Analysis of Acute Diarrheal Disease in In-Patient Department at a Tertiary Hospital: A Retrospective Study

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Abstract

Background: Acute diarrheal disease (ADD) remains a frequent cause of preventable morbidity in India. Tertiary hospitals need local, decision-relevant evidence - burden, seasonality, length of stay (LOS) and service concentration (departmental case-load distribution) - to plan beds, staffing, supplies and dehydration care and to support preparedness. **Material & Methods:** This retrospective observational study analyzed de-identified inpatient records from 23 December 2023 to 20 December 2025 at a 970-bed tertiary-care teaching hospital. ADD cases were identified using expanded diagnosis keywords. Prolonged stay (LOS of 8 inpatient-days or more) was examined using chi-square tests and multivariable logistic regression, with a strict-versus-broad case-definition sensitivity analysis. **Results:** Among 24,100 admissions, 816 were ADD (3.4%). Mean age was 42.4 ± 21.4 years and the sexes were balanced. General Medicine handled 78.1% of cases. Median LOS was 3.0 days; 89.7% were discharged within 7 days and prolonged stay occurred in 84 patients (10.3%). Age group was associated with prolonged stay, but on multivariable analysis documented renal comorbidity was the strongest independent predictor (adjusted odds ratio 3.17, 95% CI 1.91-5.27), whereas the age ≥65 association attenuated (1.66, 0.97-2.84). Dehydration severity was documented in only 48.0% of records. Monsoon contributed 45.8% of admissions. **Conclusions:** ADD produced a sustained, seasonal inpatient burden concentrated in General Medicine, with predominantly short stays. Prolonged stay was driven mainly by documented comorbidity, notably renal disease, rather than age alone. The findings support pre-monsoon surge preparation, standardized dehydration documentation, comorbidity-sensitive triage and coding-quality improvement.

Keywords: acute diarrheal disease; gastroenteritis; inpatient epidemiology; length of stay; public health; seasonality

Introduction

Diarrheal disease remains a major contributor to preventable morbidity and mortality globally, especially where safe water, sanitation, and timely care are inconsistent[1-4]. Hospitalized cases represent the more severe clinical end of disease and are directly relevant to tertiary-care operations because they involve dehydration risk, electrolyte imbalance, and multimorbidity-linked complications[5,6].

In India, burden varies by region and season, and actionable local evidence is often missing despite abundant routine hospital records. Global syntheses are dominated by child-focused estimates[7-10]; hospital-based Indian studies and national surveillance data report a meaningful share of medical admissions and pronounced monsoon clustering, yet tertiary-care inpatient profiles that integrate burden, seasonality and length of stay remain limited[11-14]. Many institutions use narrow diagnostic extraction and undercount syndrome burden when documentation is heterogeneous, which limits preparedness decisions on staffing, bed turnover, and consumable forecasting.

What is already known is that diarrheal disease remains preventable and seasonal in many settings. What remains less clear is how much burden severe enough for admission creates inside tertiary hospitals, how that burden concentrates across departments, and whether routine hospital records can provide reliable planning intelligence. This study addresses that gap by using two full seasonal cycles, expanded diagnosis capture, LOS analysis, inferential testing, and sensitivity analysis[1-3].

Hospitalized ADD reflects the intersection of clinical severity and health-system access: patients reaching tertiary admission often represent delayed or complicated trajectories, including dehydration progression, treatment received elsewhere, or coexisting chronic conditions. Inpatient burden should therefore be interpreted as a severity-enriched subset of community disease, useful for planning where public health prevention and hospital operations meet.

The analysis was framed around usability for decision-makers. A purely etiological study would require microbiology and exposure data, but a tertiary-hospital manager needs different immediate answers: when do cases rise, which service carries the load, how long do patients occupy beds, and which groups are more likely to need prolonged care. These questions are directly addressed by the present design and are relevant to district preparedness, teaching-hospital quality improvement, and routine health-system governance.

Material and Methods

Design and setting: Retrospective observational study of inpatient admissions in a 970-bed tertiary-care teaching hospital affiliated to a state health-sciences university, located on a national-highway corridor in a semi-urban region of southern India. The hospital serves a mixed urban and rural catchment and receives primary, secondary and referred tertiary cases from the surrounding district and adjacent districts, providing the full range of clinical specialties including a 24-hour emergency service.

