

Role of Synbiotic (Combination of Pre and Probiotic) in the Management and Prevention of Acute Watery Diarrhoea

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Abstract: The objective of the study was to examine the efficacy and safety of seven different probiotic cultures of lactobacilli and child specific Bifidobacterium infantis along with prebiotic (FOS) in reducing the frequency of stool excretion and stool consistency in acute watery diarrhoea. Synbiotic is a combination of probiotic and prebiotic cultures. Probiotics are friendly live bacteria, which have shown to have beneficial effects on human health. Imbalance of intestinal micro flora leads to the occurrence of diarrhoea. There currently exists good evidence for the therapeutic use of synbiotic in infectious diarrhoea in children, especially when seven different strains of lactobacilli including a child specific B. infantis are incorporated to improve the clinical course of acute diarrhoea. There were 50 children in synbiotic group and 50 in the control group. There were no differences in subject characteristics and no confounding variables were found in either group. In the synbiotic group, a more rapid improvement in the stool texture and average stool remission time was seen significantly better as compared to control group. Similar results were also seen in stool remission, where there was a significant decrease in synbiotic group. The average duration of stool remission time in the synbiotic group was 41.53 hours. This was significantly different when compared to control group average time of 74.94 hours. Finally, this study concluded that synbiotic having seven multiple Lactobacilli's strains including child specie B. infantis and FOS as probiotic significantly improved stool texture and showed better stool remission time.

Key words: Bifidobacterium Infantis • Probiotic And Prebiotic • Synbiotic Group • Intestinal Micro Flora • Acute Diarrhoea • Stool Texture

INTRODUCTION

Acute watery infectious diarrhoea is one of the common diseases of under five years in Pakistan. The incidence is very high in summer. Antibiotics are often used without any clear indication and may cause an imbalance in intestinal micro flora [1]. Diarrhoea leads to high morbidity and high hospital attendance [2].

The intestinal tract of human is a host to a vast ecology of microbes and harbors more than 500 identified species that can be cultured [3]. The concept of modulating bacterial activities directed towards improving gut microbial function has a long history [4].

Numerous probiotic agents have been studied for the management of diarrhoea, also for the

treatment and control of antibiotic associated diarrhea [5]. Few agents including Lactobacillus rhamnosus L. acidophilus. L. bulgaricus, Bifidobacterium infantis B. Longum, seem as primary agents for amelioration of the course of acute diarrhoea in children when used therapeutically [6]. Fructooligosaccharide (FOS) has prebiotic properties with no genotoxic, toxicological effects. Microorganism of the gut utilizes Prebiotics [7].

The product used in this study is a combination of multi-strains of Lactobacillus acidophilus L. casei, L. rhamnosus L. bulgaricus, Bifidobacterium breve, Bifidobacterium infantis and Streptococcus thermophiles. Prebiotic FOS (Fructooligosaccharide) is also included as a diet for the friendly bacteria [8].

Pre-clinical and experimental studies of main families of lactic acid bacteria have been well documented. They demonstrate anti-inflammatory, anti-microbial, metabolic and anti-toxic activity. Moreover, lactobacillus families stimulate an immune response in the intestinal mucosa, thereby secreting immunoglobulin, ensuring faster immune reactions to different diseases [9-11].

Based on our previous experience of the use of Lactobacilli multi-strains and prebiotic in the treatment of acute diarrhoea, this study was undertaken to further assess the efficacy and safety of multi-strained lactobacilli and Bifidobacteria in the treatment of acute diarrhea [12-16].

MATERIAL AND METHODS

Methods: Children from 6 months to 60 months of age with acute watery diarrhoea were selected according to the inclusion criteria and randomized in Synbiotic group. The two main families of Lactic acid bacteria have been provided in the synbiotic group. These species include *Lactobacillus casei*, *Lactobacillus rhamnosus*, *Lactobacillus acidophilus*. *Lactobacillus acidophilus*, *Bifidobacterium breve*, *Bifidobacterium infantis* and *Streptococcus thermophiles*, the former are located in the small intestine and the later are found in the large intestine/colon [17]. The sachet contained 1 billion CFU, 1×10^9 CFU/day of one gm. sachet in once daily, sachet also contained FOS fructooligosaccharide (they were also given ORS and nutritional support). The control group was treated with sucrose, ORS and nutritional support. Active treatment phase was 5 days. Stool texture, stool excretion frequency and remission time were assessed in every child. A comparison of the two groups was done. This double blind placebo controlled randomized trials was carried out in National Institute of Child Health (NICH) Karachi, one of the largest Government Teaching Hospital in Karachi having 475 beds with a 1000 patients OPD daily. NICH has also the largest Neonatal ward in Pakistan with 90-100 patients capacity. This is the only children hospital in Karachi administered by Federal Government catering to fulfill the need of a metropolitan city of 15 million.

