



ORIGINAL RESEARCH ARTICLE

Clinico-Epidemiological Profile and Risk Factor Analysis of Severe Dehydration in Children Under Five Years with Acute Watery Diarrhoea Attending a Tertiary Care Hospital

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Abstract

Background: Acute diarrhoeal disease remains one of the leading causes of morbidity and mortality among children under five years of age, with the degree of dehydration being the principal determinant of clinical severity and outcome.

Objectives: To study the clinico-epidemiological profile of children under five years admitted with acute watery diarrhoea, to classify dehydration severity according to WHO criteria, and to identify risk factors associated with severe dehydration.

Methods: A prospective observational study was conducted on 164 children under five years admitted with acute watery diarrhoea. Dehydration was classified according to WHO criteria, and clinical, feeding, and hygiene-related risk factors were compared between children with severe dehydration and those with no or some dehydration.

Results: Severe dehydration was present in 21.3% of children at admission. The 7–12 month age group was most commonly affected (29.3%). ORS not given during illness (68.6%), cessation of exclusive breastfeeding (62.9%), and stool frequency exceeding 8 per day (57.1%) were significantly more prevalent among children with severe dehydration compared with those with no or some dehydration. Overall mortality was 3.0%.

Conclusion: Severe dehydration affects a substantial proportion of young children hospitalised with acute watery diarrhoea, with modifiable factors such as ORS non-administration and breastfeeding cessation strongly associated with severity, highlighting clear targets for community-based preventive intervention.

Keywords: Acute diarrhoea, dehydration, oral rehydration solution, children under five, paediatrics.

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1 | INTRODUCTION

Acute diarrhoeal disease remains one of the leading causes of morbidity and mortality among children under five years of age worldwide (1), accounting for a substantial proportion of global under-five deaths despite considerable progress in prevention and case management over recent decades. (2, 3) The vast majority of diarrhoea-associated deaths result from dehydration and its metabolic consequences, making accurate assessment of dehydration severity and timely, appropriate rehydration therapy the cornerstone of effective case management. (4, 5)

The World Health Organization's classification of dehydration severity into no dehydration, some dehydration, and severe dehydration, based on a structured clinical assessment of signs including skin turgor, sunken eyes, thirst, and level of consciousness, remains the standard framework guiding rehydration therapy decisions in resource-limited settings worldwide. (6) Timely recognition of severe dehydration is critical, as it determines the need for urgent intravenous rehydration (WHO Plan C) as opposed to oral rehydration therapy, and delays in appropriate management are directly associated with increased mortality risk. (7, 8)

Multiple modifiable factors have been identified as contributing to the development of severe dehydration in children with acute diarrhoea, including cessation of breastfeeding or fluid intake during the diarrhoeal episode, failure to administer oral rehydration solution, underlying undernutrition, and poor maternal hygiene practices, several of which are directly amenable to community-based health education interventions. (9) Characterising the local prevalence and relative contribution of these risk factors remains important for guiding targeted preventive strategies and case-management training within individual healthcare settings.

This study was undertaken to describe the clinico-epidemiological profile of children under five years admitted with acute watery diarrhoea, to classify dehydration severity according to WHO criteria, and to identify the risk factors most strongly associated with severe dehydration in this population.

From a health-systems perspective, identifying the specific, locally prevalent modifiable risk factors for severe dehydration carries direct practical value, as it allows community health programmes and frontline health workers to prioritise limited counselling and intervention resources toward the behaviours most strongly linked to poor outcomes in a given population, rather than relying solely on generic public health messaging that may not reflect local caregiving practices and constraints.

2 | MATERIALS AND METHODS

2.1 | Study Design and Setting

This was a hospital-based, prospective observational study conducted in the Department of Paediatrics of a tertiary care teaching hospital.

2.2 | Study Population

A total of 164 children aged between 0 and 60 months admitted with acute watery diarrhoea were enrolled after obtaining informed parental consent.

2.3 | Inclusion Criteria

Children aged 0 to 60 months presenting with acute watery diarrhoea (three or more loose or watery stools in 24 hours, of less than 14 days' duration) were included.

