



## Prevalence of diarrhea among severely malnourished children admitted in Government Hospital, Lahore, Pakistan

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**Key words:** Diarrhea, Malnourished, Children younger than five years

**Article Published: 24 August 2020**

### Abstract

Mortality rate of children under the age of five has reduced worldwide, but still the probability of a child dying before the age of five is greatest in underdeveloped countries. Pakistan reports child mortality rates in same bracket as other South Asian countries due to malnutrition and diarrhea. To determine the prevalence and factors associated in children less than five years of age a cross sectional study was conducted with mothers whose children were admitted in pediatric government Hospital, Lahore. A convenient sample of 101 children (6-59 months, 53 males and 48 females) suffering from malnutrition and diarrhea were selected from hospital. Data about socio demographic, anthropometric, clinical and dietary variables were collected and analyzed by using SPSS version 16. The results showed that mean age of patients was  $19.36 \pm 10.5$  months. The illiteracy rate among mother and father of patients was 94.1% and 69.3% respectively. 94.1% of the patients were breastfed while 47.5% of the patients were on bottle feed with breast milk. 66.3% patients families has very low-income rate while 33.7% were satisfactory. 40.6% patients were not vaccinated against immunization. Out of 101 patients, 39.6% of the patients had diarrhea while 6.9% of the patients had chronic diarrhea. The prevalence rate of diarrhea (39%) was less among children who were younger than 18 months as compared to those who were above 18 months (40.5%). The most significant factors that caused the incidence of diarrhea in children was form of water storage system, complementary feeding practices, and hand wash cleaning materials. This study concluded that government, nongovernmental organizations and families living with children and mothers could cooperate on strategies to minimize the risks of the diarrhea among children less than five years of age.

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## Introduction

Given the global reduction in the mortality rate of children under 5 years of age, 5.9 million children died in Asia and Africa which is approximately 60 percent of the world (Liu *et al.*, 2016). The probability of dying until they reach at the age of five remains the highest issue in African Region (90 per 1000 live births), and is roughly 7 times greater than in European Region (12 per 1000 live births) (Dietrich *et al.*, 2017). Children in developed nations are unduly impacted by preventable and treatable diseases with easy and inexpensive treatments. As a consequence, children in developing countries are ten times more likely to die by the age of five than children in developed nations (Murdoch & Howie 2018). Pakistan listed among other South Asia countries in the chart of infant mortality rates. Complication attributable to early pregnancy, influenza, diarrhea, measles and starvation are the main cause to this (Gebremedhin *et al.*, 2016). Pakistan is the seventh nation in the world where 90,000 children perish every five years owing to diarrhea (Freedman *et al.*, 2019). While diarrhea medication is accessible to all children in the country but people are not aware of its value and access to hospitals is not simple for every child. Approximately 1 in 9<sup>th</sup> infant death is due to diarrheal disease worldwide, rendering it is the second leading cause of death in younger children who are less than five year of age (Lembo *et al.*, 2016). Diarrhea is a preventable and may defined as loose or watery stools more than three times in twenty four hours. Nevertheless, it emphasizes the importance of adjusting stool consistency rather than duration, and the parental experience when determining whether or not children have diarrhea. Diarrhea is a drastic increase in the number and looseness of stool (bowel movement). This may range from few or mushy stools to a number of watery stools. One or two loose stools are not diarrhea, so no medication is required (Bivins *et al.*, 2017). Illness due to diarrhea is the world's main source of mortality and morbidity. A large proportion of deaths related to diarrhea have been recorded in children under the age of five years.

Most childhood diarrhea episodes are moderate, sever cases may contribute to substantial fluid loss and starvation, which may lead to death or other serious effects, if fluids are not restored. This disease is also very common in children who are on cow milk and infant feeding formulas (Schiller *et al.*, 2017). Diarrhea is often caused by a viral infection, bacteria, parasite or specific virus. Many researches indicate that the occurrence of diarrhea in the population differs over time, especially throughout the season. Therefore, the appropriateness of standardized measurements of diarrhea incidence has been challenged. While this data is present, there has still been a shortage of studies at nation level to obtain up-to-date knowledge on the disease and to offer priority to initiatives by policy makers to address the issue (Al. Baki *et al.*, 2019). Therefore, the aim of this study was to evaluate the magnitude and factors that cause diarrhea in children less than five years of age.

