DOI: https://doi.org/10.53350/pjmhs2023175281

ORIGINAL ARTICLE

Comparison of Outcome of Lactose-Free Formula Milk with Yogurt in Children with Acute Diarrhea

MAHJABEEN AKRAM[1], SADAM HUSSAIN[1], MUHAMMAD WASIM SALIM[1], FAIZA PERVAIZ[1], SUMERA ABDUL KARIM[1], HUMAYUN IQBAL KHAN[1]
[1]*Department of Pediatrics, Services Hospital Lahore.*
Corresponding author: Mahjabeen Akram, Email: mahjabeenaakram@gmail.com

ABSTRACT

Background: Diarrhea is one of the most common problems in Pakistan where Khyber Pakhtunkhwa has the maximum prevalence i.e, 28% followed by Sindh (23%), Punjab (22%), and Baluchistan (12%). According to WHO every year 1.5 million children under 5 years, die just because of diarrhea. Therefore, this study aimed to look at the effect of lactose-free formula milk versus homemade plain yogurt in children with acute diarrhea.

Methods: A randomized controlled trial was carried out on 60 children of age 4-24 months, 30 in each group in the Department of Pediatrics, Services Hospital Lahore. Group 1 was given yogurt while lactose-free milk was given to group 2. The duration of resolution of diarrhea was noted in hours and data was statistically analyzed using SPSS version 20.

Practical Implication: The practical implication of comparing lactose-free formula milk with yogurt as a dietary intervention for children with acute diarrhea involves several considerations. Firstly, the severity and duration of diarrhea should be evaluated to determine the appropriate intervention. Secondly, the age and nutritional needs of the child should be taken into account. Thirdly, the availability and acceptance of lactose-free formula milk and yogurt in the local context should be considered. Additionally, the potential benefits and drawbacks of each option, such as the nutritional content, ease of digestion, and probiotic properties of yogurt, need to be assessed. It is important to consult with healthcare professionals and make an informed decision based on the specific circumstances to promote optimal outcomes in managing acute diarrhea in children.

Results: Out of 60 children, 26 (43.33%) were male and 34 (56.67%) were female. In groups 1 and 2, the mean duration of resolution of diarrhea (outcome) was 43.9 ± 7.30 hours and 71.57 ± 12.92 hours respectively. Group 1 patients' treatment showed a significant difference in the outcome than group 2 patients (P value= 0.00). However, the treatment effect on gender was found non-significant (P value= 0.48). The outcome in females was 43.6 ± 7.5 hours with yogurt and 70.6 ± 8.4 hours with lactose-free milk while in males the outcome was 44.3 ± 8.6 hours with yogurt and 73.1 ± 9.1 hours with lactose-free milk.

Conclusion: The use of yogurt is better than lactose-free formula milk for the resolution of diarrhea.

Keywords: Lactose-free formula milk, homemade plain yogurt, diarrhea.

INTRODUCTION

Diarrhea is a prevalent condition that results in remarkably repeated and liquid bowel movements. If the daily stool volume is more than 10 ml/kg in infants and more than 200 g/24 hours in older children, it is termed diarrhea[1]. Diarrhea is such a common problem that every child faces it, at least once in his lifetime. The effect of diarrhea is dehydration of the body that ultimately causes an imbalance of electrolytes and water and get worsen if not treated timely[2]. It is reported by World Health Organization that 1.5 million children less than 5 years of age die every year just because of diarrhea. Breastfeeding, especially in the first six months of an infant's life, is known to be a preventive measure against death due to diarrhea. Breastfeeding provides a newborn with protective antibodies, oligosaccharides, lysozyme, and lactoferrin that protects the body against enteropathogens. It also gives maternal white blood cells. Unfortunately, in developing countries, less than 40% of babies are breastfed and diarrhea is a chief cause of death in infants in these countries[3].

Diarrhea is a consequence of either direct infection or indirect effects of infection that causes severe harm to intestinal villus tips, the point where lactase is present. Such infections lead to lactose intolerance. Damage to the intestines prompts a diminishing absorptive surface zone, which thus interferes with the absorption of nutrients and leads to their retention, especially carbohydrates. Beneficial intestinal flora is also altered with the use of antibiotics and can also lead to diarrhea[4].

