Effect of Mothers' Application of Yogurt Probiotic Bacteria on Relieving their young Children's Acute Gastroenteritis

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Abstract

Background: Acute gastroenteritis causes millions of deaths annually among young children, mostly in developing communities. It is a common reason for hospital admission in inpatient medical wards. So, optimal nursing management is required for those children. **Objective**: This study aimed to investigate the effect of mothers' application of yogurt probiotic bacteria on relieving their young children's acute gastroenteritis. **Design:** A quasi-experimental research design was used to accomplish this study. **Setting:** This study was conducted at the inpatient medical ward for gastroenteritis in El-Raml Children's Hospital at Alexandria, Egypt from November 2022 to July 2023. The study was registered in ClinicalTrials.gov (NCT06090708). **Subjects:** A convenient sample of Sixty young children with acute gastroenteritis with no or some dehydrations were divided randomly into two equal groups; control and probiotic study groups. **Methods:** Characteristics and clinical data of children with acute gastroenteritis assessment record and assessment of children's diarrhea, vomiting and dehydration interview schedule were used to collect the necessary data. Study outcomes were evaluated before intervention and daily after intervention for three consecutive days for each child from their mothers. Children in control group received the standardized hospital care for acute gastroenteritis and children in probiotic study group received daily fresh yogurt with probiotics for three consecutive days beside to the standardized hospital care of acute gastroenteritis. **Results**: It was found that young children who received yogurt with probiotics bacteria exhibited less vomiting than other children in the control group through the study period. Besides that, the probiotic study group showed statistically significant improvement in diarrhea on third day of study compared to control group (P=.010). Further significant improvement was noticed related to the degree of dehydration for probiotic study group on second and third days of study compared to children in the control group (P= .021 &.002, respectively). **It is concluded** that the application of yogurt probiotic bacteria had a beneficial significant effect on young children with acute gastroenteritis on reducing its duration, frequency and severity of vomiting and diarrhea as well as improving severity of dehydration besides standardized care of hospital.

Keywords: Yogurt, Probiotic, Bacteria, young Children, Acute Gastroenteritis, Nursing Care.

Introduction

Worldwide, gastroenteritis is a major reason for childhood deaths, primarily in developing countries. Worldwide, around 1.5 to 2.5 million children die each year from diarrhea and dehydration that is caused by gastroenteritis (Hartman et al., 2019). Additionally, 68% of diarrheal disease occurs in young children globally as well as it is reported as the fifth leading killer of young children (Mitra et al., 2023; Hartman et al., 2019). Gastroenteritis is an inflammation of the digestive tract that results in diarrhea, vomiting, or both, nausea, poor appetite, and other symptoms of digestive upset (abdominal cramps) could occur. These are sometimes accompanied by fever that can lead to dehydration. Inflammation of the mucous membrane of the intestines, or gastroenteritis, is

the main cause of acute diarrhea, which generally lasts a few days (Shen et al., 2024; Szajewska et al., 2014). This inflammation can be caused by viral, or bacterial pathogens, or parasite; in children, however, it mainly results from rotavirus infection. Rotavirus is the most common cause of severe, dehydrating diarrhea among infants and children globally. Rotavirus-associated diarrhea accounts for about 760,000 annual deaths and 40% of hospitalizations in children under five years of age across the world (Sumera et al., 2024; Gera et al., 2016).

Most young children die from extreme dehydration resulting from a combination of severe diarrhea, vomiting, and inadequate fluids intake (Hartman et al., 2019; LaMont, 2018). Severe gastroenteritis causes dehydration and electrolytes imbalance because of a loss of body fluids in the vomit and stool. Nearly three to five milliard episodes occur globally annually, most common in children under five years who habitat in countries where those children are more at risk, and often difficult to access care (Mitra et al., 2023; Hartman et al., 2019). According to the World Health Organization (WHO) dehydration is defined as a condition that results from excessive loss of body water. The most frequent triggers of dehydration in children are diarrhea and vomiting. Dehydration causes a drop in total body water in both volumes of the intracellular and extracellular fluid. Volume diminution closely associates with the signs and symptoms of dehydration (Hojsak & Kolaček, 2024).

Thus, it is essential to assess hydration status for young children to determine the immediate management of his condition and prevent serious complications. Clinical signs are usually not displayed until a child has lost at least 5% of his or her body weight (Shen et al., 2024). Documented current weight loss is an appropriate indicator of the degree of dehydration, but this information is rarely available for young children (Hojsak & Kolaček, 2024; Sumera et al., 2024). There are different scales based on the clinical features to estimate the degree of dehydration; Clinical Dehydration Scale (CDS), Gorelick Scale and WHO Scale (Falszewska et al. 2019). The WHO scale was adopted in the surrent study for assessing degree of dehydration which classified into no dehydration, some dehydration and severe dehydration (WHO, 2015).

In fact, proper hygiene, breastfeeding, and rotavirus vaccination can decline the rate of acute gastroenteritis in young children. Young children with no dehydration can be treated at home. Oral rehydration solutions are recommended for some dehydration. Antiemetics may be prescribed if needed to manage or prevent vomiting and improve tolerance of ORS (Hojsak & Kolaček, 2024; Hartman et al., 2019). Fluids and rehydrating solutions are given, but sometimes children are required to follow up and even to be hospitalized. Oral Rehydration Therapy is the most common therapy but does not reduce the duration of diarrhea (Hartman et al., 2019). Recently, the most important goal in management of acute gastroenteritis is rehydration therapy to correct fluid, glucose, and electrolyte deficits in the body (Gera et al., 2016). However, rehydration therapy is not effective for management of the severity and duration of acute diarrhea. Due to the probability of dangerous complications related to prolonged and severe dehydration in early childhood, there is a need to investigate further interventions to introduce innovative approaches to reduce duration and frequency of gastroenteritis as well as liquid and electrolyte losses within the first days of incidence (Hojsak & Kolaček, 2024; Mayor, 2018).