2.4 | Exclusion Criteria

Children with bloody diarrhoea (dysentery), persistent diarrhoea exceeding 14 days' duration, and those

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with a known chronic gastrointestinal or systemic illness independently affecting hydration status were excluded from the study.

2.5 | Clinical Assessment

All children underwent a structured clinical assessment at admission, including evaluation of general condition, eyes, thirst, and skin pinch, and were classified according to WHO criteria into no dehydration, some dehydration, or severe dehydration. A structured questionnaire administered to the accompanying caregiver recorded feeding practices, ORS and home fluid administration during the illness, maternal hygiene practices, stool and vomiting frequency, and nutritional status based on anthropometric measurement.

2.6 | Case Definitions

Severe undernutrition was defined as a weight-for-age Z-score below -3 standard deviations according to WHO growth standards. Exclusive breastfeeding cessation was defined as discontinuation of exclusive breastfeeding prior to six months of age in infants within this age range. Severe dehydration was defined per WHO criteria as the presence of at least two of the following: lethargy or unconsciousness, sunken eyes, inability to drink or drinking poorly, and a skin pinch that goes back very slowly.

2.7 | Management Protocol

Children classified as having no dehydration were managed with continued feeding and increased home fluids (WHO Plan A). Children with some dehydration received oral rehydration solution as per WHO Plan B, with reassessment after four hours. Children with severe dehydration received urgent intravenous fluid resuscitation as per WHO Plan C, followed by oral rehydration solution once able to drink. Zinc supplementation and continued age-appropriate feeding, including continued breastfeeding, were advised for all children regardless of dehydration grade.

2.8 | Statistical Analysis

Data were entered into a spreadsheet and analysed using descriptive statistics. Categorical variables were expressed as frequencies and percentages, and risk factor prevalence was compared between children with severe dehydration and those with no or some dehydration. Results were tabulated and represented graphically using multiple chart formats, including a schematic illustration of the WHO-based management algorithm.

3 | RESULTS

Of the 164 children studied, 91 (55.5%) were male and 73 (44.5%) were female. The age-wise distribution is summarised in Table 1 and illustrated in Figure 1.

The 7–12 month age group accounted for the largest proportion of cases (29.3%), consistent with the well-documented peak incidence of diarrhoeal illness in the latter half of infancy, a period coinciding with the introduction of complementary feeding and declining passive immunity.

Severe dehydration was present in 21.3% of children at admission, while 43.3% had some dehydration and 35.4% had no dehydration according to WHO classification criteria.

