Original Article

Role of Bowel Wash and Gut-Sterilization in Recovery from Hepatic Encephalopathy: A Prospective Observational Study from a Tertiary Centre in Central India

Ajay Kumar Nandmer[1], Vijay Kumar Nandmer[1]

[1]Professor, Gandhi Medical College, Bhopal, Madhya Pradesh, India

Abstract

Background: Hepatic encephalopathy (HE) is a major complication of advanced liver disease; gut-directed strategies such as bowel wash and gut-sterilization are used to hasten neurological recovery. **Material and Methods:** We conducted a prospective observational study for one year at the Department of Medicine, Gandhi Medical College, and associated Hamidia Hospital, Bhopal. Adults admitted with the West Haven criteria staged him. Interventions comprised bowel wash and gut-sterilization administered at frequencies tailored to HE stages. The primary endpoint was improvement/time to recovery; secondary endpoints were in-hospital outcomes. Sample size was n=100; IEC approval and informed consent were obtained. **Results:** Baseline HE stages were: stage 1, 9% (n=9); stage 2, 54% (n=54); stage 3, 34% (n=34); stage 4, 3% (n=3). Most patients received 3–4 bowel washes/day (83%); 13% received 2–3/day and 4% received 4–5/day. Mean time to recovery increased with HE stages: 1.89 (stage-1), 3.79 (stage-2), 5.97 (stage-3), 12.00 days (stage-4); $P < 0.001$. Outcomes varied by stage ($P < 0.001$): stage-1 all recovered (n=9); stage-2 recovered 52, LAMA 2; stage-3 recovered 28, LAMA 3, deaths 3; stage-4 recovered 1, deaths 2 (totals: recovered 90, LAMA 5, deaths 5). **Conclusion:** In this tertiary-care cohort, bowel wash with gut-sterilization was associated with clinically meaningful recovery across HE stages, with faster recovery in lower stages and a clear gradient in outcomes by severity. These findings support gut-directed therapy as a practical component of HE management and motivate optimizing the protocol's frequency and duration.

Keywords: Hepatic encephalopathy; bowel wash; gut-sterilization; West Haven stages; recovery time; tertiary care India.

Received: 22 October 2025 **Revised: 01 November 2025** **Accepted: 17 November 2025** **Published: 05 January 2026**

Introduction

Hepatic encephalopathy (HE) is a serious neuropsychiatric complication of liver dysfunction that spans a spectrum from subtle cognitive changes to coma and carries substantial management and prognostic challenges.[1,2] The gut–liver axis is central to pathogenesis: impaired hepatic detoxification permits the accumulation of neurotoxins, classically ammonia, while gut dysbiosis and altered intestinal permeability amplify neuroinflammation and the clinical expression of HE.[3]

These insights have positioned gut-directed therapies as pragmatic targets in HE care. Bowel wash techniques (e.g., enemas) mechanically evacuate fecal substrates that harbor neurotoxic metabolites, thereby lowering the intestinal ammonia burden and potentially accelerating neurologic recovery.[4] Gut-sterilizing strategies, including non-absorbable antibiotics (e.g., rifaximin) and probiotics, modulate the intestinal microbiota to reduce ammonia production, restore barrier function, and support cognitive improvement.[5,6]

Beyond ammonia, HE is increasingly understood as a disorder intensified by systemic and neuroinflammation triggered by microbial products and dysbiosis. Bowel wash may blunt this inflammatory milieu by removing endotoxin-rich luminal contents, while gut-sterilizing agents help re-establish microbial balance and dampen pro-inflammatory signaling mechanisms relevant to both acute episodes and prevention of recurrence.[7,8] The favorable tolerability of these approaches further supports their incorporation into routine care when used under medical supervision.[9]

However, operational questions remain regarding how intensively and for how long to deploy these interventions across HE stages in real-world inpatient settings. The present study explicitly targets these gaps by quantifying the role of bowel washes and gut sterilization in HE recovery and by evaluating the effective number and duration of bowel washes required for clinical improvement.

Hence, the present study aimed to assess the role of bowel wash and gut-sterilizing agents in the recovery of patients with hepatic encephalopathy and to determine the effective frequency and duration of bowel wash required for improvement.

