

# Knowledge, Attitudes, and Practices regarding Oral Fluid, Electrolyte, and Energy Management in Acute Nondiarrheal Illnesses among Physicians in India



Harshad Malve<sup>1\*</sup>, Prachee Sathe<sup>2</sup>, Pavitra Chakravarty<sup>3</sup>, Priti Thakor<sup>4</sup>, Christian Tesado<sup>5</sup>

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## ABSTRACT

**Background:** Fluid, electrolytes, and energy (FEE) management is important in the treatment of acute nondiarrheal illnesses. However, the use of FEE drinks in managing such illnesses is not well-documented.

**Objective:** This study aimed to understand physicians' knowledge, attitude, and practices (KAP) and perceived patient outcomes in treating FEE deficits in acute nondiarrheal illnesses using FEE drinks in India.

**Materials and methods:** A cross-sectional respondent-blinded survey was designed and administered among practicing physicians across various specialties and prescribing statuses in India. KAP among groups of physicians was assessed, and the correlations between knowledge–attitudes, knowledge–practice, and knowledge–perceived outcomes were explored.

**Results:** A total of 494 physicians participated in the study from September to October 2021. Overall, knowledge scores were moderate. Prescribers had a higher average knowledge score and more proactive attitudes and practices as compared to nonprescribers. Most physicians agreed that FEE management recommendations could improve patients' recovery speed. There were significant positive correlations between knowledge scores and physicians' attitudes toward the importance of FEE management awareness, the importance of FEE management for patient recovery, and a physician's perception that FEE drinks improved patients' recovery time. There was no significant correlation between knowledge score and practices.

**Conclusion:** There may be benefits from improving the knowledge of physicians in India in FEE management and developing guidelines for the use of FEE drinks in acute nondiarrheal illnesses. Further research exploring the knowledge–practice gap and evaluating the clinical benefit of FEE drinks in acute nondiarrheal illnesses should also be undertaken to develop such guidelines.

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## INTRODUCTION

Adequate water intake is essential to maintain several physiological functions and cellular homeostasis.<sup>1</sup> Accordingly, dehydration, which can be defined as a complex condition resulting in a reduction in total body water, can lead to a worsening health status.<sup>1</sup> Hydration is; therefore, a key aspect of disease management, especially across acute conditions, and the prescription of fluid and electrolyte therapy is a key tool in addressing this. Treating dehydration due to diarrheal diseases is well-documented, and there are well-established hydration guidelines by the World Health Organisation (WHO). The WHO and United Nations Children's Fund even jointly developed official guidelines for the manufacture of oral rehydration solutions (ORS) in 1969 and included it in the WHO's model list of essential medicines.<sup>2,3</sup>

Additionally, there may also be instances in acute nondiarrheal illnesses when there is overt or subclinical dehydration and where rehydration and electrolyte repletion is

important. Conditions associated with such dehydration may include fever (due to diseases such as dengue, malaria, and typhoid), nausea, vomiting, heat-related illnesses, and infections such as upper respiratory tract infections and urinary tract infections. These can be further exacerbated in the elderly or children due to their physiology.<sup>1,4</sup> In such cases, physicians may also find it important to prescribe fluid and electrolyte therapy. However, as there are no formal guidelines in the management of dehydration linked to these conditions, physicians often extrapolate clinical management from diarrheal illnesses to nondiarrheal illnesses and prescribe the WHO ORS.

