Original Research Article

UNRAVELING THE VARIOUS DRIVERS OF CHILDHOOD DIARRHOEA: A CROSS SECTION STUDY

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ABSTRACT

Background: Childhood diarrhoea is a major public health problem in low- and middle-income countries. Each year, nearly 1.7 billion cases of childhood diarrhoea are reported and kills around 443 832 under five year children annually. Diarrheal diseases have a deleterious effect on child growth and cognitive development.

Materials and Methods: A community based cross-sectional study was conducted among under 5 years children residing in selected 5 urban slums of Sular in Patiala city over a period of 1 year from January 1st 2019 to December 31st 2019. A house-to-house survey was conducted in selected clusters across five urban slums, covering 565 households. A total of 350 under five years children were included in the study.

Results: In this study a significant association of higher age (Chi = 7.125 p value = 0.0283), lower socio economic status (Chi = 8.3321, p value = 0.039624) and underweight ($\chi 2$ = 5.7637, p = 0.016) with diarrhoea was found. The type of complementary food being fed showed significant association with occurrence of diarrhoea (Chi = 6.3807, p value = 0.04115) and those being fed combination feed reporting higher prevalence of diarrhoea (66.67%). Greater prevalence was seen among children living in households where waste was dumped in open (57.89%) and were using insanitary type of latrine (59.02%).

Conclusion: This study clearly highlights the vital role of clean household environment and nutritional status of children in reducing the occurrence of diarrhoea among children. Mother/ caretaker of children should consistently practice good hygiene.

Keywords: Diarrhoea, underweight, stunting, wasting, appropriate food, Commercial food.

INTRODUCTION

Childhood diarrhoea is a significant health concern in low- and middle-income countries, particularly among children under five.[1] It is the third leading cause of death and a major driver of malnutrition in this age group. According to WHO, diarrhoeal disease involves passing three or more loose stools per day and adversely impacts child growth and cognitive development.[2,3] Annually, it accounts for 1.7 billion cases and 443,832 deaths globally, with most fatalities occurring in children below two years.[1,2] Sub-Saharan Africa and South Asia report 90% of cases.[4] Despite progress in reducing child mortality, preventable diseases like diarrhoea remain prevalent in India, where NFHS-5 data shows a 7.3% prevalence among under-five children in the two weeks preceding the survey.[5]

The prevalence of diarrheal diseases in children under five is influenced by a combination of socio-demographic, environmental, and behavioural factors. Socio-demographic determinants include the child's age, their place of residence, and the economic conditions of their household. Environmental contributors, such as access to clean drinking water, proper sanitation, and effective waste disposal systems, play a significant role. Furthermore, behavioural factors, including dietary habits and hand hygiene practices, are key drivers of diarrheal occurrences in young children.[1]

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"According to NFHS-5, the prevalence rates of key malnutrition indicators in India are as follows: stunting at 35.5%, wasting at 19.3%, and underweight at 32.1%.[5] Malnutrition and diarrheal mortality are inter-related sharing bidirectional relation.[6] Malnutrition weakens the immune system, increasing susceptibility to infections such as diarrhoea.[7] Conversely, diarrhoea exacerbates malnutrition by diminishing appetite, reducing energy intake, causing nutrient loss, and impairing nutrient absorption.[8]

Identification of various environmental, feeding and sociodemographic factors is necessary to decrease the incidence of diarrhoea-related morbidity and mortality among the children. With this aim, the present study was undertaken.

Objective

To identify and study the association of various risk factors responsible for the occurrence of diarrhoea among under five year children.

MATERIALS AND METHODS

Study Design: A community based cross-sectional study was conducted among under 5 years children residing in urban slums of Sular in Patiala city over a period of 1 year from January 1st 2019 to December 31st 2019 after obtaining the necessary approval from the institutional ethical committee. The total population of 15 slums in sular area is 20,636. There are 4 dispensaries namely Motibagh, Dhiru Ki Majri, Sular, Daru Kutia and 31 AWCs which provide health services in the area. The study was conducted in 5 slums selected using Simple Random Sampling technique by lottery method from sampling frame of 15 urban slums.

Study Population: A house-to-house survey was conducted in selected clusters across five urban slums to gather data. From each household, the eldest child under five years of age was chosen as study participant because these children were more prone to be neglected by mothers in the presence of younger children. The respondents were the caregivers or mothers of the selected children.