Period and data source: De-identified electronic inpatient records from 23 December 2023 to 20 December 2025 were analyzed.

Sampling and sample size: No sampling was performed. The study was a complete enumeration (census) of all eligible inpatient admissions during the two-year period, and every ADD-related admission meeting the case definition was included. The resulting 816 ADD admissions, with 84 prolonged-stay events, provided approximately 14 events per covariate for the six-variable multivariable model, satisfying the conventional minimum of 10 events per variable.

Case definition: ADD-related admissions were identified using expanded diagnosis keywords including gastroenteritis, acute GE/AGE, diarrhea/diarrhoea, dysentery, cholera, food poisoning, and dehydration-linked variants. Records with only incidental gastrointestinal mentions were excluded. A strict explicit-term definition was additionally applied as a sensitivity analysis.

Variables: Age, sex, department, admission month, season, and LOS were analyzed. Age groups were 0-4, 5-17, 18-34, 35-49, 50-64, and 65+ years. LOS categories were 1 day, 2-3 days, 4-7 days, 8-14 days, 15-30 days, and more than 30 days.

Data cleaning: Date-time fields were standardized and LOS was recalculated from admission-discharge timestamps. Duplicate checks used identifier and timestamp combinations. Implausible values were screened before category derivation to maintain consistency across tables, figures, and inferential outputs.

Statistical analysis: Continuous variables were summarized as mean ± SD, median, and IQR; categorical variables as counts and percentages. Prolonged stay was defined a priori as an LOS of 8 inpatient-days or more (equivalent to the combined 8-14, 15-30 and >30-day length-of-stay categories), chosen for service-planning relevance. Chi-square tests assessed associations of prolonged stay with sex, age group, season, and department group. Kruskal-Wallis testing assessed LOS variation across age groups. Unadjusted odds ratios (OR) with 95% confidence intervals (CI) were estimated for key binary contrasts. To isolate the independent contribution of age from related risk factors, a multivariable logistic regression model was fitted with prolonged stay as the outcome and age ≥65 years, female sex, monsoon season, General Medicine admission, and documented diabetes and renal comorbidity as covariates, yielding adjusted odds ratios (aOR). The documentation of dehydration and its graded severity, of comorbidity, and of etiology was quantified from the diagnosis field. Statistical significance was set at $p<0.05$. Analyses used Python (pandas, SciPy and statsmodels). Findings were interpreted as planning-oriented associations, not causal effects.

Reporting and ethics: Reporting followed STROBE guidance[15]. The study was granted exemption from full ethical review by the Shridevi Medical College Institutional Ethics Committee (SIMS&RH, Tumakuru; reference number SIMSRH/IEC/2026-27/498; study reference SRC2026016; dated 11 April 2026) because it analyzed secondary, de-identified records[16].

Results

The Sex split (Female 410 [50.2%]; Male 406 [49.8%] and age range (1-107 years) Out of 24,100 total admissions, 816 were ADD, yielding an inpatient burden of 3.4%. Mean age was 42.4 years (SD 21.4), median age was 43 years, and sex distribution was balanced.

Table 1. Age-group distribution of ADD admissions.

Age group, years	Count	Percentage, %
0-4	17	2.1
5-17	61	7.5
18-34	237	29.0
35-49	168	20.6
50-64	171	21.0
65+	162	19.9

Age groups in completed years; percentages of 816 ADD admissions.

Age distribution: The largest age group was 18-34 years (29.0%), followed by 50-64 years (21.0%), 35-49 years (20.6%), and 65+ years (19.9%) (Table 1).

Service concentration: General Medicine managed 637 cases (78.1%), followed by Pediatrics, General Surgery, and Obstetrics (Table 2).

Table 2. Department-wise distribution of ADD admissions, top services.

Department	Count	Percentage, %
General Medicine	637	78.1
Pediatrics	55	6.7
General Surgery	53	6.5
Obstetrics	25	3.1
Gm -Cardiology	15	1.8
Emergency Medicine	14	1.7
Respiratory Medicine	10	1.2
GS-Neuro Surgery	2	0.2

Top admitting departments; percentages of 816 ADD admissions.