Address for correspondence: Dr. Vijay Kumar Nandmer, Professor, Gandhi Medical College, Bhopal, Madhya Pradesh, India
E-mail:nandmer@yahoo.com

DOI:
10.21276/amit.2026.v13.i1.286

How to cite this article: Nandmer AK, Nandmer VK. Role of Bowel Wash and Gut-Sterilization in Recovery from Hepatic Encephalopathy: A Prospective Observational Study from a Tertiary Centre in Central India. Acta Med Int. 2026;13(1):11-14.

Materials and Methods

Study design and setting: This was a prospective observational study conducted in the Department of Medicine at Gandhi Medical College and the associated Hamidia Hospital, Bhopal, over 1 year.

Participants and eligibility: Population & source: Consecutive inpatients with hepatic encephalopathy (HE), staged by West Haven criteria.

Inclusion criteria: Adults with HE meeting West Haven stage definitions (stages 1–4).

Exclusion criteria: Age <18 years; pregnancy; other neurological comorbidities; intellectual disability; markedly deranged coagulation profile.

Sample size and sampling technique: Sample size was estimated using a single-proportion formula (parameters: z, p, q, allowable error d); the target sample was 100 patients. Participants were recruited prospectively from eligible admissions.

Operational definitions and grading: Hepatic encephalopathy severity was categorized according to West Haven stages (1–4) using standard clinical descriptors (ranging from subtle cognitive/behavioral changes to coma).

Treatment protocol (gut-directed therapy): All enrolled patients received bowel wash and gut sterilization as part of routine care; frequency/intensity were tailored to the HE stage at the clinician's discretion. The study recorded the frequency of bowel washes per day and their duration to evaluate relationships with clinical improvement.

Outcomes:

Primary outcome: improvement in HE stage and time to recovery.

Secondary outcomes: changes in relevant biochemical parameters and in-hospital disposition (recovery/LAMA/death).

Data collection and measurements: Data were captured on a pre-designed proforma: demographics, clinical examination, and laboratory tests. Investigations included: Hb, TLC/DLC, platelets; Na/K; urea/creatinine; random blood sugar; coagulation profile; liver function tests (bilirubin, SGOT, SGPT); lipid profile (TG, LDL, VLDL, HDL); ascitic fluid routine/microscopy and SAAG as indicated. Clinical monitoring (vitals, neurological status) was performed regularly during admission.

Ethical considerations: The protocol received approval from the Institutional Ethics Committee (IEC), Gandhi Medical College; informed consent was obtained from all participants/guardians. The study adhered to the principles of the Declaration of Helsinki, consistent with AMI requirements.

Statistical analysis: Data were analyzed using standard statistical tests. Chi-square examined associations between contributory factors and outcomes; one-way ANOVA compared mean values across HE stages. A two-sided $P < 0.05$ denoted statistical significance. (Software/version not specified in the thesis.)

Results

Baseline characteristics: The cohort included 100 inpatients with hepatic encephalopathy (HE). Mean age was 46.8 ± 14.39 years; age-group distribution was ≤30 (13%), 31–40 (26%), 41–50 (25%), 51–60 (15%), and >60 (21%) (Figure 1). Male patients comprised 85% (n=85) and female patients 15% (n=15) (Figure 2). Vital signs and laboratory indices at admission were: SBP 101.86 ± 8.78 mmHg, DBP 60.90 ± 9.33 mmHg, pulse rate 76.86 ± 13.43/min, RBS 114.69 ± 20.27 mg/dL, Hb 9.19 ± 1.97 g/dL, TLC 8265.30 ± 9675.03/mm³, platelets 1.49 ± 0.59 lakh/mm³, serum bilirubin 2.54 ± 3.43 mg/dL, SGOT 114.37 ± 374.60 IU/L, SGPT 95.98 ± 351.81 IU/L, serum urea 43.31 ± 33.69 mg/dL, and serum creatinine 0.93 ± 0.81 mg/dL. Coagulation parameters were available for n=92: PT 23.31 ± 5.58 s, INR 1.61 ± 0.62. Mean SAAG (n=81) was 1.66 ± 0.37.

