ASSOCIATION OF BOTTLE FEEDING WITH ACUTE DIARRHOEA IN CHILDREN AGED 0-5 YEARS

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ABSTRACT

BACKGROUND
Diarrhoea is defined as the passage of three or more liquid or watery stools, weighing approximately 250 grams in the preceding 24 hours. Acute diarrhoea is defined as diarrhoea lasting for less than 7 days, but can persist up to 14 days. Chronic diarrhoea lasts for more than 14 days and is of non-infective origin. Persistent diarrhoea starts as an acute diarrhoea, but lasts for more than 14 days and is associated with a series of enteral infections. Protracted diarrhoea lasts for more than 14 days and is associated with malnutrition. According to WHO, UNICEF there are about 2 billion cases of diarrhoeal disease every year. Each child under the age of five experiences an average of 3 episodes of acute diarrhoea annually. Globally acute diarrhoea is the second leading cause of death after pneumonia. Lack of exclusive breast feeding and use of feeding bottles for feeding contribute as an important risk factor for acute diarrhoea.

MATERIALS AND METHODS
A total of 500 children aged 0 - 5 years with diarrhoeal episodes > 3/day, stools approximately > 250 cc admitted in the Paediatric Department in Rajarajeshwari Medical College and Hospital, Bangalore admitted from November 2014 to February 2016, a total of 15 months fulfilling the inclusion and exclusion criteria were considered for the study. Feeding pattern and in specific history of bottle feeding was enquired. History pertaining to the type of feed in bottle (cow milk or artificial feeds) were taken. History of acute diarrhoea in the past was considered. Association between past history of acute diarrhoea and bottle feeds were analysed.

RESULTS
In the present study, majority of the subjects were in the age group of 6 months to 2 years (62.8%). Incidence of acute diarrhoea was more in males (52.8%) than females (47.2%). Only 42.2% of the subjects were exclusively breast fed. Majority of them were on bottle feeds (82%) and among them 37.2% were on cow milk and the remaining 44.8% were on artificial feeds. Past history of acute diarrhoea was reported in 66.2% of the subjects.

CONCLUSION
Majority of the subjects had episodes of diarrhoea during the period of weaning and in those on bottle feeds indicating the role of artificial feeds and their preparation and method of administration as a causative factor. The criteria used for determining the risk factors and severity of dehydration was fairly accurate. Significant association between past history of diarrhoea and exclusive breast feeding, bottle feeding was reported in the present study. Hence, the incidence of acute diarrhoea can be reduced if the above mentioned risk factors are taken into consideration and prompt action is taken towards it.

KEYWORDS
Acute Gastroenteritis, Bottle Feeds, Exclusive Breast Feeding.


BACKGROUND
Diarrhoea ranks among top three killers of children in the developing world. Globally around one billion episodes of illness and 3 - 5 million deaths occur as a result of diarrhoeal disease each year. Eight out of ten of these deaths occur in the first two years of life. In developing countries on an average every child suffers 3.3 episodes of diarrhoea per year, but in some areas the average exceeds 9 episodes per year. In India children under 5 years of age suffer from 2 - 3 episodes of diarrhoea annually. In India 17% of all deaths in inpatients are diarrhoeal related. The high incidence of morbidity and mortality in diarrhoea is related to malnutrition, poverty, poor education, low socio-economic status, bad sanitary conditions, trends of early breast milk substituents and bottle feeding. Repeated attacks of diarrhoea also aggravate the compromised nutritional status of underprivileged children with a consequent increase in the susceptibility to infectious diseases. Hence, diarrhoea is an important contributing factor for malnutrition which in turn predisposes the child to further diarrhoea, thereby initiating a vicious cycle.

Age Incidence
Most of the diarrhoeal episodes occur during the first two years of life, especially between 7 - 12 months compared to other age groups and the difference is also statistically
significant. It is more especially in this age, because at this age wearing foods are introduced and the child is also exposed more to the environmental condition, as it starts crawling and walking. The next vulnerable age group was found to be 13 - 24 months (32.1%). The prevalence of diarrhoea was found to be only 17% in the age group 0 - 6 months, which probably reflects the protection offered by breastfeeding.[7] There were 57.6% diarrhoea cases in children of 7 - 12 months’ age group followed by 25.71% in those of 13 - 24 months’ age group; with increasing age the prevalence of diarrhoea gradually decreased.

