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EFFECTIVENESS OF TENDER COCONUT WATER IN CONTROLLING AND REPLACEMENT OF ELECTROLYTES AMONG CHILDREN WITH ACUTE GASTRO ENTERITIS AT INSTITUTE OF CHILD HEALTH AND RESEARCH CENTRE, GRH, MADURAI.

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Abstract:

Introduction: The Background: Acute Gastroenteritis (AGE) is a major cause of illness and death in children under five. Tender coconut water, rich in natural electrolytes, may help manage dehydration. **Aim:** The study aimed to evaluate the effectiveness of tender coconut water in correcting electrolyte imbalance in children with AGE at GRH, Madurai. **Methods:** A one-group pretest-posttest design was used. Forty children aged 1–12 years with AGE and some dehydration received age-appropriate doses of tender coconut water three times daily for three days, along with standard care. Pretest and posttest electrolyte levels were compared using paired t-test, and associations were analyzed using Chi-square test. **Results:** Hyponatremia and hypokalemia were present in 70% and 67.5% of children, respectively, before the intervention. Post-intervention, 92.5% had normal sodium and 97.5% had normal potassium levels. Mean sodium rose from 133.03 to 137.45 and potassium from 3.39 to 3.91 ($p = 0.000$). Electrolyte levels were significantly associated with gender, income, temperature, vomiting, and urine output. Conclusion: Tender coconut water is an effective natural therapy for restoring electrolytes in children with AGE and can be used to support standard treatment.

Keywords: Tender coconut water, Acute Gastroenteritis, Electrolyte imbalance.

INTRODUCTION

Adolescence is a critical stage of human development marked by rapid physical, emotional, and cognitive growth. During this phase, individuals are naturally curious, seek identity, and crave social connection. With the increasing presence of digital technology, the internet has become deeply embedded in the daily lives of adolescents, offering platforms for learning, entertainment, and communication. However, alongside its many advantages, the uncontrolled or excessive use of the internet has led to a serious concern—commonly referred to as internet addiction.

The internet, recognized globally as one of the most influential technological platforms, serves as a hub for knowledge, commerce, education, and social interaction. In India, internet usage has grown significantly, with over 665 million users reported in 2019, making it the second-largest user base in the world. This widespread use has transformed human lifestyles, making online access an inseparable part of modern life.

Internet addiction is increasingly being classified as a behavioral disorder, similar to impulse control disorders. It is characterized by an excessive or poorly controlled preoccupation with internet use, often leading to distress and functional impairment.

Adolescents, who are still developing emotional regulation and decision-making skills, are especially vulnerable. Warning signs of internet addiction include excessive time spent online, failed attempts to reduce usage, mood changes when offline, neglect of responsibilities, and using the internet to escape emotional difficulties. Overuse can also result in physical issues such as sleep disturbances, eye strain, headaches, and back pain.

The consequences of internet addiction extend to academic failure, social isolation, psychological stress, and a decline in self-esteem. Research consistently shows strong links between internet addiction and mental health challenges such as anxiety, depression, and feelings of loneliness. Personality traits like shyness and lack of confidence are also associated with this condition.

Despite its risks, the internet remains a powerful educational and social tool. The challenge lies in striking a healthy balance maximizing its benefits while preventing its misuse. Encouraging digital literacy, responsible usage, parental involvement, and school-based awareness programs is essential to promote adolescent well-being in the digital era.

NEED FOR THE STUDY

The internet connects billions worldwide, with Northern Europe having the highest usage rates. Asia leads in internet users, with China, India, and the U.S. at the forefront. A 2022 global study by Shi-Qiu Meng et al. found 26.99% smartphone addiction, 17.42% social media addiction, and 14.22% internet addiction, especially in the Eastern Mediterranean and low-income countries. In Qatar, 29.64% of adolescents were addicted, influenced by family and school. In India, internet addiction among college students ranged from 19.9% to 40.7%. A 2022 study in Jammu found 78.7% prevalence, linked to depression and anxiety. In Puducherry,

42% had mild addiction, with 63% reporting poor sleep. These findings highlight the significant health impact of internet addiction, particularly among adolescents.

In India, rotavirus causes around 11.37 million AGE episodes annually in children under five, resulting in 3.27 million outpatient visits, 872,000 hospital admissions, and over 10.37 billion INR in direct costs. The mortality rate remains high, with an estimated 78,000 rotavirus-related deaths in 2011, mostly in children under two. Regional studies reveal climatic factors like rainfall influence diarrhoeal outbreaks, particularly in South India. For instance, research in Tamil Nadu and Chennai links increased diarrhoea cases to rainfall. A hospital-based study at the Institute of Child Health, Madurai, observed 180 diarrhoeal cases over a year, with 76% under the age of one. Most children presented with no or mild dehydration, and only 5% had received Oral Rehydration Therapy before hospitalization.