Population and Sample: Children 6 months to 60 months of age presenting with moderate to severe dehydration were included in this trial. The study population of 102 children was randomized into two groups. In synbiotic group patients were managed with WHO Protocols, along

with control group. *Lactobacillus* and *Bifidobacterium* cultures and FOS (Fructooligosaccharide) 1 gm. sachet, providing 1 billion CFU / sachet, 1×10^9 CFU / day.

Study Design: This was a double blind placebo controlled randomized trial with 102 patients. The product is manufactured by Probiotic International Ltd. UK and is marketed by Prism Health Pakistan. The active treatment period was 5 days. All study participants were examined on day 0 inclusion day in NICH and were sent to Diarrhoea Ward for the treatment. The data was collected by filling a Proforma. The data collection included weight and height of child, duration of diarrhoea, stool consistency, No. of stool per day, signs of dehydration, No. of vomits/day, sensorium and other data. After admission in the Diarrhoea ward the child was observed daily until diarrhoea subsided.

RESULTS

One hundred two patients were analyzed in these studies, fifty-one patients in each group. One Patient in each group was excluded or fell in category of LAMA. Subject characteristics in control study group were comparable Table 1.

Diarrhoea Remission Rate: Diarrhoea remission rate for each day was observed. From the second day examination, an improvement to the stool texture and decreasing of stool frequency was observed. It was noted that 45 patients were having sticky stools on second day whereas 27 in the control group. It was 90% in synbiotic group while 54% in control group.

At third day all the 50 patients had solid and formed stools in synbiotic group. However there were 20 patients with formed stool in control group, this suggests faster improvement in stool texture in synbiotic group. Percentage wise it was 100% in synbiotic group and 40% in control group. Distribution of stool texture in the synbiotic group and control group during hospitalization in diarrhoea unit, National Institute of Child Health (NICH), Karachi, April-August 2007.

Mean Remission Time: Mean value of stool remission time (Hours) of acute watery diarrhea patients in synbiotic group and control group during hospitalization in diarrhoea unit of National Institute of Child Health (NICH), Karachi, April-August 2007.

Table 1: Subject Characteristics (Synbiotic & Control Group)

Subject Characteristics	Synbiotic Group	Control Group
Number	50	50
Age (Avg)	16.50 months	17.56 months
Sex % male	54 %	63 %
Stool Consistency, liquid without residue	31/50	32/50
Stool Consistency liquid with residue	19/50	20/50
No. of Vomits/day	08	07
Duration of Diarrhea	2.5 days	2.2 days
No. of stools/day	16	15
Moderate Dehydration	15 %	16 %

Table 2: Diarrhoea Remission Rate

Day	Synbiotic Group			Control Group		
	Liquid	Sticky	Solid & Formed	Liquid	Sticky	Solid & Formed
1	50	0	0	50	0	0
2	5	45	0	23	27	0
3	0	0	50	5	25	20
4	0	0	50	2	23	25
5	0	0	50	0	0	50

Table 3: Stool Mean Remission Time

Group	No of Patients	Mean hours
Synbiotic Group	50	41.53
Control Group	50	74.94
Total Sum	100	