**Sex Incidence**

The incidence of diarrhoea in males is around 64% and 36% in females. As a matter of fact, it is difficult to conceive of any valid explanation for a higher male incidence, except that males are more prone to all infections. It could possibly be attributed to our unfavourable social outlook, ignoring and neglecting, the ailments of female children and bringing mostly the boys to the hospital.

This requires periodic assessment of bacteriologic patterns of diarrhoea and therapeutic trials; not only to ensure effective therapy, but also to forestall its dreaded complications.

**Bottle Feeds**

It has long been established that bottle-fed children are at great risk of diarrhoea than those who are breastfed due to milk contamination. Even though it was not statistically significant in the multivariate analysis, the odds of bottle-fed children having diarrhoea was approximately one and a half times greater than for children who were not bottle fed. Bottle feeding was significantly related with higher diarrhoeal morbidity in bivariate analysis.[8] Stopping breast-feeding early has been recognised as one of the risks. Lack of Breast Feeding during first 4 - 6 months of life:

- Feeding patterns play an important role as shown by much higher incidence of diarrhoeal diseases in artificially fed infants than in exclusively breast fed infants.[9] Breast milk is the ideal food during the first 6 months of life, which is critical for the growth and development.

In this study, an attempt has been made to analyse the association between past history of acute diarrhoea and bottle feeds.

**Source of Data**

A total of 500 children aged 0 - 5 years with diarrhoeal episodes > 3/day, stools approximately > 250 cc admitted in the Paediatric Department in RajaRajeshwari Medical College and Hospital, Bangalore.

**Method of Collection of Data**

- Subjects presenting with episodes of acute diarrhoea fulfilling the inclusion and exclusion criteria were considered for data collection.
- Feeding pattern and in specific history of bottle feeding was enquired.
- History pertaining to the type of feed in bottle (cow milk or artificial feeds) were taken.
- History of acute diarrhoea in the past was considered.
- Association between past history of acute diarrhoea and bottle feeds were analysed.

**Duration of Study**

November 2014 to February 2016- total of 15 months.

**Inclusion Criteria**

- Patients/attenders giving consent, irrespective of sex to undergo the study.
- Patients with diarrhoeal episodes > 2/day, stools approximately > 250 cc in the preceding 24 hours.
- Patients aged between 0 - 5 completed years.
- All types of diarrhoeal episodes (viral/bacterial)

**Exclusion Criteria**

- Patients with severe systemic illness preventing participation in the study.
- Patients not willing to undergo the study.
- Patients more than 5 years.
- Patients with malabsorption syndrome, chronic, persistent diarrhoea.

**Statistical Analysis**

Data was entered into Microsoft Excel data sheet and was analysed using SPSS 22 version software. Categorical data was represented in the form of frequencies and proportions. Chi-square test was used as test of significance for qualitative data.

Continuous data was represented as mean and standard deviation. Independent ‘Y’ test or Mann-Whitney U test was used as test of significance to identify the mean difference between two quantitative variables and qualitative variables respectively.

ANOVA (Analysis of Variance) or Kruskal-Wallis test was the test of significance to identify the mean difference between more than two groups for quantitative and qualitative data respectively.

**Graphical Representation of Data**

MS Excel and MS Word was used to obtain various types of graphs, such as Bar diagram and Pie diagram.

P value (probability that the result is true) of < 0.05 was considered as statistically significant after assuming all the rules of statistical tests.

**Statistical Software**

MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyse data. Epi Info (CDC Atlanta), Open Epi, MedCalc and Medley’s desktop were used to estimate sample size, odds ratio and reference management in the study.

**RESULTS**

<table>
<thead>
<tr>
<th></th>
<th>Count</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breast Feeding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exclusive Breast Feeding</td>
<td>211</td>
<td>42.2%</td>
</tr>
<tr>
<td>No Exclusive Breast Feeding</td>
<td>289</td>
<td>57.8%</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 1. Exclusive Breast Feeding among the Subjects

<table>
<thead>
<tr>
<th>Bottle Feeding</th>
<th>Count</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow milk</td>
<td>186</td>
<td>37.2%</td>
</tr>
<tr>
<td>Artificial</td>
<td>224</td>
<td>44.8%</td>
</tr>
<tr>
<td>No bottle feeds</td>
<td>90</td>
<td>18.0%</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 2. Bottle Feeding among Subjects
In the study, 37.2% of them were bottle fed with cow milk and 44.8% were bottle fed with artificial feeds and 18% were not bottle fed.