As far as the treatment of diarrhea is concerned balanced nutrition along with oral rehydration therapy is considered to be more important than the use of drugs including antibiotics, which play only a limited role in diarrhea management. The oral therapy for the rehydration and maintenance of children dehydrating with diarrhea has become the mainstay of National diarrheal control programs. Intravenous fluid therapy remains essential for those patients presenting with severe dehydration. For the management of acute diarrhea in children guidelines from the World Health Organization recommends the use of Zinc and ORS[5].

The use of oral zinc in diarrhea patients is one of the recent strategies made to minimize diarrhea-associated mortality in children. The efficaciousness of zinc has been studied thoroughly and it is concluded that zinc is well tolerated and leads to a reduced risk of prolonged diarrhea and can be used either in a disease state or as a preventive measure[6]. The latest research pattern is turning towards the utilization of probiotics in diarrhea management. Multiple researches carried out in children have demonstrated that lactobacillus oral administration showed good anti-diarrheal effect[7]. These lactobacillus bacteria are very safe and non-toxic for the body. One study reported that the use of Bifidobacterium bifidum in conjugation with Lactobacillus acidophilus reduces the duration of diarrhea, therefore the use of probiotics gained much importance when considering the treatment of diarrhea.

Yogurt is the product of milk fermentation by bacteria. Bacteria ferment lactose, a milk sugar, to synthesize the final product i.e. lactic acid. This acid gives texture as well as a representative tang to the yogurt[8]. Yogurt contains both B. bifidum and L. acidophilus which have been proved to be having good antidiarrheal properties[9].

Normally diarrhea persists for a few days but if it prolongs for more than 2 weeks then it is termed persistent diarrhea which is due to milk protein intolerance and malabsorption of carbohydrates. Yogurt again proves to be good therapy for persistent diarrhea. This is because of three major reasons i.e. it has good nature of probiotics, contains low pH, and can digest lactose. Even one of the studies represented that yogurt containing L. acidophilus can also decrease the duration and severity of antibiotic-mediated diarrhea[10,11].

Diarrhea is one of the most common problems in Pakistan where Khyber Pakhtunkhwa has the maximum prevalence i.e. 28% followed by Sindh, Punjab, and Baluchistan where the occurrence of diarrhea is 23%, 22%, and 12% respectively[12,13]. This study aimed to look at the effect of lactose-free formula milk (LF) in comparison with homemade plain yogurt (HY) in children with acute watery diarrhea.

MATERIALS AND METHODS

A randomized controlled trial using non-probability consecutive sampling was carried out on 60 children, 30 in each group in the Department of Pediatrics, Services Hospital Lahore. This study was approved by the Ethical Review Board, Services Hospital Lahore. Children of age 4-24 months of either gender presenting with acute diarrhea were included in the study and those on antibiotic therapy within 48 hours before the presentation, with severe dehydration requiring IV fluids, and malnourished children (<-2SD as per WHO criteria) were excluded from the study. Informed written consent was taken from the parents of the children. Ethical issues were considered and maintained throughout the study.

Demographic details (name, age, gender, weight) and duration of diarrhea were noted on history taking. Then all children were admitted to the Pediatric ward and randomly divided into two groups by using the lottery method. In group 1; children were given HY while in group 2, children were given LF. In both groups, the feed was given 5-8 times per day along with oral rehydration solution (ORS) and zinc supplementation. Patients were followed up till the resolution of symptoms and discharge from the hospital.

Data obtained was analyzed by SPSS software of version 20[14]. Quantitative variables were expressed as mean ± S.D whereas qualitative variables were expressed by percentage and frequency. The student's t-test was employed to compare the results of mean duration of diarrhea with 95% confidence level, 80% power of the test, before and after the treatment. A P-value of ≤0.05 was considered to be significant.

RESULTS

A total of 60 patients between the ages of 4-24 months were selected, Table 1 showed the age and gender-wise distribution of patients in which 38 patients (63.33%) were between 4-14 months while the remaining 22 (36.7%) were 15-24 months of age. The gender of the selected patients was checked and it was found that out of 60 patients, 26 (43.44%) were males and 34 (56.66%) were females.