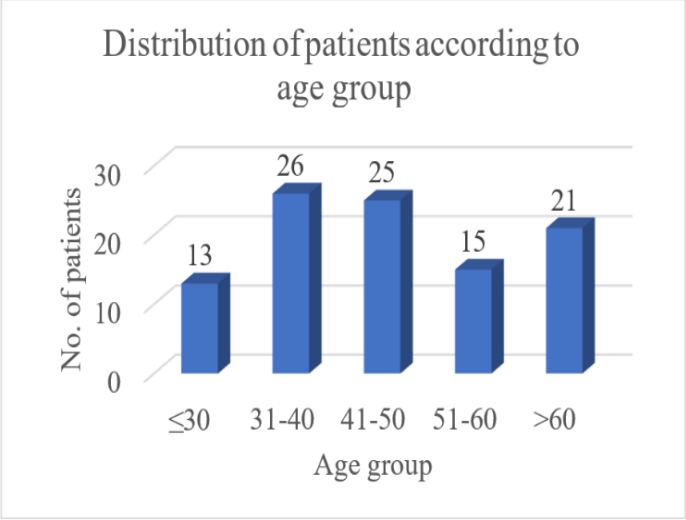

Figure 1: Distribution of patients according to age group

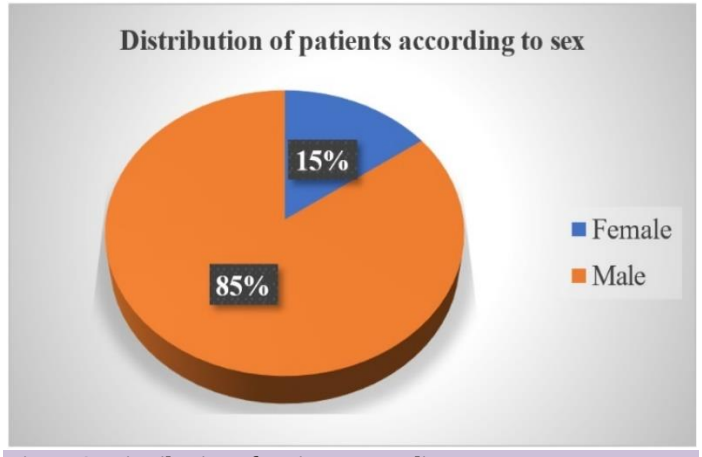

Figure 2: Distribution of patients according to sex

Etiologic profile: A history of alcohol use was present in 77% (n=77) of patients; 23% (n=23) reported no alcohol use. On viral markers, HEP.B positive in 8% (n=8) and HEP.C positive in 2% (n=2); 90% (n=90) were negative for both [Table 1].

Table 1: Distribution of patients as per viral marker

Viral marker	No. of patients	Percentage of patients
HEP. B +	8	8.0
HEP. C +	2	2.0
Negative	90	90.0
Total	100	100.0

HE stage at presentation: At admission, Stage-2 HE was most common (54%, n=54), followed by Stage -3 (34%, n=34); Stage-1 and Stage-4 accounted for 9% (n=9) and 3% (n=3), respectively [Table 2].

Table 2: Distribution as per Stage of Hepatic Encephalopathy

Stage of Hepatic Encephalopathy	No. of patients	Percentage of patients
1	9	9.0
2	54	54.0
3	34	34.0
4	3	3.0
Total	100	100.0

Table 3: Distribution as per SAAG scoring (n=82)

SAAG scoring (n=82)	No. of patients	Percentage of patients
>=2	8	9.8
1.1-1.49	14	17.1
1.5-1.99	56	68.3

Exposure to gut-directed therapy: Most patients received 3–4 bowel washes/day (83%, n=83); 13% (n=13) received 2–3/day, and 4% (n=4) received 4–5/day.

Ascites profile (SAAG categories): Among those assessed (n=82), 68.3% (n=56) had SAAG 1.5–1.99, 17.1% (n=14) had 1.1–1.49, and 9.8% (n=8) had ≥2.0 [Table 3].

