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The value of promoting standardized diagnosis and treatment technology for childhood diarrheal diseases within county medical communities

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Abstract

Objective: To investigate the clinical value of promoting standardized diagnosis and treatment techniques for childhood diarrhea in county medical communities.

Methods: In January 2022, the "standardized diagnosis and treatment of diarrhea in children" was implemented in the pediatric department of the county medical community. We selected 100 children with diarrhea, categorizing them into the control and experimental groups for the first 6 months and 6 months after implementation, respectively. We compared the rate of doctors' mastery of standardized diarrheal disease treatment before and after training, the rate of children receiving standardized diarrhea treatment before and after training, the time to symptoms normalization in both groups, treatment cost, and parental satisfaction.

Results: After training, physicians achieved a mastery rate of 97.5% in the standardized diarrhea treatment, significantly higher than the 83.75% before training. The rate of children receiving standardized treatment increased to 94% after training, significantly higher than the 79% rate before training. In the experimental group, the time to normalization of diarrhea, vomiting, dehydration, and fever was (2.4±0.7) days, (2.2±0.7) days, (2.3±0.7) days, and (2.2±0.7) days, respectively. These times were significantly shorter than those in the control group, which were (2.6±0.7) days, (2.4±0.7) days, (2.6±0.6) days, and (2.4±0.7) days. The differences were statistically significant (t-values = 4.321, 2.22, 4.264, 2.895, $P < 0.05$, respectively). The treatment cost for the children in the experimental group was less (CNY 75.8±6.6) than that of the control group (CNY 96.1±12.5), and the difference was statistically significant (t-value 16.141, $P < 0.01$). The satisfaction rate of the families of the children in the experimental group was 97.00%, significantly higher than the 85.00% satisfaction rate in the control group ($\chi 2=11.234$, $P = 0.004$).

Conclusion: Promoting standardized diagnosis and treatment technologies for childhood diarrheal within county medical communities has clinical value, improving efficacy in children while reducing treatment costs and increasing parental satisfaction.

Keywords: County medical communities; Childhood; Diarrheal diseases; Standardized diagnosis and treatment; Promotional value

1. Introduction

Diarrheal disease is a common condition in pediatrics, comprising a group of diseases caused by various pathogens and factors increasing the number of stools and stools characterized by changes in the clinical syndrome. Despite a steady decline in pediatric diarrheal deaths over the past 3 decades, diarrhea remains the leading cause of death and illness in children under 5 years of age, leading to approximately half a million deaths annually[1]. In response, China issued the

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Expert Consensus on the Principles of Diagnosis and Treatment of Children's Diarrheal Diseases, Clinical Practice Guidelines for Children's Acute Infectious Diarrheal Diseases, and Diagnostic and Treatment Criteria for Children's Acute Infectious Diarrheal Diseases in 2009, 2016, and 2020, respectively. These guidelines standardized rehydration therapy (oral and intravenous), dietary therapy, zinc supplementation, probiotics, and antibiotics treatment. However, a recent survey regarding the standardized diagnosis and treatment of childhood diarrhea in primary hospitals revealed that the standardized treatment rate fell significantly below the standard[2-5]. Therefore, promoting standardized diagnostic and treatment techniques and their stringent implementation by primary care pediatricians are crucial for ensuring the early recovery of children with diarrhea.

In this study, in January 2022, 80 pediatricians from our hospital's member units in the county medical community underwent training in promoting "appropriate technology for the standardized diagnosis and treatment of children's diarrheal diseases." This training aimed to investigate the impact on the efficacy of treating children's diarrhea diseases and parents's satisfaction.