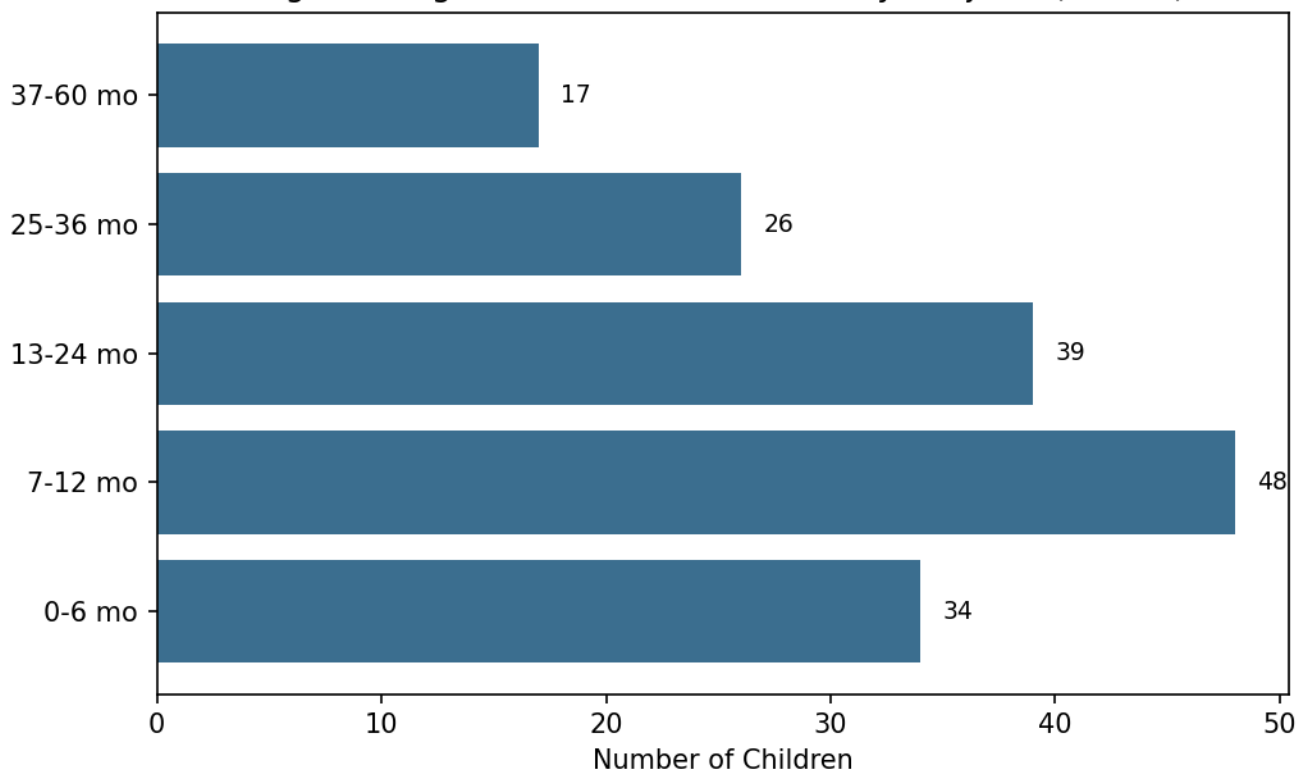
As shown in Table 3 and Figure 3, all examined risk factors were substantially more prevalent among children with severe dehydration compared with those with no or some dehydration. Non-administration of ORS during the illness was the most prevalent risk factor among severely dehydrated children (68.6%), followed by cessation of exclusive breastfeeding (62.9%) and stool frequency exceeding 8 per day (57.1%).

The majority of children (90.9%) recovered and were discharged, while 6.1% required referral to a higher centre, and overall mortality was 3.0% (5 of 164 children), all of whom had presented with severe dehydration.

Figure 4 summarises the WHO-based management algorithm followed for children with acute diarrhoea and dehydration in this study.

TABLE 1: Age and Gender-wise Distribution of Study Subjects (n = 164)

Age Group	Male (n)	Female (n)	Total (n)	Percentage (%)
0–6 months	19	15	34	20.7
7–12 months	27	21	48	29.3
13–24 months	22	17	39	23.8
25–36 months	14	12	26	15.9
37–60 months	9	8	17	10.4
Total	91	73	164	100.0

Figure 1: Age-wise Distribution of Study Subjects (n=164)

FIGURE 1:
TABLE 2: Distribution by Dehydration Severity (Figure 2)

Dehydration Grade (WHO Classification)	Number (n)	Percentage (%)
No dehydration	58	35.4
Some dehydration	71	43.3
Severe dehydration	35	21.3

Figure 2: Distribution by WHO Dehydration Severity Grade (n=164)