Length of stay: Median LOS was 3.0 days (IQR 1.9-4.6). Most patients were discharged within 7 days (89.7%). Prolonged stay, defined as an LOS of 8 inpatient-days or more (the combined 8-14, 15-30 and >30-day categories in Table 3), occurred in 84 patients (10.3%) .

Table 3. Length-of-stay categories among ADD admissions.

LOS category	Count	Percentage, %
1 day	88	10.8
2-3 days	319	39.1
4-7 days	325	39.8
8-14 days	70	8.6
15-30 days	12	1.5
30+ days	2	0.2

LOS expressed in inpatient bed-days; percentages of 816 ADD admissions. Categories 8–14, 15–30 and >30 days together constitute prolonged stay (=8 days; n=84, 10.3%).

Documentation, comorbidity and etiology: Dehydration or volume status was recorded in the diagnosis field for 414 admissions (50.7%), and a graded dehydration severity (mild, moderate or severe) was documented in 392 (48.0%). A specific etiology or organism was documented in only 28 records (3.4%). Documented comorbidity included renal disease in 155 admissions (19.0%), diabetes in 135 (16.5%) and hypertension in 138 (16.9%); at least one of these was present in 298 (36.5%). No structured discharge-outcome field was available in the dataset, and no in-hospital deaths or discharge-against-medical-advice events were recorded in the diagnosis text.

Seasonality and monthly trend: Monsoon accounted for 45.8% of ADD admissions, followed by summer at 28.1%, Winter 13.8% & Post Monsoon 12.3%. The highest monthly counts were June 2025 (90 cases), June 2024 (80 cases), and May 2025 (73 cases). The reproducible pre-monsoon and monsoon peaks coincide with the onset of the southwest monsoon (June-September); formal correlation with district rainfall was not possible because meteorological data were not linked to the admission records, and is identified as a priority for future work. LOS category visualization confirms a dominant short-stay pattern with a small long-stay tail.

Inferential findings: Prolonged stay was significantly associated with age group (chi-square p=0.0013). Associations were not significant for sex (p=0.5330), season (p=0.2334), or General Medicine versus other departments (p=0.2568). On unadjusted analysis, patients aged 65+ had higher odds of prolonged stay (OR 1.96; 95% CI 1.19-3.23), and documented renal comorbidity was strongly associated with prolonged stay (OR 3.24; 95% CI 2.00-5.22). LOS differed across age groups on Kruskal-Wallis testing (p<0.001) (Table 4).

Table 4. Inferential analysis for prolonged LOS (=8 days).

Analysis item	Statistic	Interpretation
Prolonged LOS prevalence	84/816 (10.3%)	High -utilization subgroup
Age group association	Chi-square p=0.0013	Significant
Sex association	Chi-square p=0.5330	Not significant
Season association	Chi-square p=0.2334	Not significant
General Medicine vs others	Chi-square p=0.2568	Not significant
Age 65+ vs <65	OR 1.19 - 3.23	Higher unadjusted odds in elderly
Renal comorbidity vs none	OR 2.00 - 5.22	Strong association with prolonged stay
LOS across age groups	Kruskal-Wallis p<0.001	Distribution differs by age group

Prolonged stay = LOS =8 inpatient-days (n=84/816). Statistical tests: Pearson chi-square for categorical associations; unadjusted odds ratios with 95% CI; Kruskal–Wallis test for LOS across age groups. OR, odds ratio; CI, confidence interval; LOS, length of stay.

Multivariable analysis: On multivariable logistic regression (Table 5), documented renal comorbidity remained the strongest independent predictor of prolonged stay (aOR 3.17; 95% CI 1.91-5.27; p<0.001). The association of age ≥65 years attenuated and was no longer statistically significant after adjustment (aOR 1.66; 95% CI 0.97-2.84; p=0.063), indicating that part of the crude age effect was attributable to comorbidity burden. Sex, monsoon season and diabetes were not independently associated, whereas admission under

Table 5. Multivariable logistic regression for prolonged length of stay (=8 inpatient-days).