Having witnessed numerous cases of AGE during my posting in the pediatric ward, and after reviewing literature, I developed an interest in exploring the effectiveness of tender coconut water as a natural electrolyte replenisher. Its potential in promoting faster recovery and supporting standard treatment protocols for children with AGE merits further research.

AIM OF THE STUDY:

The aim of the study to evaluate the effectiveness of tender coconut water in controlling and replacement of electrolytes among children with Acute Gastro Enteritis at Institute of Child Health and Research Centre, GRH, Madurai.

MATERIALS AND METHODS

Study design and participants:

This study adopted a quantitative evaluative approach using a pre-experimental one-group pretest-posttest design. The study was conducted in the Pediatric Medical Ward and Pediatric Outpatient Department at the Institute of Child Health and Research Centre, Government Rajaji Hospital, Madurai. A total of 40 children aged 1–12 years, diagnosed with Acute Gastroenteritis (AGE), were selected using a non-probability consecutive sampling technique based on the inclusion criteria.

Inclusion and exclusion criteria:

Inclusion criteria were children aged 1–12 years admitted on the day of hospital admission with diarrhoea and some dehydration. Exclusion criteria included children with severe vomiting, severe dehydration, persistent diarrhoea or vomiting due to chronic conditions such as celiac disease, irritable bowel syndrome, or kidney disorders.

Tools:

The research tool consisted of four sections. Section A collected socio-demographic data such as age, gender, residence, family type, parental education and occupation, income, water source, defecation area, and handwashing habits. Section B recorded clinical variables including developmental age, nutritional status, hospitalization history, medication history, food allergy, fever, vomiting episodes, diarrhoea duration, abdominal pain, and urine output. Section C assessed dehydration using the Clinical Dehydration Scale (CDS), which rated four characteristics—appearance, eyes, mucous membranes, and tears—on a 0–2 point scale. Section D involved laboratory assessment of serum sodium and potassium levels, categorized as normal, low, or high based on standard medical reference ranges.

Ethical clearance:

Ethical approval was obtained from the Institutional Review Board of Madurai Medical College, Madurai. Formal permissions were secured from the Director of the Institute of Child Health and Research Centre and the Principal of the College of Nursing. Informed written and verbal consent was obtained from the children's caregivers, ensuring privacy, confidentiality, and the right to withdraw at any time.

Data Collection Procedure:

Data collection was carried out from 04 July 2022 to 14 August 2022. After obtaining necessary permissions, the investigator introduced herself to the caregivers, explained the study objectives, and obtained informed consent. On the day of admission, baseline data and pretest blood samples were collected to assess serum sodium and potassium levels. Tender coconut water was administered in age-appropriate quantities (30ml for 1–3 years, 50ml for 3–5 years, 75ml for 5–8 years, and 100ml for 8–12 years) three times daily for three consecutive days, along with routine medical treatment. On the fourth day, posttest blood samples were collected to reassess electrolyte levels. Children included in the pilot study were excluded from the main data collection.

Data Analysis:

Descriptive and inferential statistics were used for data analysis. Frequencies and percentages described the socio-demographic and clinical characteristics of the sample. The paired t-test was used to evaluate the effectiveness of tender coconut water in restoring electrolyte balance. Chi-square tests were used to analyze associations between post-intervention electrolyte levels and selected socio-demographic and clinical variables. All procedures were conducted in adherence to ethical standards to ensure the rights and welfare of participants.

RESULTS:

Demographic variables:

The study involved 40 children with Acute Gastroenteritis. Most were aged 1–3 years (60%) and male (62.5%). A majority were Hindu (92.5%) and from urban areas (57.5%). Most lived in nuclear families (65%). Regarding parental education, 35% of both fathers and mothers had a diploma or higher. Fathers were primarily private employees (65%), while most mothers were homemakers (67.5%). Half of the families had a monthly income between ₹10,001–₹15,000. The main water source was corporation water (67.5%), and 87.5% used sanitary latrines. Handwashing with soap was reported by 55%, while 30% used plain water, and 15% used sanitizer. (Table 1)

Clinical variables:

Most children were toddlers (60%) and had first-degree malnutrition (65%). A majority (65%) had no prior medication history, and 67.5% had no previous hospitalization. Only 27.5% had received prior medical treatment; none had surgical history. Food allergies were rare (10%), with no cases of egg, milk, or seafood allergies. Normal body temperature (36.5°C–38.4°C) was observed in 92.5%, and 77.5% had normal skin turgor. Vomiting was absent or limited to 1–2 episodes in 85%, and diarrhoea lasted 2–3 days in 52.5%. Watery stools were common (95%), mostly yellow in color (82.5%). Abdominal pain was reported by 35%, and 77.5% had normal urine output.