Nowadays, probiotics are increasingly used widespread. Probiotics are those helpful and nonpathogenic microorganisms that have protective and therapeutic effects on the intestine and contribute to a healthy intestinal flora. To reduce the morbidity and mortality of acute diarrhea, some available measures including probiotic administration may be of great benefit (Cruchet et al., 2015; Eden et al., 2019). Treatment of diarrhea by administering living or dried bacteria to restore a disturbed intestinal microflora has a long tradition. Probiotics are available as capsules, tablets, packets, or powders and are contained in various fermented foods. Their products may contain a single microorganism or a mixture of several species (Kluijfhout et al., 2020). The most consumed probiotics are fermented dairy products such as yogurt and buttermilk. Interestingly, yogurt had been developed and introduced into the market with an inexpensive, easily prepared, and easily available remedy against diarrhea in children and was sold in pharmacies (Sharif et al., 2017). Probiotics are generally recognized as safe and well tolerated among children. The most common adverse effects include bloating and flatulence; however, these are typically mild and subside with continued use (Sumera et al., 2024; Cruchet et al., 2015;).

Pediatric nurses have a crucial role in the management of children of acute gastroenteritis. Nursing assessment is an important step in early identifying and management of those children before incidence of complications. Pediatric nurses should find and apply the most evidence interventions for gastroenteritis. Today, the consumption of probiotic dairy products namely yogurt, cheese or ice cream is increasing with the media drawing attention to their promotive effects on general health (Freedman et al., 2020; Szajewska et al., 2014). The beneficial effect of probiotic bacteria on intestinal microbial balance and immunity is still a matter of interest for researchers (Shen et al., 2024; Kluijfhout et al., 2020). Thus, the use of probiotics needed further investigated for possible benefits in young children with acute gastroenteritis.

Aim of the study:

The present study was aimed to investigate the effect of mothers' application of yogurt probiotic bacteria on relieving their young children's acute gastroenteritis.

Research Hypothesis: Children with acute gastroenteritis who receive yogurt probiotic bacteria exhibit less diarrhea, vomiting and dehydration than those who don't.

Materials and Method:

Study design: A quasi-experimental research design was used to accomplish this study.

Setting: The study was conducted at the inpatient medical ward for gastroenteritis in El-Raml Children's Hospital (Wingat) at Alexandria. The study was registered in ClinicalTrials.gov (NCT06090708) and was designed and implemented in accordance with the CONSORT guidelines (Schulz et al., 2010).

Subjects: A convenient sample of 60 children with acute gastroenteritis was comprised the study subjects their ages ranged from two to five years, newly admitted children with no or some dehydration and with acute and non-bloody watery diarrhea as clarified in table (1) (WHO Guidelines, 2015).

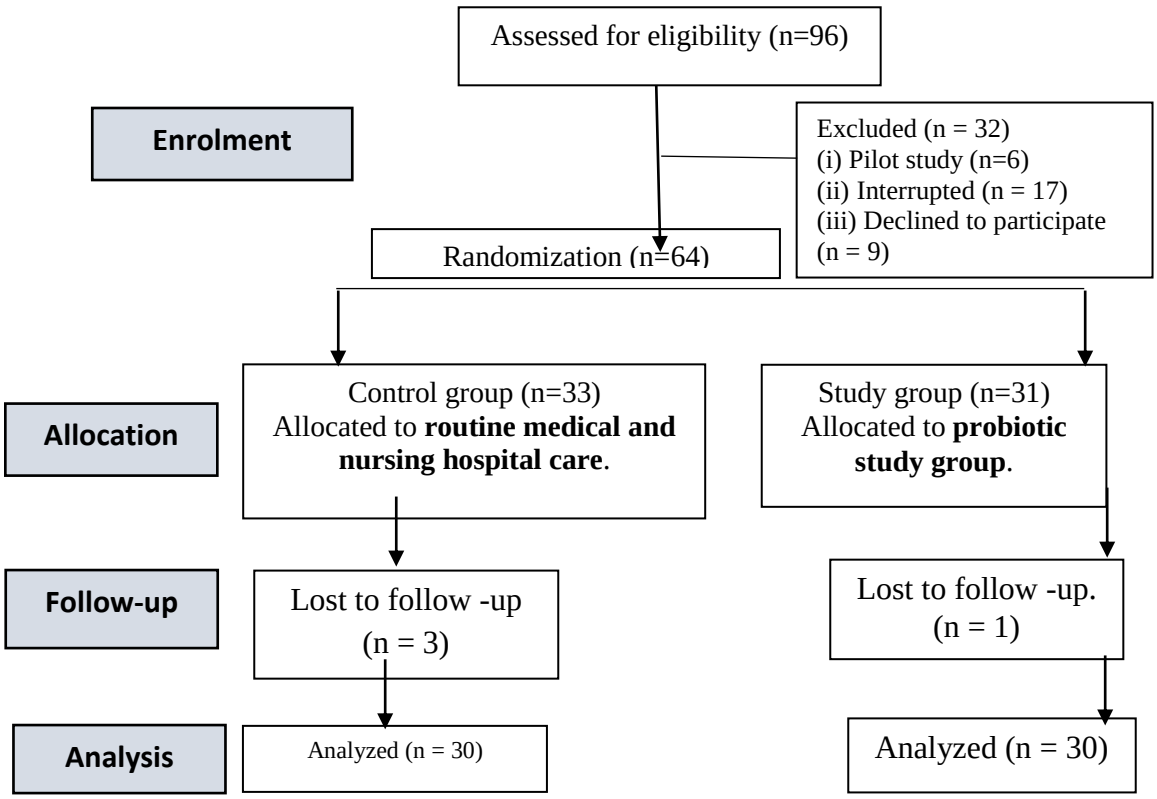

Figure 1: The process of the study according to the CONSORT Flow diagram.

