

# Knowledge of Caretakers about the Use of Oral Rehydration Solutions in Children with Acute Diarrhea

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## ABSTRACT

**Background:** Diarrhea is known to be the major factor causing morbidity and mortality, especially among pediatric age groups globally. This study was done to assess the knowledge of caretakers regarding the use of oral rehydration solution (ORS) in children with acute diarrhea.

**Methods:** This cross-sectional study was conducted at the Department of Pediatric Medicine, Children's Hospital and Institute of Child Health, Multan, Pakistan, from February 2023 to July 2023. We analyzed caretakers of children aged 1-12 years who presented with acute diarrhea that had less than 14 days of duration. Both male and female caretakers, with ages ranging from 25 to 50 years, were included. Knowledge of the formulation of ORS, the process of its preparation, and usage were asked. Participants describing all correct answers about the formulation, preparation, and use of ORS were considered as having knowledge of ORS. Effect modifiers were stratified, and applying the post-stratification chi-square test, their effects on outcome were observed. A p-value  $\leq 0.05$  was considered significant.

**Results:** In a total of 240 study participants, the mean age of caretakers was  $36.01 \pm 8.08$  years. There were 23 (9.6%) male and 217 (90.4%) female caretakers. Among caretakers, 79 (32.9%) had knowledge of ORS while 161 (67.1%) did not know ORS. A statistically significant association of knowledge about ORS was found with residential status ( $p < 0.001$ ), socio-economic status ( $p < 0.001$ ), and source of drinking water ( $p < 0.001$ ).

**Conclusion:** This study found that among caretakers of children having acute diarrhea, there was a lack of knowledge regarding ORS use, formulation, and preparation.

**Keywords:** Caregiver, Diarrhea, Knowledge, Oral Rehydration Solution.

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## INTRODUCTION

Diarrhea is known to be the major factor causing morbidity and mortality, especially among pediatric age groups globally<sup>1,2</sup>. In certain regions across the globe, diarrhea is responsible for more deaths than all other causes combined. Among these fatalities, childhood diarrhea, which affects children aged five and below, contributes to about 63% of the total global burden of diarrhea<sup>3</sup>. Diarrhea ranks as the second leading cause of infant mortality in developing countries, where inadequate sanitation and limited access to safe drinking water play pivotal roles<sup>4</sup>.

The existing body of literature underscores a notable variability in the occurrence rates of enteropathogen isolations within the context of acute diarrhea. This variability can be attributed to the diverse methods and techniques employed for both the sampling and subsequent microbiological analysis of such cases, as they tend to differ significantly among various studies and healthcare settings<sup>5</sup>. Among these enteropathogens, diarrheagenic *Escherichia coli* (*E. coli*) emerges as the most frequently encountered bacterial pathogen associated with acute diarrhea. This bacterial strain is known for its wide prevalence and significance in diarrheal diseases<sup>6</sup>.

World Health Organization and experts universally recommend a specific approach when dealing with mild to moderate dehydration in children, emphasizing the utilization of commercially prepared oral rehydration solutions (ORS)<sup>7</sup>. The rationale behind this recommendation is multifaceted. ORS solutions are widely accessible, allowing for easy and convenient administration, particularly in resource-limited settings. They are well-tolerated by patients and provide appropriate quantities of essential components such as glucose and electrolytes, thus aiding in the restoration of fluid and electrolyte balance. Moreover, ORS is an economically viable solution for managing dehydration in children.

It's worth highlighting that the effectiveness of ORS in addressing mild to moderate dehydration is on par with intravenous rehydration, an alternative approach. However, ORS holds the additional advantages of cost-effectiveness and a lower incidence of adverse effects, making it a preferred choice in many clinical settings. This dual effectiveness, coupled with its safety profile and economic feasibility, positions ORS as a cornerstone in the management of dehydration associated with acute diarrhea, particularly in pediatric populations<sup>7</sup>.

Various studies have pointed out that mothers had poor knowledge of the etiology of the disease, symptoms, treatment, and methods to handle

diarrheal children<sup>7-9</sup>. Since diarrhea causes childhood mortality more frequently around the globe, specifically in underdeveloped countries like Pakistan, extraordinary improvements in the knowledge of caretakers regarding the management and treatment of diarrhea are needed.