The composition of a typical ORS used for diarrhea mostly includes fluids and electrolytes (sodium and potassium). A small amount of glucose is added, and the synergistic combination of these ingredients facilitates the absorption of sodium and water in the small intestine and replaces essential ions that are lost.<sup>2</sup> However, with other acute nondiarrheal illnesses, there may be a need

for an extra energy component due to the hypermetabolic response to such illnesses.<sup>5</sup> Also, patients may experience anorexia during such illnesses.<sup>6</sup> Hence, the extrapolation of ORS use to nondiarrheal illnesses is likely inadequate and represents a potential management gap. Recommendations to eat solids to obtain additional calories may also result in lower compliance as patients may find it easier to consume fluids instead during periods of anorexia.<sup>7</sup> Patients may also find the WHO ORS unpalatable due to the reported strong salty taste.<sup>8,9</sup> The addition of added energy (glucose) to fluid and electrolytes drinks could therefore improve palatability and patient compliance.<sup>10</sup> A ready-to-drink (RTD) format may also have the added advantage of being more convenient to consume and being sterile packed.<sup>11</sup>

The use of ORS in acute diarrhea, its prescription trend, and the knowledge and practices by healthcare providers are well-evaluated and reported in India.<sup>12–14</sup> However, in acute nondiarrheal illnesses, the need to prevent and treat dehydration as well as energy management may often be overlooked, and there are no data describing the utilization of drinks that contain FEE in nondiarrheal illnesses in India. This study will therefore be the first to provide data on the use of FEE drinks in nondiarrheal illnesses. The objectives were to evaluate physicians' KAP regarding the treatment of

<sup>1</sup>Therapy Area Head, Medical Affairs, Johnson & Johnson Consumer Health Pvt Ltd, Mumbai; <sup>2</sup>Head, Department of Critical Care Medicine, Ruby Hall Clinic, Pune, Maharashtra; <sup>3</sup>Consultant Pediatrician, Department of Pediatrics, Columbia Asia Hospital, Kolkata, West Bengal; <sup>4</sup>General Medical Affairs Manager, Medical Affairs, Johnson & Johnson Consumer Health Pvt Ltd, Mumbai, Maharashtra, India; <sup>5</sup>Johnson and Johnson Consumer Health, Medical Affairs, AP, Singapore; \*Corresponding Author

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FEE deficits in patients with acute nondiarrheal illness and to examine if there are differences amongst different groups of physicians in India. Physicians' reported impact of FEE management on the speed of patients' recovery was also explored.

## MATERIALS AND METHODS

### Questionnaire Design

A cross-sectional online questionnaire was developed to assess the KAP of physicians in treating FEE deficits in patients with acute nondiarrheal illness using FEE drinks in India. The questionnaire consists of four domains. The first domain of knowledge aimed to obtain information on the awareness of FEE deficits, knowledge about dehydration, definitions, clinical challenges, signs, symptoms, and biomarkers. The second domain evaluated a physician's attitude toward the use of FEE drinks in different clinical situations. The third domain assessed the physician's current practice, including FEE drink prescription and recommendation behaviors. The fourth domain evaluated physician-perceived patient outcomes with questions surrounding the impact of FEE management on a patient's recovery.

Figure 1 illustrates the questionnaire design process. A multi-phase approach was used to develop the questionnaire to optimize the validity of the study. The first phase included a literature review and a focus group discussion consisting of key opinion leaders (KOLs) in India with a deep understanding of the fluid and electrolyte management landscape. Four KOLs were recruited, and topics such as the dehydration landscape, guidelines and best practices, and fluid recommendation protocols were discussed. The second phase included the development of the questionnaire based on

information obtained during the focus group. Finally, the third phase involved questionnaire dissemination to the KOLs in obtaining feedback and comments. Iterative changes were then made to the questionnaire, and the final version was approved by all KOLs. The final questionnaire administered is provided in the appendix.

### Questionnaire Administration

The questionnaire was administered through an online platform from September to October 2021. Verified physicians were recruited to participate and remained anonymous. Informed consent was obtained prior to the questionnaire administration. Ethics approval was not required as this was an anonymous survey, and no identifiable information, patient data, and no personal information were obtained. Quota sampling was used to recruit participants based on prescribing status, clinical specialty, and area of practice. This allowed us to examine the differences in KAP amongst different groups of physicians. Prescribers were defined as physicians who give formal written or electronic prescriptions of FEE drinks to 50% or more of their eligible patients for FEE deficit management, whilst nonprescribers do not give formal written or electronic prescriptions of such products. As there were no specific guidelines nor literature that defined prescribers and nonprescribers, the criterion of a 50% or more prescription rate was obtained after discussions with the KOLs. During the questionnaire development phase, it was also suggested that questions should be tailored according to the physician's specialty and prescribing status. Therefore, the online platform was designed to distribute customized questions to the participants based on their clinical specialty and prescribing status. For example, a pediatrician will receive pediatric-specific knowledge questions about hydration in children and

