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MATERNAL AWARENESS, PRACTICES, AND ASSOCIATED FACTORS OF HOME-BASED DIARRHOEA MANAGEMENT IN BIHAR: A HOSPITAL-BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Bihar has the highest childhood diarrhoea prevalence among major Indian states. Maternal competence in home-based care is a key determinant of outcomes. The objective is to assess maternal awareness, home-based practices, and factors associated with correct knowledge of oral rehydration solution (ORS) preparation among mothers of children under five years.

Materials and Methods: Hospital-based cross-sectional study of 230 mothers at the immunisation outpatient department of Indira Gandhi Institute of Medical Sciences (IGIMS), Patna, Bihar (October 2024–March 2025). Recruitment of participants was done on randomly selected days used a pre-tested structured questionnaire. Multivariable logistic regression assessed factors associated with correct verbal knowledge of Oral Rehydration Solution (ORS) preparation (primary outcome).

Results: Although 82.6% (n = 190) had heard of ORS, only 57.0% (n = 131) showed correct preparation knowledge. Awareness about zinc was 18.3% (n = 42); 6.1% (n = 14) knew the 10–14-day duration. Myths included teething (38.3%) and the "evil eye" (14.3%). Secondary or higher education increased odds of correct ORS knowledge (adjusted odds ratio [AOR] 2.96; 95% confidence interval [CI]: 1.68–5.21; P < 0.001); above-median income decreased odds (AOR 0.47; 95% CI: 0.27–0.81; P = 0.007).

Conclusion: High ORS awareness does not ensure correct preparation knowledge. Hands-on frontline education on ORS–zinc use and myth dispelling is needed across socioeconomic groups.

Keywords: Diarrhoea; Health Knowledge, Attitudes, Practice; Mothers; Fluid Therapy; Child, Preschool.

INTRODUCTION

In paediatrics age group, diarrhoea is defined as the passage of three or more loose, liquid, or watery stools per day, or a stool frequency that is noticeably greater than the child's normal baseline pattern.[1] Childhood diarrhoeal disease remains among the leading causes of morbidity and mortality in children under five years in low- and middle-income countries.[1] Global estimates continue to attribute a large number of under-five deaths to diarrhoea and related infectious causes annually, and India contributes a substantial share of this burden.[2-10] The relationship between malnutrition and diarrhoea is bidirectional: undernourished children are more vulnerable to severe enteric infections, which in turn worsen nutritional deficits and may contribute to stunting and developmental delay.[4,11-18]

Effective management of acute watery diarrhoea depends heavily on the caregiver's ability to provide immediate home care with oral rehydration solution (ORS) and zinc supplementation, as recommended by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF).[5] This approach aims to prevent dehydration, reduce stool

volume, and shorten illness duration. National Family Health Survey (NFHS-5) data indicate that ORS was given during diarrhoeal episodes in a substantial proportion of children nationally; however, survey indicators of "ORS use" do not measure whether caregivers can correctly reconstitute ORS packets, and co-administration of zinc remains suboptimal.[6] Dangerous practices—such as food restriction during illness and inappropriate antibiotic use—continue to be reported and may hinder recovery while contributing to antimicrobial resistance.[7]

This burden is particularly acute in the Eastern India. According to NFHS-5, Bihar records the highest prevalence of childhood diarrhoea among major Indian states (13.7%), establishing the region as a public health priority.[6] Despite urban health infrastructure in Patna, translation of public health messaging into household competence appears incomplete. Prior work has linked maternal education and socioeconomic position with paediatric diarrhoeal outcomes and care practices.[8]

Given these regional disparities, this study assessed maternal awareness and self-reported practices regarding home-based prevention and management of diarrhoeal disease in Patna, Bihar. Secondarily, it identified sociodemographic factors associated with correct knowledge of ORS preparation, to inform culturally tailored interventions in Bihar.

