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Risk Factors Associated with Gastroenteritis in Children 2-5 Years of Age Attending Rehman Medical Institute Peshawar

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Abstract

A case control study was conducted to determine the risk factors associated with gastroenteritis in children 2-5 years of age at Rehman Medical Institute Hayatabad, Peshawar during Oct, 2014 to Feb, 2015. A total of 200 children mothers (100 cases and 100 controls) were interviewed regarding socio-demographic variables, anthropometric measurements, mother's knowledge and approach during disease, hygiene and sanitation status. Data was analyzed by SPSS and standard chi-square test was applied on categorical data to establish an association between the variables at 5% level of significance; t-test was used for quantitative data analysis of mean comparison. The results showed that 44% of children with gastroenteritis had low socioeconomic status, 25% children had family income <12000 rupees. Nutritional status of children showed that 10% controls and 27% cases were severely malnourished. Wasting was recorded 3% in controls and 10% in cases. The percentage of underweight was 27% and 35% in controls and cases respectively. Stunting was found lower in controls (26%) and higher in cases (46%). Significant difference was found in height for age, mid upper arm circumference and weight for height z-score. Odds ratio (OR) for the association of gastroenteritis with joint family structure was 3.11 (95% CI 1.736-5.594), weight for height z-score was 3.593 (95% CI: 958-0.863), weight for age z-score was 1.456 (95% CI: 0.796-2.661), age of complementary feeding <6 months was 2.405 (95% CI: 1.233-4.689), child eating picked stuff 3.977 (95% CI: 2.180-7.256), child admitted in hospital 1.860 (95% CI: 1.008-3.432), child who does not washed hand before meal was 0.288 (95% CI: 0.164-0.677) and child who does not washed hand after attending washing were 0.288 (95% CI: 0.161-0.517). It was concluded that low socioeconomic status, parental education, malnutrition, poor hygiene and inappropriate complementary feeding are associated with gastroenteritis.

Keywords

Gastroenteritis, Anthropometry, Stunting, Poor Hygiene

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1. Introduction

Gastroenteritis is the inflammation of gastrointestinal tract exemplified by a combination of abdominal pain, cramping, nausea, vomiting, diarrhea and dehydration. It may be acute or chronic as acute gastroenteritis usually lasts less than 14 days, while chronic gastroenteritis lasts among 14 and 30 days [1]. It can have an effect on individuals of any age and is a major health hazard [2]. Chronic gastroenteritis is the most widespread cause of childhood mortality [3]. Diarrhea stays one of the most common illnesses in children around the world [4]. Gastroenteritis is primarily caused by viruses,

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but protozoa, bacteria and helminthes may also be the cause in developing countries [5]. In developed countries almost 87% of the acute gastroenteritis is caused by virus and of which rotavirus is the most common. In infants 40% of the cases of diarrhea are attributed to rotavirus globally. Rotavirus was responsible for almost 145,000 deaths each year in Asia, with the maximum numbers taking place in India, Pakistan, and Indonesia. An estimated 1 in 40 infants experience a severe episode of rotavirus gastroenteritis annually in Pakistan [6]. Breastfeeding is thought to be protective factor against gastrointestinal infections [7]. Zinc supplementation along with ORS is found to be highly effective in the management of acute gastroenteritis [8, 9].

In acute diarrhea excessive fluid and electrolyte losses leads to dehydration and acidosis which is the main cause of death. By providing fluid on time and replacing electrolytes losses greater part of deaths are preventable. Other direct outcomes of gastroenteritis in children in developing countries are malnutrition reduced growth and impaired cognitive development [10]. Acute gastroenteritis is the main cause of morbidity in developed countries [11]. Malnutrition raises the occurrence and severity of diarrhea and other infections [12]. The basic reason for malnutrition is diarrhea changing from minor to severe and children suffer from loss of appetite, food restriction and malabsorption syndrome [13].

Most important risk factors associated with gastroenteritis are diarrhea, and its occurrence remains a remarkable burden on children in low and middle income countries [14] due to various elements [15] like child malnutrition [16] low socioeconomic status and low education of mothers [17, 18] lack of safe drinking water, inadequate sanitation and poor hygiene [19, 20] crowding [21] and low maternal age [22]. Moreover, diarrheal incidence turn down as a child grows older is greatest in the first two years of life, environmental factors and hospitalization [23] and unemployment [24]. The behaviors that promote gastroenteritis are lack of hand washing after defecating and before food handling [25].

