A POPULATION BASED STUDY OF ACUTE DIARRHOEA AMONG CHILDREN UNDER 5 YEARS IN A RURAL COMMUNITY IN SOUTH INDIA

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ABSTRACT:

Aim of the study

To estimate the prevalence of acute diarrhoea in children under 5 years in a rural population and to study the different modalities of treatment adopted by the mother and family members. The other objective is to find out association between certain risk factors and diarrhoea among children under 5 years.

Methodology

Five hundred and ten under 5 children were selected from Poonamallee block of Thiruvallur District in Tamil Nadu, by Cluster sampling method. Background information, details of acute diarrhoea and treatment modalities were obtained among the respondents of under 5 children. Any child having acute diarrhoea at the time of interview or had acute diarrhoea in the preceding 2 weeks was taken as a case of acute diarrhoea.

Results

The prevalence of Acute diarrhoea was found to be 22.5% (95% CI 17.4% - 27.6%). The prevalence of acute diarrhoea among males and females were 21.4% and 23.8% respectively. The difference in prevalence of acute diarrhoea among male and female children was small and the difference was not statistically significant ($p > 0.05$). Children in the age group 7-12 months had the highest prevalence of diarrhoea to the extent of 40.7% followed by the age group 13-24 months and 0-6 months. The age group 25 months and above had the lowest prevalence. The difference in the prevalence of diarrhoea in different age groups was found to be statistically significant ($P < 0.001$). Oral Rehydration Therapy use rate was found to be 65.2% (95% CI 56.5 – 73.9). The percentage of use of ORT in children who had diarrhoea was found to be higher with increase in the age of the child, though not statistically significant. There was no marked difference in ORT use among male and female children.

Conclusion

The prevalence of acute diarrhoea among under 5 children was found to be 22.5 % and the most vulnerable age group was 7-12 months which corresponds to the time of weaning. The ORT use rate was found to be 65.2% much higher than other studies. The ORT use rate was higher among literate mother.

Key Words

Acute Diarrhoea, Under Five Children, Oral Rehydration Therapy and Population based study.

SRJM 2009; 1 (1): 1 - 7

INTRODUCTION:

The challenge of the time is to study child health in relation to community, social values and social policy[1]. Child health has been given greatest priority over the years both at National level and at State level[2]. However, acute diarrhoea continues to be one of the main health problems in children. One in four deaths in children under the age of 5 years is estimated to be due to diarrhoea[3]. One out of ten babies born in developing countries fails to reach its fifth birthday falling victim to diarrhoeal diseases[3]. The high mortality and morbidity due to diarrhoeal diseases can be markedly reduced by Oral Rehydration Therapy (ORT) which includes proper home management with Home Available Fluids (HAF) and Oral Rehydration Salt solution (ORS) and by continuing usual feeding. The Oral Rehydration Therapy is rightly considered as one of the important medical advances of the 20th century in terms of simplicity and scope to save lives[4].

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The prevalence of diarrhoea varies from place to place[5]. The community practices relating to ORT and other treatment modalities also vary from place to place[6]. It is important to know the prevalence of diarrhoea in children in different populations and how the mother and other family members respond in treating the child with diarrhoea. This may help in planning appropriate preventive measures for effectively reducing mortality and morbidity due to diarrhoea in children. In view of this a population based study of acute diarrhoea among children under-5 years and ORT was taken up in one of the rural populations in Tamil Nadu.

MATERIAL & METHODS:

This population based cross sectional study was done in Poonamallee block of Thiruvallur district in Tamilnadu. The study population included the under 5 children residing in the Poonamallee block. The Poonamallee block has 160 villages, 34460 house holds and a total of 13790 under 5 children. Cluster sampling method was used for selecting the under-5 children as study subjects from the above study population. Based on the assumption of 20% as prevalence of acute diarrhoea in under 5 children and with an alpha error of 5%, and limit of accuracy of 25% of prevalence and a design effect of 2, the minimum sample size required for the study was found to be 492. Thirty clusters were selected by probability proportionate to size (PPS) method[7]

and 17 under 5 children were selected from each cluster to obtain a total sample of 510 under 5 children for this study.