Covariate	Adjusted OR (95% CI)	p-value
Age =65 years (vs <65)	1.66 (0.97-2.84)	0.063
Female (vs male)	0.85 (0.53-1.35)	0.478
Monsoon season (vs non monsoon)	1.17 (0.73-1.88)	0.501
General Medicine (vs other departments)	0.56 (0.33-0.95)	0.033
Documented diabetes	0.87 (0.46-1.66)	0.681
Documented renal comorbidity	3.17 (1.91-5.27)	<0.001

Multivariable binary logistic regression; outcome = prolonged stay (LOS =8 inpatient-days); n=816. aOR, adjusted odds ratio; CI, confidence interval. Comorbidity covariates were derived from documentation in the diagnosis field.

General Medicine carried lower.

Sensitivity analysis: A strict explicit-term definition identified 776 cases (3.22% burden), compared with 816 cases (3.39% burden) using the expanded definition. Expanded extraction increased ascertainment by 5.2%, supporting its value in heterogeneous hospital diagnosis text.

Box 1. Policy translation actions for hospital and public health preparedness.

Action	Timeline	Measurable indicator
Pre-monsoon ADD surge micro-plan in medicine wards	Within 1 month	Bed and roster trigger activated before June each year
Standardized dehydration and severity template in admission notes	Within 2 months	At least 90% ADD notes contain severity field
Rapid electrolyte correction and rehydration bundle	Within 2 months	Median time to first rehydration reduced
Monthly data-quality audit for diagnosis coding	Within 3 months	Missing or ambiguous ADD coding reduced by at least 30%
Hospital-public health dashboard linkage for early warning	Within 6 months	Monthly surveillance review completed and documented

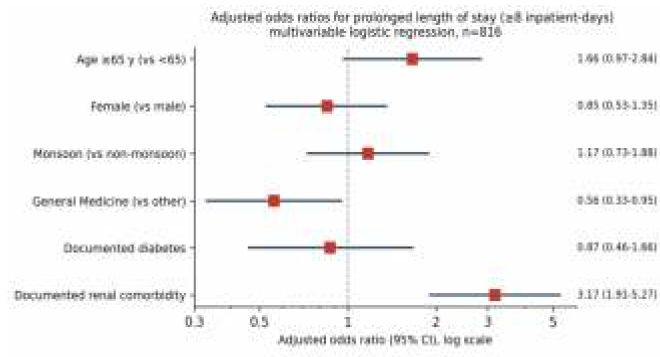

Figure 1. Forest plot of adjusted odds ratios (95% CI) for prolonged length of stay (>=8 inpatient-days).

Discussion

This revised version strengthens the evidence base in four ways: it preserves the descriptive burden profile, adds inferential context for prolonged stay, introduces multivariable adjustment to separate age from comorbidity, and quantifies robustness through sensitivity analysis. The main message is consistent: ADD creates a sustained inpatient burden, with predictable monsoon-linked volume and heavy concentration in General Medicine.

The distinction between volume and severity is important. Monsoon increased case volume but was not significantly associated with prolonged LOS. Surge planning should therefore prioritize rapid turnover capacity, hydration supplies, and triage flow during high-volume periods, rather than assuming that seasonal cases are intrinsically longer-stay admissions. Although older patients had higher unadjusted odds of prolonged stay, multivariable analysis showed that documented renal comorbidity - not age itself - was the dominant independent correlate, and the age association lost significance after adjustment. This supports the interpretation that advanced age acts partly as a marker of comorbidity burden, and it sharpens the operational message: renal-function monitoring and early specialist liaison, rather than chronological age alone, should trigger closer discharge-readiness review.

The service concentration finding is operationally useful. Since General Medicine handled nearly four-fifths of cases, a targeted quality-improvement package in this department is likely to provide the largest return. Practical components include dehydration severity documentation, early electrolyte correction pathways, and discharge-readiness criteria. The policy actions are summarized in Box 1.

Comparison with the literature: The inpatient ADD burden of 3.4% of all admissions, the marked monsoon clustering, and the predominantly short LOS are consistent with hospital-based Indian reports of acute gastroenteritis and with national surveillance data showing recurrent seasonal diarrheal outbreaks during the monsoon[2,7-10,11-14]. The Integrated Disease Surveillance Programme and National Centre for Disease Control similarly record diarrheal diseases among the leading causes of seasonal outbreaks in India, reinforcing the external relevance of these single-centre operational findings[12,13]. Recent Indian community-based studies likewise report a substantial diarrheal burden with marked urban-rural and seasonal variation, complementing the present inpatient perspective[17,18].