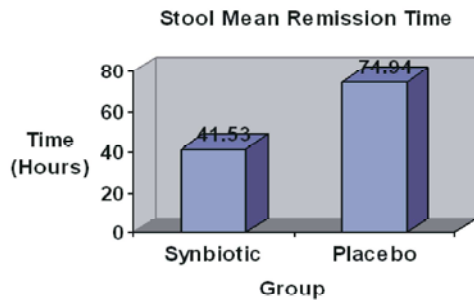


Fig 1. Stool Mean Remission Time

Table 5: Sticky Stool- Day2

Sticky Stool	Synbiotic	Placebo
Day 2	45/50	27/50

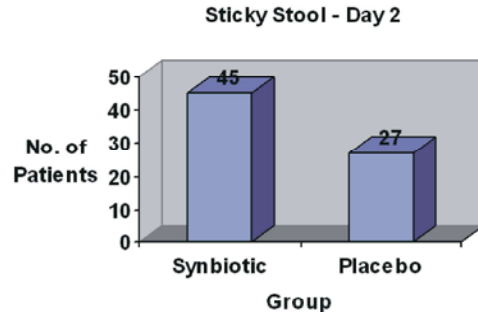


Fig 3. Sticky Stool-Day 2

Table 4: Liquid Stool Day 2

Liquid Stool	Synbiotic	Placebo
Day 2	5/50	23/50

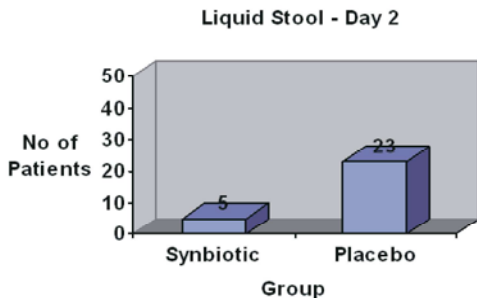


Fig 2. Liquid Stool-Day 2

Table 6: Solid & Formed Stool Day 3

Solid & Formed Stool	Synbiotic	Placebo
Day 3	50/50	20/50

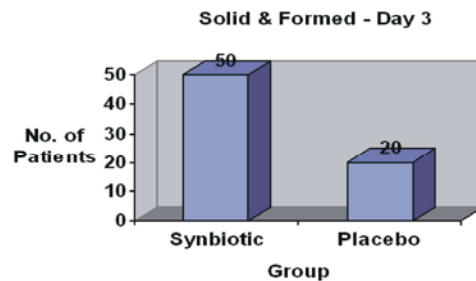


Fig 4. Solid & Formed-Day 3

Stool Texture: Significantly faster improvement-less number of liquid stool from Day 2 in the symbiotic group. (Liquid → sticky → Solid & Formed)

Faster conversion of liquid stool into sticky stool from Day 2 in the symbiotic group.

DISCUSSION

Probiotics are defined as “live Microbe of food supplement or components of bacteria which have been shown to have beneficial effects of human health” [12-16]. Most friendly bacteria used generally fulfilling this criterion are Lactobacilli and Bifidobacteria. A Prebiotic is defined as “non absorbable food component that beneficially stimulate one or more of the gut beneficial microbe groups and thus have a positive effect on human health” [18].

Synbiotic is the combination of probiotic and prebiotic. Synbiotic group in this trial contains the best Lactic acid bacteria and Bifidobacteria along with *Streptococcus thermophiles* [19]. It is worth mentioning that a child specific strain of *Bifidobacterium infantis* and *Streptococcus thermophiles* have also been included. This synbiotic also contain the most appreciable and documented prebiotic, Fructooligosaccharide (FOS).

There are numerous studies claiming promising results on the use of the above mentioned combination (Synbiotic) in reputed journals on human. Several recent studies [20-21-22] published advocate the use of Lactic acid and Bifidobacteria in children in the treatment of acute diarrhoea. The Synbiotic supplied here contained the both combination of Lactic acid bacteria along with FOS as prebiotic [20-21-22].

Many strains of Probiotic bacteria that produce Lactose also produce a substance like bacteriocin that having antibiotic properties for eradicating pathogens that cause diarrhoea. No Side effects were observed during the active treatment period with the use of synbiotic, this also highlights the high safety profile [23].

CONCLUSION

Based on our experience of this trial we conclude that Synbiotic is a useful and welcome addition to the treatment of acute watery diarrhoea in infants and young children. Synbiotic reduces the frequency of stool and duration of illness. The study found stool remission time in Synbiotic group as 41.53 hours whereas; in controlled group it was found 74.94 hours. Finally, this study concluded that Synbiotic, having seven multiple

Lactobacilli's strains including child specie *B. infantis* and FOS as prebiotic, which, significantly improved stool texture and showed better stool remission time.

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