infants, while an obstetrician-gynecologist will receive questions about hydration in pregnant and lactating women. Wordings were also tweaked to make them appropriate to the specialty and prescribing status. Details of the differences are shown in the questionnaire provided in the appendix.

### Statistical Analysis

Knowledge scores were summed into a total maximum score of 6. We used a two-sample t-test to analyze the differences in knowledge scores between prescribers and nonprescribers. Results were illustrated in mean [standard deviation (SD)]. Pearson's Chi-squared test was used to evaluate the difference in attitude between prescribers and nonprescribers, and results were illustrated in proportions. Correlation analysis was used to measure the strength and direction of the associations that existed between knowledge score and attitude, practices, and perceived patient outcomes. The corresponding correlation coefficients were reported. To describe the strength of a correlation coefficient, we defined a correlation of <0.2 as very weak, between 0.2 and 0.4 as weak, between 0.4 and 0.6 as moderate, and >0.6 as strong.<sup>15</sup> We used Statistical Package for the Social Sciences 25 for all statistical analyses. All hypothesis tests were performed using a 2-sided  $\alpha = 0.05$ .

## RESULTS

Participants' demographics are described in Table 1. There was a comparable distribution of participants from various clinical specialties, prescriber status, and practice areas due to quota sampling. Results of the differences between KAP are described in Table 2.

### Knowledge

The knowledge level of all physicians regarding dehydration and FEE management, evaluated by average knowledge score, was moderate

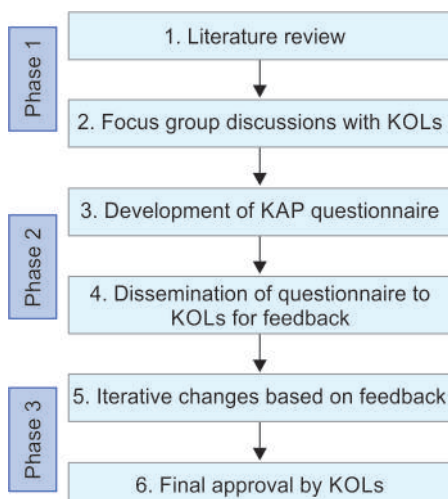


Fig. 1: Knowledge, attitude, and practices (KAP) questionnaire development process

Table 1: Demographics of participants

Characteristic	Participants (n = 494)
No of practice years, mean (SD)	17.8 (6.6)
No of patients a month, mean (SD)	536 (196.1)
Specialty, n (%)	
• GP	128 (25.9)
• MD physician	121 (24.5)
• Pediatrician	123 (24.9)
• OB-GYN	122 (24.7)
Prescribe Status, n (%)	
• Prescriber	248 (50.2)
• Nonprescriber	246 (49.8)
Practice Area, n (%)	
• Metros	252 (51.0)
• Mini metros	242 (49.0)

**Table 2:** Differences in KAP between prescribers and nonprescribers

Knowledge	Prescriber, mean ( $\pm$ SD)	Nonprescriber, mean ( $\pm$ SD)	p-value
Knowledge Score (max 6 points)	3.43 (1.34)	3.13 (1.36)	$p = 0.01$
Attitude	Prescriber, n (%)	Nonprescriber, n (%)	p-value
Perceived importance of FEE management awareness and application in nondiarrheal illness (% high importance)	163 (65.7)	99 (40.2)	$p < 0.01$
Perceived importance of FEE management for patient health during recovery from acute nondiarrheal illness? (% high importance)	154 (62.1)	84 (34.2)	$p < 0.01$
Perceived impact of chronic undetected dehydration on health (% high impact)	148 (59.7)	106 (43.1)	$p < 0.01$
Practice	Prescriber, n (%)	Nonprescriber, n (%)	p-value
Assess the patient for hydration level	179 (72.2)	146 (59.4)	$p < 0.01$
Recommend FEE drinks (% high—>70%)	95 (38.3)	52 (21.1)	$p < 0.01$
Time spent providing hydration advice (% high—>5 minutes)	112 (45.2)	60 (24.4)	$p < 0.01$