Electrolyte Levels among Children:

In the pretest, 70% of children had hyponatremia and 67.5% had hypokalemia. Only 30% and 32.5% had normal sodium and potassium levels, respectively. Posttest results showed significant improvement, with 92.5% having normal sodium levels and 97.5% having normal potassium levels. Hyponatremia dropped to 7.5% and hypokalemia to 2.5%. No cases of hypernatremia or hyperkalemia were reported in either phase. (Table 3)

Comparison of Mean score:

Tabe 3 shows that there was a significant increase in both sodium and potassium levels after the intervention. Sodium improved from 133.03 to 137.45 (mean difference = 4.43, t = -10.06, p = 0.000), and potassium increased from 3.39 to 3.91 (mean difference = 0.52, t = -33.14, p = 0.000). Both results were statistically highly significant, indicating the effectiveness of the intervention in restoring electrolyte balance. (Figure 1 and Figure 2)

Association between the post-test level of electrolytes:

The analysis showed a statistically significant association between sodium levels and gender, monthly family income, body temperature, episodes of vomiting, and urine output among children with Acute Gastroenteritis. No significant association was found with other sociodemographic or clinical variables.

Table 1: Socio demographic variables among children with Acute Gastro Enteritis. N = 40

S.No	Socio-Demographic Variables	Category	f	%
1	**Age of the child**	1–3 years	24	60.0
		3–6 years	8	20.0
		6–9 years	3	7.5
		9–12 years	5	12.5
2	**Gender**	Male	25	62.5
		Female	15	37.5
3	**Religion**	Hindu	37	92.5
		Muslim	3	7.5
4	**Place of Domicile**	Urban	23	57.5
		Sub-urban	8	20.0
		Rural	9	22.5
5	**Type of Family**	Nuclear	26	65.0
		Joint	13	32.5
		Extended	1	2.5
6	**Father's Education**	Diploma & above	14	35.0
		Secondary	10	25.0
		Primary	9	22.5
		Non-formal	4	10.0
		Higher Secondary	3	7.5
7	**Mother's Education**	Diploma & above	14	35.0
		Primary	10	25.0
		Secondary	8	20.0
		Higher Secondary	6	15.0
		Non-formal	2	5.0
8	**Father's Occupation**	Private Employee	26	65.0
		Self-employed	9	22.5
		Others	5	12.5
9	**Mother's Occupation**	Homemaker	27	67.5
		Private Employee	6	15.0
		Others	4	10.0
		Self-employed	2	5.0
		Government Employee	1	2.5

10	**Monthly Family Income**	₹10,001–15,000	20	50.0
		₹5,001–10,000	17	42.5
		>₹15,000	2	5.0
		<₹5,000	1	2.5
11	**Water Supply**	Corporation Water	27	67.5
		Borewell	7	17.5
		Mineral Water	5	12.5
		Well Water	1	2.5
12	**Area of Defecation**	Sanitary Latrine	35	87.5
		Open Field	5	12.5
13	**Hand Washing Habit**	Soap and Water	22	55.0
		Plain Water	12	30.0
		Sanitizer	6	15.0

Table: 2 Pretest and Posttest Electrolyte Levels among Children with Acute Gastroenteritis.

Level of Electrolytes	Category	Pretest (f)	Pretest (%)	Posttest (f)	Posttest (%)
Sodium	Hyponatremia	28	70.0	3	7.5
	Normal	12	30.0	37	92.5
	Hypernatremia	0	0.0	0	0.0
Potassium	Hypokalemia	27	67.5	1	2.5
	Normal	13	32.5	39	97.5
	Hyperkalemia	0	0.0	0	0.0

Table 3: Comparison of Mean, Standard Deviation, and Mean Difference in Pretest and Posttest Levels of Electrolytes (n = 40)

Electrolyte	Test	Mean	Mean Difference	Standard Deviation	t-value	p-value	Significance
Sodium	Pretest	133.03		3.06			***HS
	Posttest	137.45	-4.43	2.15	-10.06	0.000	
Potassium	Pretest	3.39		0.27			***HS
	Posttest	3.91	-0.52	0.26	-33.14	0.000	