MATERIALS AND METHODS

Study design and setting: This hospital-based cross-sectional study was conducted at the immunisation clinic of Indira Gandhi Institute of Medical Sciences (IGIMS), a tertiary care teaching hospital in Patna, Bihar, over six months from October 2024 to March 2025. The study is reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[9] The objective of the study was to assess maternal awareness of diarrhoea and its home-based prevention and management practices (ORS preparation knowledge, zinc knowledge, hygiene, and feeding) among mothers of children under five years. We also assessed the sociodemographic factors associated with the maternal awareness of diarrhoea and its home-based prevention and management practices.

Participants and sampling: The study population comprised mothers of children aged 0–59 months who visited the hospital's immunisation OPD. Inclusion criteria were mothers of children under five years who provided written informed consent. Exclusion criteria were mothers who were critically ill, unable to communicate, or who declined participation.

The minimum sample size was calculated as 207 using Cochran's formula for a single proportion, with reference prevalence (p) of 0.84 for adequate maternal knowledge from a previous hospital-based study,[10] margin of error (d) of 0.05, and 95% confidence level (Z = 1.96). After allowing for an anticipated 10% non-response, the target sample size was fixed at 230 mothers. Consecutive sampling was used on two days of the week selected at the start of each month by drawing lots, to reduce day-of-week selection bias (this approach does not constitute probability sampling of all mothers in Patna). On selected days, mothers were approached consecutively during immunisation OPD sessions until a daily target of five participants (ten per week) was achieved. A total of 255 mothers were approached; 242 met eligibility criteria and 12 refused (non-response rate 5.0%), yielding a final analysed cohort of 230 [Figure 1].

Data collection tool: A structured, pre-tested, interviewer-administered questionnaire of 24 items was used. The tool was developed after an extensive literature and guideline review in English, translated into Hindi, and back-translated by independent bilingual experts. A pilot study among 20 mothers informed minor wording adjustments for cultural items; pilot participants were excluded from the final analysis. Domains were: Section I, sociodemographic profile (five items); Section II, general awareness and misconceptions (eight items); Section III, management knowledge and practices related to ORS and zinc (six items); and Section IV, sanitation, hand hygiene, and information sources (five items). Internal consistency of multi-item sections yielded Cronbach's alpha of 0.81; this indicates acceptable reliability of the item set but does not constitute full psychometric validation (see Limitations).

Operational definitions

1. Correct knowledge of ORS preparation (primary outcome): Mother's ability to verbally describe correct reconstitution of a commercial ORS packet in one litre of clean water, thorough mixing, and discarding unused solution after 24 hours; or, for home-made sugar–salt solution, the correct ratio of six teaspoons of sugar and half a teaspoon of salt in one litre of clean water. Commercial ORS was preferred in counselling; home-made solution was scored only when that method was described. This outcome measures knowledge of correct technique, not observed preparation during an illness episode.

2. Continued feeding practices: Self-reported continuation of breastfeeding and maintenance of normal or increased feeding and fluids during the diarrhoeal episode without nutritional restriction.

3. Appropriate handwashing: Self-reported consistent use of soap and water at critical times (after toilet use, after cleaning a child, and before preparing or serving food).

4. Danger-sign awareness: Ability to recognise at least one severe clinical indicator of dehydration or severe illness (lethargy or weakness, sunken eyes, blood in stool, or inability to drink or breastfeed). "Severe danger-sign knowledge" was defined as recognition of blood in stool or inability to drink or breastfeed.

5. Correct zinc duration knowledge: Stating a treatment duration within the WHO-recommended 10–14 days.[5]

Ethics

The study was conducted in accordance with the ethical standards of the institutional ethics committee and the Declaration of Helsinki (1975, revised 2000 and subsequent updates). Ethical clearance was obtained from the Institutional Ethics Committee of Indira Gandhi Institute of Medical Sciences (IGIMS), Patna (Approval No. 371/IEC/IGIMS/2025) before data collection. All participants were briefed on the study purpose, benefits, and voluntary nature. Written informed consent was obtained before the interview. Confidentiality was maintained by anonymising records. Mothers with inadequate knowledge or incorrect reported practices received a brief educational demonstration on correct ORS preparation, zinc duration, and hygiene immediately after data collection.