Rotavirus gastroenteritis is passed on through the fecal oral means [26]. Other modes of transmission may include indigestion of food and water infected by fecal matter, person to person contact, or direct contact with feces [27]. It can also be transmitted through respiratory droplets and hands [28]. Some studies reported that contaminated food and water are responsible for 70% of all cases of diarrhea [29, 30]. Sometimes the basis of gastroenteritis are inappropriately cooked food or reheating of meat, dairy, seafood, bakery products and non-infectious causes may include poisoning with heavy metals like arsenic and cadmium [12]. Unhygienic and unsafe environment put children at risk of death [31]. In children with acute gastroenteritis breastfeeding should be sustained at all times, even during the initial rehydration phase. On the other hand widespread contradictions about lactose-free or lactose-reduced formulas are found but do not have to be removed and usually are needless. Banana, rice, apple, toast, cereals and potatoes diet should be offered [32]. Probiotics builds an improved equilibrium in intestinal micro flora and promotes best possible health and are very useful in reducing and preventing the length and severity of illnesses related to diarrhea [33].

Since Pakistan harbors a high burden of gastroenteritis infection and very limited studies related to gastroenteritis have been conducted on children so the present study was hypothesized to assess the risk factors associated with gastroenteritis in children 2-5 years of age in North West of Pakistan as children are more prone to gastroenteritis.

2. Material and Methods

2.1. Design and Location

This case-control study was conducted in Rehman Medical Institute, Hayatabad Peshawar- Pakistan.

2.2. Sample Selection and Criteria

A total of 200 children were randomly selected (100 cases and 100 controls) for determination of risk factors associated with gastroenteritis in children 2 to 5 years of age. Inclusion criteria for cases involved children with gastroenteritis and controls were healthy children. An exclusion criterion for cases was children who were admitted in ICU or seriously ill patients other than gastroenteritis and controls were children with diseases.

2.3. Study Protocol

The approval for conducting the study was taken from the Chief Executive of the Rehman Medical Institute Peshawar. Pediatric ward of hospital was used as a platform for enrolled subjects. Children admitted in Pediatric ward were interviewed for different risk factors associated with gastroenteritis through standard questionnaire. The subjects meeting the inclusion criteria of cases were enrolled for the study and informed consent was obtained prior to their enrollment.

2.4. Data Collection

A questionnaire was used to collect data regarding socio-demographic variables, anthropometric measurements, and assessment of different risk factors associated with gastroenteritis in children.

2.5. Demographic and Socioeconomic Status

Demographic and socioeconomic characteristics of the subjects such as family type, education, monthly income,

occupation were assessed by interviewing the subjects and recording their responses in the questionnaire.

2.6. Anthropometric Measurement

Weight, Height and Mid Upper Arm Circumference was measured on the day of admission. The calibrated equipments were used for anthropometric measurements. Weight was measured on pediatric beam scale. Children were weighed standing on a scale. All heavy clothes and hair ornaments were removed while weighing. Height was measured using height board (stadiometer), height was measured standing upright, children greater than 2 years or 87 cm. Age of patient was asked from the mother. Mid Upper Arm Circumference (MUAC) was measured by MUAC tape.

2.7. Clinical and Health Assessment

Parents of the subjects were asked about different symptoms associated with gastroenteritis and their response was recorded in questionnaire. Mothers of subjects were interviewed about their child's feeding history such as breastfeeding, weaning food, type of milk, mother's approach when child gets diarrhea and care imparting behavior of mother. They were also asked about their sanitation and hygiene status such as source of drinking water, hand hygiene and garbage disposal.

2.8. Statistical Analysis

Data was entered into the Statistical package for social sciences (SPSS) for error checking and statistical analysis. Descriptive statistics including mean, median, frequency, and standard deviation were determined and checked for distribution of the data to apply appropriate statistics. Standard chi-square test was applied on categorical data to establish an association between the variables at 5% level of significance; t-test was used for quantitative data analysis for mean comparison. Odds ratio was applied to estimate the relationship between risk factors and gastroenteritis.

