pancreatic insufficiency; or diarrhoea secondary to systemic non-infectious causes such as hyperthyroidism or diabetic autonomic neuropathy. Patients who declined consent were excluded.

Data collection was performed using a structured, pre-tested case record form developed after literature review and expert consultation. Within 24 hours of admission, socio-demographic data including age, gender, occupation, and residence (urban or rural) were recorded. Detailed clinical history included onset, duration, frequency, and character of stools; presence of blood or mucus; associated symptoms such as nausea, vomiting, abdominal cramps, fever, and tenesmus; recent travel history; dietary exposure including consumption of outside food or potentially contaminated water; and personal habits such as smoking and alcohol intake. Past medical history documented pre-existing comorbidities including hypertension, diabetes mellitus, ischemic heart disease, chronic kidney disease, chronic liver disease, and immunocompromised states.

Clinical examination included recording of vital parameters (temperature, pulse, blood pressure, respiratory rate) and systematic assessment for dehydration using WHO clinical dehydration classification based on general condition, thirst, eye appearance, and skin pinch response.[19] Patients were categorized into no dehydration, some dehydration, or severe dehydration. Abdominal examination findings including tenderness, distension, guarding, and bowel sounds were documented, along with systemic findings suggestive of complications such as altered sensorium or oliguria.

Routine laboratory investigations were performed as part of standard clinical care. Complete blood count was analyzed using automated hematology analyzers to assess hemoglobin, total leukocyte count, differential leukocyte count, and platelet count. Renal function tests including serum urea and creatinine were measured to evaluate dehydration-related renal impairment. Serum electrolytes (sodium, potassium, chloride) were analyzed using ion-selective electrode methods to identify electrolyte disturbances. Random blood glucose levels were assessed to detect stress-induced hyperglycemia or uncontrolled diabetes.

Fresh stool samples were collected in sterile containers for macroscopic and microscopic examination. Macroscopic examination assessed consistency, color, and presence of visible blood or mucus. Microscopic examination involved saline and iodine wet mount preparations to detect leukocytes, red blood cells, ova, cysts, and trophozoites. Stool cultures were performed selectively in patients with severe symptoms, high-grade fever, or suspected invasive bacterial infection. Samples were inoculated onto selective and differential media, and antimicrobial susceptibility testing was conducted using the Kirby–Bauer disk diffusion method according to standardized laboratory guidelines.[20]

Management of patients was purely observational and not influenced by the study protocol. All therapeutic decisions were made by the treating physicians according to institutional and national guidelines. Rehydration therapy formed the cornerstone of management, with oral rehydration solution administered for mild to moderate dehydration and intravenous fluids such as Ringer's lactate or normal saline for severe dehydration or shock.[19] Antibiotics were prescribed selectively for suspected or confirmed bacterial infections. Supportive therapies including antiemetics, zinc supplementation, probiotics, and dietary advice were recorded.

Treatment outcomes were assessed at discharge and categorized as improved, stable, or worsened based on resolution of diarrhoea, normalization of vital parameters, and ability to tolerate oral intake. Length of hospital stay was documented. Complications including electrolyte imbalance, acute kidney injury (defined as rise in serum creatinine ≥0.3 mg/dL from baseline), and sepsis were recorded.

Data were entered into Microsoft Excel and analyzed using IBM SPSS version 25. Continuous variables were expressed as mean ± standard deviation or median with interquartile range depending on distribution assessed by Shapiro–Wilk test. Categorical variables were expressed as frequencies and percentages. Associations between categorical variables were analyzed using Chi-square test or Fisher's exact test as appropriate. A p-value < 0.05 was considered statistically significant.[18]

The study was conducted in accordance with the Declaration of Helsinki. Institutional Ethics Committee approval was obtained prior to initiation of data collection. Confidentiality was maintained by assigning unique identification numbers to participants and restricting access to data to the research team.

RESULTS

The present study evaluated acute diarrheal disease in adults with emphasis on etiological factors, complications, and management outcomes among 100 hospitalized patients at RMRI Bareilly. Demographic variables did not demonstrate a decisive role in disease distribution; therefore, subsequent analysis focused on clinically and epidemiologically relevant parameters that directly influenced disease severity and treatment response.