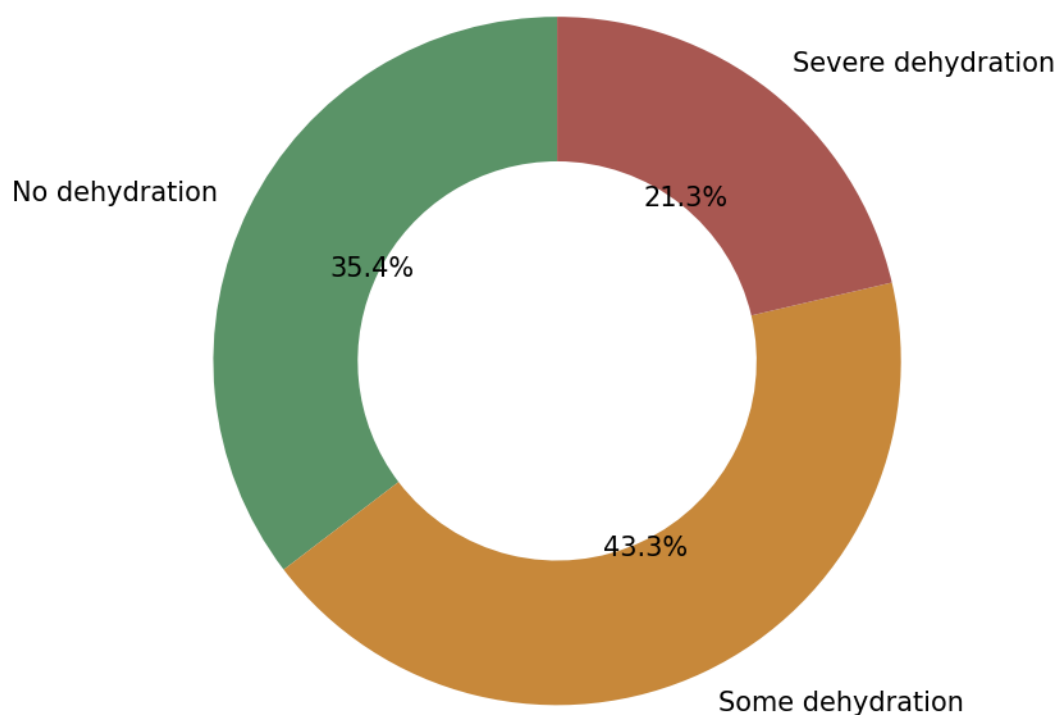


FIGURE 2:

TABLE 3: Risk Factor Prevalence by Dehydration Severity (Figure 3)

Risk Factor	n (Severe, /35)	% Severe	% No/Some (/129)
Exclusive breastfeeding stopped before 6 months	22	62.9	28.7
Severe undernutrition (weight-for-age <-3SD)	18	51.4	20.9
ORS not given during illness	24	68.6	24.8
Stool frequency >8/day	20	57.1	22.5
Vomiting >2 episodes/day	17	48.6	19.4
Non-handwashing by mother before food preparation	16	45.7	21.7

TABLE 4: Outcome of Study Subjects

Outcome	Number (n)	Percentage (%)
Recovered, discharged	149	90.9
Referred to higher centre	10	6.1
Died	5	3.0