Recovery time by HE Stage: Mean time to recovery rose stepwise with HE severity: 1.89 days (stage-1), 3.79 (stage-2), 5.97 (stage-3), and 12.00 (stage-4); P < 0.001 [Figure 3]. Overall, 90 patients recovered, 5 left against medical advice (LAMA), and 5 died. Outcomes differed significantly by stage (P < 0.001): all stage-1 patients recovered (9/9); in stage-2, 52 recovered and 2 LAMA (n=54); in stage-3, 28 recovered, 3 LAMA, 3 deaths (n=34); in stage- 4, 1 recovered and 2 died (n=3) [Table 4].

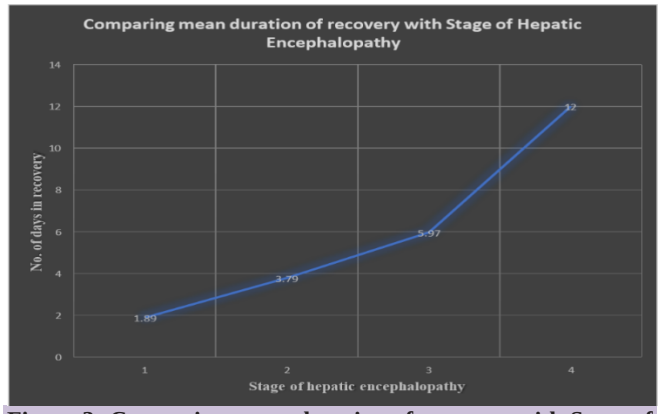

Figure 3: Comparing mean duration of recovery with Stage of Hepatic Encephalopathy In-hospital outcomes by HE stage.

Table 4: Comparing patients' outcome with Stage of Hepatic Encephalopathy

		Outcome			Total	P value
		Death	Lama	Recovered		
Stage of Hepatic Encephalopathy	1	0	0	9	9	<0.001
	2	0	2	52	54	
	3	3	3	28	34	
	4	2	0	1	3	
Total		5	5	90	100	

Discussion

In this prospective observational cohort from a tertiary centre in Central India, we evaluated gut-directed therapy in 100 inpatients with hepatic encephalopathy (HE). The admission profile skewed toward intermediate–advanced stages, stage-2 (54%) and stage-3 (34%), with fewer stage-1 (9%) and stage-4 (3%) cases, reflecting a substantial inpatient burden of overt HE.

The cohort was predominantly male (85%) with a mean age of 46.8 years, consistent with an alcohol-predominant aetiology in this dataset, as 77% reported alcohol use. Viral markers were positive in 10% overall (HBsAg: 8%; anti-HCV: 2%).

Baseline laboratory indices highlighted the physiologic context of decompensated liver disease: anaemia (Hb 9.19 g/dL), coagulopathy (PT 23.31 s; INR 1.61), and elevated transaminases (SGOT 114.37 IU/L; SGPT 95.98 IU/L).

Ascites parameters supported clinically relevant portal hypertension: the mean SAAG was 1.66, and among those profiled (n=82), 68.3% clustered between 1.5–1.99, with 17.1% at 1.1–1.49 and 9.8% at ≥2.0.

The central observation is a monotonic gradient in time to recovery across HE stages, with mean recovery of 1.89, 3.79, 5.97, and 12.00 days in stages 1–4, respectively (P < 0.001). This

pattern underscores the clinical salience of early-stage presentation and quantifies the incremental resource intensity with increasing severity.

Correspondingly, in-hospital outcomes varied significantly by stage ($P < 0.001$): all stage-1 patients recovered; stage-2 saw 52 recoveries and 2 LAMA; stage-3 had 28 recoveries, 3 LAMA, and three deaths; while stage-4 included one recovery and two deaths (overall: 90 recovered, 5 LAMA, five deaths).

Regarding exposure, most patients received 3–4 bowel washes/day (83%), with smaller subsets receiving 2–3/day (13%) or 4–5/day (4%), a pragmatic pattern that reflects routine clinical practice in this setting.