3. Results and Discussion

3.1. Socio Demographic Characteristics of the Children

Age of the subjects was 2-5 years with mean age of controls 3.56±1.19 and case was 3.11±1.07 years. No significant difference ($p < 0.005$) was found in patient's father occupation, mother occupation, and family size between the two groups while significant difference was found in patient's age, gender, patient's education, patient's mother education, family type, family income and socioeconomic status. The results indicate that low education level of parents; poor socioeconomic status and low family income may be the risk factors leads to gastroenteritis. Zolaly *et al*. (2011) reported that the mean age of the children was 4.4±2.72 years for cases and significant difference (p=0.000) was found between three age groups. He also reported that 1.6% fathers were illiterate, 12.1% had educational level below intermediate and 86.3% had greater than intermediate with a significant difference of p= 0.000 while 4.8% mothers of were illiterate, 24.2% were below intermediate and 71% had educational level greater than intermediate with significant difference of p= 0.000 between three different levels of education [34]. Rheingans *et al*. (2009) reported that in Bangladesh 33% and in Pakistan 61% children with gastroenteritis were not going to school [35]. Bhandari *et al*. (1989) reported that 24% father whose child is suffering from gastroenteritis had no education [36]. Mansour *et al*. (2013) reported that 36% of the cases mothers were illiterate as reported in the present study [37]. Kurugol *et al*. (2003) reported that low income was found in 24% controls and 27.8% cases [38]. Nguyen *et al*. (2006) reported that socio demographic status was unsatisfactory in 25.9% and satisfactory in 20.6% cases while in controls 23.3% had unsatisfactory and 21.3% satisfactory level with a significant difference of p=0.006 respectively [39]. Ahmed *et al*. (1995) conducted a study in Karachi and reported that in family income <2000 rupees per month was 36% chronic gastroenteritis patients and 24% acute gastroenteritis patients [40]. Augistina *et al*. (2013) conducted a study in East Jakarta and reported that 52% gastroenteritis patients had nuclear and 48% had joint family structures and socioeconomic status reported to be very low in 54% cases and medium-low in 46% of the case group [41]. Khattak *et al*. (2007) reported that family income was less than Pakistani 5000/rupees per month in 60% children with gastroenteritis while 40% had income greater than 5000 rupees [42].

Table 1. Socio demographic characteristics of the Cohort (n=200).

Variables		Mean ± SD/Frequency (%) Control	Case	P-value
Age (years)		3.56 ±1.19	3.11±1.07	0.006*
Gender	Male	39(39)	55(55)	0.003*
	Female	61(61)	45(45)	
Patient's education	School going	49(49)	25(25)	0.001*
	None	51(51)	75(75)	
Patient's father education	Illiterate	7(7)	22(22)	0.000*
	Less than intermediate	34(34)	56(56)	
	≤ intermediate	59(59)	22(22)	
Patient's mother education	Illiterate	6(6)	35(35)	0.000*
	Less than intermediate	60(60)	47(47)	
	≤ intermediate	34(34)	18(18)	
Patient's father occupation	Government	51(51)	37(37)	0.75
	Private	39(39)	55(55)	
	None	10(10)	8(8)	
Patient's	Working	14(14)	8(8)	1.75

Variables		Mean ± SD/Frequency (%) Control	Case	P-value
mother occupation	House wife	86(86)	92(92)	
Family Type	Joint	44(44)	71(71)	0.000*
	Nuclear	56(56)	29(29)	
Family size	>five	24(24)	22(22)	0.737
	≤ Five	78(78)	76(76)	
Family income (rupees)	<12000	9(9)	25(25)	0.000*
	12000-15000	15(15)	27(27)	
	>25000	76(76)	48(48)	
Socioeconomic condition	Satisfactory	72(72)	56(56)	0.014*
	Unsatisfactory	27(27)	44(44)	

SD=Standard deviation, * significant at p<0.05, p=probability, %=percentage.

3.2. Anthropometric Measurements of the Subjects

Weight, height, MUAC, weight for height z-score, weight for age z-score, height for age z-score of controls was reported 15.39±3.36, 96.60±11.29, 15.32±2.13, 15.32±2.13, 0.09±1.15 and -0.68±1.49 while cases were 13.08±3.02, 89.44±10.51, 13.78±2.04, 0.22±1.2, -0.77±1.52 and -1.68 ± 1.39 respectively. As these anthropometrics indicates the nutritional status of the individuals, so no significant difference was found in weight for height z-score whereas there was significant difference (p>0.005) in the rest of the parameters with in both groups. Mostly in gastroenteritis dehydration occurs and it leads to muscles wasting which elevate the anthropometrics of the children. This significant difference in anthropometric measurements indicates that by losing nutrients, body fluids and low absorption of nutrients may affect nutritional status of children in gastroenteritis.