Data processing and statistical analysis: Data were checked daily for completeness and entered into Microsoft Excel. Analyses were performed using Jamovi software (version 2.7.13) and verified in Python. Descriptive statistics (means, standard deviations, frequencies, and percentages) summarised the sample. Bivariate associations between sociodemographic characteristics and correct ORS preparation knowledge were evaluated with the Chi-square test; crude odds ratios (OR) with 95% confidence intervals (CI) were calculated. Multivariable logistic regression estimated adjusted odds ratios (AOR) for the primary outcome, with a priori covariates: maternal education (secondary and above versus below), monthly family income (above versus below sample median in Indian rupees), maternal age (continuous), and number of children (continuous). Income rather than full Kuppuswamy class was used in the adjusted model to reduce collinearity with education (education contributes to the composite socioeconomic status [SES] score); variance inflation factors (VIF) were inspected and remained below 2.5 for all covariates. Model fit was summarised with model Chi-square and McFadden pseudo R-square. A two-sided P value < 0.05 was considered statistically significant; exact P values are reported where available. There were no missing data for variables in the regression model. Knowledge–behaviour and knowledge-depth pairs were compared with McNemar's test.

RESULTS

Sociodemographic profile: Two hundred and thirty mothers participated. Mean maternal age was 28.18 ± 6.29 years. Age distribution was 18–24 years in 27.0% (n = 62), 25–34 years in 62.2% (n = 143), and 35 years or older in 10.9% (n = 25). A majority had completed secondary education or higher (63.0%, n = 145); 9.1% (n = 21) had no formal schooling. Using the modified Kuppuswamy scale (2024 updates), the largest SES groups were Class III (lower middle: 33.0%, n = 76) and Class IV (upper lower: 26.1%, n = 60). Parity was one child in 28.3% (n = 65), two to three children in 53.0% (n = 122), and more than three children in 18.7% (n = 43) [Table 1].

Table 1: Sociodemographic characteristics of participants (N = 230)

Sociodemographic characteristic	Frequency (n)	Percentage (%)
Maternal age (years)		
18–24	62	27.0
25–34	143	62.2
≥35	25	10.9
Maternal education		
No formal education	21	9.1
Primary (1st–5th)	64	27.8
Secondary (6th–12th)	87	37.8
Graduate and above	58	25.2
Socioeconomic status (SES)*		
Class I (Upper)	12	5.2
Class II (Upper middle)	48	20.9
Class III (Lower middle)	76	33.0
Class IV (Upper lower)	60	26.1
Class V (Lower)	34	14.8
Number of children		
1 child	65	28.3
2–3 children	122	53.0
>3 children	43	18.7

*SES by modified Kuppuswamy scale (2024 CPI-adjusted updates): composite of education and occupation of the household head and monthly family income. Score bands: Upper (I) 26–29; Upper middle (II) 16–25; Lower middle (III) 11–15; Upper lower (IV) 5–10; Lower (V) <5.

Awareness, knowledge depth, and self-reported practices: A clear gap was observed between general ORS awareness and correct preparation knowledge (Figure 2). Although 82.6% (n = 190) of mothers had heard of ORS, only 57.0% (n = 131) correctly described preparation. Knowledge of aetiology was mixed: 77.8% (n = 179) correctly identified contaminated water, whereas 38.3% (n = 88) endorsed teething and 14.3% (n = 33) endorsed the "evil eye" as causes [Table 2].

Table 2: Maternal knowledge and self-reported practices regarding diarrhoea management (N = 230)

Awareness and practice indicators	n	%
General aetiology and prevention		
Contaminated water causes diarrhoea (knowledge)*	179	77.8
Teething causes diarrhoea (myth)*	88	38.3
Evil eye causes diarrhoea (myth)*	33	14.3
ORS and zinc		
Aware of ORS (heard of ORS)	190	82.6
Correct knowledge of ORS preparation (primary outcome)	131	57.0
Aware of zinc supplementation	42	18.3
Correct zinc duration knowledge (10–14 days)	14	6.1
Maternal feeding		
Continued feeding is important (belief)	175	76.0
Maintained/increased feeding during episode (self-reported practice)*	112	48.7
Dehydration danger signs recognised*		
Lethargy/weakness	65	28.3
Sunken eyes	44	19.1
Blood in stool	34	14.8
Inability to drink/breastfeed	34	14.8
Do not know (cannot recognise any danger sign)	85	37.0

*Multiple responses permitted for aetiology, practices, and danger signs; percentages may exceed 100%. Continued-feeding belief and practice were assessed as separate items.