Table 1: Degree of Dehydration According to WHO Guidelines (2015).

No signs of dehydration	Some dehydration	Severe dehydration
Weight Loss <5%	**Weight Loss 5 -10%**	**Weight Loss >10%**
Not enough signs to classify as some or severe dehydration	Two of the following signs: ▪ Restless, irritable ▪ Sunken eyes ▪ Drinks eagerly, thirsty ▪ Skin pinch goes back slowly.	Two of the following signs: ▪ Lethargic or unconscious ▪ Sunken eyes ▪ Not able to drink or drinking ▪ Poorly Skin pinch goes back very slowly

Sample size was estimated based on a sample size calculator with the following parameters: population size = 62, Expected frequency = 50%, Acceptance error = 5%, Confidence coefficient = 95% and the minimum sample size was 54 children. Ten percent of the required sample size was combined to overwhelmed rolled-out children. Matching between the two groups' characteristics was not significant ($p \leq 0.05$) at the beginning of the study, so no need to increase the sample size to reduce the great variance between both study groups. The study subjects were divided randomly into two equal groups (control group and probiotic study group, 30 children for each). Where the registered nurse performed a sequentially numbered list of hospitalized children and assigned as follows; the first child was assigned into control group, then, the second one was assigned into study group and so on (Fig. 1).

- **Probiotic Study Group:** Children with acute gastroenteritis received fresh probiotic yogurt (1st day of production) for three consecutive days in addition to standard hospital care and prescribed medication for acute gastroenteritis.

- **Control Group**: Children with acute gastroenteritis received standard hospital care and the prescribed medication of control group for acute gastroenteritis.

Tools: Two tools were used to collect the necessary data:

Tool one: Biosocial and Clinical Data of Children with Acute Gastroenteritis Assessment record:

This tool was developed by the researchers and included two parts as following:

Part I: Demographic Data of Children such as children's age, gender, residence, and type of feeding.

Part II: Clinical data of Children such as diagnosis, prescribed medication, and children's weight.

Tool Two: Assessment of Children's Fever, Diarrhea, Vomiting and Dehydration Interview Schedule:

This tool was developed by the researchers after thorough review of literatures and to assess the fever, vomiting, diarrhea, and dehydration of children with gastroenteritis (Essawy et al., 2021; Gera et al., 2016; Hartman et al., 2019). Items related to vomiting are experiencing, duration, amount, consistency, and frequency. The items related to diarrhea are experiencing, duration, amount, frequency, and consistency. Clinical assessment for degree of dehydration has been done according to WHO guidelines (2015) based on child's general

appearance, eyes, thirst, and skin turgor. The child has severe dehydration, if clinically has two or more of these signs; lethargic or unconscious, sunken eye, drink poorly or not able to drink and skin turgor goes back very slowly. The child has some dehydration, if clinically has two or more of these signs; restless or irritable, sunken eyes, drinks eagerly or thirsty and skin turgor goes back slowly. The child has no signs of dehydration, if clinically has two or more of these signs; well and alert, normal eyes, drink normally or not thirsty and skin turgor goes back quickly.

Ethical Considerations

Approval from the Research Ethics Committee, Faculty of Nursing, Alexandria University was obtained before conducting the study. An official letter was obtained from the faculty of nursing and sent to the director of the El-Raml Children's Hospital to facilitate data collection process after explaining the aim of the study. Written informed consent was obtained from the children's caregiver after explaining the aim of the study and their rights to withdraw from the study at any time. Child's guardians were ascertained about confidentiality of their children's data.

Method

- Approval from the Research Ethics Committee, Faculty of Nursing, Alexandria University was obtained before conducting the study.
- An official letter was obtained from the faculty of nursing and sent to the director of the El-Raml Children's Hospital (Wingat) to facilitate data collection process after explaining the aim of the study.
- Study tools were developed by the researchers.
- The study tools were tested for its content validity by five experts in the pediatric nursing field (professors and assistant professors of pediatric Nursing, Pediatric Nursing Department, Faculty of Nursing, Alexandria University) and necessary modifications were done.
- Study tools were tested for reliability by Cronbach's alpha test, r =0 .89.
- A pilot study was carried out on six children (10% of the sample) who suffered from acute gastroenteritis to test the feasibility of the tools and accordingly the necessary modifications were done. Those children were excluded from the study subjects.
- At the initial contact, children's demographic and clinical data were obtained by using tool one.
- Assessment of children's diarrhea, vomiting and dehydration was done before starting the interventions.
- **Interventions:**
  - **For Control group:** The children in the control group received standard medical and nursing hospital care for acute gastroenteritis which consists of multiple measures including fluid replacement, continued feeding, oral zinc and prescribed medication as clarified in table 1.
  - **For study group**: children in probiotic study group were received 15 mg/kg of market available fresh probiotic yogurt bacteria (1^{st} day production) after stopping vomiting every four to six hours for three consecutive days (Sharif, et al. 2017) beside to the standard hospital care and the prescribed medication for acute gastroenteritis.
- Assessment of children's diarrhea, vomiting and dehydration was done and recorded daily by the researchers for the three consecutive days for both groups by using tool two.

