European Journal of Clinical Pharmacy

Print ISSN: 2385-409X **Online ISSN**: Applied
Website: https://farmclin.com/

Original Research Article

Predictors of Dehydration Severity in Pediatric Diarrhea: A Retrospective Study

Article History:

Name of Author:
Hamid Raza[1], Sadia Amir[2], Touseef Ahmad[3], Fatima Tahir[4], Sadia Arshad[5], Sharon Chinwuba [6]

Affiliation:
[1]*Paeds Consultant Pediatric Medicine, Shakir hospital Sheikhupura*
[2]*Senior Registrar Pediatric Medicine, Lahore General Hospital*
[3]*Postgraduate Trainee Pediatrics, University of Lahore Hospital*
[4]*Medical Officer General Medicine, Tallat Zahoor Medical Center, Lahore*
[5]*M.Phil Pharmacy, University of Sargodha*
[6]*Medway Hospital, Gillingham, UK.*

Corresponding Author:
Hamid Raza
hamidraza081@yahoo.com

Received: 02-12-2025
Revised: 19-12-2025
Accepted: 27-12-2025
Published: 30-12-2025

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-Noncommercial-Share Alike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Abstract:

Background: Acute diarrhea is a leading cause of morbidity in children, with dehydration being the most serious complication influencing clinical outcomes.

Objective: To determine the predictors of dehydration severity among pediatric patients presenting with acute diarrhea.

Methods: This retrospective study was conducted at Lahore General Hospital from Sep 2025 to Nov 2025, included 355 children aged 1 month to 5 years presenting with acute diarrhea. Data were extracted from medical records, including demographic characteristics, clinical features, feeding practices, and nutritional status. Dehydration severity was classified according to WHO guidelines.

Results: The mean age of participants was 24.6 ± 13.2 months, with 55.8% males. Dehydration was observed in 49.6% of patients, with 21.7% having severe dehydration. Children with severe dehydration were younger (20.2 ± 12.8 months) and had longer duration of diarrhea (3.6 ± 1.4 days) and higher stool frequency (8.3 ± 2.3/day) ($p<0.001$). Vomiting (80.5%) and fever (67.5%) were significantly more common in severe cases. Malnutrition was present in 45.5% of severely dehydrated children ($p<0.001$), while breastfeeding showed a protective effect. Multivariate analysis identified age <24 months (OR 1.82), duration >3 days (OR 2.64), stool frequency >7/day (OR 2.91), vomiting (OR 2.38), and malnutrition (OR 2.76) as independent predictors of severe dehydration.

Conclusion: Younger age, prolonged diarrhoea, increased stool frequency, vomiting, and malnutrition are significant predictors of severe dehydration in pediatric diarrhoea. Early identification of these factors can improve clinical outcomes through timely intervention and appropriate management strategies.

Keywords: Pediatric diarrhoea, dehydration, risk factors, malnutrition, vomiting, stool frequency.

INTRODUCTION

Acute diarrhoea is one of the most common causes of morbidity and death in children under the age of five, especially in low and middle-income countries [1]. Even though the world has become more hygienic, vaccinated, and healthcare is more accessible to more people, diarrheal diseases have remained a significant clinical and economic burden, and the most life-threatening
complication is dehydration [2]. Clinical outcomes are mainly based on the severity of dehydration, which dictates the decision to hospitalise, the choice of fluids, and overall management. Pediatric diarrhoea causes dehydration because of excessive fluid and electrolyte loss in frequent loose stools and vomiting, which are usually exacerbated by poor oral intake [3]. Children are more susceptible because of their increased body water content, increased metabolic needs and reduced physiological reserves. Unless early diagnosed and treated, intense dehydration may quickly develop into hypovolemic shock, metabolic acidosis and death [4]. Thus, the need to identify children who are at risk of severe dehydration at an early age is crucial to intervene

© 2025 European Journal of Clinical Pharmacy; Volume: 7: Issue: 1| All Right Reserved

in time and provide a better prognosis [5].

Although clinical assessment instruments like the World Health Organization (WHO) classification system are common in classifying the degree of dehydration as far as they utilize physical manifestations which are subjective and may depend on examiner experience. In addition, the escalation of mild to severe dehydration is also dependent on various factors, such as age, nutritional status, feeding, diarrhea duration and frequency, existence of vomiting and underlying infections [6].

These predictors are important to identify to risk stratify, particularly in resource-limited settings where sophisticated diagnostic tools might not be easily accessible. Individual risk factors about the severity of dehydration have been studied before but the results of the study have varied among various population groups and health care institutions [7].