<table>
<thead>
<tr>
<th>Past History of Age</th>
<th>Yes</th>
<th>No</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count %</td>
<td>Count %</td>
<td>Count %</td>
</tr>
<tr>
<td></td>
<td>331 66.2</td>
<td>169 33.8</td>
<td>500 100</td>
</tr>
</tbody>
</table>

Table 3. Past History of Acute Gastroenteritis among the Subjects

<table>
<thead>
<tr>
<th>Bottle Feed</th>
<th>Past History of Acute GE</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count %</td>
<td>Count %</td>
</tr>
<tr>
<td>Yes</td>
<td>410 82</td>
<td>331 66.2</td>
</tr>
<tr>
<td>No</td>
<td>90 18</td>
<td>169 33.8</td>
</tr>
<tr>
<td>Total</td>
<td>500 100</td>
<td>500 100</td>
</tr>
</tbody>
</table>

Table 4. Association between Past History of Acute Gastroenteritis and Bottle Feeding in Subjects

In the Present Study Majority of the Subjects were in the Age Group 6 Months to 2 Years (62.8%):

- Incidence of acute diarrhoea was more in males (52.8%) than females (47.2%).
- Only 42.2% of the subjects were exclusively breast fed.
- Majority of them were on bottle feeds (82%) and among them 37.2% were on cow milk and the remaining 44.8% were on artificial feeds.
- Past history of acute GE was reported in 66.2% of the subjects.

DISCUSSION

Age Distribution

In the present study, 72.2% of the subjects were below 2 years of age. Among them 9.4% were < 6 months, 62.8% were between 6 months and 2 years and 27.8% were between 2 - 5 years. Higher incidence during the first 2 years was also reported by Arora and Poltowalla(6) (1955) 72%, Sood(9) (1963) 91%.

The high incidence of diarrhoeal disease in the first 2 years of life can be related to faulty feeding, unhygienic handling and storage of milk, food and water, higher incidence of malnutrition, development of mouthing habits at this age.

Immaturity of the immune system of the body rendering it susceptible to an attack by the enteric pathogens, especially in association with malnutrition is also a contributory factor.

Sex Distribution

In the present study, the male-to-female ratio was estimated as M: F= 1.11: 1. Similar observations were made by Victor Cardens et al(10) 1993 (M: F= 1.07), Karmarkar et al(11) 1983 (M: F= 1: 0.83).

Feeding Pattern

In the present study, bottle feeds were reported in 82%. Among them 37.2% were on cow milk and 44.8% were on artificial feeds concluding that children on artificial feeds were at a higher risk for acute diarrhoea and may be attributed to the storage of milk in the bottles.

Manchanda and Arora(12) (1958) have reported that 31.2% of the children with diarrhoea were breast fed and 60.8% were on artificial feeds with or without breast milk. Sood (1963) reported 23% and 77% respectively. Naruka BS et al(13) reported 32.5% and 67.5% respectively.

<table>
<thead>
<tr>
<th>Study</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bottle Fed</td>
</tr>
<tr>
<td>Manchanda and Arora</td>
<td>68.8</td>
</tr>
<tr>
<td>1958 (13)</td>
<td></td>
</tr>
<tr>
<td>Sood</td>
<td>77</td>
</tr>
<tr>
<td>1963</td>
<td></td>
</tr>
<tr>
<td>Naruka BS</td>
<td>67.5</td>
</tr>
<tr>
<td>Present Study</td>
<td>82</td>
</tr>
</tbody>
</table>

Table 5. Comparison of Bottle Feeds and exclusive Breast Feeding among other Studies

Past History of Acute Gastroenteritis

In India, every child suffers 2 - 3 episodes of diarrhoea annually.(4) These can be attributed to certain risk factors like bottle feeds, failure to exclusively breast feed the child for 6 months, poor personal hygiene, poor socioeconomic status, poor sanitation and the high possibility for the risk of contamination of water. In the present study, 66.2% of the subjects had a previous history of acute diarrhoea, thereby requiring adequate measures to reduce the possible risk factors.

CONCLUSION

Majority of the subjects had episodes of diarrhoea during the period of weaning and in those on bottle feeds indicating the role of artificial feeds and their preparation and method of administration as a causative factor. The criteria used for determining the risk factors and severity of dehydration were fairly accurate. Significant association between past history of acute diarrhoea and exclusive breast feeding, bottle feeding was reported in the present study.

Hence, the incidence of acute diarrhoea can be reduced if the above mentioned risk factors are taken into consideration and prompt action is taken towards it.

REFERENCES