Selection of Village Clusters and under 5 Children

A list of all the villages and their population in Poonamallee block was first obtained. Adjoining villages with very small populations were clubbed together so that each village cluster had atleast 1000 population. This reduced the 160 villages to 105 village clusters. From the 105 clusters, 30 clusters were selected by PPS sampling method [7]. In each selected village cluster, first house was selected randomly[7]. In the selected house, it was inquired, if there is a child below 5 years. If the family has a child under-5 years relevant data were collected. If not the interviewer moved to the next adjoining house. Similarly adjoining houses were visited in the same direction, till 17 under 5 children were studied. By the same method 17 under five children were studied in each of the 30 clusters for a total 510 under 5 children.

Data Collection

A brief introduction was given to the respondents regarding the purpose of study, if a child under 5years was present in the house. After getting the informed consent orally, relevant information about the under 5 child in the family was obtained from the respondent using a pretested structured questionnaire in the local language. If there were more than one child in the family, one of them was chosen randomly. The environmental conditions of the household were also surveyed. Any of the selected children having acute diarrhoea at the time of interview or had acute diarrhoea in the preceding 2 weeks was taken as a case of acute diarrhoea for this study. The weights of the children were measured and on the basis of IAP Classification, they were classified as undernourished and normal. The duration of breast feeding were also collected from children less than 18 months.

Analysis

Data entry and analysis were done using SPSS-8.0 software. Prevalence of diarrhoea and 95% confidence interval (C.I) were calculated. The 95% C.I was corrected for the design effect of cluster sampling by multiplying the variance by a factor of 2. The association between risk factors and diarrhoea was estimated by odds ratio and 95% CI calculated. Adjusted odds ratios were calculated by using logistic regression. Percentages were calculated for ORT use.

Definition of terms used:

Acute Diarrhoea

Acute Diarrhoea is sudden onset of passage of loose liquid or watery stools which usually lasts 3 - 7 days but may last upto 10 - 14 days.

Literacy

A person is deemed as literate if he or she can read or write with understanding in any language.

RESULTS:

Using cluster sampling method, 510 under 5 children were selected. There was no refusal to take part in the study. Among the selected under 5 children 52.2% were males. The mean age was 25.7 months ranging from 2 months to 59 months. Almost 50% children were in the age group 25 months and above (Table 1). A large proportion of the selected children (80%) belong to nuclear family, the average size of the family was 3.2 ranging from 1 to 4. Based on Gupta's socio economic classification[8], a large proportion of selected children (56.5%) belong to Class IV. Majority of the respondents for the study were mothers (75.5%) followed by grand parents (19.8%) and the rest were brothers, sisters and others.

Table1: Age and Sex Distribution of Children

Age in months	*Male n (%)*	*Female n (%)*	*Total n (%)*
0-6	27 (5.3)	20 (3.8)	47 (9.1)
7-12	32 (6.3)	27 (5.3)	59 (11.6)
13-24	80 (15.7)	82 (16.1)	162 (31.8)
25 & Above	127 (24.9)	115 (22.6)	242 (47.5)
TOTAL	266 (52.2)	244 (47.8)	510 (100.0)

Birth Weight, Feeding and Weaning

Particulars about birth weight could be collected reliably only from 62.6% of respondents. The mean birth weight was 2.6 kg (S.D. 0.4) with a minimum of 1.7 kg to a maximum of 4.1 kg. The proportion of low birth weight (< 2.5 kg.) was found to be 28.2%. The information about breast feeding was obtained for children less than 18 months (n = 203). The mean duration of breast feeding was 10 months ranging from 1 month to 18 months. The details about weaning was obtained for the children belonging to age group 5 – 18 months (n = 180). The mean age of commencement of weaning was 6 months with a minimum of 5 months and a maximum of 9 months.

Status of Immunization, Vitamin–A Supplementation and Malnutrition

Immunization status was obtained from children between 1 - 2 years (n = 162). The children fully immunized were 88.9% and the remaining 11.1% were partially immunized. Information about vitamin A supplementation was obtained from children between 6 - 60 months (n = 463). Among them vitamin A supplementation was given to 79.1% of children within preceding 6 months. Based on IAP classification[9] (weight for age) 23.1% of children were undernourished.

Environmental hygiene

Based on per capita floor area, 58.2% of houses were found to be overcrowded. Sanitary latrine was available only in 25.5% of houses. Most of the houses had public source of water supply which was boiled for consumption constituted to 76.9% and sanitary disposal of garbage was resorted to only in 29.8% of houses. Based on the personal habits of hand washing with soap before preparing food and feeding the child, the personal hygiene was satisfactory in only 18.2% of respondents.