The caregivers/mothers were briefed regarding the nature and purpose of study, after which written informed consent was obtained in their vernacular language. Confidentiality was strictly maintained throughout the process. Those meeting the inclusion criteria were interviewed using a validated and pretested semi-structured questionnaire. The questionnaire was used to collect data regarding socio-demographic profile, economic conditions, feeding practices, and the occurrence of diarrhoea among under five year children in the 2 weeks preceding the survey.

Anthropometric measurements of the selected children were recorded using appropriately calibrated instruments and plotted on WHO growth charts. The socio-economic status of each family was assessed using the Modified Kuppuswamy Scale (2018) .[9]

Inclusion Criteria

1. Children less than 5 years of age at the time of study.
2. Children whose mother/ caregiver gave consent to participate in the study.

Exclusion Criteria

1. Children who were unavailable at the time of 2nd visit to house.

Sample Size: With a reported prevalence (p) of diarrhoea of 9.2% among children under five years in India[10] , the required sample size was calculated using the formula:

$$n = 4pq/l^2$$
$$= (4*9.2*90.8)/(5*5)$$
$$= 133.6$$

Where

- n = sample size
- p = prevalence
- q = 1 - p
- l = precision (5%)

After rounding, the sample size was determined to be 134.

Taking into account a design effect of 2 and a dropout rate of 15%, the final sample size was estimated at 308.

A house-to-house survey was conducted in selected clusters across five urban slums, covering 565 households over a period of one year. A total of 350 under five years children were included in the study.

Operational Definitions:

1. **Diarrhoea-** As per WHO, Diarrhoea is defined as the passage of 3 or more loose or liquid stools per day (or more frequent passage than is normal for the individual). Frequent passing of formed stools is not diarrhoea, nor is the passing of loose, pasty stools by breastfed babies.[2]

2. **Appropriate food –** It includes combination of cereals and pulses (Khichdi, Dalrice, etc.), locally available staple foods such as chapati, paratha with oil/ ghee, and some amount of sugar, idli, dosa, dhokla, ragi, mashed fruits -banana,mango, papaya, sweet potato and potato, sprouts, legumes, well grinded groundnuts, almonds, cashewnuts, raisins.[11]

3. **Commercial food –** It includes commercial breakfast cereals, biscuits, breads, pastry, chocolates, cheese, softy, ice cream, doughnuts, cakes,tinned foods, packaged or stored foods, artificially cooked foods with preservatives or chemicals, fruit juices and drinks with preservatives, repeatedly fried foods containing trans-fattyacids.[11]

4. **Combination feed–** It include use of both appropriate and commercial food.[11]

5. **Stunting-** Failure to attain the expected height/length as compared to healthy, well-nourished children of the same age is a sign of stunting. Stunting is an indicator of linear growth retardation that results from failure to receive sufficient nutrition over a long period or recurrent inadequate nutrition over a long period or recurrent infections. It may be exacerbated by

recurrent and chronic illness. It is an indicator of past growth failure.[12]

6. **Wasting-** Wasting represents a recent failure to receive adequate nutrition and may be result of recent episodes of diarrhoea and other acute illnesses. Wasting indicates current or acute malnutrition which might be a consequence of failure to gain weight or actual weight loss. Various causes include inadequate food intake, incorrect feeding practices, diseases, and infections or, more frequently, a combination of these factors.[12]

7. **Underweight-** Underweight, based on weight-for-age, is a composite measure of stunting and wasting, and is recommended as the indicator to assess changes in the magnitude of malnutrition over time. Underweight is often used as a fundamental indicator of the status of a population's health as weight is easy to measure.[12]

8. The indices for nutritional status i.e. weight for age (underweight), height/length for age(Stunting) and weight for height/length (wasting) were recorded on New WHO Child Growth charts.

Analysis: The data was entered, cleaned, and analyzed using Microsoft Excel Office Software 2021. Descriptive statistics was summarized using frequency and percentage distributions. To examine the relationship between various categorical variables, the Chi-square test was applied. A p-value of less than 0.05 was considered statistically significant.

