ORIGINAL ARTICLE

COMPARISON BETWEEN YOGURT AND COMMERCIAL PROBIOTICS IN THE DURATION OF DIARRHEA IN PEDIATRIC AGE GROUP

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Abstract

Objective: To compare the mean duration of diarrhea between children taking yogurt and with the group taking commercial probiotics, containing lactobacillus in acute watery diarrhea. Materials and Methods: This descriptive study was conducted in the Department of Pediatrics, Services Hospital, Lahore. The duration of this cross sectional study was 6 months, from June 2013 to November 2013. A total of 200 children suffering from acute watery diarrhea were involved in the study after the informed consent under the said hospital. Their demographic information was recorded and later divided in two groups of 100 each; group A received yogurt and group B was given commercial probiotic. The duration of diarrhea was observed in both groups. The results were compared by using independent sample t-test. Results: The average duration of diarrhea in group A, was 1.98 ± 1.31 day while that in group B was 3.09 ± 1.64 days. Student's t-test was applied and the difference between the two groups was found to be statistically significant (p< 0.05). Conclusions: Treatment with yogurt significantly decreases the mean duration of diarrhea as compared to probiotic among patients with acute watery diarrhea.

Keywords: Lactobacillus, Yogurt, Probiotics, Duration of Diarrhea

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Introduction

Diarrhea is defined as passage of 3 or more loose stools per 24 hours [1]. In developing countries diarrhea accounts for millions of deaths each year in young children. In developed countries, it is a common cause of admission in emergency departments [2]. Diarrhea accounts for 18% of mortality under 5 years and more than 5000 deaths...
every day [3], 78% of deaths are from African and South-East Asian region. Pakistan contributes 500 deaths per day in this death toll [4]. According to a Pakistan Medical Association report, the incidence of diarrhea among children in Pakistan is 20% [5].

Conventional treatment modalities for acute watery diarrhea include intravenous fluids, oral rehydration solution (ORS) with Zinc supplements which reduces the duration of diarrhea by 25% and stool volume by 30%. Home remedies include rice water and yogurt [6]. Children with poor reserves are at higher risk of complications like repeated hospital admission, malnutrition, electrolyte disturbance (hypokalaemia) and prolonged hospital stay [7]. Appropriate clinical assessment of a patient should be done to guide a cost effective and evidence based approach for diagnostic investigations and treatments [8]. Oral rehydration solutions have reduced the complications caused by diarrhea to a significant extent, but it neither changes the consistency of stools nor normalizes the gut flora [9].

Probiotics are viable as well as, non-pathogenic microorganisms which when given in proper amount, offer a health benefit to the host. Examples of the commonly used bacterial probiotics include *Lactobacillus* species, *Escherichia coli* *Bifidobacterium* species, *Streptococcus* species, and the yeast *Saccharomyces boulardii* [9,10].

*Lactobacillus*, normal inhabitant of human intestinal and peritoneal flora, is known to have its anti-diarrheal activities since 1960s [11,12]. *Lactobacillus* is found to be beneficial in preventing and treating antibiotic-associated diarrhea. It is also effective in children who are susceptible of poor nutrition, impaired immune status, or frequent exposure to pathogens. In spite all those encouraging reports pediatrician from America do not routinely prescribe *Lactobacillus*, because they believe that its effectiveness has not been proved [13,14].

*Lactobacillus bulgaricus* and *Streptococcus thermophilus* are responsible for the fermentation of milk that results in the formation of yogurt. Commercially available yogurt usually contains *Lactobacillus bulgaricus* and *Streptococcus thermophilus* in equal proportions [15]. It can be easily prepared at home and is believed to be beneficial in diarrheal disorders in most of Pakistani families.

In Turkey, a trial of comparison of yogurt and probiotic *Saccharomyces boulardii* demonstrated that in both groups stool consistency normalized at the same time (3.07 ± 2.01 days versus 3.07 ± 1.73 days (P > 0.05). As far as duration of hospitalization was concerned, there was no difference among both groups (4.68 ± 2.37 versus 4.23 ± 1.72 days; P=0.45) [16]. A subgroup analysis in the same study on patients with rotavirus infection showed reduction in diarrhea duration in the group taking yogurt (4.61 ± 1.68) compared with *Saccharomyces boulardii* (5.47 ± 2.37) (P=0.74) [17]. A study in Italy compared the placebo with *lactobacillus*. After enrollment, duration of diarrhea was 3.0 ± 1.14 days in placebo versus 2.42 ± 1.15 days in *lactobacillus* group (mean ± SD with P value = 0.03) and in rotavirus-positive children, duration of diarrhea lasted 3.19 ± 1.73 days versus 2.34 ± 0.7 days respectively (P < 0.008). Diarrhea continued for more than 7 days in 10.7% of placebo as compared to 2.7% of lactobacillus group (P < 0.01). Hospital stay was significantly less in group B than in group A [18]. There is no local study available comparing the yogurt (natural source of *Lactobacilli*) and commercial
probiotics containing lactobacillus, but many trials of different strains of lactobacillus show efficacy in diarrheal diseases [19].