The study prospectively captured the frequency and duration of bowel wash/gut-sterilisation to explore their relationship with clinical improvement; however, it was not designed or powered for a formal dose–response comparison between frequency strata and outcomes, which should be the focus of subsequent analytical or randomised work.

Two additional observations contextualise the findings. First, the alcohol-predominant history (77%) likely shaped the age/sex distribution and may influence recovery dynamics and recurrence risk; this reinforces the need for structured counselling and alcohol-cessation support during and after admission.

Second, LAMA events (n=5) clustered in stages 2–3, introducing potential attrition bias in outcome estimates for these strata and underscoring the importance of discharge planning and caregiver engagement. Strengths of this work include its prospective design, standardised grading (West Haven), and systematic capture of bowel-wash frequency/duration alongside clinically relevant outcomes and biochemistry.

Limitations

- Observational, single-centre design: As a prospective observational study from a tertiary- care department at Gandhi Medical College & associated Hamidia Hospital, Bhopal, causal inference is limited and generalizability beyond similar inpatient settings may be constrained.
- Sample size (n = 100): Precision is limited for infrequent outcomes especially high-stage HE where stage-4 n=3, constraining stable estimates for mortality in this stratum.
- No protocolized comparator: Bowel wash and gut-sterilization were administered at varying frequencies by stage as part of routine care; the study was not designed/powered for formal dose–response comparisons or head-to-head protocol evaluation.
- Attrition (LAMA): Five patients left against medical advice, mostly in intermediate stages, introducing potential attrition bias in outcome estimates.
- Contextual confounding: The cohort's alcohol-predominant history (77%) may influence recovery dynamics and limits extrapolation to non-alcohol-related HE populations.

Conclusion

In this prospective observational inpatient cohort (n=100), gut-directed therapy bowel wash plus gut-sterilization was widely used and associated with a clear severity-gradient in recovery: mean time to recovery rose stepwise from 1.89 (stage-1) to 12.00 days (stage-4), and in-hospital outcomes varied significantly by stage (overall 90 recovered, 5 LAMA, 5 deaths; $P < 0.001$). These data support gut-directed strategies as practical components of HE management while underscoring the need for protocolized regimens and comparative trials to define optimal frequency and duration across HE stages.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Swaminathan M, Ellul MA, Cross TJ. Hepatic encephalopathy: current challenges and future prospects. Hepat Med. 2018;10:1-11.
2. Savlan I, Liakina V, Valantinas J. Concise review of current concepts on nomenclature and pathophysiology of hepatic encephalopathy. Medicina. 2014;50(2):75-81.
3. Zhu R, Liu L, Zhang G, Dong J, Ren Z, Li Z. The pathogenesis of gut microbiota in hepatic encephalopathy by the gut-liver-brain axis. Biosci Rep. 2023;43(6).
4. Munk Lauridsen M, Jonasson E, Bajaj JS. Microbial Approaches to Treat and Prevent Hepatic Encephalopathy. Gastroenterol Clin North Am. 2025;54(2):429-51.
5. Won SM, Oh KK, Gupta H, Ganesan R, Sharma SP, Jeong JJ, et al. The Link between Gut Microbiota and Hepatic Encephalopathy. Int J Mol Sci. 2022;23(16).
6. Yu X, Jin Y, Zhou W, Xiao T, Wu Z, Su J, et al. Rifaximin Modulates the Gut Microbiota to Prevent Hepatic Encephalopathy in Liver Cirrhosis Without Impacting the Resistome. Frontiers in Cellular and Infection Microbiology. 2022; Volume 11 - 2021.
7. Blaney H, DeMorrow S. Hepatic Encephalopathy: Thinking Beyond Ammonia. Clin Liver Dis (Hoboken). 2022;19(1):21-4.
8. Chen Z, Ruan J, Li D, Wang M, Han Z, Qiu W, et al. The Role of Intestinal Bacteria and Gut– Brain Axis in Hepatic Encephalopathy. Frontiers in Cellular and Infection Microbiology. 2021; Volume 10 - 2020.
9. Dhiman RK. Gut microbiota, inflammation and hepatic encephalopathy: a puzzle with a solution in sight. J Clin Exp Hepatol. 2012;2(3):207-10.