## Material and method

### *Study Design & Settings*

This was a cross-sectional research design. Ethical approval by guarantying no potential harm & associated risk and non-disclosure of data was obtained from Tertiary Care Government Hospitals, Lahore, Pakistan.

### *Sample Size*

One hundred and one participants were selected purposively from pediatric center, government hospital. Lahore. Participants aged 6-49 months, enrolled consecutively after taking written informed consent. The inclusion criteria consisted of mothers who had children younger than 5 years old and admitted in hospital due to stomach issues. The data was collected in the period of five months from Feb-June 2019.

### *Demographic data*

A structured questionnaire was used to collect data on demographic and socio-economic factors such as age, education, physical activity as well as was used in the study (Dukhi *et al.*, 2017).

### Anthropometric measurement

Anthropometric measurement of child helped in evaluation of growth and development. It included weight, height/length, checking of bilateral edema, measuring of mid upper arm circumference (MUAC) and Z-score (weight for height/length). Weight was measured using Pediatric scale for Infants and beam scale for children (Gutin *et al.*, 2018). Scale was calibrated to zero and weight was recorded in kilograms after removing the heavy clothes of the child. Length board was used for measuring children length in centimeters (Hakanson *et al.*, 2017).

The child was placed on the board with crown against the fixed end of the board. The height was read to the nearest 0.1cm (Werneck *et al.*, 2016) and for children who were above 1.5 years, measuring board was used that fixed upright where the ground is level. The child stands, upright in the middle, against the measuring board. The child's head, shoulders, buttocks, knees, heels are held against the board by the assistant, while positions the head and the cursor (Abad *et al.*, 2016). The height was measured to the nearest 0.1cm. For MUAC, bend the left arm of the child.

Adjust a rope or piece of string from the tip of the shoulder to the tip of elbow. Fold the rope double, while holding the rope adjusted to the tip of the shoulder. The middle point of the arm is where the double folded rope ends. Mark this spot with a marker or pen. Place the MUAC tape on the mark around the arm, not too tight, not too loose. Read the measurement to the nearest 0.1 cm and record it.

The Z-score was determined by using a table in hospital manually, where the weight for height would be checked. If a child has  $<-3SD$  Z-score then he/she was taken as severely malnourished. If a child has  $<-2SD$  Z-score and  $>-3SD$  then he/she was taken as moderately malnourished (Conkle *et al.*, 2016).

### Data collection and analysis

The data were collected using a face-to-face administrated questionnaire and an observation checklist (Gezehegn *et al.*, 2017). SPSS version 21.0 was used for data analysis and tables were made using Microsoft word.

## Results

**Table 1.** Socio-demographic data of children on the basis of presence and absence of diarrhea

SN	Variable	Mean $\pm$ S.D Frequency%	Diarrhea	
			Mean S.D/ YES	Frequency% NO
1	Age in Months	19.36 $\pm$ 10.5	40 (39.6)	61 (60.4%)
	Age <18 Months	59(58.4%)	23 (39.0%)	36 (61.0%)
	Age >18 Months	42(41.6%)	17 (40.5%)	25 (59.5%)
2	Education Level of Father			
	Illiterate	70(69.3%)	29 (41.4)	41 (58.6%)
	Primary	3(3.0%)	1 (33.3%)	2 (66.7%)
	Middle	20(19.8%)	7 (35.0%)	13 (65.0%)
	Higher	4(4.0%)	2 (50.0%)	2 (50.0%)
3	Education Level of Mother			
	Illiterate	95(94.1%)	40 (42.1)	55 (57.9%)
	Primary	3(3.0%)	0 (0.0%)	3 (100%)
	Middle	0(0%)	0 (0.0%)	0 (0.0%)
	Higher	3(3.0%)	0 (0.0%)	3 (100%)
4	Family Type			
	Nuclear	20(19.8%)	32 (39.5%)	49 (60.5%)
5	Income Status			
	Satisfactory	34(33.7%)	24 (35.8%)	43 (64.2%)
	Poor	67(66.3%)	16 (47.1%)	18 (52.9%)