This prompted us to design this study so that the knowledge regarding the use of ORS in our population could be documented and useful baseline information about our population could be produced, as no such data from the recent past is available. The results will be helpful for health authorities to take measures to create an awareness campaign among the targeted population to decrease morbidity and mortality due to childhood diarrhea. The objective of this study was to assess the knowledge of caretakers regarding the use of ORS in children with acute diarrhea.

## METHODS

This was a descriptive, cross-sectional study, carried out at the Department of Pediatric Medicine, Children's Hospital, and the Institute of Child Health, Multan, Pakistan, from February 2023 to July 2023. A sample size of 240 was calculated considering the knowledge of ORS use among caretakers as 19.35%,<sup>8</sup> with a 5% margin of error and 95% confidence level, using the formula:  $n = z^2pq/d^2$ . Sample selection was made through non-probability consecutive sampling. Approval from the Institutional Committee was obtained (letter number EC/286/2023). All the parents or guardians were briefed about the objectives, safety, and confidentiality of the study to obtain informed and written consent from them.

Inclusion criteria were caretakers of children aged 1-12 years who presented with acute diarrhea that had less than 14 days of duration. Both male and female caretakers, with ages ranging from 25 to 50 years, were included. Exclusion criteria were caretakers of those patients who had persistent or chronic diarrhea. The mother or any other family member who was actively involved in the patient's care since the onset of acute diarrhea was considered the caretaker. The caretakers were questioned for their demographic distribution, such as educational level, residential status, and socioeconomic status. Knowledge of the formulation of ORS, the process of its preparation, and its usage were asked.

Using SPSS version 26.0, the analysis of statistical data was performed. Qualitative variables were represented in the form of frequencies and percentages. Effect modifiers like age of respondent, duration of illness, educational level, source of drinking water, residential status, socioeconomic status, relationship of caretaker, source of knowledge, and gender of respondent were stratified, and applying the

post-stratification chi-square test, their effects on outcome were observed. A  $p$ -value  $\leq 0.05$  was considered significant.

**RESULTS**

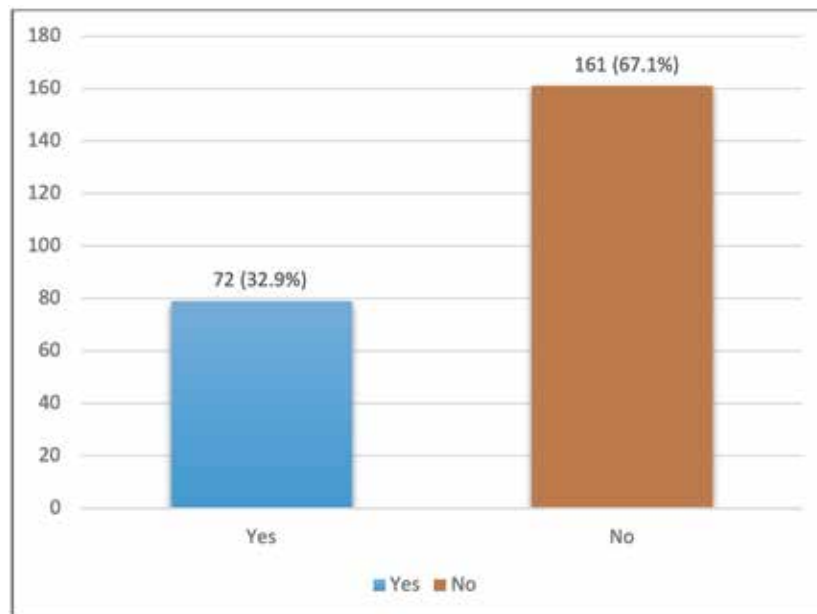
Of a total of 240 study participants, 217 (90.4%) were females. The mean ages of the children and caretakers were  $6.40 \pm 3.544$  years and  $36.01 \pm 8.08$  years respectively. In children, there were 136 (56.7%) boys

and 104 (43.3%) girls. The mean duration of illness was  $6.25 \pm 2.58$  days (ranging from 2-10 days) and the mean number of stools was  $6.65 \pm 2.23$  per day (ranging between 3-10 stools per day). There were 199 (82.9%) study participants who were living in rural areas. There were 108 (45%) participants who belonged to poor socioeconomic status. The details about the characteristics of study participants are shown in Table 1.