Data analysis

The Statistical Package for Social Sciences (SPSS) version 28 was used for data analysis. **Descriptive statistics** such as number and percentage, mean and standard deviation were used to describe children's characteristics. The Kolmogorov-Smirnov test was used to evaluate the normality of the data distribution. **Analytical statistics** including the Chi-square test (X^2), Mann-Whitney Test (Z), Fisher's Exact Test (F) and Friedman Test (F), were used to test the significance between and within study groups. All the statistical analyses were considered significant at $P < 0.05$.

Results:

Table 2 shows the characteristics and clinical data of children with acute gastroenteritis. It was found that most of children in control group (80%) and nearly two thirds of children in probiotic group (63.3%) were male with mean age 1.550±0.624 and 1.630±0.775 years respectively. Additionally, it was illustrated that sixty percent of children in the control group lived in urban areas compared to 43.3% of children in probiotic group. As regards diagnosis, it was noticed that 60% and 80% of children were admitted to hospital with bronchitis and gastroenteritis with the mean body weight were 9.200± 1.393 and 9.933± 1.518 in control and probiotic study groups, respectively. It was also shown that all children in the control group were prescribed for ORS and two thirds of them (66.7%) received IV fluids and antibiotics. Similarly, almost all children (96.7%) in the probiotics group were prescribed for ORS and nearly three quarters of them (73.3%) received IV fluid therapy. Unfortunately, it was found that no one of children received rotavirus vaccine. It was clarified also that more than one third of children in control and probiotic group were fed breast milk and ordinary diet (36.7% & 46.7% respectively).

Table 3 portrays the children's vomiting in control and study groups through the three consecutive days of the study. It was found that 40% of children in probiotic study group did not experience vomiting compared to 13.3% only of children in control group through the first day of study period. It was clarified also that more than half of children in probiotic study group (56.7%) did not experience vomiting through the second day of study period compared to 20% of children in control group. Moreover, almost all children in probiotic study group did not experience vomiting (96.7%) through the third day of study period compared to 30% only of children in control group and statistically significant' differences were shown between the two groups of study (control & probiotic study group) through the three consecutive days of study period, (P=.021, P=.004 & P=.000, respectively). Furthermore, it was noticed that slightly more than three quarters of children in probiotic study group (77.8%) had large amount of vomiting through the first day of study period compared to all children in control group (100%) while, on the second day of study period, it was illustrated that only 7.7% of children in probiotic study group who had large amount of vomiting compared to all children in control group (100%). Additionally, it was showed that all children in probiotic study group (100%) had small amount of vomiting through the third day of study compared to 61.9% of children in control group who had moderate amount of vomiting. Statistically significant differences were observed between both groups of study through the three consecutive days of study period (P=0.002, P=0.000 &P=0.000 respectively).

The same table also shows that 50% of children in the probiotic study group had watery vomitus through the first day of study period compared to all children in the control group (100%). On the second day of study period, it was observed that less than two thirds of children in probiotic study group (61.5%) had watery vomitus compared to all children in control group (100%). Additionally, all children in probiotic study group had only soft vomitus on third day of study period (100%), while all children in control group had watery vomitus (100%). Statistically significant differences were observed between both groups of study through the three consecutive days of study period (P=0.00, for each day). Furthermore, it was shown that children in the control group had vomiting with mean frequency of 5.00±2.165, 4.300±2.276 and 2.56±1.735 times through the first, second and third days of study period respectively. On contrary, children in probiotic study group experienced vomiting with less mean frequency of 3.200±2.771, 1.033±1.2994 and 0.033± 0.182 times through the first, second and third days of study period respectively and the statistically significant difference were found between both groups of study through the three consecutive days of study period (P=0.006, P=0.000 & P=0.000, respectively).

Table 4 portrays the children's diarrhea in control and probiotic study groups through the three consecutive days of study period. It was portrayed that all children in both groups of

study experienced diarrhea through the first and second days of study period (100%). Additionally, it was found that twenty percent of children in probiotic study did not experience diarrhea through the third day of sturdy period compared to no one of children in control group (0.0%) and statistically significant difference was found (P=0.010). Moreover, it was noticed that seventy percent of children in the probiotic study group had large amounts of diarrhea through the first day of study period on the contrary to all children in the control group (100%). While through the second day of study period, only 6.7% of children in probiotic study group had large amount of diarrhea compared to all those children in control group (100%). Moreover, it was illustrated that none of children in the probiotic study group had large amounts of diarrhea through the third day of study period compared to all those children in control group (100%). Statistically significant differences were found between the two groups of study through the three consecutive days of study period (P=.001, P= 0.000 & P=0.000 respectively).

The same table also reflected that child in the probiotic study group had statistically significant lower mean frequency of diarrhea through the three consecutive days of study period than those children in the control group (P=0.00 for each day). While it was noticed that the mean diarrhea frequency/day for children in probiotic group were 6.200±1.954, 5.200±2.869 & 2.566±2.144 time/day through the three consecutive days of the study compared to 8.400±1.037, 8.400±1.037 and 7.800±1.186 time/day for those children in the control group. Moreover, it was showed that most children in probiotic study group had watery diarrhea (86.7%) through the first day of study period compared to all those children in the control group (100%). Plus, it was found that 26.7% of children in probiotic study group had soft stool through the second day of study on contrary to none of children in control group (0%). It was noticed also that more than three quarters of children in probiotic study group (79.1%) had soft stool through the third day of study period compared to none of children in the control group (0%). It was amazing that a statistically significant improvement was shown between children in the probiotic and control groups concerning the consistency of diarrhea through the three consecutive days of study (P=0.040, P=0.000 &P=0.000, respectively). It was highlighted that 60% of children in probiotic study group had diarrhea with no odor through the second day of study period compared to none of those children in the control group (0%). It was noticed also that three quarters of children in probiotic study group had diarrhea with no odor (75%) through the third day of study period compared to none of children in the control group (0%).