Different environmental conditions, socioeconomic status, and access to health care also contribute to complications in the generalizability of results. As a result, the context-specific information can still be required to comprehend the factors influencing the severity of dehydration in pediatric diarrhoea [8].

Besides the clinical factors, the environmental and caregiver-related determinants are also important in determining the outcome of dehydration [9].

Unsafe drinking water, poor sanitation, and lax hygienic regulations increase the risk of frequent episodes of diarrhoea, thereby worsening fluid loss and dehydration [10].

Caregiver knowledge and practices, such as prompt administration of oral rehydration therapy (ORS), feeding during illness, and prompt health-seeking behaviour, are very important in preventing dehydration from worsening to severe stages [11].

The late presentation to healthcare facilities due to delayed attention to the warning signs by the caregivers often results in advanced dehydration in the children which may have to be aggressively treated [12].

Another factor of significant importance is malnutrition, which plays a major role in determining the severity and outcome of dehydration in pediatric patients [13]. Children with malnutrition have uncharacteristic clinical features and it is harder to judge them on whether they are dehydrated. Additionally, they have impaired immune responses and altered physiological reserves, increasing their susceptibility to severe illness and complications. The combination of diarrhea and malnutrition produces a vicious cycle, as one problem worsens the other, causing worse clinical outcomes [14].

Objective

To determine the predictors of dehydration severity among pediatric patients presenting with acute diarrhea.

METHODOLOGY:

This was a retrospective observational study, conducted at Lahore General Hospital from Sep 2025 to Nov 2025. A total of 355 pediatric patients presenting with acute diarrhea were included in the study. Non-probability consecutive sampling was used to include all eligible patients meeting the inclusion criteria. Children aged 1 month to 5 years presenting with acute diarrhea (defined as ≥3 loose stools per day for less than 14 days), of either gender, and having documented clinical assessment of dehydration at presentation were included in the study. Children with chronic diarrhea (>14 days), known chronic systemic illnesses (such as congenital heart disease, chronic kidney disease), severe malnutrition (as per WHO criteria), or incomplete medical records were excluded from the study. Upon receiving institutional review board approval, medical records of pediatric patients who met the inclusion criteria were studied. A structured data collection proforma was used to extract relevant data. The variables recorded were demographic information (age, gender), clinical variables (duration and frequency of diarrhea, vomiting, fever), feeding history, hydration status at the time of presentation, and laboratory variables as available. The severity of dehydration was categorized according to the WHO guidelines into no dehydration, some dehydration, and severe dehydration on the basis of clinical signs which included, general condition, sunken eyes, skin turgor, and thirst. Severity of dehydration (categorized as no dehydration, some dehydration, and severe dehydration) were dependent variables. Age, gender, duration of diarrhea, frequency of stools, vomiting, fever, feeding practices, and other clinical parameters were independent variables. Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 26.0. Quantitative variables such as age and duration of diarrhea were presented as mean ± standard deviation, while qualitative variables were expressed as frequencies and percentages. Stratification was performed to assess the effect of various predictors on dehydration severity. A p-value of ≤0.05 was considered statistically significant.

RESULTS

Data were collected from 355 patients, mean age of the study population was 24.6 ± 13.2 months, with a male predominance of 198 (55.8%) compared to 157 (44.2%) females. The average duration of diarrhea was 2.8 ± 1.3 days, while the mean stool frequency was 6.9 ± 2.1 episodes per day. Vomiting was present in 212 (59.7%) children, and fever in 185 (52.1%). Regarding feeding practices, 162 (45.6%) were breastfed, 98 (27.6%) were formula-fed, and 95 (26.8%) had mixed feeding. Most children had normal nutritional status (248; 69.9%), while 107 (30.1%) were malnourished. In terms of dehydration severity, 102 (28.7%) had no dehydration, 176 (49.6%) had some dehydration, and 77 (21.7%) presented with severe dehydration.