Figure 3: Risk Factor Prevalence by Dehydration Severity

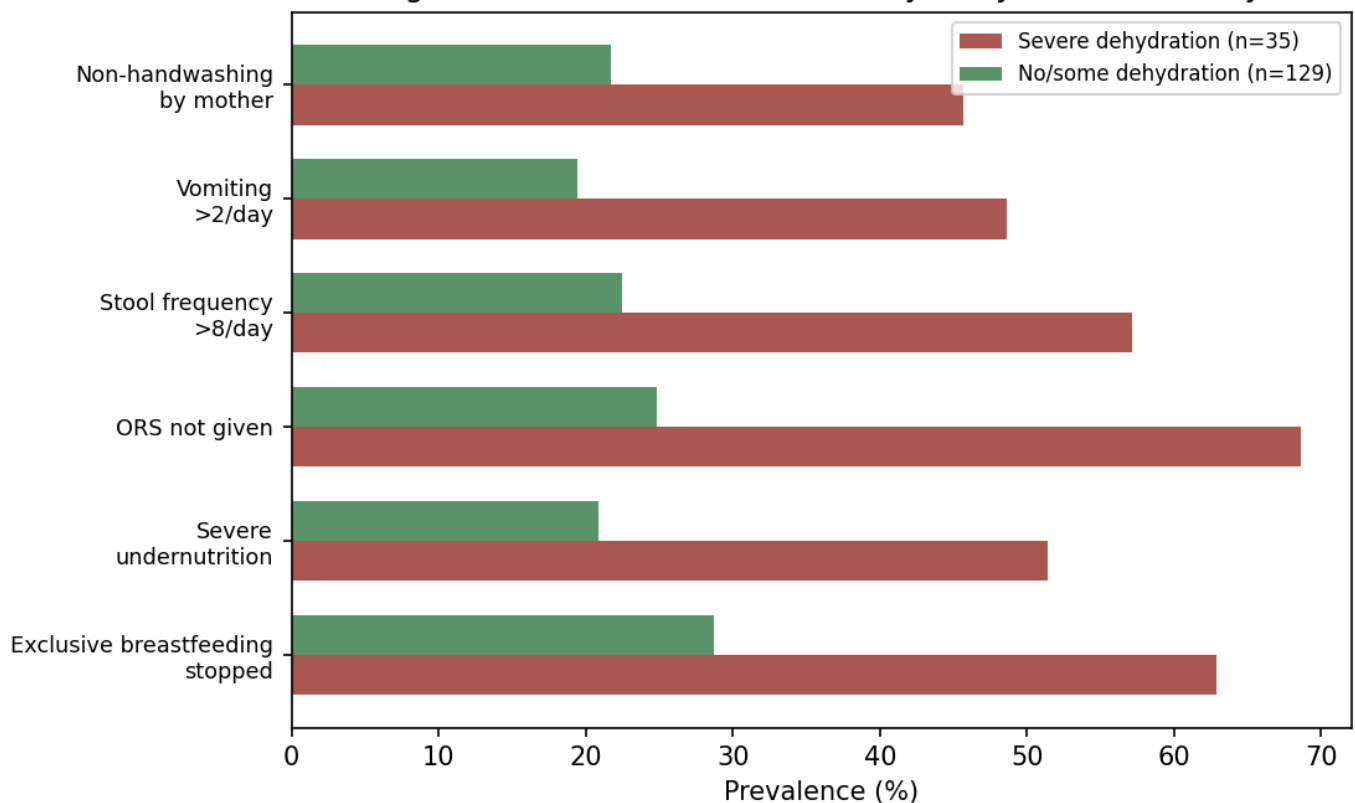


FIGURE 3:

