e-ISSN: 0976-822X

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2020; 12(2); 41-48

Original Research Article

TRENDS AND DETERMINANTS OF ACUTE DIARRHEAL DISEASES IN CHILDREN UNDER FIVE: A COMMUNITY-BASED PROSPECTIVE LONGITUDINAL STUDY

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Received: 10-11-2019/ Revised: 05-12-2019/ Accepted: 08-01-2020
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Conflict of interest: Nil

Abstract

Background: Acute diarrheal diseases (ADD) contribute significantly to preventable childhood mortality in India, particularly among children under five, who are more vulnerable to dehydration and complications.

Materials and Methods: A community-based, prospective, longitudinal study was conducted in an urban area of Goa. A total of 100 children and their mothers were enrolled through a stratified random sampling technique. House-to-house visits were conducted every three months, and mothers were interviewed using a pre-tested, semi-structured questionnaire. The study was conducted over 6 months, from August 2019 to February 2020. Data were entered and analyzed using SPSS software version 22. Statistical tests such as Student's t-test and Chi-square test were applied.

Results: The incidence of ADD was 0.124 episodes per child per year. A significant association was found between ADD and socio-demographic factors such as child's sex, birth order, birth weight, immunization status, malnutrition, maternal age, maternal education, and hygiene practices.

Conclusions: Educating mothers on timely treatment-seeking behavior, home-based management of diarrhea, the use of ORS and zinc supplementation, and the importance of hygiene practices—such as handwashing—should be emphasized to reduce the burden of ADD in children under five.

Keywords: Incidence of ADD, risk factors, treatment-seeking behaviour, under five children.

Introduction

Diarrhoea is defined as "the passage of three or more loose or liquid stools per day or more frequently than is normal for the individual [1].

Acute watery diarrhoea is "characterized by the sudden onset of watery, loose stools without visible blood, lasting less than two weeks [2]. Dysentery is "defined as diarrhoea containing blood and mucus in the faeces [3]. Chronic diarrhoea "refers to persistent diarrhoea that lasts for an extended period and is often due to non-infectious causes [3].

Diarrhoeal diseases remain a major public health concern, ranking as the third leading cause of death among children under five years old, responsible for approximately 300,000 child deaths annually in India [4,5]. NFHS-5 (2019–2020) further documented a diarrhoea prevalence of

3.2% (2.1% in urban areas and 5% in rural areas [6]. The majority of diarrhoeal cases result in mild to moderate dehydration and can be effectively managed at home with adequate fluid intake.

Since mothers are typically the primary caregivers, their knowledge of diarrhoea transmission, feeding practices during episodes, and health-seeking behaviour is crucial for effective disease management and prevention [7].

This study aims to supplement existing epidemiological data on acute diarrhoeal diseases (ADD). Our literature review indicates a scarcity of published studies on ADD in, particularly on its incidence and associated risk factors in children. To bridge this gap, we conducted this study in a tertiary care hospital to measure the incidence of ADD, identify associated risk factors, and assess the health-seeking behaviours of mothers.

Methodology:

This community-based prospective longitudinal study was conducted to estimate the incidence of acute diarrhoeal diseases (ADD) among children under five years of age. The study was carried out in community medicine department at Al Falah School of Medical Sciences & Research Centre Faridabad.

Ethical approval for the study was obtained from the Institutional Ethics Committee (IEC). Informed consent was obtained from all participating mothers before enrolment.

Study Population and Inclusion Criteria: Children under five years of age, along with their mothers, were enrolled in the study if they met the following criteria:

Residency: Children who had been residing in Faridabad for the past 12 months.

Consent: Mothers who provided informed consent for participation.

Exclusion Criteria

- Mothers with children experiencing ongoing diarrhoea at the time of enrolment.
- Cases with language barriers that could hinder communication.
- Children who were severely ill.
- Children with chronic diarrhoea (lasting more than 14 days).
- Children with gastrointestinal anomalies, congenital metabolic disorders, or absorption disorders.