Prevalence of Acute Diarrhoea

Out of the 510 under 5 children, 115 had acute diarrhoea within 2 weeks at the time of interview and the prevalence of acute diarrhoea was found to be 22.5% with 95% confidence interval from 17.4% to 27.6%. Prevalence of diarrhoea among children below 4 years and below 3 years were 23.9% and 26.4% respectively. Among males the prevalence of acute diarrhoea was 21.4% and among females it was 23.8%. The difference in prevalence of acute diarrhoea among male and female children was small and the difference was not statistically significant ($p > 0.05$).

Children in the age group 7-12 months had the highest prevalence of diarrhoea to the extent of 40.7% followed by the age group 13-24 months and 0-6 months. The age group 25 months and above had the lowest prevalence. The difference in the prevalence of diarrhoea in different age groups was found to be statistically significant ($P < 0.001$). The prevalence of diarrhoea in different age group and sex is given in Table 2. The Mean duration of diarrhoea was 3 days with a minimum of 1 day and a maximum of 5 days. The average number of times of diarrhoea per child per day was 5 with a minimum of 3 and a maximum of 10. The percentage of children who did not have any other symptom during diarrhoea was 62.6%. Among those who had symptoms, 26.9% had vomiting, 25.2% had fever, and 6.1% of children had stools mixed with blood and mucus.

Table 2: Prevalence of Diarrhoea by Sex and Age

		Prevalence of Diarrhoea in Percentages
Sex	Males	21.4
	Females	23.8
	$X^2_1 = 0.4, p > 0.05$	
Age group in months	0 - 6	17.0
	7 - 12	40.7
	13 - 24	32.1
	25 & Above	12.8
$X^2_3 = 33.5, p < 0.001$		

Acute Diarrhoea and Risk Factors

Birth weight could be obtained reliably only for 319 under 5 children and it was found that children with birth weight below 2.5 kgs, had 2.1 times greater risk for diarrhoea which was also statistically significant. There were 162 children in the age group 1-2 years. Among them it was found that partially immunized children had 4.6 times higher risk for acute diarrhoea which was also statistically significant. There were 463 children in the age group 6 to 60 months and those who did not take any dose of Vitamin A supplementation had statistically significant higher risk for acute diarrhoea (OR 7.4). Children who were under-nourished had higher risk for acute diarrhoea (OR 14.4). Details given in Table 3.

Where the personal hygiene of the mother or respondent was not satisfactory, the risk of acute diarrhoea was higher (OR 3.2). Similarly under-5 children living in overcrowded houses, living in houses with insanitary garbage disposal, insanitary excreta disposal and with poor water supply had higher risk for acute diarrhoea. All the higher risks found were statistically significant. Details are given in Table 3. Even after adjustment by logistic regression analysis low birth weight, partial immunization, under nourishment and unsatisfactory personal hygiene were found to have statistically significant higher risk for acute diarrhea among under-5 children (Table 4). Since Vitamin A supplementation is a part of nutritional status and personal hygiene is closely related to disposal of excreta and garbage, they were not included in the logistic regression analysis.

ORT Use in Acute Diarrhoea

The number of under 5 year children who received some form of fluid therapy as HAF/ORS during acute diarrhoea along with one or other type of diet was 75 with an ORT use rate of 65.2% (95% CI 56.5 – 73.9). The percentage of use of ORT in children who had diarrhoea was found to be higher with increase in the age of the child, though not statistically significant. There was no marked difference in ORT use among male and female children. The use of ORT was much higher (75.6%) when the mother was literate compared to when the mother was illiterate (43.2%) and the difference was also statistically significant. Details are given in Table 4.

Among currently breast fed children (117), 59 children (50.4%) had diarrhoea and among them breast feeding was continued only in 35 children (59.3%) during diarrhoea. Regarding the diet during diarrhoea, 80% of children received bread, followed by rice kanji (63.9%), milk (57.5%), biscuit (48.8%) and idly (41.25%).

Drugs and Home Remedies Given to Children During Acute Diarrhoea

Out of 115 children who had acute diarrhoea, 74.8% received tablets, 42.6% Suspension, 40% Injections and 7.8% I.V.fluids. The percentage of children who did not receive any drug, but only ORS was 25.2.