The present study assessed acute diarrheal disease in adults with emphasis on etiology, complications, and management outcomes. Preexisting comorbidities [Table 1] were identified in 37% of patients, most commonly hypertension and diabetes, while 63% had no underlying illness (χ^2 = 198.76, p < 0.001). Although the majority were previously healthy, chronic systemic conditions may predispose patients to more severe clinical courses.

Table 1: Preexisting comorbidities in patients

Preexisting Comorbidities	Number of Patients
No	63
Hypertension	10
Diabetes	10
Ischemic heart disease	8
CKD	5
Chronic liver disease	3
HIV	1
Total	100
Chi (χ2) – 198.76, p-value- 3.48×10^{-40}	

Evaluation of dehydration severity [Table 2] revealed that 84% of patients had no dehydration, 10% had mild, 4% moderate, and only 2% severe dehydration (χ^2 = 187.04, p < 0.001). This indicates that most cases presented early or received timely fluid replacement. Stool consistency [Table 3] demonstrated that loose stools (55%) and watery stools (23%) predominated, while mucous and bloody stools were less frequent (χ^2 = 106.9, p < 0.001), suggesting mainly toxin-mediated or viral diarrhea with fewer invasive bacterial cases.

Table 2: Dehydration severity among patients

Dehydration Severity	Number of Patients
None	84
Mild	10
Moderate	4
Severe	2
Total	100
Chi (χ2) –187.04, p-value- 2.66×10^{-40}	

Table 3: Stool Consistency among patients

Stool Consistency	Number of Patients
Loose	55
Watery	23
Mucous	11
Bloody	6
Other	5
Total	100
Chi (χ2) – 106.9, p-value- 1.04×10^{-22}	

Microbiological findings [Table 4] showed a heterogeneous distribution of pathogens. Norovirus (11%) and ETEC (10%) were the leading causes, followed by Vibrio cholerae and Salmonella spp. (χ^2 = 50.92, p < 0.001). This confirms mixed viral and

bacterial etiology, consistent with global adult diarrheal disease patterns.

Table 4: Clinical evaluation of patients for the presence of infection by pathogen

Pathogen	Number of Patients
Not done	28
Norovirus	11
E. coli (ETEC)	10
Adenovirus	9
Not identified / No growth	9
Vibrio cholerae	8
Salmonella spp.	7
Campylobacter spp.	7
C. difficile	5
Rotavirus	3
Shigella spp.	3
Total	100
Chi ($\chi 2$) – 50.92, p-value- 1.81×10^{-7}	

Complication analysis [Table 5] revealed that 73% of patients experienced no complications, while electrolyte imbalance (11%), sepsis (9%), and renal impairment (7%) occurred in a minority ($\chi^2 = 392.3$, $p < 0.001$). These findings indicate that although most cases are mild, systemic complications can occur, particularly in vulnerable individuals.

Table 5: Complications due to diarrohea among patients

Complications	Number of Patients
None	73
Sepsis	9
Electrolyte imbalance	11
Renal impairment	7
Total	100
Chi ($\chi 2$) – 392.3, p-value- 8.31×10^{-80}	

Management practices [Table 6] demonstrated high utilization of oral rehydration solution (86%) and selective antibiotic use (53%), reflecting adherence to guideline-based care. Treatment response [Table 7] showed improvement in 84% of patients, with only 8% experiencing deterioration. Correlation between therapeutic interventions and outcomes [Table 8] revealed a strong positive association ($\rho = 0.886$, $p = 0.018$), confirming that appropriate treatment significantly influenced recovery.