[Figure 3] summarises five paired contrasts. Two pairs represent knowledge–behaviour gaps based on self-report: handwashing belief (92.0%) versus consistent soap use at critical times (39.6%); and belief in continued feeding (76.0%) versus maintained feeding during illness (48.7%). Three pairs represent knowledge-depth gradients: heard of ORS (82.6%) versus correct preparation knowledge (57.0%); heard of zinc (18.3%) versus correct 10–14-day duration knowledge (6.1%); and recognition of at least one danger sign (63.0%, n = 145) versus severe danger signs such as blood in stool or inability to feed (14.8%, n = 34). McNemar tests for all five pairs were significant (P < 0.001). Importantly, 37.0% of mothers could not name any danger sign of dehydration.

[Figure 4] shows information sources among the 190 mothers with baseline awareness of diarrhoeal treatments. Healthcare personnel (doctors, nurses, and community workers such as accredited social health activists [ASHA] and Anganwadi workers) were reported by 68.4% (n = 130); informal social networks by 41.6% (n = 79); mass media by 20.5% (n = 39); digital platforms by 11.6% (n = 22); and other sources by 10.0% (n = 19). Multiple responses were allowed.

Factors associated with correct knowledge of ORS preparation: In bivariate analysis, maternal education and SES were associated with correct ORS preparation knowledge [Table 3]. Mothers with secondary education or higher had higher odds of correct knowledge than those with no formal schooling (row percentages 66.9% versus 33.3%; crude OR 4.04; 95% CI: 1.53–10.67; overall education Chi-square P = 0.0003). Kuppuswamy SES class was also associated (overall P = 0.0199), with lower SES classes showing higher rates of correct knowledge than upper classes in several pairwise contrasts.

Table 3: Bivariate association of sociodemographic factors with correct knowledge of ORS preparation (N = 230)

Factor	Correct (n=131)	Incorrect (n=99)	Total	Crude OR (95% CI)	P*
Maternal education					0.0003
No formal education	7	14	21	Referent	
Primary (1st–5th)	27	37	64	1.46 (0.52–4.10)	
Secondary and above	97	48	145	4.04 (1.53–10.67)	
Maternal age (years)					0.8497
18–24	35	27	62	Referent	
25–34	83	60	143	1.07 (0.58–1.95)	
≥35	13	12	25	0.84 (0.33–2.12)	
Socioeconomic status					0.0199
Class V (Lower)	24	10	34	Referent	
Class IV (Upper lower)	42	18	60	0.97 (0.39–2.44)	
Class III (Lower middle)	36	40	76	0.38 (0.16–0.89)	
Class II (Upper middle)	24	24	48	0.42 (0.16–1.06)	
Class I (Upper)	5	7	12	0.30 (0.08–1.16)	
Number of children					0.1669
1 child	39	26	65	Referent	
2–3 children	63	59	122	0.71 (0.39–1.31)	
>3 children	29	14	43	1.38 (0.62–3.10)	

*Overall P values from Pearson's Chi-square test across categories of each factor.

In the multivariable model [Table 4], secondary or higher education remained independently associated with correct ORS preparation knowledge (AOR 2.96; 95% CI: 1.68–5.21; P < 0.001). Above-median monthly family income (sample median ₹18,256) was independently associated with lower odds of correct knowledge (AOR 0.47; 95% CI: 0.27–0.81; P = 0.007). Maternal age (AOR 1.00; 95% CI: 0.96–1.05; P = 0.887) and number of children (AOR 1.10; 95% CI: 0.88–1.38; P = 0.389) were not significantly associated. Model Chi-square P < 0.001; McFadden pseudo R-square = 0.075, indicating that the included covariates explain only a modest fraction of outcome variability.

