Original Article

Comparison of the Clinical Efficacy of Bacteria-Based Probiotics to Fungi-Based Probiotics

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ABSTRACT

Objective: To compare the clinical efficacy of bacteria-based probiotics with fungi-based probiotics for the treatment of acute watery diarrhea in children between 5 months to 5 years of age.

Methodology: A cross-sectional descriptive study was conducted on 150 cases of acute diarrhea admitted in the Paediatrics Department, Akhtar Saeed Trust Hospital, Lahore from May to June 2020. Patients were included by convenient sampling technique and further divided into groups A & B. Group A included 75 patients treated with bacteria-based probiotic i.e. *Lactobacillus acidophilus* and group B comprised 75 patients treated with fungi-based probiotic, *Saccharomyces boulardii.* Twelve billion lyophilized heat-killed *Lactobacillus acidophilus* was given twice a day to group A patients and 250 mg of *Saccharomyces boulardii* was given twice a day to patients included in group B. The children in each group (A and B) were observed on the 3rd day of treatment to see the efficacy. If diarrhea was resolved on day 3 of starting a probiotic, then that particular probiotic was considered as clinical efficient. The efficacy of probiotics used in both groups was compared.

Results: The age range of the children included in the study was 5 months to 5 years. In group A, 31(41.33%) and in group B, 27(36%) were in age group 1-2 years. In group A, 24(32%) and 31(41.33%) in group B were between 3-4 years, while 20(26.67%) in group A and 17(22.6%) in group B were 5 years of age. The mean age was 3.22±2.53 years in group A and 3.76±2.89 years in group B. As for as gender was concerned, 39(52%) in group A and 44(58.67%) in group B were males while 36(48%) in group A and 31(41.33%) in group B were females. Comparison of clinical efficacy in both groups revealed that 43(57.33%) in group A and 21(28%) in group B were effectively treated while the remaining 32(42.67%) in group A and 54(72%) in group B did not show efficacy. A statistically significant difference (p-value=0.0001) was found in the comparison of the efficacy of both groups.

Conclusion: Clinical efficacy of bacteria-based probiotics is higher than fungi-based probiotics in the treatment of acute watery diarrhea.

Keywords: *Acute watery diarrhea. Bacteria-based probiotics. Fungi-based probiotics. Efficacy.*

INTRODUCTION

Diarrhea is reported to be one of the leading causes of death in developing countries. Every child, on average, suffers from 5-6 episodes of diarrhea per year in Pakistan. The prevalence of diarrhea in Pakistan has been found to be 7.8%.[1] Diarrhea is defined as the passage of loose, watery stools from the bowel three or more times a day, indicating a change in the consistency of stool. Diarrhea can lead to serious complications like severe malnutrition, and morbidity. The main causes of deaths due to diarrhea in developing countries are dehydration and water & electrolyte imbalances.[2] Diarrhea is one of the major known cause of prolonged hospital stay for children under five years.[3]

The term "Probiotics" is a Greek word that means "For Life". Probiotics are living microbial organisms such as bacteria or yeast which are known to be resistant to digestion. Usually, they remain alive in the colon and are beneficial to the host when ingested in the recommended dose.[4] Microbial intestinal flora is known to have a protective role probably due to their inherent metabolic activities which play a beneficial role for the host. Probiotics have shown to considerably decrease the gastrointestinal diseases such as childhood diarrhea antibiotic associated diarrhea, traveller's diarrhea, *Helicobacter pylori* infections, etc.[5]

The use of probiotics is recommended in the treatment of diarrhea in children.[6] The possible mechanisms by which probiotics work include antimicrobial products formation, competing with pathogens for nutrients required for their growth, and modifying toxins or toxin receptors. Also, they are known to modulate nonspecific and specific immune reactions in the body.[3] *Lactobacillus acidophilus,* a probiotic bacterium is effective in reducing the span of acute watery diarrhea.[7] *Saccharomyces boulardii,* a probiotic yeast, has also been documented in the treatment of various types of diarrhea.[5] Probiotics play an important role in microbiological and immunological effects in patients with watery diarrhea.[6] Probiotics differ in their ability to resist gastric acid and bile acids, colonize the intestinal tract, and influence cytokines secreted by intestinal epithelial cells. Thus, not all probiotics are alike. As a result, benefits observed clinically with one species or with a combination of species are not necessarily generalized to another. *Saccharomyces boulardii* and *Lactobacilli* have been reported to show different clinical efficacy in treating acute watery

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Received: May 24, 2021; Accepted: June 30, 2021

diarrhea.[8]

The rationale of the current study was to determine which type of probiotics either *Saccharomyces boulardii* or *Lactobacillus acidophilus* is more efficacious than the other. So, by using probiotic therapy complications of diarrhea can be prevented.

METHODOLOGY

It was a cross-sectional descriptive study conducted on 150 children with acute watery diarrhea admitted to the Paediatrics Department of Akhtar Saeed Trust Hospital, Lahore. After taking approval from the institutional ethical committee (Letter No. 1040917/ASTH, 15-04-2020), the study was conducted from May to June 2020. A total of 150 children of both genders between 5 months to 5 years of age who presented with acute watery diarrhea (more than or equal to 3 loose consistency stools in last 24 hours not more than 14 days) accompanied with severe dehydration (lethargic, drinking poorly, eyes markedly sunken, skin pinch >2 seconds) were included in the study.[9] These patients were treated with *Lactobacillus acidophilus* or *Saccharomyces boulardii.* Informed consent was taken from the parents/attendants of the children. Patients were included by convenient sampling technique and further divided into groups A & B. Group A included 75 patients treated with *Lactobacillus acidophilus* and group B comprised 75 patients treated with *Saccharomyces boulardii.* Children who had a history of antibiotic associated diarrhea and were already taking antibiotics/ antidiarrheal or probiotics in the previous weeks, immunodeficient children, children with severe abdominal distension and risk of bowel perforation, and those with a history of gastrointestinal tract surgery were excluded from the study.