Figure 2 presents the duration of diarrhea for children in control and probiotic study groups. It was illustrated that the children in probiotic group significantly experienced vomiting with the mean duration less than those children in the control group (1.066± .9802 & 2.400± 1.101 respectively). Concerning duration of diarrhea among children in both study groups, it was illustrated by **figure 3** that a statistically significant difference was shown between the mean duration of diarrhea for children in the control and probiotic groups (P=0.00), where the mean duration of diarrhea for children in the control group was 6.800±1.606 day compared to 4.766±1.006 days for children in the probiotic study group.

Table 5 clarifies the children's clinical assessment of dehydration for control and probiotic study groups through the three consecutive days of the study. It was revealed that the general condition of majority of children in probiotic study group were restless and irritable (83.3%) compared to 73.3% of children in the control group through the first day of study. It was noticed also that less than two thirds of children in probiotic study group (63.3%) had normal general condition through the second day of study period compared to 56.7% of children in the control group. Moreover, these percentages have been increased in the third day of study period to 86.7% for children in probiotic study group and 83.3% for children in the control group. Plus, through the second day of study period, it was observed that 43.3% of children in the probiotic study group had normal eye compared to one third of children in the control group (33.3%). It was also shown that most children in the probiotic study group (86.7%) had normal eye

through the third day of study period compared to 63.3% of children in the control group and statistically significant difference was found (P=.038).

Additionally, it was illustrated that 70% of children in the probiotic study group were drank eagerly and thirsty on the first day of study period compared to 86.7% of those children in the control group. It was also noticed that 80% of children in the probiotic study group drank normally through the second day of the study period compared to 50.0% of children in the control group and statistically significant difference was found (P=.016). Fortunately, 93.3% of children in the probiotic study group drank normally on the third day of study period compared to 76.7% of those children in the control group. It was clarified that the skin pinch of 20.0% of children in the probiotic study group went back quickly on the first day of study period compared to 73.3% of children in the control group and statistically significant difference was found (P=.000). Furthermore, it was clarified that the skin pinch went back quickly for 63.3% of those children in the probiotic study group on the second day of study period compared to 66.7% of children in the control group. The same observation was also noticed in the third day of study period for 83.3% of those children in the probiotic study group compared to all those children in the control group (100%).

The children's degrees of dehydration for the control and probiotic study groups through the three consecutive days of study is shown in **table 6.** It was found that 93.3% of children in the probiotic study group clinically manifested with the degree of some dehydration degree on the first day of study compared to all those children in the control group. Fortunately, children in the probiotic group showed statistically significant' improvement in their degree of dehydration on the second day of study. Where 63.3% of children were presented clinically with no dehydration compared to 33.3% of children in the control group (P=.021). Furthermore, significant improvement regarding degree of dehydration was revealed among children in the probiotic study group on the third day of study period than those children in the control group, where 93.3% of children in the probiotic study group were presented clinically with no dehydration compared to 60% of children in the control group (P=.002).

Table.2: Characteristics and Clinical data of Children with Acute Gastroenteritis. (n= 60**)**

Characteristics and Clinical data of Children	Control group (n=30) No.	%	Probiotic study group (n-30) No.	%	Test of significance
Child's age/year:					
M±SD	1.550±0.624		1.630±0.775		Z= -.135 P^U= .893
Gender:					
- Male	24	80.0	19	63.3	X^2=2.052
- Female	6	20.0	11	36.7	P=.252
Residence:					
- Urban	18	60.0	13	43.3	X^2=1.669
- Rural	12	40.0	17	56.7	P=.301
Diagnosis:					
– Gastroenteritis	12	40.0	6	20.0	X^2=2.857
– Bronchitis & Gastroenteritis	18	60.0	24	80.0	P=.158
Child's weight/kg:					
M±SD	9.200± 1.393		9.933± 1.518		Z= 326.0 P^U= .064
Prescribed Medications: ≠					
– I.V fluid	20	66.7	22	73.3	F=3.870 P=.478
– Zink Supplementation	16	53.3	15	50.0	
– ORS	30	100.0	29	96.7	
– Antibiotics	20	66.7	18	60.0	
– Others	3	10.0	4	13.3	
Received rotavirus vaccine:					
– Yes	0	0.0	0	0.0	----------
– No	30	100	30	100	
Feeding type:					
– Breast feeding and ordinary diet	11	36.7	14	46.7	X^2=1.340 P=.736
– Bottle feeding and ordinary diet	10	33.3	8	26.7	
– Breast and bottle feeding and ordinary diet	4	13.3	2	6.7	
– Ordinary diet	5	16.7	6	20.0	

X^2: Chi-Square Tests Z: Mann-Whitney Test F: Fisher's Exact Test

≠: more than one response

Table.3: The Children's Vomiting for Control and Probiotic Study Groups through the Three Consecutive Days of the Study.(n= 60)