**Table 1: Characteristics of the Caretakers at the Time of Presentation (n=240)**

Characteristics		n (%)
Age (years)	25-40	157 (65.4%)
	41-45	83 (34.6%)
Gender	Male	23 (9.6%)
	Female	217 (90.4%)
Relationship of caretaker	Father	16 (6.7%)
	Mother	162 (67.5%)
	Brother	35 (14.6%)
	Sister	27 (11.3%)
Residential status	Rural	199 (82.9%)
	Urban	41 (17.1%)
Socioeconomic status	Poor	108 (45.0%)
	Middle	102 (42.5%)
	Rich	30 (12.5%)
Education	Illiterate	49 (20.4%)
	Primary	51 (21.3%)
	Middle	40 (16.7%)
	Secondary	38 (15.8%)
	Higher Secondary	49 (20.4%)
	Graduate & above	13 (5.4%)
Water resource	Hand pump	116 (48.3%)
	Tap water	124 (51.7%)

Among caretakers, 79 (32.9%) knew about formulation, preparation, and use of ORS while 161 (67.1%) did not (figure-1).



**Figure 1: Knowledge about the formulation, preparation, and use of ORS**

A statistically significant association of residential status ( $p < 0.001$ ), socio-economic status ( $p < 0.001$ ),

and source of drinking water ( $p < 0.001$ ) was found with knowledge about ORS as shown in table-2.

**Table 2: Comparison of Knowledge of ORS according to study variables (n=240)**

Variables		Knowledge of ORS		p-value
		Yes (n=79)	No (n=161)	
Age	25-40	55 (69.6%)	102 (63.4%)	0.338
	41-50	24 (30.4%)	59 (36.6%)	
Sex	Male	7 (8.9%)	16 (9.9%)	0.790
	Female	72 (91.1%)	145 (90.1%)	
Relationship of caretaker	Father	4 (5.1%)	12 (7.5%)	0.691
	Mother	57 (72.2%)	105 (65.2%)	
	Brother	11 (13.9%)	24 (14.9%)	
	Sister	7 (8.9%)	20 (12.4%)	
Residential status	Rural	51 (64.6%)	148 (91.9%)	<0.001*
	Urban	28 (35.4%)	13 (8.1%)	
Socioeconomic status	Poor	52 (48.1%)	56 (51.9%)	<0.001*
	Middle	27 (26.5%)	75 (73.5%)	
	Rich	NA	30 (100%)	
Education	Illiterate	22 (27.8%)	27 (16.8%)	0.062
	Primary	15 (19.0%)	36 (22.4%)	
	Middle	15 (19.0%)	25 (15.5%)	
	Secondary	11 (13.9%)	27 (16.8%)	
	Higher Secondary	16 (20.3%)	33 (20.5%)	
	Graduate & above	NA	13 (100.0%)	
Source of drinking water	Tap water	22 (27.8%)	102 (63.4%)	<0.001*
	Hand-pump	57 (62.2%)	59 (36.6%)	
Duration of diarrhea (days)	2-5	37 (46.8%)	60 (37.3%)	0.156
	6-10	42 (53.2%)	101 (62.7%)	

\* $< 0.05$  was considered significant.