The sensitivity analysis addresses an important methodological concern in retrospective hospital research. A strict diagnosis filter would have missed 40 cases and reduced measured burden by 5.2%. This is meaningful for monthly burden estimates, ward expectations, and pre-season procurement. In institutions with mixed documentation quality, expanded but clinically curated keyword logic can improve surveillance completeness without requiring major software changes.

Mortality and outcomes: The dataset did not include a structured discharge-outcome or vital-status field, and no in-hospital deaths or discharge-against-medical-advice events were captured in the diagnosis text, consistent with the predominantly short, uncomplicated course of most admissions. In-hospital mortality from acute diarrheal disease is generally low in adult tertiary care but is concentrated in elderly and comorbid patients; the inability to report outcomes formally is a limitation, and prospective capture of mortality, readmission and renal recovery is recommended.

Strengths: Include two-year continuous coverage, reproducible seasonal trend capture, integrated utilization metrics, inferential analysis with multivariable adjustment, and sensitivity testing.

Limitations : include single-centre design; retrospective dependence on documentation quality; possible misclassification from keyword-based extraction; derivation of comorbidity, dehydration severity and etiology from the diagnosis field (which itself reflects - and is limited by - recording completeness); absence of a structured outcome/mortality field; no microbiological etiology stratification; and absence of linked socioeconomic, meteorological or water-quality covariates. The findings should be interpreted as descriptive and planning-oriented rather than causal.

Future work: should include multicenter replication, harmonized case definitions, basic laboratory severity indicators, and linkage with meteorological or water-quality surveillance streams. A near-real-time dashboard that tracks monthly burden, prolonged-stay risk, and service concentration could strengthen outbreak sensitivity and improve timing of preventive communication.

Etiology and antimicrobial stewardship: A specific etiology was documented in only 3.4% of records, mirroring the limited stool-microbiology and severity recording typical of routine tertiary care and precluding organism-level inference. Most acute diarrheal admissions in such settings are managed empirically as presumed infective gastroenteritis. Better syndrome documentation, graded dehydration recording, and etiology-oriented testing policies can reduce empirical ambiguity and support antimicrobial stewardship. In future work, linking diagnosis text with stool testing, antibiotic exposure, renal function and outcomes would allow deeper assessment of care quality; for the present study, the appropriate contribution is to identify where routine systems can be improved immediately and which data fields should be strengthened prospectively.

A further practical implication concerns training. Because a large share of ADD admissions pass through General Medicine, standardized case documentation and hydration protocols can be introduced through existing ward rounds, postgraduate teaching, and monthly audit meetings. This makes implementation feasible without requiring a new vertical program. The same approach can be adapted by Pediatrics and Obstetrics for smaller but clinically sensitive subgroups. Such incremental improvements are more likely to be sustained than broad recommendations without ownership.

Conclusions

ADD imposed a persistent inpatient burden with predictable seasonal concentration and predominantly short admissions. Prolonged stay (10.3% of admissions) was driven mainly by documented comorbidity - notably renal disease - rather than by age alone. The strongest practical priorities are pre-monsoon surge preparation, standardized dehydration documentation, comorbidity-sensitive triage (with renal-function monitoring) for prolonged-stay risk, and structured coding-quality improvement. These are feasible, measurable actions for tertiary-care settings facing seasonal communicable disease pressure.

Declarations

Ethics approval and consent to participate: The study was granted exemption from full ethical review by the Shridevi Medical College Institutional Ethics Committee (SIMS&RH, Tumakuru; reference number SIMSRH/IEC/2026-27/498; study reference SRC2026016; dated 11 April 2026) for the use of secondary, de-identified records. Individual consent was waived for de-identified retrospective records.

Consent for publication: Not applicable.

Availability of data and materials: De-identified aggregated data can be shared on reasonable request subject to institutional policy.

Competing interests: None declared.

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Declaration on the Use of Artificial Intelligence: AI-assisted tools were used only for language editing, formatting, table/figure preparation and to assist with reproducible statistical computation (data handling and statistical scripting in Python). The authors reviewed and edited all AI-assisted output and approved the final manuscript.

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