Table 1. showed the Socio-demographic data of children on the basis of presence and absence of diarrhea. The mean age of the patients was 19.36 $\pm$ 10.5 months. 58.4% of the patients were less the 18 months of age while 41.6% of the patients were over 18 months of age. 39% of patients aged less than 18 months had diarrhea while 40.5% patients aged more than 18 months had diarrhea. The illiteracy rate was high in mother (94.1%) as compared to father (69.3%). Children of illiterate fathers had 41.4% patients suffering from diarrhea.

Children of graduate fathers had only 25% patient with diarrhea. Children of illiterate mothers had 42.1% of patients suffering from diarrhea whereas children of literate mothers had 0% patients suffering from diarrhea. 80.2% of the families had Nuclear family type while 20.8% of the families belonged to joint family system. 39.5% of patients belonging to nuclear family type suffered from diarrhea and 40% of patients belonging to joint family type suffered from diarrhea. 33.7% of the families had a good monthly income while 66.3% families had low income. 35.8% of patients belonging to good monthly income families suffered from diarrhea and 47.1% of patients belonging to low monthly income families suffered from diarrhea.

**Table 2.** Anthropometric measurements and nutritional status of children on the basis of presence and absence of diarrhea.

Variables	Mean $\pm$ S.D Frequency%	Diarrhea	
		Mean S.D/ Frequency%	Frequency%
		YES	NO
Age (6-59) Months	19.36 $\pm$ 10.5	18.70 $\pm$ 9.809	19.64 $\pm$ 10.29
Age < 18 Months	12.6 $\pm$ 4.1	11.78 $\pm$ 2.9	13.19 $\pm$ 4.49
Age > 18 Months	28.6 $\pm$ 8.5	28.06 $\pm$ 7.79	28.92 $\pm$ 9.14
Weight (kg)	6.1 $\pm$ 1.81	5.93 $\pm$ 1.76	6.1 $\pm$ 1.84
Height (cm)	69.5 $\pm$ 8.1	69.4 $\pm$ 7.85	69.5 $\pm$ 8.22
Grades of Malnutrition	1.72 $\pm$ .585	1.72 $\pm$ 0.640	1.72 $\pm$ 0.552
Mild	7 (6.9%)	3 (42.9%)	4 (57.1%)
Moderate	14 (13.9%)	11 (78.5%)	3 (21.5%)
Severe	80 (79.2%)	47 (58.8%)	33 (41.2%)

Table 2. showed that anthropometric measurements and nutritional status of children on the basis of presence and absence of diarrhea. The mean age of patients was 19.36 ( $\pm$ 10.5) months. The mean age (months) of the patients who had diarrhea was 18.70 ( $\pm$ 9.809) whereas non- diarrheal patients mean age was 19.64 ( $\pm$ 0.29). The mean weight of the patients was 6.1 ( $\pm$ 1.81) kg. The mean weight of the patients who suffered with diarrhea was 5.93 ( $\pm$ 1.76) kg whereas the mean weight of no diarrheal was 6.1 ( $\pm$ 1.84) kg. The mean height of patients was 69.5 ( $\pm$ 8.1) cm. The mean height of the patients having diarrhea was 69.4 ( $\pm$ 7.85) and with non-diarrheal was 69.5 ( $\pm$ 8.22). 6.9% patients were mild malnourished, 13.9% patients were moderate malnourished and 79.2% patients were severe malnourished. Mild malnourished patients had 42.9% chances of diarrhea whereas moderate malnourished patients had 78.5% chances and severe malnourished had 58.8% chances of diarrhea.