Table 4: Multivariable logistic regression of factors associated with correct knowledge of ORS preparation (N = 230)

Predictor variable	AOR	95% CI	P
Maternal education (secondary & above vs below)*	2.96	1.68–5.21	<0.001
Monthly family income (above median vs below)**	0.47	0.27–0.81	0.007
Mother's age (continuous, per year)	1.00	0.96–1.05	0.887
Number of children (continuous, per child)	1.10	0.88–1.38	0.389

Dependent variable: correct knowledge of ORS preparation (yes vs no). *Reference: primary education and below. **Reference: below sample median monthly family income (₹18,256). Model Chi-square P < 0.001; McFadden pseudo R-square = 0.075. No missing data. All VIFs < 2.5.

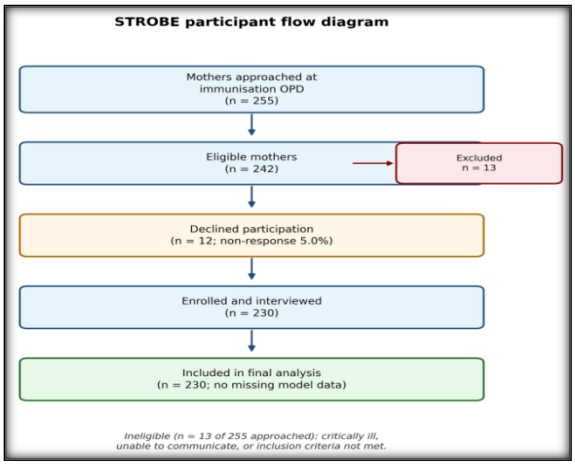

Figure 1: STROBE participant flow diagram for the hospital-based cross-sectional study (n = 230 analysed).

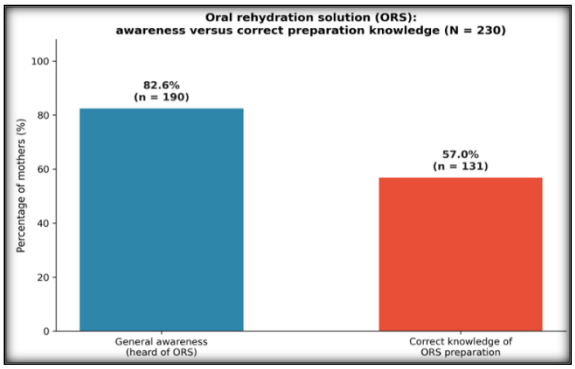

Figure 2: General awareness of ORS versus correct knowledge of ORS preparation among mothers (N = 230).

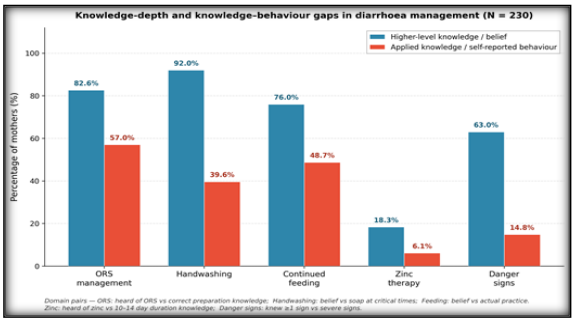

Figure 3: Grouped bar chart of knowledge–behaviour gaps across five diarrhoea-management domains (N = 230). Blue bars: higher-level knowledge or belief; red bars: applied knowledge or self-reported behaviour. Domain pair definitions are given in the figure footnote.