2. Participants and methods

2.1. Participants

Beginning in January 2022, 80 pediatricians from 15 member units of the hospital's county medical community underwent training in promoting "appropriate technology for the standardized diagnosis and treatment of children's diarrheal diseases." Before and after the training, these 80 pediatricians completed a "pre-training questionnaire" and a "post-training questionnaire" to assess their proficiency in using appropriate technology for the standardized diagnosis and treatment of diarrhea. One hundred children with diarrhea were selected as the control and experimental groups, observed within the 6 months before and 6 months after the training. No statistically significant differences were found between the two groups regarding age, sex, illness duration, or level of dehydration ($P > 0.05$, Table 1). Inclusion criteria: Children aged 6 months to 5 years, diagnosed with diarrhea characterized by increased stool frequency (≧ 3 times/day) and change in stool characteristics (such as dilute watery stools, pasty stools, mucus-pus-blood stools). Exclusion criteria: Children with unstable vital signs, congenital heart disease, digestive system diseases, or those who did not cooperate with the treatment. The relevant information comprised pre- or post-training treatment, consultation and treatment costs, time taken for symptoms and signs to return to normal, and parental satisfaction. The two groups, before and after training, were composed of the same group of physicians and were comparable.

Table 1 Comparison of general clinical data of children in two groups

groups	number	gender		age (y)		duration (d)		dehydration (number)		
		boys	girls	$\bar{x}$	*s*	$\bar{x}$	*s*	mild	moderate	severe
control	100	54	46	2.1	1.2	3.0	0.8	41	49	10
treatment	100	51	49	2.2	1.2	2.9	0.8	43	45	12
χ^2/t		0.180		0.241		0.528			0.400	
P		0.671		0.81		0.598			0.819	

3. Methods

Before the training, pediatricians from each community member completed a pre-training questionnaire. Pediatric experts from the General Hospital of the Medical Community established the "Medical Community standardized diagnosis and treatment of children's diarrheal diseases" program to promote the application of lecturers." They also prepared "standardized diagnosis and treatment of children's diarrheal diseases" manuals, handbooks, multimedia courseware, and other educational materials. Training was provided through courses and lectures, grassroots clinics, and clinical training for member unit pediatricians at the General Hospital, using various training formats. After the training, the aforementioned pediatricians completed a "post-training questionnaire" to assess the increase in their proficiency with appropriate technology for standardized diagnosis and treatment of diarrhea after doctoral training. Questionnaires were distributed to parents to gather information about their children.

3.1. Observation indicators

The rate of doctors' mastery of standardized treatment of diarrhea before and after the training: Questionnaire scores <80 were considered "no mastery," between 80 and 90 were classified as "basic mastery," and >90 as mastery. This section provides the statistics and comparisons of physician mastery rates before and after training.

The rate of children receiving standardized treatment for diarrhea before and after the training: Count and compare the rate of children receiving standardized treatment for diarrhea before and after the training, focusing on fluid therapy, antibiotic use, and zinc and probiotic use.

Time of improvement of symptoms and signs in the children: The time of significant symptom improvement for diarrhea, vomiting, dehydration, and fever was counted and compared between the two groups.

Parental satisfaction: A questionnaire was administered to parents, covering aspects such as treatment effects, treatment costs, treatment programs, and seven other items, with a total score ranging from 0 to 21 points. Scores of 15-21 points indicated a "very satisfied" response, scores between 8-14 indicated "satisfied," and scores from 0 to 7 indicated "dissatisfied."

Statistical analysis was conducted using SPSS 27.0 software. Measurement data were expressed as (mean ± standard deviation), and the t-test was used. Count data were analyzed using the χ^2 test. Results were considered statistically significant at a significance level of $P<0.05$.

4. Results

4.1 The rate of doctors' mastery of standardized treatment of diarrhea before and after training: The rate of mastery of standardized treatment of diarrhea among 80 primary pediatricians before training was 83.75% (67/80), while after training, the rate increased to 97.5% (78/80). This difference was statistically significant ($P < 0.05$, Table 2).

Table 2 The rate of doctors' mastery of standardized treatment of diarrhea before and after training（%）

groups	number	<80 score	80-90 score	>90 score	mastery（%）
pre-training	80	13	18	49	83.75
post-training	80	2	9	69	97.50
χ^2					14.456
P					<0.001

4.2 The rate of children receiving standardized treatment for diarrhea before and after training: The rates of 100 children with diarrhea receiving standardized treatment before and after training were 79% (79/100) and 94% (94/100), respectively. This difference was statistically significant ($P < 0.05$, Table 3).