© 2025 European Journal of Clinical Pharmacy; All Right Reserved

Table 1. Baseline Demographic, Clinical Characteristics, and Dehydration Severity (n = 5) 35

Variable	Category	n (%) / Mean ± SD
Age (months)	—	24.6 ± 13.2
Gender	Male	198 (55.8%)
	Female	157 (44.2%)
Duration of Diarrhea (days)	—	2.8 ± 1.3
Frequency of Stools/day	—	6.9 ± 2.1
Vomiting	Yes	212 (59.7%)
	No	143 (40.3%)
Fever	Yes	185 (52.1%)
	No	170 (47.9%)
Feeding Status	Breastfed	162 (45.6%)
	Formula-fed	98 (27.6%)
	Mixed	95 (26.8%)
Nutritional Status	Normal	248 (69.9%)
	Malnourished	107 (30.1%)
Dehydration Severity	No Dehydration	102 (28.7%)
	Some Dehydration	176 (49.6%)
	Severe Dehydration	77 (21.7%)

Children with severe dehydration were younger (20.2 ± 12.8 months) compared to those with some dehydration (24.3 ± 13.0 months) and no dehydration (28.1 ± 12.5 months) ($p = 0.01$). The duration of diarrhea increased progressively with severity, from 2.1 ± 1.0 days in no dehydration to 3.6 ± 1.4 days in severe dehydration ($p < 0.001$). Similarly, stool frequency rose significantly from 5.2 ± 1.5 to 8.3 ± 2.3 episodes/day across severity groups ($p < 0.001$).

Table 2. Association of Clinical Factors with Dehydration Severity

Variable	No Dehydration (n=102)	Some Dehydration (n=176)	Severe Dehydration (n=77)	p-value
Age (months)	28.1 ± 12.5	24.3 ± 13.0	20.2 ± 12.8	0.01
Duration of Diarrhea (days)	2.1 ± 1.0	2.9 ± 1.2	3.6 ± 1.4	<0.001
Stool Frequency /day	5.2 ± 1.5	6.8 ± 1.9	8.3 ± 2.3	<0.001
Vomiting	41 (40.2%)	109 (61.9%)	62 (80.5%)	<0.001
Fever	39 (38.2%)	94 (53.4%)	52 (67.5%)	0.002

Breastfeeding was more common in children without dehydration (56.9%) and decreased in those with severe dehydration (32.5%), whereas formula feeding and mixed feeding were more frequent in the severe group (32.5% and 35.0%, respectively) ($p = 0.01$). Malnutrition showed a strong association with dehydration severity, increasing from 17.6% in children without dehydration to 45.5% in those with severe dehydration ($p < 0.001$).

Table 3. Association of Feeding and Nutritional Status with Dehydration Severity.

Variable	No Dehydration (n=102)	Some Dehydration (n=176)	Severe Dehydration (n=77)	p-value
Breastfed	58 (56.9%)	79 (44.9%)	25 (32.5%)	0.01
Formula-fed	21 (20.6%)	52 (29.5%)	25 (32.5%)	
Mixed Feeding	23 (22.5%)	45 (25.6%)	27 (35.0%)	
Malnutrition	18 (17.6%)	54 (30.7%)	35 (45.5%)	<0.001

Children aged less than 24 months had a significantly higher risk (OR 1.82, 95% CI: 1.12–2.95, $p = 0.01$). Prolonged diarrhea (>3 days) was associated with a 2.64-fold increased risk ($p < 0.001$), while high stool frequency (>7/day) showed the strongest association (OR 2.91, $p < 0.001$). Vomiting was also a significant predictor (OR 2.38, $p = 0.003$), and malnutrition

© 2025 European Journal of Clinical Pharmacy; All Right Reserved

increased the risk nearly threefold (OR 2.76, $p < 0.001$).

Table 4 Multivariate Logistic Regression Analysis for Predictors of Severe Dehydration.

Variable	Adjusted OR	95% CI	p-value
Age (<24 months)	1.82	1.12–2.95	0.01
Duration >3 days	2.64	1.55–4.49	<0.001
Stool Frequency (>7/day)	2.91	1.68–5.04	<0.001
Vomiting	2.38	1.35–4.21	0.003

DISCUSSION

This paper assessed the predictors of the severity of dehydration in children with acute diarrhea and found that there are several important clinical and demographic predictors of poor outcomes. The results showed that young age, a long duration of diarrhoea, stool frequency, vomiting, and malnutrition were strong predictors of severe dehydration, indicating the complexity of disease progression in this population. The factor of age appeared to be a significant one, as younger children are more likely to develop severe dehydration. In the current study, the mean age of children with severe dehydration (20.2 ± 12.8 months) was lower than that of children without dehydration (28.1 ± 12.5 months). This may be attributed to the fact that younger children have limited physiological reserves, increased body water turnover and are prone to rapid fluid loss. Past studies have also indicated that infants and toddlers are more vulnerable to dehydration-related problems because of their inefficiency in replacing the losses in fluid [15].

