Evaluation of yogurt effect on acute diarrhea in 6-24-month-old hospitalized infants

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Yogurt helps in treatment and prevention of diarrhea. The aim of this study was to determine the efficacy of consumption of local factory yogurt, which is made with pasteurized milk, on moderately dehydrated hospitalized infants aged 6-24 months with acute non-bloody and non-mucoid diarrhea.

Eighty moderately dehydrated breast-feeding children aged between 6-24 months with acute non-bloody and non-mucoid diarrhea for fewer than four days were included in the study. Patients were randomly separated into two groups according to their treatment. Infants in the case group received at least 15 ml/kg/day of pasteurized cow milk yogurt orally plus routine hospital treatment. Infants in the control group received routine hospital treatment as in the case group. Weight gains, period of hospitalization, and reduction in diarrhea frequency during hospitalization period of the two groups were compared.

Mean duration of hospitalization (days), weight gain, and reduction in diarrhea frequency were 2.7±0.91 vs 3.1±0.74 days, 435± 89.20 vs 383±98.9 g, and 4.30±1.74 vs 3.60±1.23 times for case and control groups, respectively. Significant differences were observed in mean hospitalization days (p=0.035), reduction in diarrhea frequency (p=0.049) and weight gain (p=0.017).

This study recommends universal use of yogurt in acute non-bloody diarrhea.

Key words: yogurt, diarrhea, probiotic, infant, hospital.

The word yogurt is Turkish in origin[1]. Yogurt is defined by the Codex Alimentarius of 1992 as a coagulated milk product that results from fermentation of lactic acid in milk by *Lactobacillus bulgaricus* and *Streptococcus thermophilus*[2]. For at least a century, researchers have hypothesized that live bacterial cultures, such as those found in yogurt, may help treat and prevent diarrhea[3]. It is estimated that children under five years old had 2.2 episodes of diarrhea per year resulting in 4.6 million deaths[4]. Of all pediatric medical attendants at accident and emergency departments in England, diarrhea accounted for 16%[5]. In the United States, acute gastroenteritis in children younger than five years is responsible for approximately 3.7 million acute care visits annually. Two hundred and twenty thousand children are hospitalized each year, accounting for an estimated 9,255,000 hospital days[6,7].

Beneficial effects of probiotics and yogurt on health have been scientifically established[8]. Clinical studies in children 6 months to 5 years who were admitted with non-bloody non-mucoid diarrhea revealed that in cases with yogurt consumption in treatment, duration and frequency of diseases are reduced[9,10]. Regarding our country, yogurt is easily available and our people believe that it is useful for diarrhea. This study was conducted to assess pasteurized yogurt effect on non-bloody, non-mucoid diarrhea in 6-24-month-old children who were admitted in Urmia Imam Hospital.

Material and Methods

Eighty-six breast-feeding children aged between 6-24 months with moderate dehydration and acute non-bloody, non-mucoid diarrhea for fewer than four days were included in the study. Three patients in the yogurt treatment

group and three patients in control group were excluded from the study because of their irregular cooperation. Patients were randomly separated into two groups according to their treatment. Infants in the case group received at least 15 ml/kg/day of pasteurized cow milk yogurt orally plus routine hospital treatment up to the time of hospital discharge. Infants in the control group received timely routine hospital treatment as in the case group. Hospital treatment for moderate dehydration due to possible non-bacterial gastroenteritis in the infant period is a compound of intravenous serum therapy, oral rehydration solution (ORS) and mother's milk in breast-feeding infants and complementary food according to their month of age. The criteria for exclusion of patients were as follows: contraindication to oral feeding, pneumonia, septicemia, malnutrition, severe dehydration, intolerance of oral intake, stool culture positive for bacteria and cases that did not consume the required amount of yogurt or had a recent history of yogurt intake in the case or control group. We chose non–bloody, non-mucous diarrhea to limit the scope of diarrhea. Stool analysis, stool culture, complete blood count (CBC), chest X-ray, electrolyte check, blood sugar, blood urea nitrogen and creatinine are the routine tests in our hospital for gastroenteritis patients. The Research Council of the university approved this study. We chose a local exclusive factory product because its components are fixed and obvious. Components of yogurt reported by the factory laboratory were as follows: fat 2.5%, sugar 3%, lactic acid 1%, water 74%, *Lactobacillus bulgaris* 50,000/ml, *Streptococcus thermophilus* 50,000/ml and pH=4.7. The patients were enrolled from September to December 2002. Written consent was obtained from one of their parents. Comparing indexes were weight-gain, reduction in diarrhea frequency and hospitalization duration. Regular and daily data were collected from patients' files and were recorded on a pre-structured schedule.