(mean: 3.28 ( $\pm$ 1.36) out of 6). Prescribers had better knowledge and understanding of dehydration topics as compared to nonprescribers (mean: 3.43 ( $\pm$ 1.34) vs 3.13 ( $\pm$ 1.36) out of 6;  $p = 0.01$ ).

### Attitude

Prescribers had a more proactive attitude towards FEE management in nondiarrheal illness. The proportion of prescribers who perceived FEE management awareness and application in nondiarrheal illness as of high importance was higher than in nonprescribers (65.7 vs 40.2%;  $p < 0.01$ ). The proportion of prescribers who perceived FEE management as of high importance for patient health during recovery from acute nondiarrheal illness was also higher as compared to nonprescribers (62.1 vs 34.2%;  $p < 0.01$ ). More prescribers also felt that chronic undetected dehydration had a higher impact on health compared to nonprescribers (59.7 vs 43.1%;  $p < 0.01$ ).

### Practice

Prescribers displayed a more proactive practice toward assessing dehydration, time spent providing hydration advice, and recommending FEE to patients. A higher proportion of prescribers assess patients for hydration level (72.2 vs 59.4%;  $p < 0.01$ ), spend >5 minutes providing hydration advice (45.2 vs 24.4%;  $p < 0.01$ ), and recommend FEE drinks to >70% of their patients (38.3 vs 21.1%;  $p < 0.01$ ) as compared to nonprescribers.

### Physicians Perceived Patient Outcomes

Most physicians (87%) agreed that recommendations for FEE management would aid in improving the speed of recovery. Around 98% of the prescribers also agreed that RTD FEE drinks are more effective in shortening recovery duration as compared to non-RTD FEE drinks and that patients will

**Table 3:** Correlation between knowledge scores and attitude, practices, and patient outcomes

Attitude	Correlation coefficient	p-value
Importance of FEE management awareness and application for physicians in acute nondiarrheal illnesses (high, medium/low)	$r_b = 0.41$	$p < 0.01$
Importance of FEE management for patient health during recovery from acute nondiarrheal illnesses (high, medium/low)	$r_b = 0.38$	$p < 0.01$
Practices	Correlation coefficient	p-value
Percentage of patients assessed for hydration	$r = 0.06$	$p = 0.19$
Percentage of patients recommended FEE drinks (high, medium/low)	$r_b = 0.20$	$p < 0.01$
Average time spent on hydration advice (high, medium/low)	$r_b = 0.25$	$p < 0.01$
Patient outcomes	Correlation coefficient	p-value
Agreement on improving the speed of recovery if recommended FEE drinks (yes, no)	$r_b = 0.42$	$p < 0.01$
Agreement on improving the speed of recovery if RTD FEE drinks are recommended vs non-RTD FEE drinks (yes, no)	$r_b = 0.41$	$p = 0.03$
Agreement on improving the speed of recovery if a written prescription is given vs verbal advice	$r_b = 0.49$	$p < 0.01$

recover faster if written prescriptions of RTD FEE drinks are given compared to verbal advice alone. Based on around 40% of physicians across specialties who were able to provide an estimate, the recovery duration was estimated to be shortened by 4.38 ( $\pm$ 3.04) days and 3.83 ( $\pm$ 2.16) days on average, respectively.