Items		**1st day** Control group. (n= 30)		Probiotic group (n= 30)		**2nd day** Control group. (n= 30)		Probiotic group (n= 30)		**3rd day** Control group. (n= 30)		Probiotic group (n= 30)		Sig. (F)
		No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	
1.-Experience of Vomiting														
-	yes	26	86.7	18	60.0	24	80.0	13	43.3	21	70.0	1	3.3	P1=.022*
-	No	4	13.3	12	40.0	6	20.0	17	56.7	9	30.0	29	96.7	P2= .000*
Sig		Z=-2.316 P=.021*				Z=-2.896 P=.004*				Z=-5.313 P=.000*				
If yes:		N=26		N=18		N=24		N=13		N=21		N=1		
2-Amount of vomiting /time														
-	Small	0	0.0	0	0.0	0	0.0	4	30.8	0	0.0	1	100.0	P1= .000*
-	Moderate	0	0.0	4	22.2	0	0.0	8	61.5	13	61.9	0	0.0	P2= .000*
-	Large	26	100.0	14	77.8	24	100.0	1	7.7	8	38.1	0	0.0	
-	Severe	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	
Sig		Z=-3.073 P=.002*				Z=-4.901 P=.000*				Z=-5.545 P=.000*				
3-Consistancy														
-	Watery	26	100.0	9	50.0	24	100.0	8	61.5	21	100.0	0	0.0	P1= .022*
-	Abnormal constitutes (mucous)	0	0.0	9	50.0	0	0.0	3	23.1	0	0.0	0	0.0	P2= .000*
-	Soft	0	0.0	0	0.0	0	0.0	2	15.4	0	0.0	1	100.0	
Sig.		Z=-3.969 P=.000				Z=-3.738 P=.000*				Z=-5.660 P=.000*				
4-Frequency of Vomiting/day														
	M±SD	5.00±2.165		3.200±2.771		4.300±2.276		1.033±1.2994		2.56±1.735		0.033± 0.182		P1= 1.18
Sig.		Z=-2.749 P=.006*				Z=-4.920 P=.000*				Z=-5.547 P=.000*				P2= .000*

Sig.(F): Friedman Test of significance within group Z: Mann-Whitney U between groups

P1: significance between different times in control group. P2: significance between different times in study group.

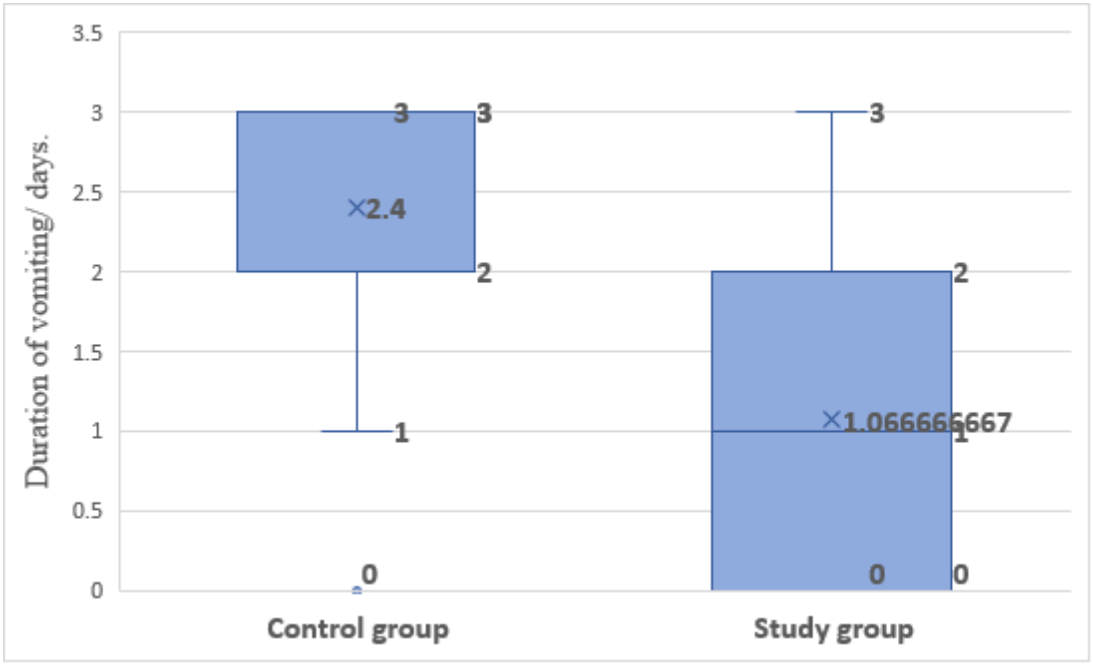

Figure 2: Duration of vomiting for children in control and probiotic study groups (n= 60)**,** Friedman Test of significance/ Z=-4.617, P=.000*

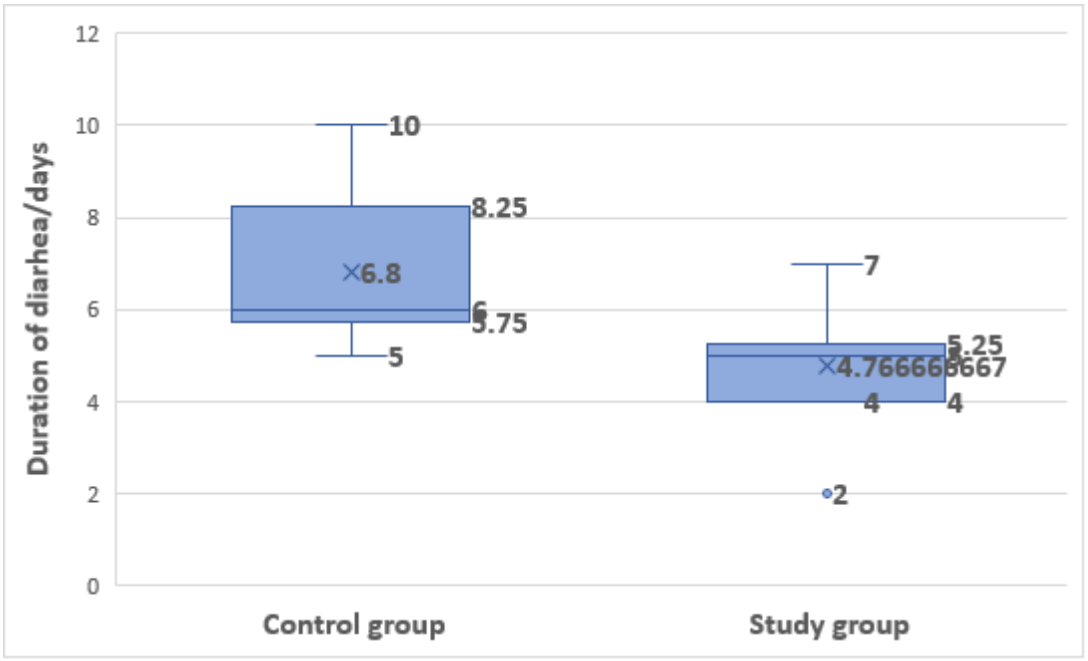

Figure 3: Duration of diarrhea for children in control and probiotic study group (n=60)**,** Friedman Test of significance/ Z=-4.956, P=.000*