In Pakistan, diarrhea related morbidity and mortality are quite high in children below 5 years especially in low socioeconomic status. Little work has been done about the affect of yogurt supplementation on duration of diarrhea. Yogurt has advantages with respect to cost effectiveness, easy availability, community trust in addition to its probiotic role as well as nutritional value. The rationale of this study is to observe whether yogurt is as effective as commercially available probiotics (lactobacillus) in decreasing duration of diarrhea so that we can suggest a cheaper and easily available remedy for the treatment of a very common disease such as Acute Watery Diarrhea.

Material and Methods

The study was carried out in the Department of Pediatrics, Services Hospital, Lahore. A total of 200 cases were selected for this cross-sectional study; 100 in each group after informed consent from the parents under the hospital, with 95% confidence interval, 80% power of test and taking magnitude (mean ± SD) of duration of diarrhea with yogurt supplemented group and commercial lactobacillus probiotics group i.e 3.07 ± 2.01 and 2.42 ± 1.15, respectively. Duration of study was 6 months. Inclusion criteria were children presenting with acute watery diarrhea between 6 months to 5 years having grade IV or more watery stools greater than 3 per day for more than 2 days. Children who were simultaneously receiving antibiotics, who had clinical or lab evidence of bacillary dysentery and lactose intolerance, who developed complications like ileus: sepsis, acute renal failure or had history of co-morbid conditions like chronic renal failure, chronic liver disease and third degree malnutrition were excluded. Their demographic information including name, age, sex, address was recorded. 200 children fulfilling the inclusion criteria were admitted through emergency and out-patient department. Approval from Hospital ethical committee of Services Hospital, Lahore was taken. Informed consent from parents was taken and risks and benefits of study were explained. Cases were registered for the study and demographic information of the patients (name, age, sex, address) was obtained.

On receiving the patient in ER, vital signs were recorded and examination was done to assess for signs of dehydration. After preliminary rehydration and stabilization, patients were shifted to the ward and divided into two groups by lottery method. Standard treatment with oral/IV fluids and anti-pyretic (if indicated) was started to both groups. One group (A) was advised to take yogurt (natural source of lactobacillus), 20mL twice a day along with standard treatment and other group (B) to take probiotics one sachet twice a day with standard treatment. Patients were reassessed daily by asking mother for grading and frequency of stools till improvement. Less than 3 stools of grade 1 per day were considered as improvement. Duration of diarrhea from both groups was recorded on a predesigned proforma.

Data was analyzed by using SPSS-14 for windows. Qualitative data i.e. sex was presented as percentage and frequency. Quantitative data (age and durations of diarrhea) were presented as mean, standard deviation and duration of diarrhea were compared by using independent sample t-test. A p-value of 0.05 or less was statically significant.
Results

The total number of patients included in the study was 200 (including both males and females) and they were divided in two equal groups A and B respectively. The mean age of the patients included in group A was 22.140 ± 10.556 months (range 6 - 60 months). There were 14% patients of age range of 6 - 12 months, 16% patients of age range of 13 - 24 months, 28% patient of age range of 25 - 36 months, 22% patients of age range of 37 - 48 months, and 20% patients of age range of 49 - 60 months. (Table 1)

Table 1. Distribution of patients by age (n=200)

<table>
<thead>
<tr>
<th>Age (months)</th>
<th>Group A</th>
<th></th>
<th>Group B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>6 - 12</td>
<td>14</td>
<td>14</td>
<td>27</td>
<td>27</td>
</tr>
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<td>13 - 24</td>
<td>16</td>
<td>16</td>
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<td>15</td>
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<td>25 - 36</td>
<td>28</td>
<td>28</td>
<td>21</td>
<td>21</td>
</tr>
<tr>
<td>37 - 48</td>
<td>22</td>
<td>22</td>
<td>17</td>
<td>17</td>
</tr>
<tr>
<td>49 - 60</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>22.140 ± 10.556</td>
<td></td>
<td>21.091 ± 9.977</td>
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<tr>
<td>p-value</td>
<td>0.381</td>
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<tr>
<td>Range</td>
<td>6 - 60</td>
<td></td>
<td>6 - 60</td>
<td></td>
</tr>
</tbody>
</table>

Patient's mean age included in group B was 21.091 ± 9.977 months [ranges from 6 - 60 months]. There were 27% patients of age range of 6 - 12 months, 15% patients of age range of 13 - 24 months, 21% patient of age range of 25 - 36 months, 17% patients of age range of 37 - 48 months, and 20% patients of age range of 49 - 60 months. Chi-square test was applied and there was no significant difference between the two groups (p > 0.05) (Table 1).