**Table 3.** Feeding practices of the children on the basis of presence and absence of diarrhea.

Variables	Mean $\pm$ S.D Frequency%	Diarrhea	
		Mean S.D/ Frequency%	Frequency%
		YES	NO
Feeding type			
Breastfed	95 (94.1%)		
Age <18 Months	56 (58.9%)	36 (37.9%)	59 (62.1%)
Age >18 Months	39 (41.1%)		
Not Breastfed	6 (5.9%)		
Age <18 Months	3 (50.0%)	4 (66.7%)	2 (33.3%)
Age >18 Months	3 (50.0%)		
Bottle fed	48 (47.5%)		
Age <18 Months	25 (52.1%)	16 (33.3%)	32 (66.7%)
Age >18 Months	23 (47.9%)		
Not Bottle fed	53 (52.5%)		
Age <18 Months	34 (64.1%)	24 (45.3%)	29 (54.7%)
Age >18 Months	19 (35.9%)		

Table 3. showed the feeding practices of the children on the basis of presence and absence of diarrhea. 94.1% patients were on breastfeed. 58.9% patients who were less than 18 months had breastfeeding while 41.1% patients were above the age of 18 months and had breastfeeding. 62.1% patients who were on breastfeed had no diarrhea. 5.9% of the patients had no breastfeed. 66.7% of the patients had diarrhea who were not breastfed while 33.3% had no diarrhea. 47.5% patients were on bottle feed. 33.3% had diarrhea who were bottle feed while 66.7% had no diarrhea. 45.3% of the patients had diarrhea who were not bottle fed while 54.7% had no diarrhea respectively.

**Table 4.** Diarrheal status of the children in Nutritional Rehabilitation Center.

Variables	Mean $\pm$ S.D Frequency%	Diarrhea	
		Mean S.D/ Frequency%	Frequency%
		YES	NO
Patients with Diarrhea			
Acute Diarrhea		40 (39.6%)	61 (60.4%)
Age <18 Months	59 (58.4%)	23 (39.0%)	36 (61.0%)
Age >18 Months	42 (41.6%)	17 (40.5%)	25 (59.5%)
Chronic Diarrhea		8 (7.9%)	93 (92.1%)
Age <18 Months	59 (58.4%)	2 (3.4%)	57 (96.6%)
Age >18 Months	42 (41.6%)	6 (14.3%)	36 (85.7%)

Table 4. showed the diarrheal status of the children in nutritional rehabilitation center. 39.6% patients had acute diarrhea while 60.4% patients had no diarrhea. 39% patients aged less than 18 months had diarrhea while 61% patients aged less than 18 months had no diarrhea. 40.5% patients aged more than 18 months had diarrhea while 60.5% patients aged more than 18 months had no diarrhea. 7.9% of the patients had chronic diarrhea. Only 3.4% patients aged less than 18 months had chronic diarrhea while only 14.3% patients aged more than 18 months had chronic diarrhea.

**Table 5.** Diarrheal treatment of the children suffering from diarrhea.

Variables	Diarrheal Mean $\pm$ S.D Frequency%	Diarrhea Recovered	
		Mean S.D/ Frequency%	Frequency%
Treatment		YES	NO
ORS	23 (22.8%)	20 (87%)	3 (13%)
Zinc Syrup	14 (13.8%)	12 (85.7%)	2 (14.3%)
Nothing given	64 (63.4%)	8 (12.5%)	56 (87.5%)

Table 5. showed the treatment of the children suffering from diarrhea. 23 patients used ORS, 14%

patient used zinc Syrup and 64 patients were given nothing for diarrheal treatment. 87% of the patients who used ORS for treatment recovered from diarrhea. 85.7% patients who used Zinc Syrup for treatment recovered from diarrhea while only 12.5% of the patients who were given nothing for treatment could recover from diarrhea.