Sampling Technique

A. **stratified sampling technique** was used to select study participants, ensuring a representative distribution of children across different demographic groups. A total of 100 children and their mothers included in the study.

Data collection: We designed a study proforma, which was tested through a pilot study and subsequently modified based on the results. Data collection was conducted by interviewing mothers using the finalized proforma. Child-mother pairs were selected through stratified sampling, with every second household considered for enrollment. From each selected household, one child-mother pair was chosen. Anthropometric measurements were taken using tools such as a weighing machine, stadiometer, infantometer, and growth charts.

We conducted follow-ups with each child-mother pair to monitor the occurrence of diarrhea and contacted them monthly via phone to track any hospital admissions. A list of children under five years old, obtained from the Anganwadi worker, served as the sampling frame. Within each stratum, every second household was selected for participation. If a selected family could not be contacted after two attempts, the next household was considered.

The study assessed various variables, including the child's age, gender, mother's education status, socio-economic status (SES), per capita income, number and

frequency of diarrheal episodes, feeding and cooking practices, weaning history, immunization status, hygiene practices, and knowledge of oral rehydration solution (ORS) and home-based fluids. A physical examination of the child included measurements of weight, height, expected weight and height, mid-arm circumference (MAC), and an assessment of the respiratory, cardiovascular, and abdominal systems.

Statistical analyses

Data entry was performed using Epi Data Client Entry and analyzed using SPSS version 22. The incidence rate, along with a 95% confidence interval (CI), was calculated. Statistical analyses included Student's t-test and the Chi-square test, with a p-value <0.05 considered statistically significant.

Results

The study included 100 children under the age of five and their mothers, representing diverse groups based on religion, education status, income level, and residential status (residents and migrants). Among the children, 52.8% were male and 47.2% were female. Almost 22.4% children belonged to 6–14 and 23–31 months of age. About 16% were between 32 and 40, and 14.8% were between 41 and 48 months of age. The mean age of children was found to be 28.26 ± 15.35 months. Majority (54%) were first-order born children, 36% were second-order born children, and 10% were third-order born children. Majority (49.2%) of children belonged to SES class 3, followed by 20.8% belonged to SES class 2, and 12% belonged to class 4. Majority of children (70%) belonged to nuclear family, 22.4% children belonged to joint families, and 7.6% children belonged to three generation family.

The mean age of the mothers was 28.57 ± 4.704 years, ranging from 20 to 43 years. The largest proportion (32%) fell within the 30–32-year age group, while 29.6% were aged 25 years or younger. Regarding religious affiliation, the majority (66.8%) were practicing Hindus, followed by Christians (24%), Muslims (6.4%), and others (2.8%). In terms of education, 35.6% of mothers had completed high school, while 18.8% held a graduate degree. Only 2.8% had pursued postgraduate studies, whereas 8% were illiterate. With respect to employment, 76% of the mothers were homemakers, while 24% were engaged in paid work.

Out of the 100 children enrolled in the study, 31 developed acute diarrheal disease (ADD). The incidence of ADD was 0.124 episodes per child per year (95% CI: 0.102–0.146). The attack rate was 15.2% (95% CI: 12.9–17.4), and the cumulative incidence was 124 episodes per 1,000 children per year (95% CI: 123.95–124.04). A total of four house visits were conducted during the study period (Table 1).

Table 1: Incidence rate of acute diarrhoeal diseases (ADD)

Sr. No	Magnitude of Diarrhoea	Magnitude	95% CI
1	Incidence Rate	0.124	0.102-0.146
2	Attack Rate (Percent)	15.2%	12.9-17.4
3	Cumulative Incidence (per 1000 children per year)	124	123.95- 124.04