The length and frequency of diarrhoea were also strongly associated with the severity of dehydration. Severely dehydrated children experienced a longer illness duration (3.6 ± 1.4 days) and greater stool output (8.3 ± 2.3 episodes/day), both of which were significant predictors of illness severity. These results are in line with prior studies showing that chronic fluid loss over time leads to eventual dehydration, particularly when not properly replaced through oral rehydration therapy [16]. The multivariate analysis also established that diarrhoea lasting more than 3 days and more than 7 stools per day were significant predictors of severe dehydration. Another important clinical feature of dehydration severity was vomiting: 80.5% of children in the severe dehydration group vomited, compared with 40.2% in the no dehydration group [17]. Vomiting not only plays a direct role in fluid loss but also reduces oral fluid intake, thereby worsening hydration status. This is a two-fold effect that causes vomiting to be a critical clinical indicator to respond to. Prior studies have also made similar observations with vomiting cited as being a significant factor in the severity of dehydration in pediatric diarrhea [17].

Dehydration severity was also strongly associated with fever, but it did not have as strong an influence as other variables. Fever episodes may indicate an underlying infectious aetiology, which can compound fluid loss by augmenting metabolic requirements and inflammatory reactions [18]. Although fever might not be a direct cause of dehydration, it is often a comorbid condition of more serious infections and thus indirectly leads to poorer clinical outcomes. This study reported malnutrition as one of the most significant predictors of severe dehydration, and almost half of the severely dehydrated children (45.5) were malnourished. The multivariate analysis once again showed that malnutrition is an independent risk factor, significantly increasing the risk of severe dehydration [19]. Nutritionally deprived children may have distorted physiological reactions, defective immunity, and non-characteristic clinical manifestations, which complicate the early detection and treatment. The two-way interaction between diarrhea and malnutrition also adds to the risk since both conditions worsen each other. The results of this study have important clinical implications. High-risk patients can be identified using readily measurable clinical parameters to conduct early triage and initiate appropriate treatment in a timely manner [20]. The use of clinical predictors is even more important in resource-limited environments, where laboratory investigations may be limited. These predictors can be incorporated into clinical assessment methods to enhance clinical decision-making and minimise the chances of complications related to untimely treatment.

Limitations

As a retrospective study, it is prone to certain biases like incomplete data and the accuracy of medical records. Also one center was used to conduct the study, thus this could not be generalized to the rest. Multicenter, prospective studies are suggested in the future to confirm these findings and create standardized predictive algorithms to assess the severity of dehydration.

CONCLUSION:

It is concluded that dehydration remains a common and clinically significant complication in children with acute diarrhea, with younger age, prolonged duration of illness, increased stool frequency, vomiting, and malnutrition identified as key independent predictors of severe dehydration. Among these, high stool frequency and malnutrition showed the strongest associations, emphasizing the need for heightened clinical vigilance in these high-risk groups. Early recognition using simple clinical parameters can enable timely intervention, appropriate triage, and effective fluid management, particularly in resource-limited settings.

REFERENCES:

1. ELECTROLYTES AND RENAL PROFILE IN CHILDREN SUFFERING FROM ACUTE GASTROENTERITIS: A COMPREHENSIVE ANALYSIS. (2025). NORTHWEST JOURNAL