An increase in the frequency, fluidity and volume of feces was defined as diarrhea. Treatment of dehydration, reduction in stool frequency to at least half the frequency at time of admission and no need for intravenous solution were considered as recovery and discharge criteria. The number of patients enrolled was considered a sufficient number to detect an assumed difference of 40% between groups in the duration of diarrhea. We considered final measures at discharge as final data analysis. The probability of significant differences between the indexes for independent groups was assessed by t-test. Chi-square and t-test were used to compare the probability of sex and age difference between case and control groups. Results are presented as the mean, 95% confidence interval (CI), 0.05% significance level and 80% power.

Results

The total number of enrolled patients was 80, with 40 cases in each group (21 M, 19 F in case group vs 22 M, 18 F in control group). Mean ages at time of admission were 12.58±5.22 for case and 12.38±5.13 months for control group.

Mean admission weights were 9.03±1.29 and 9.18±1.31 kg for case and control groups, respectively. Both groups had comparable clinical characteristics at admission including age, weight and diarrhea counts (Table I).

Average number of hospitalization days was 2.7±0.91 (95% CI 2.40-2.99) and 3.1±0.74 (95% CI 2.8-3.3) for case and control groups, respectively. The average difference between the two groups was 0.4 day (p=0.035).

Table I. Patient Data at Admission

Data of study	Case	Control	Difference	P–value	Significance
Sex (F/M)	21/19	22/18	–	0.82	NS
Number of patients	40	40	–	–	–
Age (month)	12.58±5.22	12.38±5.13	0.20	0.86	NS
Initial weight (kg)	9.04±1.30	9.18±1.32	0.14	0.63	NS
Primary diarrhea counts	8.53±3.45	7.25±2.60	1.27	0.062	NS

NS: Not significant.

Average weight gain was 435±89.3 (95% CI 406.44-463.55) and 383±98.96 (95% CI 352.10-415.39) g for case and control groups, respectively. An average of 52 g higher weight gain in the case group compared to that in the control group was significant (p=0.017).

Average reduction in frequency of diarrhea (stool excretion) was 4.30±1.74 (95% CI 3.74-4.83) and 3.60±1.23 (95% CI 3.23-4.01) for case and control groups, respectively. The average difference between the two groups was 0.7/day (p=0.049).

Discussion

In our study, the mean number of hospitalization days in the case group was 0.4 days less than in the control group per patient (p=0.035). A study conducted by Agarwal et al.[11] in Delhi in 2001 to assess the effect of local India yogurt (Indian Dahi) on acute diarrhea in children aged 6 months to 5 years determined that the mean hospitalization days for children with diarrhea reduced from 2.7 for controls to 2 days for cases. A multicenter European trial about probiotics in children with acute diarrhea showed a significant reduction in the duration of the disease and in the time of hospital stay in children who received probiotics compared with children who received the rehydration solution with placebo[12]. Our result regarding hospitalization days is in accordance with the results of these studies.

Van Neil et al.[14] also revealed an effect of yogurt on the reduction in diarrhea duration of about 0.7 days. Their study also showed a reduction of 1.6 in stool frequency on day 2 of treatment. D'Souza et al.[15] and others[16] confirmed that co-administration of probiotics and antibiotics reduces the frequency of diarrhea.

This study revealed a significant weight gain of about 52 g per patient in the case (p=0.017) compared to control group. As weight gain depends on diarrhea frequency, this result was expected.

In the two groups, the distribution of age, sex, dehydration status, weight and primary diarrhea count were matched. Thus, any significant difference in hospital stay, weight gain and reduction in diarrhea counts was due to yogurt treatment (Table II).

The beneficial effects of yogurt are due to: microbial B galactosidase in fermented milk product, delayed gastrointestinal transit, positive effect on intestinal function and colonic microflora and many immunity-promoting effects[17].

More research is necessary to determine the detailed effect of yogurt in acute diarrhea, but in accordance with the results of this study, we can recommend local yogurt consumption in the treatment of acute non-bloody and non-mucoid diarrhea.

Table II. Patient Data After Treatment

Data of Study	Case	Control	Difference	P-value	Significance
Hospital stay (day)	2.7±0.91	3.1±0.74	0.4	0.035	S
Weight gain (g)	435±89.3	383.75±98.96	52	0.017	S
Stool frequency reduction	4.3±1.74	3.63±1.23	0.7	0.049	S

S: Significant.

In this study, overall decreased diarrhea frequency was 0.7/day per patient, similar to that reported in Boudraa et al.'s[13] study conducted to compare the effect of infant formula versus the same formula subjected to microbial fermentation (yogurt) on the duration of diarrhea in young children with acute diarrhea. Yogurt feeding is associated with a clinically relevant decrease in stool frequency (p=0.049) and a 31% decrease in the median duration of diarrhea.

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