RESULTS

In this study a significant association of diarrhea with higher age (Chi = 7.125 p value = 0.0283) and lower socio economic status (Chi = 8.3321, p value = 0.039624) was found. Female children reported higher prevalence of diarrhea (55%). Religion had no significant influence on the occurrence of diarrhea [Table 1]

Table 1: Association of Diarrhoea with socio demographic variables (n=350)

Variables	Total	Diarrhoea	
Gender		Present N(%)	Absent N(%)
Male	170	84 (49.41)	86 (50.59)
Female	180	99 (55)	81 (45)
Chi square (χ2) = 1.0944, p value = 0.295501, df=1, Non Significant			
<1 years	65	25 (38.46)	40 (61.54)
1- 3 Years	200	107 (53.50)	93 (46.50)
4-5 Years	85	51 (60.00)	34 (40.00)
Chi square (χ2) = 7.125, p value=0.0283, df=2, Significant			
Religion			
Hindu	249	127 (51.00)	122 (49.00)
Sikh	85	50 (58.83)	35 (41.17)
Muslim and Christian	16	6 (37.50)	10 (62.50)
Chi square (χ2) = 3.0223, p value = 0.220651, df=2, Non Significant			
Socio economic status			
Lower class	27	18 (66.67)	9 (33.33)
Upper lower	234	115 (49.15)	119 (50.85)
Lower middle	80	48 (60)	32 (40)
Upper middle	9	2 (22.22)	7 (77.78)
Chi square (χ2) = 8.3321, p value = 0.039624, df=3, Significant			

In this study diarrhea was more frequent among children living in households where waste was dumped in open (57.89%) and were using insanitary type of latrine (59.02%) and among children whose mother did not trim their nail (54.97%). Children residing in overcrowded settings 173 showed higher prevalence of diarrhea 96 (55.49%). However no significant association was found with any of these factors. [Table 2]

Table 2: Association of Environmental factors and hygiene of mother with the occurrence of diarrhoea (n=350)

Hand washing by mother before cooking meal	Total	Diarrhoea	
		Present N(%)	Absent N(%)
Yes	323	171 (52.94)	152 (47.06)
Not on routine basis	27	15 (55.56)	12 (44.44)
Chi square (χ2)=0.0684, p value=0.79369, df=2, Non significant			
Nails of mother -trimmed			
Yes	159	78 (49.06)	81 (50.94)
No	191	105 (54.97)	86 (45.03)
Chi square (χ2) =1.2178, p value=0 .2697, df=1, Non significant			
Waste disposal			
Open	76	44 (57.89)	32 (42.11)
Dustbin with lid	95	42 (44.21)	53 (55.79)
Dustbin without lid	179	97.00 (54.19)	82.00 (45.81)
Chi square (χ2) =3.7017, p value =0.157, df=2, Non significant			
Latrine			

Sanitary 289	289	152 (52.60)	137.00 (47.40)
Insanitary 61	61	36 (59.02)	25 (40.98)
Chi square (χ2) = 0.8353, p value = 0.360735, df=1, Non significant			

A notable association emerged between children being underweight (69.09%) and diarrhea (χ2 = 5.7637, p = 0.016). Although children experiencing stunting (58.73%) and wasting (51.06%) showed a higher prevalence of diarrhoea, however no statistical association was found. [Table 3]

Table 3: Distribution of children as per anthropometric indicators and diarrheal episodes (n=350)

Anthropometric indicators	Total	Diarrhoea Yes N(%)	No N(%)	Total	Significance
Normal	295	152 (51.53)	143 (48.47)	295	Chi square (χ2)=5.7637
Under weight	55	38 (69.09)	17 (30.91)	55	P value =0.016 Significant
Normal	287	153(53.31)	134 (46.69)	287	Chi square (χ2) = 0.6115
Stunted	63	37 (58.73)	26 (41.27)	63	P value = 0.434 Not Significant
Normal	303	151(49.83)	152 (50.17)	303	Chi square (χ2)= 0.0246
Wasted	47	24 (51.06)	23 (48.94)	47	P value =0.875426 Not Significant

In the present study a significant association was seen between the occurrence of diarrhea and the type of complementary food given (Chi = 6.3807, p value = 0.04115) with greater prevalence among those children who were given combination feed i.e both appropriate and commercial feed). No association was seen with age of starting complementary feed (Chi = 2.224, p value = 0.32887), although greater prevalence of diarrhea was reported when complementary feeding was introduced earlier (<6 months of age) and later (>9 months of age) than around 6 months of age.
[Table 4]