Twelve billion lyophilized heat-killed *Lactobacillus acidophilus* was given twice a day to group A patients and 250 mg of *Saccharomyces boulardii* was given twice a day to patients included in group B. The children in each group (A and B) were observed on the 3rd day of treatment to see the efficacy. If diarrhea was resolved on day 3 of starting a probiotic, then that particular probiotic was considered as clinical efficient. Rehydration and Zinc supplements were given to every patient as recommended by World Health Organization.

STATISTICAL ANALYSIS

Analysis of data was done by Statistical Package for the Social Sciences (SPSS) version 25. Comparison of efficacy of probiotics in both the groups was analysed by using Chi-square test. A p-value ≤ 0.05 was considered to be statistically significant.

RESULTS

A total of 150 patients qualifying the inclusion were enrolled to compare the clinical efficacy of bacteria-based probiotics with fungi-based probiotics in treating watery diarrhea in children between 5 months to 5 years of age. The mean age in group A was 3.22±2.53 years while the mean age in group B was 3.76±2.89 years. Age distribution of patients included in group A & B is shown in Table 1. Our study showed that diarrhea is common under the age of 4 years and there is a decreasing trend of the proportion of older children affected by diarrhea. Frequency & severity of acute diarrhea was equal in both genders i.e. 52% in group A and 58.67% in group B affected by diarrhea were males, while 48% in group A and 41.33% in group B affected by diarrhea were females. Both bacterial and fungal probiotics showed significant clinical efficacy in diarrhea treatment. Comparison of efficacy in both groups showed that diarrhea was resolved in 57.33% in

Table 1: Study Variables of Group A & B

Study Variables		Group A	Group B
		Frequency (Percentage)	Frequency (Percentage)
Age (Years)	1-2	31(41.33%)	27(36%)
	3-4	24(32%)	31(41.33%)
	5	20(26.67%)	17(22.67%)
Gender	Male	39(52%)	44(58.67%)
	Female	36(48%)	31(41.33%)
Efficacy	Yes	43(57.33%)	21(28%)
	No	32(42.67%)	54(72%)

Table 2: Stratification for Efficacy in Both Groups According to Age & Gender

Study Variables		Group A (n=43)	Group B (n=21)
		Frequency (Percentage)	Frequency (Percentage)
Age (Years)	1-2	14(32.56%)	9(42.86%)
	3-4	17(39.53%)	7(33.33%)
	5	12(27.91%)	5(23.81%)
Gender	Male	26(60.47%)	14(66.67%)
	Female	17(39.53%)	7(33.33%)

group A and 28% in group B while the rest of 42.67% in group A and 72% in group B did not show efficacy. A statistically significant difference (p-value=0.0001) was found in the comparison of the efficacy of both groups. Stratification of age and gender in both groups is shown in Table 2.

DISCUSSION

Worldwide, diarrhea is the second most important cause of death in less than five years paediatric age group. Early management of diarrhea in children is essential, as it may lead to significant morbidity and mortality.[10]

Our study showed that diarrhea is common under the age of 4 years and there is a decreasing trend of the proportion of older children affected by diarrhea. This indicates that infants and younger children are more susceptible to organisms causing acute diarrhea. A study conducted by Shati et al., showed that diarrhea is more prevalent in children under 2 years of age.[11] In a recent study by Sanyaolu et al., it was illustrated that diarrhea was predominant among children less than 5 years of age.[9] The findings are similar to the present study results in terms of the age group affected by acute watery diarrhea.

Frequency & severity of acute diarrhea was equal in both genders i.e. 52% in group A and 58.67% in group B affected by diarrhea were males, while 48% in group A and 41.33% in group B affected by diarrhea were females. These findings are similar to a recent study which also supports our findings that there is no difference in severity or frequency of diarrhea in both genders.[10] A study by Mahmud et al., found that dehydrating diarrhea was more prevalent in girls when they presented to the hospital as compared to the boys, which contradicts the current study findings.[12]

Probiotics have therapeutical potential in treating dysbiosis involved in treating gastrointestinal disorders.[13] Our results showed that both bacterial and fungal probiotics showed significant clinical efficacy in diarrhea treatment. *Lactobacillus* was effective in treating 57.33% of all diarrhea cases. Another study revealed that it is beneficial in the treatment of diarrhea in children.[14] In the fungal probiotic group *Saccharomyces* showed clinical efficacy of 42.67%. A study conducted on beneficial effects on *Saccharomyces boulardii* also showed that it's a safe and effective remedy in treating acute diarrhea.[15]

Our results showed that clinical efficacy of bacterial-based probiotics given in group A is higher than fungal-based probiotics given in group B (p-value=0.0001). Comparable results were found in another study by Erdogan et al., showing that the clinical efficacy of bacterial probiotics is significantly higher than fungal probiotics coinciding with the present study results.[16]

CONCLUSION

Clinical efficacy of bacteria-based probiotics is higher than fungi-based probiotics in the treatment of acute watery diarrhea.

LIMITATIONS & RECOMMENDATIONS

Lactobacillus acidophilus is found more efficacious than *Saccharomyces boulardii* for resolving acute watery diarrhea. So, use of bacteria-based probiotics can decrease disease morbidity and mortality.

This study did not compare the adverse effects of the probiotics and hospital stay of the patients. Further studies are suggested to be carried out so that any adverse effects may be addressed.

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