### Correlation Analysis

Table 3 describes the correlation between knowledge scores and attitude, practices, and physician-perceived patient outcomes. For attitude, there was a significant moderate positive correlation between overall knowledge score and attitude toward the importance of FEE management awareness for physicians ( $r_b = 0.41$ ;  $p < 0.01$ ) and attitude toward the importance of FEE management for patient recovery ( $r_b = 0.38$ ,  $p < 0.01$ ). For physician-perceived patient outcomes, the knowledge score was positively correlated to a physician's

perception that FEE drink recommendation improved a patient's recovery time ( $r_b = 0.42$ ,  $p < 0.01$ ). Knowledge score was also positively correlated to a physician's perception that RTD FEE drinks as compared to non-RTD FEE drinks and the provision of written prescription as compared to verbal advice improved a patient's recovery time ( $r_b = 0.41$ ,  $p = 0.03$ ;  $r_b = 0.49$ ,  $p < 0.01$ ). Regarding physician practice, no significant correlation was observed between knowledge score and physician practice such as the proportion of patients assessed for hydration ( $r = 0.06$ ,  $p = 0.19$ ). There was also a weak positive correlation between patients who were recommended FEE drinks ( $r_b = 0.20$ ,  $p < 0.01$ ) and the average time spent on hydration advice ( $r_b = 0.25$ ,  $p < 0.01$ ).

### DISCUSSION

Fluid, electrolytes, and energy (FEE) management is important in the treatment of acute illnesses. Several studies have



found that dehydration amongst the elderly, especially those with concomitant infections, are associated with increased morbidity and mortality and, consequently, healthcare resource utilization.<sup>16–18</sup> Similarly, dehydration in children is associated with increased numbers and length of hospitalizations.<sup>19,20</sup> Metabolic changes in common chronic conditions such as diabetes may also cause patients to be more susceptible to FEE deficits.<sup>21</sup> Oral rehydration treatment hence is an important first-line therapy for rehydration.<sup>2</sup> Electrolyte replacements are also vital in the treatment of heat-related illnesses, particularly heat cramps and heat exhaustion.<sup>22</sup> The imbalance in fluids and electrolytes can lead to symptoms such as malaise, vomiting, and confusion.<sup>23</sup> RTD FEE drinks containing such electrolytes can be a useful therapy in such scenarios when treatment is time sensitive. Disease states such as fever and infections are hypermetabolic in nature, and patients with nausea or vomiting may also have a reduced appetite, which can result in inadequate fluid and energy intake.<sup>5,24</sup> While recommendations to increase solid food intake can mitigate the caloric deficit, patients are unlikely to be compliant due to the satiety effect of solid food and the anorexia related to their acute illnesses.<sup>6,7</sup> Calories in the form of glucose in FEE drinks can be useful in mitigating these energy deficits. A common concern with the addition of energy into ORS is that it increases its osmolarity, which can potentially exacerbate osmotic diarrhea. However, this is unlikely to be relevant in nondiarrheal cases, and the added energy component could be argued as an essential component of the FEE drink, allowing patients access to important energy sources, especially during bouts of anorexia. There is a clear differentiation between the different types of drink (FEE and ORS) that should be used to treat different dehydration profiles.

This study provides valuable insights into physicians' current KAP in treating FEE deficits in patients with acute nondiarrheal illnesses using FEE drinks and the differences amongst different groups of physicians in India. It provides evidence of the positive and significant correlations between knowledge–attitudes and knowledge–perceived outcomes among physicians.