Table 2. Anthropometric Measurements of the Cohort (n=200).

Variables	Mean ±SD Control	Case	P value
Weight of the subject(kg)	15.39±3.36	13.08±3.20	0.000*
Height of the subject (cm)	96.60±11.29	89.44±10.51	0.000*
MAUC of the subject (cm)	15.325±2.13	13.780±2.04	0.000*
WHZ	0.43±1.03	0.22±1.52	0.243
WAZ	-0.09±1.15	-0.77±1.52	0.000*
HAZ	-0.68±1.49	-1.698±1.39	0.000*

MUAC= mid upper arm circumference, WHZ=Weight for height z-score, WAZ=Weight for age z-score, HAZ=Height for age z-score, p=probability, SD=standard deviation, %=percentage, *significant at p<0.05, p=probability.

3.3. Nutritional Status of the Subjects

The study suggest that on the basis of MUAC severely malnourished children were 10% and 27%, moderately malnourished 11% and 20% and healthy were 79% and 53% in control and cases group respectively. According to WHZ, wasting in children was recorded 3% in control and 10% in case group. The percentage of underweight children in control and case group was 27% and 35% respectively. Stunting was found 26% in controls and 46% in cases whereas 74% of the children in control group were normal and 54% in case group and significant difference was found in Height for age z-score, MUAC z-score and Weight for height z-score while non-significant results were observed in Weight for age z-score. Mwangome *et al.* (2011) revealed that severe malnutrition was found in 13% of cases, moderate in 21% and healthy were 66% on the basis of MUAC in gastroenteritis patients and observed significant difference (p= 0.001) between three categories of MUAC which is partially similar to our findings [43]. Augistina *et al.* (2013) reported that 32% children showed stunting, 19% underweight and 12% wasting and significant difference of (p<0.005) was found between three variables [41]. Nitiemia *et al.* (2011) considered that 31% children with gastroenteritis suffered from stunting [44]. Opintan *et al.* (2010) conducted a study on Pediatric diarrhea in Southern Ghana and reported that weight for age z-score <-2 in 16.7% cases and 10% controls showed underweight, weight for height z-score <-2 in 22% cases and 6.3% controls showed wasting and height for age z-score <-2 in 37.2% cases and 14.3% controls showed stunting in gastroenteritis children [45].

Table 3. Nutritional status of the subjects (n=200).

Variables		Categories	Frequency (%) Control	Case	P-value
MUAC	<11.5cm	Severely malnourished	10(10)	27(27)	0.000*
	11.5-12.5cm	Moderate malnourished	11(11)	20(20)	
	>12.5cm	Healthy	79(79)	53(53)	
WHZ	<-2	Wasting	3(3)	10(10)	0.045*
	≥-2	Normal	97(97)	90(90)	
WAZ	<-2	Underweight	27(27)	35(35)	0.221
	≥-2	Normal	73(73)	65(65)	
HAZ	<-2	Stunting	26(26)	46(46)	0.003*
	≥-2	Normal	74(74)	54(54)	

MUAC= mid upper arm circumference, WHZ=weight for height z-score, WAZ=weight for age z-score, HAZ=height for age z-score, p=probability, SD=standard deviation, %=percentage, * significant at p<0.05, p=probability.

3.4. Influence of Mother's Education on Child Health

The study reported significant difference in feeding pattern, child's daily meal intake, child taking lunch from home, mother's approach when child gets diarrhea, boiled water consumed, child's habit of eating picked stuff, boiling of feeder while non-significant difference was reported in age of complementary feeding, ORS offered to child, consumption of water by the child during diarrhea, hospitalization for overnight during diarrhea and increase in weight and height of child. From the above result, it has been revealed that mother education regarding adequate feeding practices, adequate child meal intake and child eating habits may