Table 3 Prevalence of children receiving standardized treatment for diarrhea before and after training（%）

groups	number	Number of cases with standardized treatment	Number of cases without standardized treatment		Standardized treatment rate（%）
pre-training	100	79	21		79.00
post-training	100	94	6		94.00
χ^2					9.634
P					0.002

4.3 Comparison of symptom improvement time and treatment cost between the two groups: The time required for diarrhea, vomiting, dehydration, and fever to normalize and treatment costs in the experimental group were significantly lower than those in the control group. ($P < 0.05$, Table 4).

Table 4 Comparison of time to symptom improvement and treatment cost between two groups of children

groups	number	diarrhea (d)		vomit (d)		dehydration (d)		fever(d)		treatment cost （CNY）	
		$\bar{x}$	*s*	$\bar{x}$	*s*	$\bar{x}$	*s*	$\bar{x}$	*s*	$\bar{x}$	*s*
control	100	2.6	0.7	2.4	0.7	2.6	0.6	2.4	0.7	96.1	12.5
treatment	100	2.4	0.7	2.2	0.7	2.3	0.7	2.2	0.7	75.8	6.6
t		4.321		2.22		4.264		2.895		16.141	
P		<0.001		0.029		<0.001		0.005		<0.001	

4.4 Comparison of parental satisfaction of children in the two groups: Parental satisfaction with children in the experimental group was significantly higher than that in the control group ($P < 0.05$, Table 5).

Table 5 Comparison of parental satisfaction of children in two groups

groups	number	extremely satisfied	satisfied	dissatisfied	satisfaction（%）
control	100	53	32	15	85
treatment	100	71	26	3	97
χ^2					11.234
P					0.004

5. Discussion

5.1. The need for standardized diagnosis and treatment of appropriate technology at the grassroots level

Primary care physicians' participation in standardized training increases their knowledge, enabling crucial decision-making to enhance patient outcomes and ensure healthcare system continuity[6]. The study's results demonstrated a significant improvement in doctors' mastery of the standardized diarrhea treatment after the training, highlighting its effective role in enhancing primary care physicians' knowledge of managing diarrhea in children. This is consistent with the findings reported by Li et al.[7]. Furthermore, there was a significant increase in the number of children receiving standardized treatment for diarrhea after the training. Regarding long-term effects, transitioning from theoretical knowledge to clinical practice among primary care physicians will enhance the standardized management of children with diarrhea. This underscores the effectiveness of training in improving the standardized treatment of childhood diarrhea among primary care physicians.

5.2. Oral and intravenous rehydration therapy

Studies have demonstrated that oral rehydration therapy (ORT) is equally, if not more effective than, intravenous fluid (IV) rehydration therapy for children with mild to moderate dehydration. Furthermore, ORT is less invasive, easier to administer, cost-effective, and applicable in various settings, including at home[8]. For children with mild to moderate dehydration, outpatient treatment using ORT as the primary is recommended[9]. Rapid intravenous rehydration is required in severely dehydrated children until pulse, perfusion, and mental status normalize. Once a child is stabilized, ORT should be initiated[10]. This training on standardized diagnosis and treatment of children's diarrhea will focus on determining the degree of dehydration and rehydration therapy, especially oral rehydration and mild to moderate dehydration: ORS dosage (m1)= weight (kg)×(50-75) , to be administered within 4 h[11]. The study's results demonstrated a significant reduction in disease duration and enhanced treatment efficacy in the treatment group compared to the control group.

5.3. Zinc supplementation therapy

Acute diarrhea is associated with increased fecal zinc loss, negative zinc balance, and decreased tissue zinc levels. Studies have demonstrated that zinc supplementation in children with diarrhea can reduce the duration and severity of diarrhea[12]. Zinc deficiency is widespread in developing countries, and zinc supplementation for diarrhea is effective and cost-effective[13]. The beneficial effects of zinc supplementation on diarrhea are hypothesized to be partially mediated by an increase in villus height and intestinal absorptive capacity [14]. Our study found a significant reduction in the duration of illness in children treated with zinc supplementation. Consequently, we recommend routine zinc supplementation for children with diarrhea. The recommended Zn supplementation dose is 20 mg daily for 10-14 days.