© 2025 European Journal of Clinical Pharmacy; All Right Reserved

OF MEDICAL SCIENCES, 4(1), 3-8. https://doi.org/10.69723/njms.04.01.0519

2. Juliao P, Guzman-Holst A, Gupta V, Velez C, Petrozzi V, Ochoa TJ. Acute gastroenteritis morbidity and mortality trends following universal rotavirus vaccination in children in Peru: ecological database study with time-trend analysis. Infect Dis Ther. 2021;10(4):2563–2574. doi:10.1007/s40121-021-00532-5
3. Khan MA. Epidemiological studies on gastroenteritis in children in the Bannu district, Khyber Pakhtunkhwa, Pakistan. J Public Health (Berl). 2021;31(5):739–746. doi:10.1007/s10389-021-01592-0
4. Malek MA, Curns AT, Holman RC, Fischer TK, Bresee JS, Glass RI, et al. Diarrhea- and rotavirus-associated hospitalizations among children less than 5 years of age: United States, 1997 and 2000. Pediatrics. 2004;113(3):189–195. doi:10.1542/peds.113.3.189
5. Gómez-Sánchez E, Mayta-Tristán P, Huapaya JA, et al. Factors associated with severe dehydration in children under five with acute gastroenteritis in a national hospital in Peru: a case-control study. BMC Pediatr. 2021;21(1):1–8. doi:10.1186/s12887-021-02625-0
6. Ezuruike EO, Ibeneme CA, Uwaezuoke SN. Dyselectrolytemia in under-five children with acute diarrhoea-induced dehydration: a cross-sectional study in a South-East Nigerian hospital. Int J Contemp Pediatr. 2022;9(11):1006–1015. doi:10.18203/2349-3291.ijcp20222759
7. Mehta RL, Kellum JA, Shah SV, Molitoris BA, Ronco C, Warnock DG, et al. Acute Kidney Injury Network: report of an initiative to improve outcomes in acute kidney injury. Crit Care. 2007;11(2):R31. doi:10.1186/cc5713
8. Al-Abdi T, Al-Badri M, Al-Maqbali A, Al-Hinai M, Al-Busaidi M, Al-Maskari F, et al. Acute gastroenteritis-related acute kidney injury in a tertiary care center in Oman. Ann Saudi Med. 2023;43(2):82–88. doi:10.5144/0256-4947.2023.82
9. Turgut F, Awad AS, Abdel-Rahman EM. Acute kidney injury: medical causes and pathogenesis. J Clin Med. 2023;12(1):375. doi:10.3390/jcm12010375
10. Marzuillo P, Baldascino M, Guarino S, Perrotta S, Miraglia del Giudice E, Nunziata F. Acute kidney injury in children hospitalized for acute gastroenteritis: prevalence and risk factors. Pediatr Nephrol. 2021;36:1627–1635. doi:10.1007/s00467-020-04834-7
11. Tandukar S, Awasthi S, Shrivastava N, Misra RP, Singh R. Predictors of acute kidney injury in children with severe dehydration due to acute gastroenteritis. Pediatr Nephrol. 2021;36(3):599–606. doi:10.1007/s00467-020-04656-0
12. Ahamad S, Iqbal RI, Quddus MA, Zaib J, Khan MA, Rasheed A. Electrolyte abnormalities in children presenting with acute gastroenteritis. Pak J Med Health Sci. 2021;15(12):3361. doi:10.53350/pjmhs2115123361
13. Chun T, Schnadower D, Casper TC, Sapién R, Tarr PI, O'Connell K, et al. Lack of association of household income and acute gastroenteritis disease severity in young children: a cohort study. Acad Pediatr. 2022;22(4):581–589. doi:10.1016/j.acap.2021.07.009
14. Van Agtmaal MJM, Van der Werf W, Smit FJ, Kollen BJ, Berger MY, Van der Wouden JC, et al. Course of uncomplicated acute gastroenteritis in children presenting to out-of-hours primary care. BMC Pediatr. 2022;22(1):261. doi:10.1186/s12887-022-03335-5
15. Salk Vatandas N, Yurdakok K, Yalcin SS, Celik M. Validity analysis on the findings of dehydration in 2 to 24-month-old children with acute diarrhea. Pediatr Emerg Care. 2021;37(12):1227–1232. doi:10.1097/PEC.0000000000001980
16. Anigilaje EA (2018) Management of Diarrhoeal Dehydration in Childhood: A Review for Clinicians in Developing Countries. Front. Pediatr. 6:28. doi: 10.3389/fped.2018.00028
17. Ahmad, T., Ahmad, K., Khan, I., Iqbal, A., Tirimzi, S. S. A., & Shah, S. J. (2025). Frequency of Hypokalemia in Children with Acute Watery Diarrhea: Hypokalemia in Children with Acute Watery Diarrhea. Pakistan Journal of Health Sciences, 6(9), 87–93. https://doi.org/10.54393/pjhs.v6i9.3469
18. Öztelcan Gündüz B, Kutlutürk K, Ünay B. Rotavirus Infections in the Pediatric Population: A Comparative Study of Pre-COVID and COVID-19 Pandemic Periods. Frontiers in Public Health. 2025 Jan; 13: 1495848. doi: 10.3389/fpubh.2025.1495848.
19. S P and S S. Electrolyte Abnormalities and Type of Feeding in Acute Diarrhoea in Children Upto Five Years. International Journal of Contemporary Pediatrics. 2023 Mar; 0(3), 361–364. doi: 10.18203/2349-3291.ijcp20230436.
20. Kazi S, Majumdar R, Mahajan D. Assessment of Electrolyte Imbalance and Its Predictors in Children Admitted with Acute Gastroenteritis-Cross-Sectional Study. Indian Journal of Child Health. 2025 Apr; 12(2): 19-24. doi: 10.32677/ijch.v12i2.5089.

© 2025 European Journal of Clinical Pharmacy; All Right Reserved