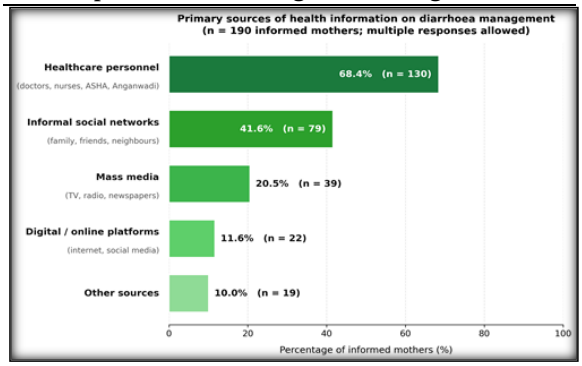

Figure 4: Primary sources of health information on diarrhoea management among informed mothers (n = 190; multiple responses allowed).

DISCUSSION

This hospital-based cross-sectional study documents an important competence gap among mothers attending a Patna immunisation OPD: high recognition of ORS (82.6%) coexists with substantially lower correct preparation knowledge (57.0%). Zinc knowledge was particularly weak (18.3% awareness; 6.1% correct 10–14-day duration knowledge), and more than one-third of mothers could not name any danger sign of dehydration. These findings suggest that public health messaging in Bihar may achieve broad name recognition without ensuring procedural literacy required for safe home

care. NFHS-5 indicators of ORS use during recent diarrhoea are not directly comparable to preparation-knowledge estimates, but both point to incomplete household-level competence.[6]

Similar gaps have been described elsewhere in India, where caregivers may know that ORS exists without mastering dilution and storage steps.[11] Incorrect reconstitution can render rehydration ineffective or, if over-concentrated, risk hypernatraemia in infants.[12] Passive information transfer is often insufficient; demonstration-based teaching improves retention of preparation steps.[10]

Cultural beliefs remain barriers. Teething was endorsed by 38.3% of mothers, consistent with findings from neighbouring settings,[13] and may delay care-seeking if diarrhoea is viewed as a benign developmental event. Belief in the "evil eye" (14.3%) may divert families toward traditional remedies instead of rehydration. Food restriction during illness, reflected in the gap between feeding belief (76.0%) and practice (48.7%), aligns with systematic evidence of harmful practices in low- and middle-income countries.[14] Hand hygiene showed a large belief–behaviour gap (92.0% versus 39.6% soap use), underscoring the need to address both supplies and habits, not awareness alone.[15]

Maternal education was strongly associated with correct ORS preparation knowledge (AOR 2.96), consistent with broader evidence linking maternal schooling with better child health behaviours.[8] The inverse association with above-median income was unexpected and should be interpreted cautiously. Plausible explanations—greater reliance of higher-income urban families on private clinics or pre-mixed commercial solutions, and more intensive ASHA or Anganwadi outreach among poorer households—were not directly measured in this study and remain hypotheses for future work.[16,17] The low pseudo R-square (0.075) indicates that unmeasured factors (prior training, recent illness experience, media exposure, health-worker contact intensity) likely drive much of the variation in preparation knowledge. Educational programmes should therefore reach mothers across socioeconomic strata rather than assuming that higher income guarantees competence.

Programmatically, ASHA and Anganwadi workers are well placed to deliver repetitive, household-level demonstration of ORS–zinc co-administration, danger-sign recognition, and soap use at critical times. Experience from public-sector diarrhoea management scale-up in Indian states, including Bihar, supports integrating commodity supply with skill-focused counselling.[17]

Limitations: As this was a cross-sectional design, hence causal inference can't be ascertained. As there was single-centre recruitment from an immunisation clinic so attending mothers are already engaged with preventive services and may have higher health literacy than the general population. The primary outcome was verbal description of preparation steps, not observed reconstitution or behaviour during a real diarrhoeal episode; self-reported handwashing and feeding are subject to social desirability bias and may overestimate desirable practices, so reported gaps are likely minimum estimates.

CONCLUSION

Among mothers in this Patna tertiary-care immunisation OPD sample, ORS name recognition was high, but correct preparation knowledge, zinc duration knowledge, danger-sign recognition, and several self-reported care practices were inadequate. Cultural myths regarding teething and the "evil eye" persist. Public health strategies in Bihar should emphasise hands-on demonstration and community-based education—leveraging ASHA and Anganwadi workers—to close the gap between awareness and correct ORS–zinc home management across all socioeconomic groups.

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