5.4. Montmorillonite and Probiotics

Montmorillonite, an adsorbent, reduced the duration of diarrhea in 18 randomized and semi-randomized trials involving 2616 children[15]. The dose of montmorillonite in the experimental group in this study was 1.5g bid for children <1 year old and 3g tid for children >1 year old. Probiotics can improve diarrhea management by modulating the host immune response, producing short-chain fatty acids, and increasing colonic sodium and fluid absorption through cyclic adenosine monophosphate-independent mechanisms. They are considered well-tolerated and safe treatments for diarrhea, significantly reducing its duration[16]. In this study, the experimental group was administered probiotics at the early stage of the disease. This included Saccharomyces boulardii, Lactobacillus acidophilus, and Bacillus casei for acute watery diarrhea and Saccharomyces boulardii for antibiotic-associated diarrhea. The treatment efficacy in the experimental group significantly improved compared with that in the control group.

5.5. Antibiotics

Antibiotics are not recommended for most cases of diarrhea, particularly viral ones, where antibiotics provide no benefit[17]. In cases where bacterial diarrhea is suspected, antibiotics are typically not the first line of treatment because most acute diarrhea caused by pathogenic bacteria is self-limiting. However, antibiotic therapy is recommended for children with dysentery-like diarrhea, suspected cholera accompanied by severe dehydration, immunodeficiency disorders, and chronic underlying diseases.

The selection of antibiotics should be based on fecal culture, drug sensitivity results, and the child's clinical condition, as antibiotic resistance situations can vary across different parts of China. In this study, treatment adhered to the Clinical Practice Guidelines for Acute Infectious Diarrheal Diseases in Children in China, as issued by the Gastroenterology Group of the Pediatrics Branch of the Chinese Medical Association. The treatment group demonstrated a significant improvement in efficacy compared to the control group[18].

5.6. Dietary therapy

Early feeding enhances infection-induced intestinal osmotic pressure, reduces the duration of diarrhea, and improves the child's nutritional status. A lactose-free diet also shortens the duration of diarrhea in children. During acute diarrhea, it is recommended to resume eating as soon as possible following the initiation of oral or intravenous rehydration. Provide an age-appropriate diet and continue breastfeeding for breastfed infants [19]. Formula feeders can choose between low-lactose or lactose-free formulas, while older children can have an unrestricted diet that includes cereals, meats, yogurt, fruits, and vegetables. Foods abundant in complex carbohydrates (e.g., rice, grains, bread, wheat, and potatoes), fruits, vegetables, and lean meat are better tolerated than those in high simple sugars and fats. Additionally, it is advisable to avoid foods high in simple sugars, as they may cause osmotic diarrhea[20]. High-fat content foods should be avoided.

5.7. Strengths, limitations, and prospects

Currently, there are limited reports on the promotion of appropriate technology for the standardized diagnosis and treatment of children's diarrhea in China, especially within the healthcare community[21]. Our study allows primary community service center doctors to master appropriate techniques for diagnosing and treating diarrhea, ensuring that children with diarrheal diseases receive reasonable, timely, and effective standardized treatment. However, this study has some limitations. First, standardized treatment for diarrhea involves a combination of treatments, making it challenging to conduct specific controlled assessments of individual treatments. Second, owing to various factors, such as individual comprehension and the acceptance abilities of primary care doctors, not all doctors achieved 100% knowledge regarding the standardized management of diarrhea following this training. Since different training features affect healthcare workers differently, it is recommended to consider tailored approaches rather than a one-size-fits-all approach [22-23]. Future research should investigate training models based on this study to determine the most suitable model for the specific conditions in China's county medical communities.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors do not report any financial or personal connections with other persons or organizations, which might negatively affect the contents of this publication and/or claim authorship rights to this publication.

Statement of ethical approval

The Institutional Review Board of The First People's Hospi- tal of Xiaoshan District approved this study (Protocol Number:2021-XS-47).

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Author contributions

KYP, ZXC and GHZ contributed to the technical promotion data collection, analysis,and writing of the manuscript. KYP contributed to the study design and editing of the manuscript.

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