HS* – Highly significant at $p < 0.05$

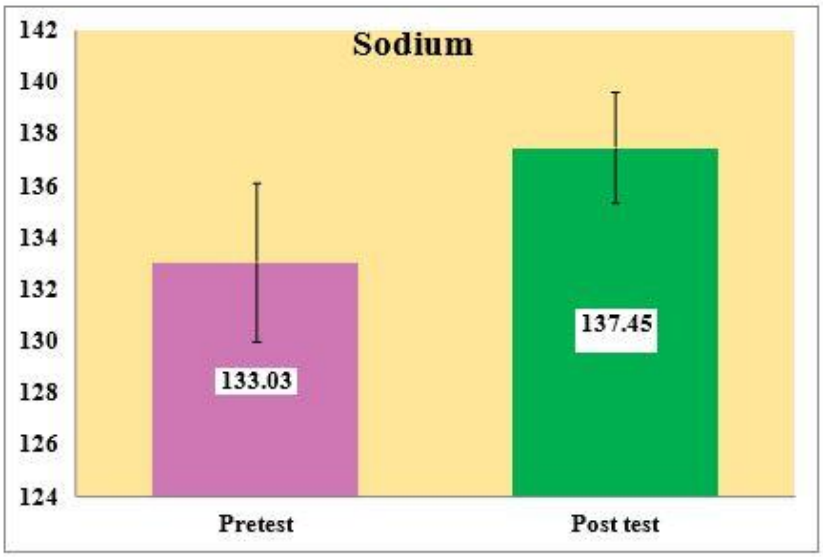

Figure 1: Comparison of Mean, Standard deviation, in pretest and posttest level of electrolytes.

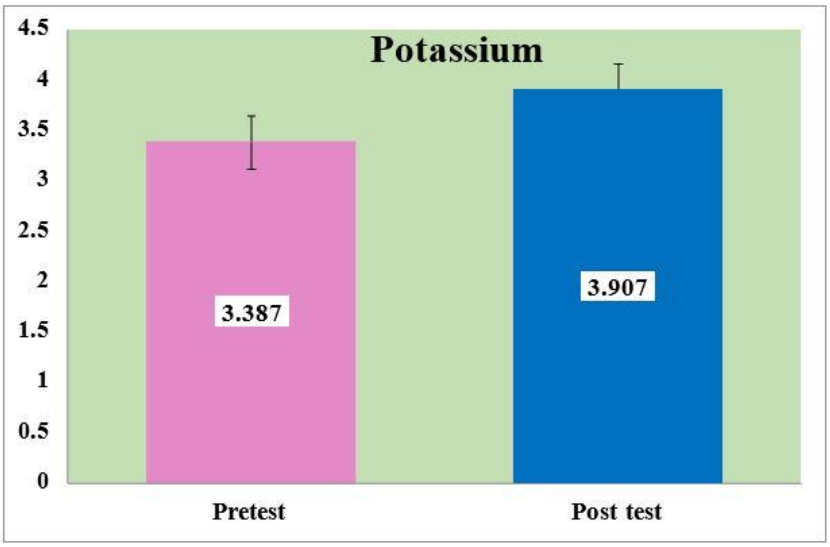

Figure 2: Comparison of Mean, Standard deviation, in pretest and posttest level of electrolytes.

DISCUSSION:

This study assessed the effectiveness of tender coconut water in managing electrolyte imbalance among children with Acute Gastroenteritis. Most children were toddlers (60%), male (62.5%), and came from nuclear families with modest monthly incomes. Clinically, 65% had first-degree malnutrition, and most had mild or no vomiting, watery diarrhoea, and normal urine output. Before the intervention, 70% of children had hyponatremia and 67.5% had hypokalemia. Following three days of tender coconut water administration, 92.5% had normal sodium levels and 97.5% had normal potassium levels. The increase in mean sodium from 133.03 to 137.45 and potassium from 3.39 to 3.91 was statistically highly significant ($p = 0.000$), demonstrating the effectiveness of tender coconut water in correcting electrolyte imbalances.

These findings are supported by a study conducted by Martins et al. (2012), which compared fresh young coconut water with commercially available electrolyte beverages in middle-aged athletes. The study concluded that coconut water was more effective in restoring hydration and electrolyte balance after physical exertion, suggesting its potential as a natural rehydration fluid. Additionally, Astikasari et al. (2017) conducted a pre-experimental study among children aged 5–10 years with diarrhoea. The study showed a significant reduction in dehydration levels after the administration of coconut water. The authors concluded that coconut water, rich in natural electrolytes, is effective in replacing fluid loss during diarrhoeal episodes. This study also found significant associations between post-intervention sodium and potassium levels with selected socio-demographic and clinical variables, reinforcing the relevance of personalized nutritional care in paediatric gastroenteritis management.

CONCLUSION:

The study concluded that tender coconut water is an effective, natural intervention for controlling and replacing electrolytes in children with Acute Gastroenteritis. The significant improvement in sodium and potassium levels after its administration highlights its potential as a supportive therapeutic measure. Therefore, incorporating tender coconut water into the management of paediatric gastroenteritis can enhance recovery and promote better hydration outcomes.

RECOMMENDATION:

Future research can focus on assessing the prevalence of electrolyte imbalances in children with Acute Gastroenteritis. Similar studies with larger sample sizes may help in generalizing the findings. Additionally, using a structured questionnaire that includes relevant socio-demographic and clinical variables can provide deeper insights into contributing factors

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