Table 3: Association between risk factors and acute diarrhoea in under 5 children

		Diarrhoea		Odds Ratio	95% CI	p value
		Present n	Not Present n			
Birth weight						
N = 319	< 2.5 kgs	38	52	2.1	1.2- 3.6	< 0.05
	> 2.5 kgs	60	169			
Immunization						
1-2 yrs n = 162	Partially Immunised	12	6	4.6	1.5-4.7	< 0.01
	Fully Immunised	44	100			
Vitamin A Supplementation						
6- 60 monthsN = 463	Not Received	54	43	7.4	4.4- 2.6	< 0.001
	Received	53	313			
Nutrition						
	Undernourished	74	44	14.4	8.5- 4.4	< 0.001
	Normal	41	351			
Personal Hygiene						
	Unsatisfactory	106	311	3.2	1.5 - 7	< 0.01
	Satisfactory	9	84			
Overcrowding						
	Yes	88	209	2.9	1.8- 4.8	< 0.001
	No	27	186			
Garbage Disposal						
	Insanitary	102	256	4.3	2.2-8.3	< 0.001
	Sanitary	13	139			
Source of Water Supply						
	Public Tap& Well	101	291	2.6	1.4- 4.9	< 0.001
	House Tap & Well	14	104			
Excreta Disposal						
	Insanitary	103	277	3.7	1.9- 7.3	< 0.001
	Sanitary	12	118			

DISCUSSION:

This study has shown that the prevalence of acute diarrhoea among under-5 children in the rural population (Poonamallee block) is high to the extent of 22.5% which once again reinforces the fact that acute diarrhoea in children is an important health priority and that every effort has to be taken to control and prevent acute diarrhoea and its sequale. The 95% confidence interval for the prevalence of acute diarrhoea is quite precise (17.4-27.6) indicating good internal validity for the study. There are few studies done on prevalence of acute diarrhoea in under-5 children in different parts of India and outside India. A study done in Bhopal by S.C. Tiwari et al has reported a prevalence of acute diarrhoea among under 5 children as 27.4% which is little higher than the present study[10]. The study done in Aligarh of Uttar Pradesh by Ansari et al has reported a prevalence of 16%. The study by Ansari et al relates to the patients attending the clinics under Rome scheme which may not be representative of the population[11]. A study done in East Africa by Mtike has reported 18% as prevalence of diarrhoea among children both in rural and urban population[12].

National Family Health Survey – I (NFHS I) was done in the year 1992 and. NFHS–II was done after about 6 years in 1998-99.In both NFHS surveys prevalence of diarrhoea was calculated as percentage of children who had diarrhoea at the time of interview or during the preceding 2 weeks as done in this study. NFHS – 1 has reported prevalence of diarrhoea for children under-4 years and NFHS-II has reported it for children under-3 years. For rural Tamil Nadu the prevalence of diarrhoea for children under 4 years was 12.9%[13] and for children under 3 years it was 14%[14] as per NFHS I and II respectively. The present study in Poonamallee

Table 4 : Association Between Risk Factors And Acute Diarrhoea In Under 5 Children After Adjustment

Background Characteristics	Adjusted Odds ratio	95% CI	p-Value
Birth weight (kg) <2.5 >2.5+	3.2	1.2-8.6	**< 0.05**
Immunization status Partial Complete+	10.4	1.4-74.8	**< 0.05**
Nutritional status Under nourished Normal+	10.1	3.9-26.2	**< 0.005**
Sources of water Public tap and well House tap and well+	2	0.6-6.8	> 0.05
Personal hygiene Unsatisfactory Satisfactory+	7.0	1.5-33.6	**< 0.05**
Over crowding Yes No+	1.5	0.6-4.0	> 0.05
'+' Reference category			

Table 5: ORT use by Socio Demographic Variables

	ORT given in Percentage	p Value
Age in months		
0 - 6	50.0	>0.05
7 - 12	54.2	
13 - 24	65.4	
25 & Above	77.4	
Sex		
Male	63.2	>0.05
Female	67.2	
Educational Status of Father		
Illiterate	56.7	>0.05
Literate	68.2	
Educational Status of the Mother		
Illiterate	43.2	>0.05
Literate	75.6	

block has found much higher prevalence of diarrhoea in children under 4 years (23.9%) and in children under-3 years (26.4%). This may be because the present study was done during peak season for diarrhoea (April to August) or because the study population is more vulnerable and has higher prevalence of diarrhoea compared to the overall prevalence in rural Tamil Nadu.

The present study has shown a very high prevalence of acute diarrhoea (40.7%) in the age group 7 - 12 months, compared to other age groups (Table 2) and the difference is also statistically significant. This may be because at this age, weaning 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. Similar trend is reported in NFHS II in which the prevalence of diarrhoea is reported as highest in the age group 7-12 months (17%) followed by 13-24 months (8.6%)[14] though the prevalence reported are much lower.