Table 1: Age & gender of patients (n=60)

Gender	Age		Total
	4-14 months	15-24 months	
Male	19(31.67%)	07(11.67%)	26 (43.33%)
Female	21(35%)	13(21.67%)	34 (56.67%)
Total	40(66.67%)	20(33.33%)	60 (100%)

Table 2: Comparison of gender response from yogurt and lactose-free formula milk

Gender	Yogurt			lactose-free milk		
	no.	Mean outcome	S.D	no.	Mean outcome	S.D
Male	14	44.3	8.6	12	73.1	9.1
Female	16	43.6	7.5	18	70.6	8.4

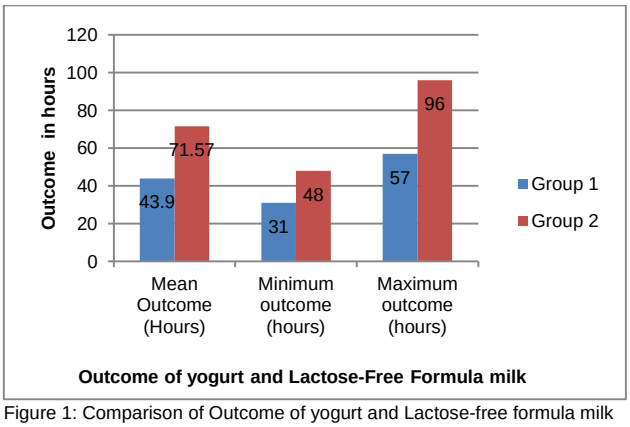

Figure 1: Comparison of Outcome of yogurt and Lactose-free formula milk

Group 1 was comprised of 14 male and 16 female children with diarrhea, in which 21 children (12 male, 9 female) were found between 4-14 months of age and 09 children (02 male, 07 female) were of 15-24 months of age. In group 2, there were 12 male and 18 female children in which 19 children (07 male, 12 female) were found between 4-14 months of age and 11 children (05 male, 06 female) were of 15-24 months of age. Additional age & gender combined description in both groups is given in Table I.

Results showed that group 1 children who were treated with HY had reduced outcome i.e. their mean duration of diarrhea was 43.9 ± 7.30 hours having a minimum outcome of 31 hours and a maximum of 57 hours. The results of Group 2 children treated with LF, showed that the outcome was 71.57 ± 12.92 hours having a minimum outcome of 48 hours and a maximum of 96 hours (Figure I). Group 1 patients' treatment showed a significant (better) difference in the mean duration of diarrhea than group 2 patients (P-value: 0.00). Statistically, the treatment effect on gender was also observed but there was no significant difference (P-value: 0.48). However, females showed a somewhat more effective response i.e. their mean duration of diarrhea with HY was 43.6 ± 7.5 hours and 70.6 ± 8.4 hours with LF, in the case of male children it was 44.3 ± 8.6 hours with HY and 73.1 ± 9.1 with LF (Table II).

DISCUSSION

Diarrhea is defined as a condition where unusual repeated and liquid bowel movements occur. It results in lactose intolerance which is due to decrease lactase enzyme production that is involved in the digestion of lactose. Due to this intolerance, children with diarrhea cannot digest the major saccharides of milk i.e. lactose which eventually longer the duration of diarrhea. Yogurt is considered to be helpful in diarrhea management because it contains certain beneficial bacteria that can degrade lactose into lactic acid and therefore substitute the role of lactase enzyme[15].

The current study aimed to compare the effects of HY with LF in children with acute diarrhea, i.e. to check out which one is more beneficial in the management of diarrhea. For this purpose 60 children with age, less than 2 years were taken and equally divided into two groups. One group was treated with HY and the other with LF. The results of the current study showed that yogurt is better to treat diarrhea as compared to lactose-free formula milk. The duration of diarrhea in yogurt-treated patients was found to be 43.9 ± 7.30 hours which is consistent with the previously reported data. For example, Choudhary et al. reported the duration of diarrhea in patients using yogurt to be 46.70 ± 14.40 hours, the patients in that study were also between the age of 3 months to 5 years and they were fed with traditional yogurt as a result of which the mean duration of diarrhea came out to be 46.70 hours[16].