improve gastroenteritis. Khattak *et al*. (2007) conducted a study in Peshawar and reported that 39% of the children with gastroenteritis started complementary feeding less than six months of age and 49.5% of the cases started complementary feeding greater than six months of age. He also reported that boiled water was consumed by 46.6% gastroenteritis children [42]. Van Derslice *et al.* (1994) reported in Philippines that 19% of the cases started complementary feeding less than six months of age [46]. Quigely *et al.* (2007) reported that 24% of the cases stop receiving breast milk at the age less than 4-6 months [47]. Robertson *et al. (*2002) reported that 23.5% of the mothers gave medicines to stop diarrhea. He also reported that significant difference ($p<0.05$) was found between four different levels of water consumed by the child during diarrhea [48]. Augistina *et al.* (2013) conducted a study in East Jakarta in diarrheal patients and reported that 8% of the mothers boil feeder before feeding their child [41]. Bonig *et al.* (2010) conducted a study in Germany and reported that 21.4% of the gastroenteritis children were breastfeed till 6 months of age and results were almost similar to the present. No home treatment was given by 39.3%, homemade fluids were used by only 32.5% and 27.5% of the respondents were given medicine, and 56.2% of the children with gastroenteritis were taken to doctor [49]. Hafeez *et al*. (2014) reported that children buying food from vendor (rahri) were at high risk to the disease [4]. Nguyen *et al*. (2006) reported that 22.3% of the cases were breastfed less than six months of age and 36.4% in controls and significant difference of ($p=<0.01$) was found between both groups. He also reported that children with age 7-12 month who received supplemental food were higher risk of diarrhea with a significant difference of 32% and 22% in cases and control respectively [39].

Table 4. Influence of Mother's Education on Child Health.

Variables		Frequency (%)		P value
		Control	Case	
Age of complementary feeding	<6 months	17(17)	33(33)	0.009*
	After 6 months	83(83)	67(67)	
Age child stop receiving BM	≤ 6 months	32(32)	20(20)	0.019*
	2 years of age	54(54)	55(55)	
	Still taking BM	12(12)	20(20)	
	Did not breastfed child	2(2)	5(5)	
How many times child takes meal/day	1 time	10(10)	17(17)	0.000*
	2 times	19(19)	25(25)	
	3 times	14(14)	33(33)	
	More than 3	57(57)	25(25)	
Child takes lunch	From home	42(42)	18(18)	0.002*
	From school	7(7)	16(16)	
	Vendor	2(2)	2(2)	
	Not school going	49(49)	64(64)	
What do you do when child gets diarrhea	Medicine	58(80.6)	14(19.4)	0.000*
	Green tea	36(42.4)	49(57.6)	
	Yogurt	2(40)	3(60.0)	
	Banana	0(0)	2(100)	
	ORS	0(0)	5(100)	
	Nothing	1(4.5)	21(95.5)	
	Doctor	3(33.3)	6(66.70	
Water consumed by the child during diarrhea	half glass	16(32.7)	33(67.3)	0.013*
	1 glass	52(55.9)	41(44.1)	
	2-3 glasses	28(66.9)	18(39.1)	
	1 bottle	4(33.3)	8(66.7)	
Offer boiled water to child	Yes	51(65.4)	27(34.6)	0.001*
	No	32(36.8)	55(63.2)	
ORS given to child	Mineral water	17(48.6)	18(51.4)	0.254
	Yes	48(54.5)	40(45.5)	
	No	52(45.5)	60(53.6)	
Feeder boiled	After used single	8(80)	1(9.1)	0.005*
	After used twice	2(20)	1(9.1)	
	After used thrice	0(0)	2(18.2)	
	Once in a week	0(0)	2(18.2)	
	Sometimes	0(0)	5(45.5)	
Child eat picked stuff	Yes	43(43)	75(75)	0.000*
	No	57(57)	25(25)	
Child admitted in hosp for over night	Yes	24(24)	37(37)	0.046*
	No	76(76)	63(63)	

ORS=oral rehydrating salts, BM=breast milk, %=percentage, p=probability, *significant at 0.05.