It was observed that there is a potential knowledge deficiency amongst physicians as the knowledge scores across all physicians are only moderate. Intervention to improve knowledge of dehydration and FEE management in acute nondiarrheal illnesses may yield better disease outcomes in the real-world setting, as it was demonstrated

that higher knowledge scores are significantly associated with a more proactive attitude and perceived improved patient outcomes. Knowledge score was associated with physicians' perception of improved recovery time for patients who recommended FEE drinks. This suggests that physicians who have better knowledge of dehydration treatment believe that the written prescription of RTD FEE drinks can shorten a patient's recovery time which can potentially lead to reduced healthcare resource utilization. Further direct evidence can be developed from real-world outcomes research to validate the actual scale of benefit RTD FEE drinks can provide. It is also unsurprising that there are differences in KAP between prescribers and nonprescribers, with prescribers having better knowledge and more proactive attitude and practices. One will expect that those with better knowledge and a proactive attitude will be more likely to prescribe FEE drinks and spend more time providing hydration advice. With the establishment of more evidence supporting the benefit of hydration, future guidelines should include dehydration assessment and minimum time spent on hydration advice as a standard of care for patients with nondiarrheal illnesses.

Another important observation is that physicians in India perceived that FEE management recommendations, the use of RTD as compared to non-RTD FEE drinks, and written prescriptions as compared to verbal advice led to a decrease in recovery time. This suggests that physicians believe that a patient's compliance with such FEE drinks may be improved with the use of RTD drinks and that written prescriptions reinforce their importance in recovery. Therefore, future guidelines should consider these initial findings, and further research should be conducted to evaluate the real-world differences in recovery time when given various forms of FEE drinks and prescription types.

We also noticed a gap between knowledge and practice, where we identified that a higher knowledge score does not explicitly translate to prescribing behaviors, even though it is perceived that it improved recovery time. Possible reasons for this misalignment may stem from a lack of guidelines or consensus regarding the prescription of FEE drinks for acute nondiarrheal illnesses or the lack of knowledge of available FEE drinks for the prescription. Further research may be required to elicit the reasons behind this attitude–practice gap.

This study had several limitations. Firstly, we employed a KAP questionnaire that was not psychometrically tested;

latent variables such as attitude are not observable, and constructs like knowledge and practices can be difficult to assess. Secondly, when defining the respondents as a prescriber or nonprescriber, the criteria for prescriber was defined through KOL consensus. This may cause some selection bias, but it is likely to reflect real-world practice patterns, and as such, the results observed are still indicative of the patterns that were intended to investigate. Thirdly, the self-reported nature of the questionnaire may result in biases. Some respondents may choose more clinically acceptable answers, or there might be a variance in the interpretation of questions. Additionally, the design of a self-reported questionnaire with dichotomous choices and the Likert scale restricts options for selection. Such limitations will need to be taken into consideration when interpreting the results. Alternatively, more rigorous methodologies such as item-to-scale correlation testing and factor analyses can be utilized to improve the psychometric properties of the KAP questionnaire.<sup>25</sup>

Nevertheless, as the first study that evaluated FEE management and the use of FEE drinks in nondiarrheal diseases, these limitations were not entirely avoidable, and the study serves as a starting point for further evidence generation. Several mitigation strategies were also done to address the identified limitations. Although a psychometrically tested KAP questionnaire was not utilized, a targeted literature review for questionnaires with similar nature was conducted, followed by a focus group discussion that involved several KOLs. This allows us to have greater insights into the fluid replacement landscape in India and ensure that only relevant questions are included in the questionnaire and that the questions are contextually suitable. Additionally, the study surveyed a relatively large sample size of 494 participants across different specialties and areas across India. The robust sample size provides adequate power to draw insights from the statistical analyses, and the wide representation increases the external validity of the study.

## CONCLUSION

In conclusion, this study evaluated physicians' KAP in treating FEE deficits in patients with acute nondiarrheal illness in India using FEE drinks and examined if there are differences amongst different groups of physicians. This study serves as a preliminary exploration of a complex and wide-ranging disease condition, and its findings suggest there may

be benefits from improving the knowledge level of physicians in India regarding FEE management and developing guidelines for the assessment of hydration and use of FEE drinks in acute nondiarrheal illnesses. A further real-world study targeting specific conditions in acute nondiarrheal illnesses may be required to validate and investigate the shortening of illness duration when FEE drinks are aptly prescribed and complied with. This has the potential to improve the quality of life for patients and minimize healthcare resource utilization which reduces the burden for both patients and healthcare systems.

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