The results of LF were expressed as the outcome of 71.57 ± 12.92 hours which is also comparable to the previously reported study of Noreen et al. Their study was conducted on 69 subjects of 1-12 months of age in Lahore in 2015. The mean duration of diarrhea was 75.84 ± 22.56 hours with LF[17] and with the study of Santosham et al., who reported the mean diarrhea period of 93 ± 56 hours among the patients of Indian tribes with the age of 9 years or less[18].

Previously reported studies on the comparison of yogurt and LF to treat diarrhea showed differential results. Some studies showed that yogurt is efficient while others showed that it is just the same as LF, for example, Bhatnagar et al. and his colleagues identified that no significant benefits of yogurt were seen against milk[19] whereas the results of Boudraa et al. represented that yogurt has a very good effect on diarrhea as compared to milk in the children with persistent diarrhea[20]. Similar results were concluded from Touhami et al. study, which revealed that yogurt is better to treat persistent diarrhea than milk and therefore can substitute milk[21].

In another study conducted in Algeria in 2001, 112 children of 3-12 months were recruited. Results of acute watery diarrhea settlement with yogurt versus milk were found at 44.1 ± 9.9 hours

and 61.7 ± 9.7 hours respectively. In short, the current study is consistent with the studies reporting yogurt to be beneficial over LF in the management of diarrhea. The reason behind the effectiveness of yogurt against LF is the presence of probiotics within it.

Results so far are encouraging, and further clinical trials are called for. The use of yogurt, rather than the frozen-dried preparations, seems the most profitable avenue to explore, as an aid to existing therapy. Several in vitro studies showed that lactobacilli or their cell-free cultures inhibit or kill H. pylori, prevent its adhesion to mammalian epithelial cells and prevent IL-8 release[22]. The idea behind using probiotics is that they may help beneficial bacteria to recover more quickly and restore healthy intestinal flora. Using yogurt when you have to take antibiotics may help to prevent diarrhea that often accompanies antibiotic treatment[23].

CONCLUSION

The current study concluded that the use of homemade plain yogurt is better than the lactose-free formulae milk for the treatment of diarrhea, as the mean duration of diarrhea with yogurt came out to be 43.9 ± 7.30 hours while it was 71.57 ± 12.92 hours with LF. This clearly showed the importance of using yogurt in diarrhea patients. Further studies are highly recommended to review the efficacy of using yogurt over lactose-free formula milk.

Acknowledgement: All the participants of the study have been included in the authors' list. This study was part of the FCPS (Pediatrics) dissertation of Dr. Mahjabeen Akram.

Conflict of Interest: The authors have no conflict of interest to disclose.