Patients were also distributed according to sex. There were 66% male patients in group A, while 35% patients were female. Female to male ratio was 1:1.63. In group B, there were 71% male patients, while 29% patients were female. Female to male ratio was 1:2.45. Chi-square test was applied and no significant difference was detected between the two groups (p > 0.301). (Figure. 1)
Figure 1. Distribution of patients by sex (n=200)

The mean duration of diarrhea in group A was 1.98 ± 1.31 days, while that in group B was 3.09 ± 1.64 days. Student's t-test was applied and difference between the two groups was found to be statistically significant (p < 0.05). (Table 2)

Table 2. The comparison of mean duration of diarrhea in two groups (n=200)

<table>
<thead>
<tr>
<th>Mean duration of Diarrhea</th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean ± SD</td>
<td>1.98 ± 1.31</td>
<td>3.09 ± 1.64</td>
</tr>
</tbody>
</table>

| p-value*                 | 0.004** |

Key:
SD Standard deviation
* Student’s t-test
** Not significant

Discussion

Probiotics are useful bacteria that can help in controlling the episodes of acute watery diarrhea. This study was a comparison of a probiotic lactobacillus, and yogurt in controlling the consistency of stools and their frequency to less than 3 in 24 hours. This was one of the largest prospective, randomized controlled trials so far, comparing the two preparations in a local Pakistani population including 200 children. The results of this study were in favor of yogurt and it was found that by its use there was decrease in the episodes of diarrhea. This was one of the larger studies including 200 children suffering from acute watery diarrhea comparing the lactobacillus with yogurt in terms of duration of diarrhea. In literature, there are only few studies on this context; however, the studies which directly compared the two treatment modalities are few.

In our study, the mean age of patients was 22.140 ± 10.556 months in group A and 21.091 ± 9.977 months in group B, while the mean age of the patients in study by
Makbule et al. 2010 [17] was 21.2 ± 28.2 months. In another study by Heydarian et al. 2010 [20], the mean age of patient was 2.5 ± 2.3 years. This difference in mean age of patient is mainly due the inclusion criteria adopted by different authors. Majority of the patients were male i.e. 62% in group A, and 72% in group B. In study by Heydarian et al. 2010 [20] male patients also predominated the female patients i.e. 57% patients were male and 43% were female. In another study by Eren et al, [17] 65% were male and 35 % were female.

Van Niel, 2002 [21] in his meta-analysis, focused on randomized and double blinded studies on different strains of Lactobacilli in 122 children. Those children, who had received antibiotics recently, were excluded from the study. It was found that Lactobacilli decreased the duration of diarrhea by 0.7 days. It was also noticed that the frequency of stools was reduced to 1.6 on day 2. Simakachorn et al. 2000 [22] conducted a study on 53 children comparing the lactobacillus with yogurt and observed lesser duration of diarrhea with treatment with bacillus (1.81 ± 1.08) days and with placebo (2.38 ± 1.51). Shornikova et al. 1997 [23] conducted a study on 46 children comparing outcome of yogurt with placebo. In this study, 21 patients received treatment with yogurt and 25 were controls. They found that duration of diarrhea was shortened in patients who were treated with yogurt (1.5 ± 1.1 days) as compared to controls (2.5 ± 1.5 days).

Billoo et al. 2006 [24] evaluated the efficacy of Sachromyces boulardi in children suffering from acute watery diarrhea in Pakistan. He concluded that the duration of acute watery was reduced in children given Saccharomyces Boulardii as compared to control group (n=50, 86.4 hours versus n=50,115.2 hours, respectively; P=0.001). Stool frequency on days 3 (P=0.01) and 6 (P=0.001) was also decreased in the group receiving Saccharomyces Boulardii.

Another study was conducted by Stefeno et al. 2000 [18] to compare the placebo with lactobacillus. Duration of watery diarrhea after enrollment was 3.0 ± 1.14 days in placebo versus 2.42 ± 1.15 days in lactobacillus group (mean ± SD; P=0.03) and in rotavirus-positive children, diarrhea lasted 3.19 ± 1.73 days in placebo versus 2.34 ± 0.7 days in lactobacilli group respectively (P < 0.008). The previous studies in literature have shown more improvement with probiotics as compared to placebo. However, when the two groups, one taking probiotics and other receiving yogurt were compared, it was found that there is improvement in the diarrheal episodes in the group taking yogurt.

The diarrhea in children may be improved due to strengthening of mucosal integrity of the intestine. Probiotic strains may adhere to receptors of epithelial cells of intestinal wall and protect it from offending microorganisms. So, absorptive defects of fluids and electrolytes and glucose are prevented. Probiotics also reinforce production of secretary IgA. The T cell activity may be enhanced by probiotics and decrease in chloride secretion of epithelial cells, causes cessation in diarrheal episodes. Probiotics may also exhibit some antimicrobial activity that can prevent offending organism from proliferation [25].

The action of probiotics takes few days to establish colonies and causing their potential effects. After reaching the optimal colonization, they reveal potential benefits like stimulation of immune system including antibodies secretion and anti-inflammatory effects.

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One of the limitations of the study was that it was conducted in an area where rich patients present in our tertiary care unit. So, it may not be a true representation of actual population of the Pakistan. This was not a double blinded study. Yogurt and probiotic sachet were physically different from each other.

Conclusion

Treatment with yogurt significantly improves the diarrheal episodes as compared to those children receiving probiotics. Hence, it is concluded that yogurt should be given to children suffering from acute watery diarrhea. To the best of our knowledge this is the first report for the said objectives in Lahore, Pakistan.

References