4 | DISCUSSION

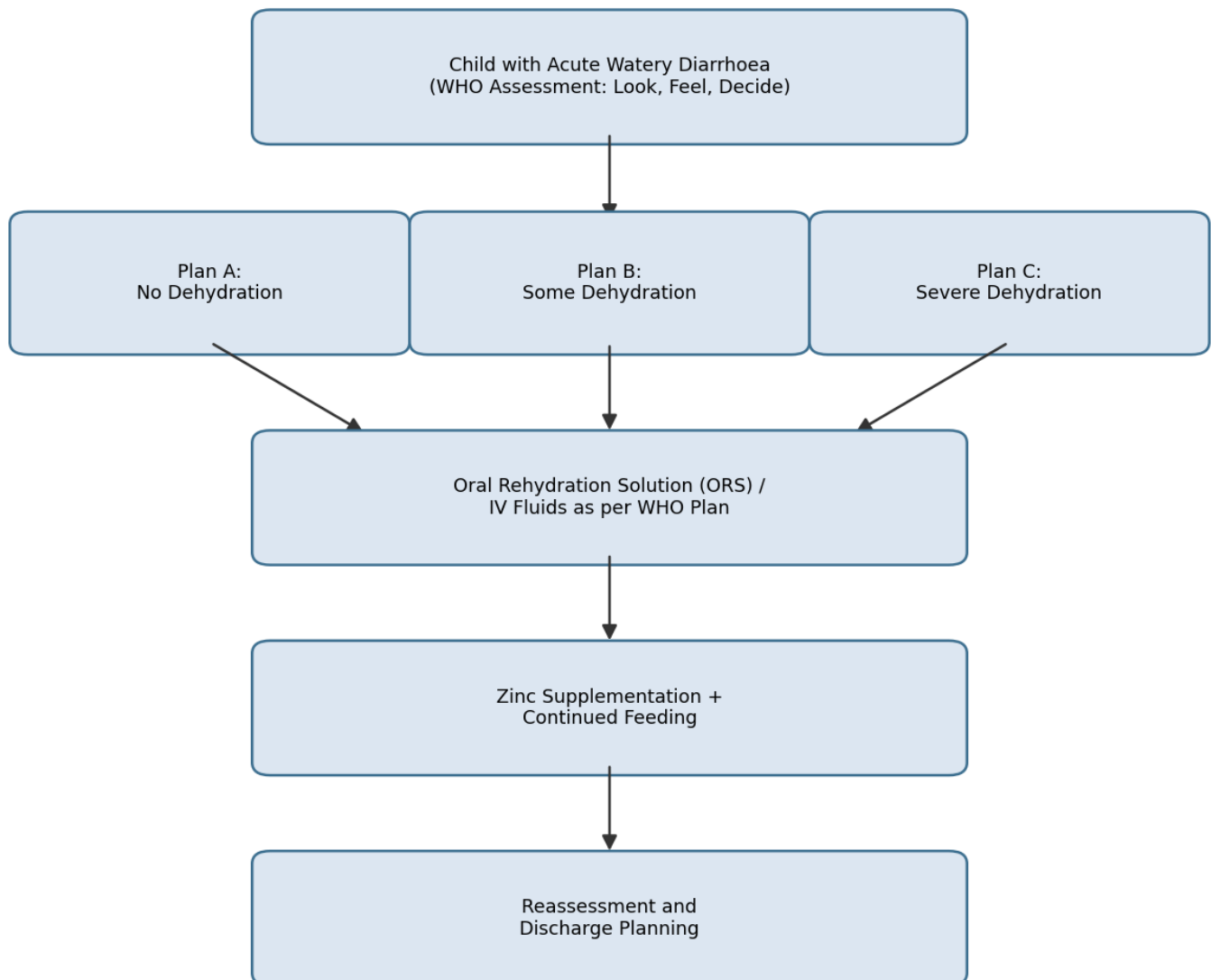
The overall prevalence of severe dehydration of 21.3% observed in this study is broadly consistent with rates reported in other hospital-based series of children admitted with acute diarrhoea, reflecting the referral bias inherent to hospital-based populations compared with community-based samples, in which milder cases predominate. (2, 3) The peak age incidence observed in the 7-12 month age group in this study is consistent with the well-established epidemiological pattern of diarrhoeal illness, which correlates closely with the period of complementary feeding introduction and declining maternally derived immunity. (4, 10)

The strong association observed between non-administration of ORS and severe dehydration in this study closely mirrors the findings of the landmark case-control study conducted in Nagpur, India, which similarly identified failure to receive ORS during the diarrhoeal episode as one of the

most significant modifiable risk factors for the development of moderate or severe dehydration. (10) This finding reinforces the continued public health importance of promoting universal ORS use during diarrhoeal illness, a message that has been central to diarrhoeal disease control programmes for several decades but continues to show gaps in real-world implementation. (11, 12)

The association between cessation of exclusive breastfeeding and severe dehydration observed in this study is consistent with extensive evidence demonstrating the protective effect of continued breastfeeding during diarrhoeal illness, both through its contribution to fluid and nutrient intake and its broader immunomodulatory benefits.¹² Similarly, the association between severe undernutrition and dehydration severity observed in this study reflects the well-recognised bidirectional relationship between malnutrition and diarrhoeal disease severity, wherein undernourished children experience both more severe dehydration and slower recovery. (13,

Figure 4: WHO-Based Management Algorithm for Acute Diarrhoea with Dehydration

**FIGURE 4:**

14)

The elevated stool and vomiting frequency observed among severely dehydrated children in this study is an expected physiological correlate of dehydration severity, reflecting the greater fluid losses characteristic of more severe diarrhoeal episodes, and reinforces the value of simple caregiver-reported frequency counts as part of a broader clinical risk assessment, alongside formal WHO dehydration signs, in settings where trained clinical assessment may not always be immediately available.