Table 4: Association of age of initiation and type of complementary feed with the occurrence of diarrhoea (n=334)*

Type of complementary feed	Total	Diarrhoea Present N(%)	Absent N(%)
Appropriate food	242	122 (50.41)	120 (49.59)
Commercial food	14	7 (50)	7 (50)
Combination food	78	52 (66.67)	26 (33.33
Chi square (χ2) = 6.3807, p value = 0.04115, df=2, Significant			
Age of starting complementary feed			
< 6 m	136	72 (52.94)	64 (47.06)
6m-9 m	175	86 (49.14)	89 (50.86)
>9m	23	15 (65.22)	8 (34.78)
Chi square (χ2) = 2.224, p value = 0.32887, df=2, Non Significant			

*16 children being < 6 month were exclusively breastfed, were excluded from this analysis
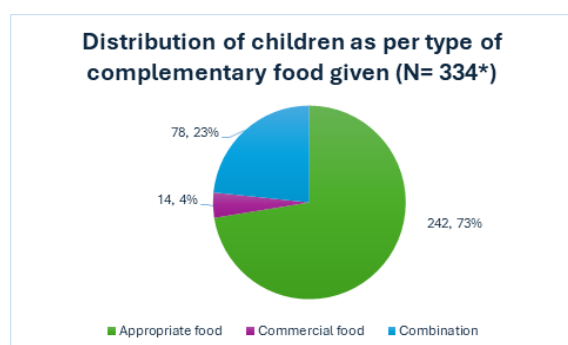

Figure 1: Distribution of Children as per type of complementary food given

*16 children being < 6 month were exclusively breastfed, were excluded from this analysis

DISCUSSION

In the present study higher occurrence of diarrhoea was observed among female children as compared to males which is consistent to the findings by Gupta A et al although no significant association between gender and occurrence of diarrhoea was seen.[13] Similarly study by Sudipta Basu also observed greater prevalence of diarrhoea among under five females.[14] However in the study by Ghosh K et al odds of female suffering from diarrhoea was lesser as compared to male counterparts and study by Anil Gupta reported no relation between the gender and occurrence of Diarrhoea.[10,15]

In the present study significant association was seen between the socio economic status and occurrence of diarrhoea with greater prevalence among those belonging to lower class as per kuppuswamy scale 2018 which in unanimity with the findings by Ghosh K et al,[10] and by Gupta P et al.[16]

In the present study occurrence of diarrhoea was greater among higher age groups among under five year children which is in contrast to the findings of study by Ghosh K,[10] Sudipta Basu,[14] Anil Gupta,[15] where smaller age groups reported higher prevalence. This difference might be because in this study eldest among under five children in a household was selected as study participant and exclusive breastfeeding of 0–6 months children offers a protective effect thus reducing their risk of exposure to environmental contaminants.

The findings in the study by Ghosh K et al,[10] Kalakheti B et al,[17] Mishra et al,[18] echoes with the present studies findings showings that children living

with unimproved sanitation and insanitary toilet facilities increased their chances of suffering from diarrhoea . In study by Wasihun AG et al,[6] it was seen that mothers who didn't wash their hands and the households where solid waste was improperly disposed off, their children were more likely to have diarrhoea which is similar to the present study observations.

In the study by Sur D et al,[19] it was seen that children weaned before 6 months of age were more at the risk of developing diarrhoea which is similar to present study where children weaned earlier (<6 months of age) and after age of 9 months showed greater chances of suffering from diarrhoea

In study by Gupta A et al,[13] and Anil Gupta,[15] malnourished children were at greater risk of developing diarrhoea which is in concordance with the present study findings

This study provides valuable insights into diarrhoea risk factors, emphasizing nutrition, sanitation, and socio-economic influences, strengthening previous research findings while giving new perspectives on age and complementary feeding practices.

CONCLUSION

In this study greater prevalence of diarrhoea was seen in females and children belonging to higher age group and lower socio economic age group. This study clearly highlights the vital role of clean household environment and nutritional status of children in reducing the occurrence of diarrhoea among children.

Recommendations: Mother/ caretaker of children should consistently practice good hygiene. While attending to a younger child, it is essential not to overlook the nutritional needs of older children. Care should be taken to introduce complementary food at appropriate age and it is always better to introduce homebased food. Health care education should be provided to mothers / care giver of under five children at every possible points of contacts to promote informed childcare practices.

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