Table 6: Management of diarrhea among patients

Treatment modality	Number of Patients
ORS	
Yes	86
No	14
IV Fluids	
No	80
Yes	20
Antibiotics	
None	51
Azithromycin	14
Metronidazole	13
Doxycycline	8
Ciprofloxacin	7
Ceftriaxone	7
Antimotility Agents	
No	89
Yes	11
Other Treatment	
None	93
Zinc supplementation	4
Antiemetic	2
Probiotics	1
Dietary Modifications	
Yes	65
No	35

Table 7: Response to treatment among patients

Response To Treatment	Number of Patients
Improved	84
Stable	8
Worsened	8

Table 8: Correlation between treatment modalities and response to treatment

Treatment Modality	Good Response (n=78)	Moderate Response (n=18)	Poor Response (n=4)	Total (n=100)
ORS Given	70	13	3	86
IV Fluids	36	9	3	48
Antibiotics	43	7	3	53
Antimotility Agents	12	4	2	18
Other Treatments	11	3	1	15
Dietary Modifications	54	9	2	65

Graphical representation further supports these findings. Figure 1 illustrates stool consistency distribution, highlighting predominance of loose and watery stools. Figure 2 demonstrates pathogen distribution, emphasizing viral and bacterial diversity. Figure 3 shows overall treatment response, reflecting the high rate of clinical improvement following evidence-based management.

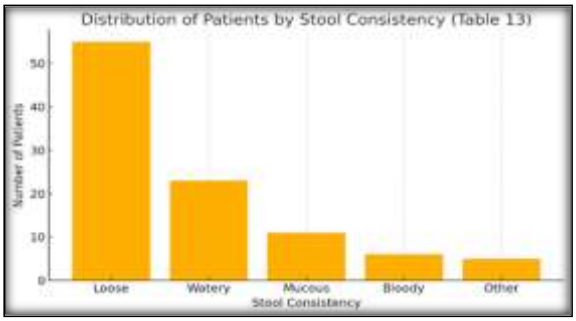

Figure 1: Stool Consistency among patients

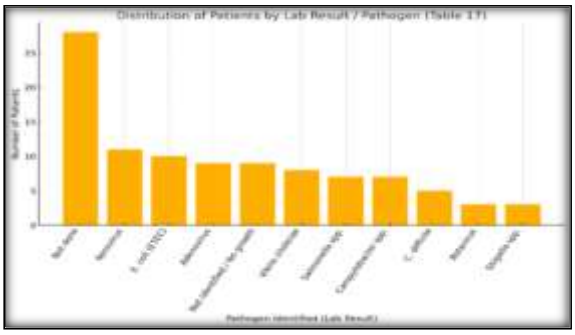

Figure 2: Clinical evaluation of patients for the presence of infection by pathogen

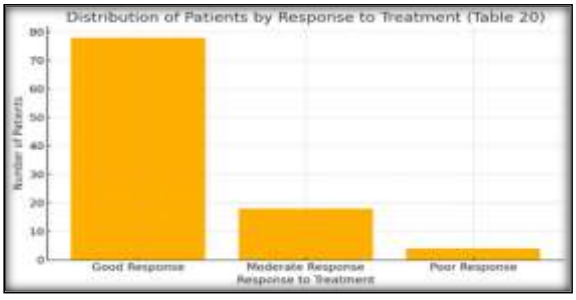

Figure 3: Response to treatment among patients

Overall, the result collectively demonstrate that acute diarrheal disease in adults is predominantly infectious, largely self-limiting when managed promptly, but capable of causing systemic complications in a subset of patients. Early rehydration and rational antibiotic use remain central to successful outcomes.

DISCUSSION

The present study conducted at RMRI Bareilly provides important insight into the clinical spectrum, etiological profile, complications, and management outcomes of acute diarrheal disease among hospitalized adults. The findings demonstrate that although most cases were self-limiting, a clinically significant subset developed systemic complications, emphasizing the need for early diagnosis and structured management protocols.