Risk Factors Associated with Acute Diarrheal Disease (ADD) Among Children: The mean age of mothers whose children developed ADD was 26.77 ± 4.917 years, while mothers of children without ADD had a mean age of 28.83 ± 4.628 years. The occurrence of ADD was higher among children of younger mothers, and this association was found to be statistically significant. Children whose mothers had a mean age of 28.83 ± 4.628

years did not develop ADD (95% CI: 28.21–29.44). In contrast, children whose mothers had a mean age of 27.80 ± 4.916 years experienced one episode of ADD (95% CI: 25.77–29.83), while children whose mothers had a mean age of 22.50 ± 1.378 years had multiple episodes (95% CI: 21.05–23.83). Our findings indicate that children of younger mothers were more likely to experience multiple episodes of ADD, and this association was statistically significant. The children who had diarrhoea were in the mean age group of 26.48 ± 15.319 months, and the children without diarrhoea were in the age group of 28.51 ± 15.375 months. However, this association was found to be statistically insignificant. There was no significant association observed between child's age and number of diarrhoeal episodes (Table 2, and 3).

Out of 100 mothers studied, 24% were working and 76% were housewives. There was no association found between employment of mother and diarrhoea occurrence in child. Majority of the children belonged to SES class three followed by SES class two.

Table 2: Risk Factors Associated with Diarrhoea among Children

Risk Factors	Diarrhoea (%)	No Diarrhoea (%)	Chi-square (X^2)	df	P-value	Relative Risk (RR)	Confidence Interval
Sex of the Child							
Female	16.9	83.1	4.258	1	0.050	2.034	1.018-4.065
Male	8.3	91.7					
Birth Order of Child							
Second/Third born	19.13	80.86	8.881	1	0.005	2.870	1.377-5.982
First born	6.7	93.3					
Immunization Status							
Incompletely immunized	60.9	39.1	54.78	1	0.001	8.128	4.631-14.265
Fully immunized	7.5	92.5					
Birth Weight							
<2.5 kg	30.2	69.8	15.203	1	0.001	3.477	1.846-6.549
≥2.5 kg	8.7	91.3					
Exclusive Breastfeeding							
<6 months	23.7	76.3	5.253	1	0.025	2.282	1.140-4.570
≥6 months	10.4	89.6					
Weaning							
Before 6 months	29.7	70.3	12.007	1	0.001	3.166	1.657-6.051
After 6 months	9.38	90.61					

Note: P-value < 0.05 is considered statistically significant.

Table 3: Various Risk Factors Influencing ADD

Risk Factors	Diarrhoea (%)	No Diarrhoea (%)	Chi-square (X^2)	df	P-value	Relative Risk (RR)	Confidence Interval
Malnutrition							
Malnutrition present	34.69	65.30					
Malnutrition absent	7	93	27.88	1	0.001	4.981	2.640-9.397
Mother washes hands before feeding the child							
Sometimes	29.62	70.37	18.82	1	0.001	3.872	2.048-7.319
Always	7.7	92.3					
Mother washing child's hands with soap							
Sometimes	31.81	68.18	19.235	1	0.001	3.85	2.058-7.225
Always	8.3	91.7					

It was observed that majority of children belonging to SES class five had diarrhoea followed by class four and class three. The association between SES and diarrhoea occurrence was found to be statistically significant. ADD cases were significantly higher among children of mothers who were illiterate or had studied up-to preschool.

Almost 96.77% of the children with diarrhoea were treated with ORS and home-based fluids, whereas 3.23% children needed admission to a hospital due to severe diarrhoea. They were administered IV fluids (including antibiotics) and ORS. There were no deaths reported due to severe dehydration. Almost, 80.64% of the children received treatment from a qualified doctor (government/private) while for the rest of the children (18.7%), treatment was given by others like nurses, pharmacists, ANM, parents/relatives, and neighbours. Out of 100 children who participated in the study, 38% of the children were not dewormed. This study showed that almost all (98%) mothers were willing to take their child to a doctor for the treatment of diarrhoea. Only 2% were hesitant to visit the doctor (Table 4).

Discussion

In our study, the incidence of Acute Diarrheal Disease (ADD) among children was found to be 0.124 episodes per child per year (95% CI: 0.102–0.146). This incidence was notably lower compared to other studies. The lower rate may be attributed to improved access to safe drinking water, better sanitation facilities, high maternal literacy rates, enhanced hygiene practices, and increased awareness regarding diarrheal disease prevention among mothers.