Table. 4: The Children's Diarrhea for Control and Probiotic Study Groups through the Three Consecutive Days of the Study.(n= 60)

Items		**1st day** Control group. (n= 30)		Probiotic group (n= 30)		**2nd day** Control group. (n= 30)		Probiotic group (n= 30)		**3rd day** Control group. (n= 30)		Probiotic group (n= 30)		Sig. (F)
		No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	
1-Experience of diarrhea														
-	Yes	30	100.0	30	100.0	30	100.0	30	100.0	30	100.0	24	80.0	P1=------
-	No	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	6	20.0	P2=.022*
Sig..		Z=-1.426 P=.154				Z=-1.426 P=.154				Z=-2.560 P=.010*				
If yes:		N=30				N=30				N=24				
2-Amount of diarrhea														
-	Small	0	0.0	2	6.7	0	0.0	3	10.0	0	0.0	9	37.5	P1=------
-	Moderate	0	0.0	7	23.3	0	0.0	25	83.3	0	0.0	15	62.5	P2=.000*
-	Large	30	100.0	21	70.0	30	100.0	2	6.7	30	100.0	0	0.0	
-	Severe	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	
Sig.		Z=-3.219 P=.001				Z=-7.049 P=.000				Z=-7.194 P=.000				
3-Frequency of diarrhea /day														
M±SD		8.400±1.037		6.200±1.954		8.400±1.037		5.200±2.869		7.800±1.186		2.566±2.144		P1=.000*
Sig.		Z=-4.273 P=.000*				Z=-4.492 P=.000*				Z=-6.261 P=.000*				P2=.000*
4-Consistency of diarrhea														
-	Watery	30	100.0	26	86.7	30	100.0	19	63.3	30	100.0	4	16.7	P1=------
-	Abnormal constitute	0	0.0	4	13.3	0	0.0	3	10.0	0	0.0	1	4.2	P2=.003
-	Soft	0	0.0	0	0.0	0	0.0	8	26.7	0	0.0	19	79.1	
Sig.		Z=-2.053 P=.040*				Z=-3.625 P=.000*				Z=-3.503 P=.000*				
5-Oder														
– odor	No	0	0.0	8	26.7	0	0.0	18	60.0	0	0.0	18	75.0	P1=------
– sive odor	Offen	30	100.0	22	73.3	30	100.0	12	40.0	30	100.0	6	25.0	P2=0.00
Sig.		Z=-3.013 P=.003*				Z=-5.028 P=.000*				Z=-6.159 P=.000*				

Sig.(F): Friedman Test of significance within group **Z: Mann-Whitney U between groups**

P1: significance between different times in control group P2: significance between different times in study group

Table .5: The Children's Clinical Assessment of Dehydration for Control and Probiotic Study Groups through the Three Consecutive Days of the Study. (n= 60)

Assessment of dehydration	1st day				2nd day				3rd day				Sig. (F)
	Control group. (n= 30)		Probiotic group (n= 30)		Control group. (n= 30)		Probiotic group (n= 30)		Control group. (n= 30)		Probiotic group (n= 30)		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
1- **General condition**													
- Normal	8	26.7	5	16.7	17	56.7	19	63.3	25	83.3	26	86.7	P1= .000*
- Restless, irritable	22	73.3	25	83.3	13	43.3	11	36.7	5	16.7	4	13.3	P2= .000*
- Lethargic or unconscious	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	
Sig.	Z=-.932 P=.351				Z=-.932 P=.351				Z=-.359 P=.720				
2- Eye													
- Normal	0	0.0	2	6.7	10	33.3	13	43.3	19	63.3	26	86.7	P1= .000*
- Sunken eyes	30	100.0	28	93.3	20	66.7	17	56.7	11	36.7	4	13.3	P2= .000*
- Very sunken eyes	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	
Sig.	Z=-1.426 P=.154				Z--.790 P=.430				Z=-2.070 P=.038*				
3- Thirsty													
- Drink normally	4	13.3	9	30.0	15	50.0	24	80.0	23	76.7	28	93.3	P1= .000*
- Drinks eagerly, thirsty	26	86.7	21	70.0	15	50.0	6	20.0	7	23.3	2	6.7	P2= .000*
- Drinks poorly or unable to drink	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	
Sig.	Z=-1.554 P=.120				Z=-2.416 P=.016*				Z=-1.793 P=.073				
4-Skin pinch													
- Goes back quickly	22	73.3	6	20.0	20	66.7	19	63.3	30	100.0	25	83.3	P1=.004*
- Goes back slowly	8	26.7	22	73.3	10	33.3	11	36.7	0	0.0	5	16.7	P2= .000*
- Goes back very slowly	0	0.0	2	6.7	0	0.0	0	0.0	0	0.0	0	0.0	
Sig.	Z=-4.169 P=.000*				Z=-.268 P=.788				Z=-2.316 P=.021*				

Sig.(F): Friedman Test of significance within group **Z: Mann-Whitney U between groups**

P1: significance between different times in control group P2: significance between different times in study group