In this study, 37% of patients had preexisting comorbidities, most commonly hypertension and diabetes, while 63% had no underlying illness. Although acute diarrheal disease affected a largely healthy adult population, individuals with chronic systemic disorders may be predisposed to more severe manifestations due to altered immunity, impaired renal reserve, and increased susceptibility to dehydration. Similar findings have been documented in adult cohorts where comorbidities increase the risk of complications and prolonged hospitalization in infectious diarrhea.[21]

Assessment of dehydration severity showed that the majority of patients had no dehydration and only a small fraction presented with severe dehydration. This likely reflects early healthcare access and timely initiation of oral rehydration therapy. The WHO has consistently emphasized that prompt and adequate rehydration significantly reduces morbidity and prevents progression to hypovolemic shock and renal impairment.[22] The high utilization of oral rehydration solution (ORS) in the present study further supports adherence to evidence-based management principles and highlights its continued effectiveness in adult diarrheal illness.

Stool consistency patterns in this study were predominantly loose and watery, with fewer cases presenting with mucous or bloody stools. This clinical profile suggests that most cases were toxin-

mediated or viral in origin, while a smaller subset likely represented invasive bacterial infections. The microbiological findings supported this observation, with Norovirus and enterotoxigenic Escherichia coli (ETEC) being the most frequently identified pathogens. These results align with global epidemiological data indicating that viral agents are major contributors to adult gastroenteritis, particularly in hospital and community outbreaks.[23] The detection of bacterial pathogens such as Vibrio cholerae and Salmonella spp. further reflects the persistent burden of food- and water-borne infections in endemic regions.

Complication analysis revealed that while the majority of patients remained uncomplicated, a meaningful proportion developed electrolyte imbalance, sepsis, or renal impairment. The occurrence of sepsis in a subset of patients underscores the potential severity of acute diarrheal disease in adults, especially among elderly or immunocompromised individuals. Gastrointestinal infections are recognized precipitants of systemic inflammatory response and sepsis when diagnosis or treatment is delayed.[24] Electrolyte disturbances observed in this cohort highlight the systemic impact of prolonged fluid loss and the necessity of careful biochemical monitoring during hospitalization.

Management patterns in the present study demonstrated rational antibiotic use in selected cases rather than routine prescription. This approach is clinically significant in the context of growing antimicrobial resistance. International guidelines recommend limiting antibiotic therapy to severe, invasive, or high-risk cases, as indiscriminate use provides no benefit in viral diarrhea and contributes to resistance development.[21] The strong positive correlation observed between treatment modalities and clinical response in this study confirms that timely rehydration, supportive therapy, and pathogen-directed antibiotics significantly improve outcomes.

Treatment response was favorable in the majority of patients, with most showing clinical improvement by discharge. This high recovery rate reinforces the effectiveness of structured, guideline-based management protocols centered on early fluid replacement and supportive care. These findings are consistent with established evidence demonstrating that appropriate rehydration remains the single most important determinant of favorable prognosis in acute diarrheal disease.[22]

Overall, the results of this study confirm that acute diarrheal disease in adults is predominantly infectious in origin, frequently mild when treated promptly, yet capable of progressing to systemic complications in vulnerable individuals. The predominance of viral and toxin-mediated cases highlights the importance of preventive public health measures such as safe drinking water, sanitation, and food hygiene. At the same time, the documented complication rate emphasizes the need for vigilant clinical monitoring and evidence-based management to prevent adverse outcomes.

In conclusion, acute diarrheal disease among adults at RMRI Bareilly is largely self-limiting but carries measurable risk of dehydration, electrolyte imbalance, and sepsis in a subset of patients. Early recognition, prompt rehydration therapy, selective antibiotic use, and monitoring for systemic complications remain essential to reducing morbidity and improving clinical outcomes.

CONCLUSION

The present study demonstrates that acute diarrheal disease in adults is predominantly infectious in origin and largely self-limiting when managed promptly. Most patients responded well to early rehydration therapy, with oral rehydration solution forming the cornerstone of treatment. Although the majority experienced uncomplicated recovery, a subset developed electrolyte imbalance, renal impairment, or sepsis, highlighting the need for careful monitoring, especially in patients with comorbidities. Timely diagnosis, adequate fluid replacement, and rational antibiotic use remain essential to ensure favorable outcomes. Strengthening preventive measures such as safe water, sanitation, and food hygiene is crucial to reducing the overall disease burden.

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