3.5. Risk Estimation of Socio-economic and Nutritional Status of the Children

Children having WHZ and WAZ ≤ -2 was odd ratio 3.593 and 1.456 respectively. Odd ratio for age of complementary feeding <6 months was 2.405, for children eat picked stuff was 3.977, for children admitted in hospital was 1.860 and for increment in child weight and height was 0.782. Those who had open drain were 0.441 times more exposed to the disease (95% CI: 0.237-0.821). Child who does not wash hand before meal was 0.288 times exposed to disease (95% CI: 0.164-0.677). Child who does not wash hand after attending washing were 0.288 times more exposed to the disease (95% CI:0.161-0.517). Those who do not use soap for washing hands were 0.392 times exposed to the disease (95% CI: 0.221-0.692). More odds ratio shows more probability of disease from the above results it indicated that less WHZ, inadequate complementary feeding, pica and staying in hospitals for long time are the risk factors of gastroenteritis. My study findings are inconsistent with the previous studies as Augistina *et al*. (2013) conducted a study in East Jakarta and reported that OR for the association of socio economic status and gastroenteritis was 1.58 (95% CI: 0.70-3.56), OR in the association between anthropometric status and gastroenteritis showed that for wasting was 2.3, underweight was 1.67 and stunted was 0.68. OR for children living in joint families were 2.27, for bottle hygiene and gastroenteritis was 0.56 (95% CI: 0.11-2.78). The OR in the association between hand hygiene and gastroenteritis, child's washing hand before eating meal and after attending washroom was 1.02 (95% CI: 0.41-1.95) and 1.00 (95% CI: 0.36-2.77) respectively whereas for using soap after attending washroom was 0.89 (95% CI: 0.41-1.95) [41]. Das *et al*. (2013) conducted a study in urban Bangladesh and reported that OR for hospital stay in last 24 hours was 1.66 (95% CI-1.05 - 2.62) [50]. Molbak *et al,* (1997) reported that OR for no of meals per day was 0.80 (95% CI; 0.71-0.91) and OR children living in nuclear family structure was 0.949 (95 % CI 0.923–0.975) [51]. Nguyen *et al*. (2006) reported that OR for supplemental food started at age 7-12 months were 2.69 (95% CI: 1.42-5.09) [39].

Table 5. Risk Estimation of Socio-Economic and Nutritional Status of the Children.

Variables	Categories	Groups (%)		OR(CI)	P-value
		Controls	Cases		
Subject's education	School going	49	25	0.347(1.191-0.631)	0.000*
	None	51	75		
Family type	Joint	44	71	3.116(1.736-5.594)	0.000*
	Nuclear	56	29		
Socioeconomic status	Satisfactory	73	56	0.477(0.264-0.863)	0.014*
	unsatisfactory	27	44		
Weight for height z-score	<-2 wasting	3	10	3.593(0.958-13.472)	0.045*
	≥ -2 normal	97	90		
Weight for age z-score	<-2 underweight	27	35	1.456(0.796-2.661)	0.221
	≥ -2 normal	73	65		
Height for age z-score	<-2 stunting	26	46	2.425(1.337-4.397)	0.003*
	≥ -2 normal	74	54		
Age of complementary	<6 months	17	33	2.405 (1.233-4.689)	0.009*
	>6 months	83	67		
ORS given to child	Yes	48	40	0.722(0.412-1.265)	0.245
	No	52	60		
Feeder boiled	Yes	10	11	0.285(0.086-0.941)	0.035*
	No	27	7		
Child eat stuff from ground	Yes	43	75	3.977(2.180-7.256)	0.000*
	No	57	25		
Child admitted in hosp for diarrhea	Yes	24	37	1.860(1.008-3.432)	0.046*
	No	76	63		
Increase in child weight/height	Yes	74	69	0.782(0.422-1.448)	0.043*
	No	26	31		
Sewage	Underground	78	61	0.441(0.237-0.821)	0.009*
	Open drain	22	39		
Child washes hand before meal	Yes	33	14	0.331(0.164-0.677)	0.002*
	No	86	67		
Child washes hand after washroom	Yes	68	38	0.288(0.161-0.517)	0.000*
	No	32	62		
Uses soap	Yes	63	40	0.392(0.221-0.692)	0.001*
	No	37	60		

%=percentage, *significant at p=0.05, p=probability, OR=odds ratio, CI=confidence interval, ORS=oral rehydrating salts

4. Conclusion and Recommendations

Low socio economic status, poor hygiene and sanitation practices, malnutrition and low parental education leads to gastroenteritis (GE). Mother's improper health care practices and knowledge regarding GE can increase the diarrheal complications. Good hygiene and better sanitation conditions can reduce the spread of disease. Mother's care imparting behavior to the child during GE and knowledge about disease and management can reduce the severity of the disease.

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