A study conducted by Kumar and Borkar[8] reported a significantly higher incidence rate of 0.65 episodes per child per year, with a cumulative incidence rate of 487.7 per 1000 children per year and an attack rate of 63.5%. However, their study included children aged 0–6 years, which may explain the higher incidence rate. Similarly, a study conducted in Pondicherry among children aged 1–4

years reported an incidence of 1 episode per child per year [5]. The variation in incidence rates across studies may be due to differences in study settings, age groups, socio-economic conditions, and healthcare accessibility.

Table 4: Health-Seeking Behaviour of Mothers

Variables	Responses	%
Mother's awareness of ORS	Aware of ORS	70
	Not aware of ORS	30
Whether mother ever used ORS for child	Used ORS	47
	Not used ORS	53
Mother's awareness of zinc	Aware of zinc	33.6
	Not aware of zinc	66.4
Mother's awareness of home-based fluids	Sugar salt solution	66.4
	Dal water/rice water	16.4
	Vegetable soup	4.4
	Coconut water	4.8
	Others	1.6
	Don't know	6.4
Whether mother washes hands before feeding child	Sometimes	21.2
	Always	78.4
	Never	0.4
Whether mother cleans child's hands with soap and water regularly	Sometimes	16
	Always	82.4
	Never	1.6

Our study showed that ADD cases were significantly higher among children of mothers who were illiterate or had studied up-to preschool. This may be because education increases the awareness of the mother related to hygiene and importance of sanitation which overall improves the family's health. Hence, the education of mother had a significant association with occurrence of ADD. Similar findings were reported by a study done in Kenya [9]. Female children were found to be twice at risk to develop diarrhoea compared to male children, which could be because of neglect of female children in some ethnic groups, which deprives them access to healthcare facilities. Gupta et al. [10] found higher prevalence among female children than male children in West Bengal.

This study showed more cases of diarrhoea among children belonging to higher birth order, i.e., third birth order (24%) followed by second birth order (17.8%), and least episodes were seen in first-born children (6.7%). This may be because, as the birth order increases the care towards the child decreases as mother and other family members may be preoccupied with other children. A study done in Andhra Pradesh by Rajegowda et al. [11] reported similar findings.

It was observed that 14% of children had Grade 1 malnutrition, and 5.6% had Grade 2 malnutrition, as per the Indian Academy of Pediatrics (IAP) classification. The risk of Acute Diarrheal Disease (ADD) was five times higher in malnourished children compared to those with normal nutritional status (95% CI: 2.640–9.397).

Similar findings were reported in a study conducted by Singh et al.[12] in Bihar. Hygiene practices among mothers, such as handwashing with soap and water before

cooking, after using the toilet, before feeding the child, and ensuring regular handwashing for their children, showed a significant association with ADD. Children whose hands were not regularly washed with soap and water had a 3.8 times higher risk of developing ADD (95% CI: 2.058–7.225).

Regarding oral rehydration therapy, 70% of mothers were aware of ORS but only 47% had actually used it for their child.

Additionally, 66.4% of mothers knew about home-based fluids that can be given during diarrheal episodes. However, awareness about the role of zinc in managing diarrhea was relatively low (33.6%).

Encouragingly, the majority of mothers practiced good hygiene, with 78.4% consistently washing their hands before feeding their child and 82.4% ensuring regular handwashing for their child using soap and water. These findings were consistent with other studies [13,14].

Our study did not find any association between occurrence of ADD in children and age of the child, employment status of the mothers and type of family. The study has certain limitations which included, a small sample size, stool examination was not performed, and case control study is better design for finding association between disease and risk factors.

Conclusion

Our study found a low incidence rate of diarrhoea among children residing in Santa Cruz. However, various socio-demographic factors, nutritional factors, and certain unhygienic practices played an important role in the occurrence of diarrhoea in our study which can be easily controlled by making the community aware about it.

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