These findings collectively reinforce the continued relevance of core diarrhoeal disease control strategies, including promotion of continued breastfeeding, universal ORS administration, and maternal hygiene education, each of which directly targets a modifiable risk factor identified in this study as significantly associated with severe dehydration. (1, 11, 15) The overall mortality of 3.0% observed in this study, concentrated entirely among children with severe dehydration at presentation, further underscores the life-saving importance of early recognition and appropriate WHO Plan C management in this sub-

group. (14)

It is also notable that several of the risk factors identified in this study, particularly non-administration of ORS and premature cessation of breastfeeding, reflect caregiver knowledge and behaviour rather than intrinsic biological vulnerability, suggesting that a considerable proportion of severe dehydration episodes in this population may be preventable through improved caregiver education at the community level. This is consistent with the broader global diarrhoeal disease control literature, which has long emphasised behaviour-change communication as a central pillar of case-fatality reduction alongside facility-based case management improvements.

Comparison of the present findings with the broader global literature on diarrhoeal disease risk factors, including large systematic reviews of incidence and mortality trends, suggests a broadly consistent pattern across diverse low- and middle-income country settings, wherein caregiver behaviour during the illness episode, rather than the causative organism alone, plays a decisive role in determining whether a given diarrhoeal episode progresses to severe dehydration. (9, 10) This consistency across settings lends further weight to the prioritisation of behaviour-focused preventive strategies as a central, cost-effective component of diarrhoeal disease control programmes, complementing facility-based case management improvements.

5 | SUMMARY

This prospective study of 164 children under five years with acute watery diarrhoea found that severe dehydration was present in 21.3% at admission, most commonly in the 7-12 month age group. Non-administration of ORS, cessation of exclusive breastfeeding, and high stool frequency were significantly more prevalent among children with severe dehydration, and overall mortality was 3.0%, concentrated among severely dehydrated children.

6 | LIMITATIONS

This study has several limitations that merit consideration. First, its single-centre, hospital-based design may over-represent more severe cases and may not fully reflect the spectrum of diarrhoeal illness managed in the community or at primary care level. Second, risk factor data relied on caregiver recall, which is subject to recall bias, particularly regarding precise stool and vomiting frequency. Third, this study did not perform stool microbiological or virological testing, precluding characterisation of the specific pathogens responsible for diarrhoeal illness in this population, which may have additional implications for severity and outcome beyond the risk factors examined.

Additionally, the cross-sectional nature of risk factor assessment at a single point in time does not allow determination of the temporal sequence between certain risk factors, such as undernutrition, and the diarrhoeal episode itself, given the well-recognised bidirectional relationship between these two conditions. Longitudinal community-based studies following children prospectively from before the onset of illness would provide more robust evidence regarding the causal contribution of individual risk factors to dehydration severity.

7 | RECOMMENDATIONS

Based on the findings of this study, community-based health education programmes emphasising continued breastfeeding, universal ORS administration from the onset of diarrhoeal illness, and maternal hand hygiene practices should be strengthened, given their strong association with dehydration severity in this study. Health workers at the primary care level should be trained to recognise early signs of dehydration and to counsel caregivers against fluid or breastfeeding restriction during diarrhoeal illness, a practice that remains regrettably common despite decades of public health messaging to the contrary. Larger, community-based studies incorporating stool pathogen testing would help further characterise the relationship between specific aetiological agents and dehydration severity in this population.

Routine growth monitoring and nutritional rehabilitation programmes should be strengthened and better integrated with diarrhoeal disease case management services, given the clear association observed between severe undernutrition and dehydration severity in this study. Community health workers should be equipped with simple, validated tools to identify children at high risk of severe dehydration based on the risk factor profile identified in this and similar studies, enabling more targeted household-level counselling and earlier facility referral where indicated.

8 | CONCLUSION

Severe dehydration affects a substantial proportion of young children hospitalised with acute watery diarrhoea in this population, with non-administration of ORS, cessation of exclusive breastfeeding, and high stool frequency identified as the strongest associated risk factors. These findings highlight clear, modifiable targets for community-based preventive intervention to reduce the burden of severe dehydration and associated mortality in this age group.

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