The prevalence of diarrhoea was found to be only 17% in the age group 0-6 months which reflects probably, the protection offered by breast feeding. Though female children had slightly higher prevalence of acute diarrhoea (23.8%) than males (21.4%), the difference is not statistically significant. A similar pattern is seen in the NFHS I study report, where the females have slightly higher prevalence[13]. However in NHFS II the prevalence of acute diarrhoea in males (14.7%) is reported slightly higher than females (14%)[14].

Acute Diarrhoea and Risk Factors

Partially immunised children had higher risk for diarrhoea (OR 4.6) compared to fully immunised children. (Table 3) This is obviously due to the protective effect of immunization especially with reference to measles immunization[15]. The percentage of fully immunised children in the study population was 88.9%. Improving immunization coverage will help to reduce the burden of illnesses due to diarrhoea in children. Those children who did not take any dose of vitamin A supplementation within preceding 6 months had 7.4 times higher risk for acute diarrhoea compared to those who had vitamin A Supplementation. It lays emphasis on the concept that Vitamin A is protective of the intestinal epithelium[16]. The vitamin-A supplementation coverage found in the study population was 79.1%. Improving the vitamin-A supplementation coverage will definitely help in reducing the burden of illnesses due to diarrhoea in children. The under-nourished children had 14.4 times higher risk for acute diarrhoea than normal children. This is in conformity with the statement made by international centre for Diarrhoeal Disease Research in Bangladesh that diarrhoea is common in malnourished children[17]. The prevalence of under nutrition in the study population was 23.1%. It is very important to prevent under nutrition by proper implementation of the various nutritional programmes for reducing the problem of diarrhoea in children.

As expected the study has shown that good personal hygiene has a protective effect against diarrhoea (Table 3). Similar observations have been found in a study done in Yavatmal by Khadse et al who have stated that hand washing with soap and water after defecation and before feeding had a protective value against diarrhoea[18].The risk of diarrhoea was 4.3 times more where insanitary practices of garbage disposal was observed (Table 3) compared to children whose family followed sanitary disposal of garbage. This may be due to increased fly nuisance affecting food hygiene at the family level. Similar observations have been made by this study that children living in over crowded houses and in insanitary condition have higher risk of diarrhoea.

One of the important objectives of diarrhoeal diseases control programme is to increase the use of ORT to prevent death due to diarrhoea as a result of dehydration. The Tamil Nadu state Plan of Action fixed 100% as the target to be achieved for ORT use in Tamil Nadu by 2000 A.D[19]. The ORT use was 27.1% and 23.1% for Tamil Nadu in the year 1991 and 1995 respectively. ORT use increased to 45.4% by the year 1998-1999 showing great improvement in the use of ORT in Tamil Nadu[19]. The present study which was done in the Poonamallee block found ORT use as 65.2% indicating that the trend in increasing use of ORT is probably continuing in Tamil Nadu.

This study has found that ORT use was much higher (75.6%) when the mother was literate compared to (43.2%) when the mother was illiterate and the difference is statistically significant. This shows that improving female literacy will further increase ORT use also. This study found that a major source of ORS as a single entity was private practitioners. Hence it is important to have continuing medical education for them, regarding correct composition and use of ORS through Indian Medical Association and other professional bodies.

Although antibiotics may be useful in reducing the duration and volume of diarrhoea in specific bacterial infection, use of antibiotics and other anti diarrhoeal drugs are not generally recommended for treatment of childhood diarrhoea. However, this study has found that 74.8%, 42.6% and 40% of children who had acute diarrhoea received tablets, Suspensions and injections respectively. NFHS II also found that 41% of children who had diarrhoea received pills or syrup and 28% received injections[14].

The other important unsound practice found in the study population was that 40.7% of mothers who were breast feeding the children did not continue to breast feed them when the children had acute diarrhoea. This may be because of the wrong belief, that intake of milk would further aggravate diarrhoea in children. The above findings indicate poor knowledge about proper treatment of diarrhoea not only among mothers and family members. The results underscore the need for informational programmes for mothers that emphasizes the importance of ORT, increased fluid intake, and continuing feeding.

Key Messages

The prevalence of acute diarrhoea is found to be 22.5% in children under 5 years in a rural population in Tamil Nadu & the most vulnerable age group is 7-12 months. The ORT use rate is found to be 65.2% much higher than found in other studies. ORT use is higher when the mother is literate. Practice of hand washing is a cost effective measure in preventing diarrhoea.

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