REFERENCES

1. Kosek M, Bern C, Guerrant R. The magnitude of the global burden of diarrhoeal disease from studies published 1992–2000. Bull World Health Organ. 2003;81(3):197-204.
2. Chu C, Rotondo-Trivette S, Michail S. Chronic diarrhea. Current Problems in Pediatric and Adolescent Health Care. 2020;50(8):100841.
3. Adelodun B, Ajibade FO, Ighalo JO, Odey G, Ibrahim RG, Kareem KY, et al. Assessment of socioeconomic inequality based on virus-contaminated water usage in developing countries: a review. Environmental Research. 2020:110309.
4. Rahman MM, Ahmed P, Kar A, Sakib N, Shibly AZ, Zohora FT, et al. Prevalence, Antimicrobial Resistance, and Pathogenic Potential of Enterotoxigenic and Enteropathogenic Escherichia coli Associated with Acute Diarrheal Patients in Tangail, Bangladesh. Foodborne Pathogens and Disease. 2020.
5. Russo M, Coppola V, Giannetti E, Buonavolontà R, Piscitelli A, Staiano A. Oral administration of tannins and flavonoids in children with acute diarrhea: a pilot, randomized, control-case study. Italian journal of pediatrics. 2018;44(1):64.
6. Abbas J, Pandey DC, Verma A, Kumar V. Management of acute diarrhea in children: is the treatment guidelines is really implemented? International Journal of Research in Medical Sciences. 2018;6(2):539-544.
7. Kianifar HR, Farid R, Ahanchian H, Jabbari F, Moghiman T, Sistanian A. Probiotics in the treatment of acute diarrhea in young children. Iranian Journal of Medical Sciences. 2015;34(3):204-7.
8. Park K. Park's textbook of preventive and social medicine. Preventive Medicine in Obstet, Paediatrics and Geriatrics. 2005.
9. Kaur S, Kaur R, Rani N, Sharma S, Joshi M. Sources and Selection Criteria of Probiotics. Advances in Probiotics for Sustainable Food and Medicine: Springer; 2021. p. 27-43.
10. María Remes Troche J, Coss Adame E, Ángel Valdovinos Díaz M, Gómez Escudero O, Eugenia Icaza Chávez M, Antonio Chávez-Barrera J, et al. Lactobacillus acidophilus LB: a useful pharmabiotic for the treatment of digestive disorders. Therapeutic Advances in Gastroenterology. 2020;13:1756284820971201.
11. Forster CS, Hsieh MH, Cabana MD. Perspectives from the Society for Pediatric Research: Probiotic use in urinary tract infections, atopic dermatitis, and antibiotic-associated diarrhea: an overview. Pediatric research. 2020:1-13.
12. D'souza RM. Housing and environmental factors and their effects on the health of children in the slums of Karachi, Pakistan. Journal of Biosocial Science. 1997;29(3):271-81.
13. Saeed OB, Haile ZT, Chertok IA. Association Between Exclusive Breastfeeding and Infant Health Outcomes in Pakistan. Journal of Pediatric Nursing. 2020;50:e62-e8.
14. SPSS S. Statistical Program for the Social Sciences version 20. Armonk: IBM. 2012.
15. Lata P. Probiotics for Human Health. Advances in Probiotics for Sustainable Food and Medicine: Springer; 2021. p. 181-212.
16. Choudhary M, Sharma D, Beniwal M, Dabi D, Pandita A. Traditional Yoghurt and Probiotic in Treatment of Acute Childhood Diarrhoea: A Blinded Randomized Controlled Non-Inferiority Trial. J Pediatr Neonatal Care. 2015;2:58.
17. Noreen A, Jalal A, Qudsia, Jabeen R, Qamar S. Comparison of Lactose Free With Lactose Containing Formula Milk in the Management of Acute Watery Diarrhoea in Infants. Pakistan Journal Of Medical & Health Sciences. 2016;10(4):1337-9.
18. Santosham M, Foster S, Reid R, Bertrando R, Yolken R, Burns B, et al. Role of soy-based, lactose-free formula during treatment of acute diarrhea. Pediatrics. 1985;76(2):292-8.
19. Bhatnagar S, Singh KD, Sazawal S, Saxena SK, Bhan MK. Efficacy of milk versus yogurt offered as part of a mixed diet in acute noncholera diarrhea among malnourished children. J Pediatr. 1998;132(6):999-1003.
20. Boudraa G, Touhami M, Pochart P, Soltana R, Mary JY, Desjeux JF. Effect of feeding yogurt versus milk in children with persistent diarrhea. J Pediatr Gastroenterol Nutr. 1990;11(4):509-12.
21. Touhami M, Boudraa G, Mary JY, Soltana R, Desjeux JF. [Clinical consequences of replacing milk with yogurt in persistent infantile diarrhea]. Ann Pediatr. 1992;39(2):79-86.
22. Lee H-A, Kim J-Y, Kim J, Nam B, Kim O. Anti-Helicobacter pylori activity of a complex mixture of Lactobacillus paracasei HP7 including the extract of Perilla frutescens var. acuta and Glycyrrhiza glabra. Laboratory animal research. 2020;36(1):1-8.
23. Akins CK. Prevention of Antibiotic Associated Diarrhea with Probiotics in Healthy Pediatric Patients. Lynchburg Journal of Medical Science. 2020;2(3):2.