Table. 6: The Children's Dehydration Degrees for the Control and Probiotic Study Groups through the Three Consecutive Days of the Study. (n= 60)

Days	Degree of dehydration	Study groups				Significance between groups
		Control group. (n= 30)		Probiotic group (n= 30)		
		N	%	N	%	
1st day	No Dehydration	0	0.0	2	6.7	Z=-1.426
	Some Dehydration	30	100.0	28	93.3	P=.154
	Severe Dehydration	0	0.0	0	0.0	
2nd day	No Dehydration	10	33.3	19	63.3	Z=-2.306
	Some Dehydration	20	66.7	11	36.7	P=.021*
	Severe Dehydration	0	0.0	0	0.0	
3rd day	No Dehydration	18	60.0	28	93.3	Z=-3.027
	Some Dehydration	12	40.0	2	6.7	P=.002*
	Severe Dehydration	0	0.0	0	0.0	
Significance within group (F)		P1= .000*		P2= .000*		

F: Friedman Test of significance within group **Z: Mann-Whitney U between groups**
P1: significance between different times in control group
P2: significance between different times in study group

Discussion

The findings of the current study showed that the statistically significant differences were illustrated between the probiotic study and control groups regarding experience of vomiting where less than half of children in the probiotic study group didn't experience vomiting on the first day and this percentage increased on the second and third day compared to the percentages of children in control group. This could be explained in the light of, the probiotic intake increased the level of Bile Salt Hydrolase generating bacteria, which produced free bile acids that enhancing gastrointestinal motility and metabolism and it also have the anti-inflammatory and metabolic effects (Săsăran, 2023; Bourgin et al.,2021). Liu et al., (2021) who studied the effect of probiotics on improvement of gastrointestinal function also support the results of the present study were mentioned that probiotic intake significantly reduced frequency of vomiting. The findings that have been shown by Yossef et al., (2019) were also congruent with these results were stated that probiotics produced highly statistically significant improvement in gastrointestinal symptoms. This could be related to the characteristics of probiotics as they active microorganisms that colonizing the human body and changing the composition of flora in the intestine (Hojsak & Kolaček, 2024; Wang et al.,2021). Where these promoting the reproduction and growth of beneficial intestinal flora, enhancing the ability to resist external pathogenic bacteria, and improving the intestinal microenvironment (Huang et al., 2021).

Normal flora in the human body regulates immunity, nutrient absorption and enhances the ordinary function of the intestinal barrier. Diarrhea is a state of imbalance in the intestinal bacteria and the composition of gut flora of children (Shen et al., 2024; Huang et al., 2021). The results of the present study noticed that about three quarters of children in the probiotic study group had large amounts of diarrhea through the first day of study period compared to all children in the control group. This percentage decreased to less than ten percent of children in probiotic study group on the second day compared to all those children in control group. While, on the third day it was found that none of the children in the probiotic study group had large amounts of diarrhea compared to all those children in control group. It could be justified that probiotics reduce the inflammatory process through eliminating toxins receptors, strengthening the immune system, production and synthesis of short-chain fatty acid, lactic acid and bacteriocin that are the

main protection mechanisms of probiotics against gastrointestinal disorders (Markowiak-Kopeć & Śliżewska ,2020). Anjana &Tiwari; (2022) and Abedini, et al., (2015) were also in the same line with the findings of the current study. Mosaddek et al., (2022) also support these results and reported that regular use of probiotics is faster decreasing the duration and frequency of diarrhea.

Fortunately, it was noticed that the mean frequency of children's diarrhea in the probiotic study group had significantly improved through the three consecutive days of study period than those in control group. It could be related to the fact that probiotics stimulate the immune system including secretory IgA and T cell activity with reduction in chloride secretion of epithelial cells that result in cessation of diarrhea. Probiotics also exhibit some antimicrobial activities that prevent proliferating and destroy-offending organisms (Heydarian et al., 2010). Sharif et al., (2017) were in the same line with these findings and noted that significant decrease in the frequency of diarrhea in the probiotic group after admission to the hospital.

Dehydration accounts for the highest percentage and is one of the common complications of acute diarrhea Lin Wu & Zhan, (2021). It was found that the significant improvement was showed in the degree of dehydration on the second and third day in probiotic study group, where slightly less than two thirds of children in the probiotic study group presented with no dehydration on the second day compared to one third of those children in control group. In addition, almost all children in probiotic group were clinically presented with no dehydration on the third day compared to less than two thirds of children in the control group. This could be related to the probiotic use in acute diarrheal diseases is acting against enteric pathogens via activation of immune signaling pathways that inducing the host to secrete anti-pathogenic factors which results in shorter duration of diarrhea and faster discharge from hospital (Mosaddek et al., 2022). The findings of Benedikte et al., 2017 were in the same line with these results were mentioned that the use of probiotics reduced the number of days in children with diarrhea with severe malnutrition. Lin Wu & Zhan, (2021) also supported the findings of this study.

Limitations

Majority of hospitalized children in this study was prescribed for antibiotics as a standardized treatment that may inhibit the effect of probiotics bacteria, so application of probiotics bacteria may show more effect on children with gastroenteritis without administration of antibiotics that need for further investigation.

Conclusions:

Based on the study findings, it can be concluded that the application of yogurt probiotic bacteria alongside the standardized hospital care had a clear beneficial effect on management of young children with acute gastroenteritis

Recommendations:

It can be concluded that children's hospitals should consider the application of yogurt probiotic bacteria in its policies for management of young children with acute gastroenteritis beside the standardized hospital care to decrease severity of manifestations. Additionally, pediatric nurses have a pillar role in educating mothers of young children about recent evidenced dietary habits in management of their children based on each child's condition.

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