### Discussion

The finding of this study showed the sociodemographic background of patients, such as maternal and paternal education, was correlated with the prevalence of diarrhea in infants. Illiteracy is related to reduce education and understanding the determinants of illness and wellness. Usually illiterate parents do not conscious of the value of sanitation, they do not wash their hands after using toilet was also a cause of diarrhea in children relative to educated parents. It is also really necessary to create awareness of hand washing before serving children's meal. Many reports have concluded that the incident rate of diarrhea in developed countries may be decreased by up to 53% with the aid of hand washing intervention (Barel, 2016). Parental income also play a very significant part in the wellbeing of the household. The research showed that children belonging to low income households had greater risk of diarrhea, because impoverished people could not manage safe food options for them and their family.

Therefore, the current research found that maternal and paternal education with household income was a significant determinant of good health in infants. This result was also confirmed by a research conducted in Kashmir and India, where the prevalence of diarrhea among children under 5 years of age was 25% (Brodish & Hakes 2016). The findings of this analysis found that 7 patients were mild malnourished and had a lower risk of diarrhea (42.9%), while 14 patients were moderate and 80 patients were seriously malnourished and had a higher risk of diarrhea (78.5%, 58.8% respectively) (Blaszowska & Górska 2016). About 10 million children under 5 die per year: approximately 2 million of diarrhea (out of total with 2.5 billion episode with diarrhea) (Joffe *et al*, 2016). The majority of diarrhea-related mortality occurs in

under developed countries, with the highest rates of diarrhea occurring among undernourished children. Breast milk is the ideal diet for an infant's first six months of development, and is further confirmed by this latest research. Among 101 children with breastfed, 95 were less likely to experience diarrhea (37.9%) than those with bottle feed.

This investigation did not differentiate the various breastfeeding practices defined by the WHO that exclusive breastfeeding, predominant breastfeeding provides infants with protection from many infections, including diarrheal disease (Siregar *et al.*, 2018). This further promotes the growth of the immune system in children and contains other health-enhancing chemicals, genes, proteins and hormones. Bottle feed shelter parasites that are the primary cause of diarrhea in babies. It is also proved by the study done in Indonesia in 2018 that parasitic agents are significantly associated with childhood diarrhea in the community (Zivich *et al.*, 2018). It is also possible that intestinal parasite infestation and associated diarrhoeal disease may be minimized by increasing the standard of hygiene (personal and environmental) and nutrition, including breast feeding. Acute diarrhea can be triggered by bacterial or viral contaminated food whereas (Rollins *et al.*, 2016), chronic diarrhea causes certain health issues like irritable bowel syndrome or intestinal disorder. The findings of this study indicate that patients, less than 18 months old had less risk of acute and chronic diarrhea than those over 18 months of age. The prevalence of acute and chronic diarrhea in children can be attributed to food cooked in unhygienic conditions. Past findings supported that foodborne illness is the key vector gastrointestinal infection, leading cause of death and morbidity in developed countries (Block *et al.*, 2016).

This study also revealed the effects of diagnosis for diarrhea. This study shows that 87% of patients treated with ORS recovered from diarrhea. 85.7% of the patients used zinc supplementations syrups to recover from the disease. Literature indicates that zinc is a significant fundamental factor in the prevention and management of diarrhea as it improve



the absorption of water and electrolytes, improves the recovery of the intestinal epithelium, raises the levels of brush border enzymes, stimulates the immune response and helps to suppress pathogens (Bala *et al.*, 2019). It was also confirmed by research that showed zinc plays a key role in the control of intestinal fluid transport, mucosal integrity and genes expression modulation that encodes essential zinc-dependent enzymes like cytokines that play important roles in the immune system (Greenland *et al.*, 2016) and the regulation of oxidative stress. This is also observed that usage of zinc with ORS reduces the mortality by 23%, and diarrheal prevalence by 19% respectively.

### Conclusion

The findings of this study revealed that one out of fifth children had diarrhea in the under developed area of Lahore city, and several factors were found to cause diarrheal disease among children. Therefore, the government, nongovernmental organizations and families dealing with children and mothers must cooperate on measures to reduce the risks of the diarrhea under the five years of age.

### Acknowledgement

No acknowledgement

### Conflict of interest

There is no conflict of interest

### Sources of support

There is no funding support from any organization.

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