## DISCUSSION

Societies that prioritize the well-being of mothers and children place immense importance on enhancing maternal and child healthcare services. Children, in particular, hold a special significance as their health can be particularly vulnerable to adverse conditions. In the case of infants, especially those in underdeveloped regions, there has been a concerning prevalence of high mortality rates attributed to diarrheal diseases<sup>3,4</sup>. One pivotal aspect of managing dehydration resulting from diarrhea in children is effective rehydration through the administration of ORS. This simple yet highly effective intervention has the potential to save lives, especially in resource-limited settings<sup>7</sup>. However, the widespread adoption of this rehydration strategy by mothers for their children hinges significantly on their level of knowledge regarding the preparation and proper usage of ORS<sup>10</sup>. It is essential to empower mothers and caregivers with the necessary information and education regarding the correct preparation and administration of ORS to ensure its optimal utilization as a life-saving measure for managing dehydration in children suffering from diarrheal illnesses. By improving maternal knowledge in this

regard, societies can further bolster their efforts to enhance maternal and child healthcare and reduce the prevalence of diarrheal-related mortality among infants, especially in regions facing significant healthcare challenges.

Within the scope of our study, it was observed that 32.9% of caretakers possessed knowledge about ORS, while a significant proportion, accounting for 67.1%, did not have any awareness regarding ORS. A study conducted by Abdinia et al. in Iran similarly reported that only 19.4% of caretakers knew ORS usage<sup>8</sup>. Interestingly, another study noted that although 70% of respondents claimed they could prepare salt-sugar solutions, a substantial 72.7% stated a preference for taking their sick children to the hospital rather than using ORS<sup>11</sup>. In contrast, a different study found that 71.2% of caregivers demonstrated knowledge about ORS, a notably higher proportion than what our study observed<sup>12</sup>. Additionally, a recent study from Nigeria revealed that 59.2% of mothers exhibited good knowledge of diarrhea prevention and home management, with 47.8% recognizing the role of ORS in treating diarrhea<sup>13</sup>. Our findings align with those of another

study where the researchers reported a low level of awareness regarding home care for diarrhea, consistent with the relatively limited knowledge observed concerning ORS and home-based diarrhea management<sup>14</sup>. These findings underscore the importance of educational efforts to enhance awareness and knowledge among caregivers, particularly regarding the use of ORS as a vital tool in managing diarrhea effectively and reducing related morbidity and mortality<sup>15-17</sup>.

Numerous studies conducted in Pakistan have consistently highlighted a concerning trend: many mothers and caregivers continue to address pediatric diarrhea using home remedies or self-prescribed medications, often including antibiotics<sup>18,19</sup>. Shockingly, only around one-third of caregivers opt for the recommended approach of managing pediatric diarrhea with ORS<sup>18-20</sup>. These findings shed light on significant issues about the limited accessibility and affordability of ORS, which serves as a substantial barrier to its widespread utilization in Pakistan, particularly in socioeconomically disadvantaged regions<sup>21</sup>. To address this challenge, concerted efforts should be made to enhance the availability and affordability of ORS<sup>22,23</sup>. One potential strategy is to provide subsidies that reduce the cost of ORS, making it more accessible to a broader segment of the population. Such interventions can contribute significantly to improving the management of pediatric diarrhea and reducing the associated morbidity and mortality rates, particularly in areas facing socioeconomic challenges<sup>24,25</sup>.

The results of this research revealed that the vast majority of the respondents had inaccurate knowledge about ORS use, formulation, and preparation. Being a single-center study, conducted on a relatively small sample size, our findings need further verification in large multicentric trials. We were unable to measure the impact of poor ORS on the disease management of affected children.

### CONCLUSION

Among caretakers of children having acute diarrhea, the knowledge about ORS use, formulation, and preparation was deficient. The present study highlights the need to improve the knowledge and awareness about ORS among the general population. The findings of this study can prove helpful for health authorities to take measures to create an awareness campaign among the targeted population to improve knowledge about ORS which can contribute to decreasing the morbidity and mortality associated with diarrhea, especially among the pediatric population.

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### CONFLICT OF INTEREST

The authors declare no conflict of interest.

### ETHICS APPROVAL

Ethical approval for conducting this study was obtained from the ethics committee of the study institute (letter number EC/286/2023).

### PATIENT CONSENT

Informed consent was taken from all patients before obtaining the data.

### AUTHORS CONTRIBUTION

MAT is involved in the study conception, write-up, critical review, and approval of the final version of the manuscript. SI and ZM contributed to data collection, data analysis, and literature review.

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