



## Hypomagnesaemia in children under five years of age having acute diarrhea.

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**ABSTRACT... Objective:** To determine the frequency of hypomagnesaemia in children under five year of age having acute diarrhea. **Study Design:** Descriptive Cross Sectional study. **Setting:** Department of Pediatric Medicine, Rashid Latif Medical College / Arif Memorial Teaching Hospital, Lahore. **Period:** August 2019 to January 2020. **Material & Methods:** A total of 96 children aged between 6 months to five years having acute diarrhea and duration of illness < 14 days were enrolled. All the patients were subjected to measurement of serum magnesium level. The proportion of hypomagnesaemia was analyzed in acute diarrhea. The effect modifier and confounding variables were controlled through stratification of data on duration of illness less as < 14 days and more than 14 days, age as < 2 year or > 2 year and weight as < 2SD or > 2SD on weight for age chart. Chi square test was applied considering p value < 0.05 as significant. **Results:** Our study comprised of 96 patients having acute diarrhea, of these 96 study cases, 62 (64.6%) were boys and 34 (35.4%) were girls. Mean age of our study cases was 19.25±15.71 months. Mean weight of study cases was 9.56±3.01 kg. Mean duration of illness was 5.74 ± 3.26 days. Mean Serum Magnesium level was 1.63 ± 0.32 mg/dl (ranging from 1.0 mg/dl to 2.8 mg/dl). Hypomagnesaemia was present in 47 (49%) cases. **Conclusion:** High frequency of hypomagnesaemia was observed in children under 5 years of age having acute diarrhea. Duration of illness had significant impact on hypomagnesaemia. Serum magnesium levels must be regularly monitored in children with acute diarrhea.

**Key words:** Acute Diarrhea, Hypomagnesaemia, Magnesium Levels.

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## INTRODUCTION

World Health Organization (WHO) describes diarrhea as “the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual)”.<sup>1</sup> Globally, diarrheal diseases are estimated to be the commonest cause of death in children under 5 years of age.<sup>2</sup> In some countries, diarrheal diseases are accounted to cause more deaths than all other causes combined.<sup>2,3</sup> Diarrhea in children under the age of 5 years is estimated to form around 63% of global diarrhea burden and is found to be the 2<sup>nd</sup> leading cause of infantile mortality among developing countries.<sup>4,5</sup>

Gastrointestinal loss is one of the major causes of hypomagnesaemia.<sup>6</sup> Magnesium is forth most common cation in the body and third most intracellular divalent. Magnesium is essential

enzyme activator.<sup>7</sup> Intracellular magnesium has been assessed as an index of magnesium status. Clinically it has been suggested that low serum level is sufficient to confirm the diagnosis.<sup>8</sup> Hypomagnesaemia is thought to be under-recognized while it might progress leading into serious complications.<sup>9</sup>

Paul FM and O'Brien D in their study from Singapore described the high frequency of hypomagnesaemia in acute diarrhea.<sup>10</sup> In a study, 39 out of 83 patients with gastroenteritis were found to be hypomagnesaemia. Not much work has been done to find out the existence of hypomagnesaemia among children under 5 years of age with acute diarrhea. With the help of this study we planned to determine the frequency of hypomagnesaemia in children with acute diarrhea, so that early detection and timely

intervention can protect the patients from the fatal complication of hypomagnesaemia like seizure, cardiac arrhythmias or coma.

## MATERIAL & METHODS

This descriptive cross-sectional study was done at the Department of Pediatric Medicine, Rashid Latif Medical College / Arif Memorial Teaching Hospital, Lahore, from August 2019 to January 2020.

A sample size of 96 was calculated according to the formula:  $n = z^2 * p * (1 - p) / e^2$

Where:  $z = 1.96$  for a confidence level ( $\alpha$ ) of 95%,  $p = 47\%$ ,<sup>10</sup>  $e = 10\%$

A total of 96 children aged between 6 months to five years having acute diarrhea and duration of illness <14 days were enrolled. Hypomagnesaemia was defined as serum magnesium level <1.56mEq/dL has been defined as hypomagnesaemia. Acute diarrhea was labeled as passage of three or more loose stools in the past 24 hours with or without dehydration. Children suffering from chronic kidney diseases or acute renal failure were excluded.

Study was started after permission from ethical committee of the institution. Patients having acute diarrhea were recruited. After explaining risk and benefit of study written informed consent was taken from parents or guardians. All the patients were subjected to measurement of serum magnesium level. Two ml of blood was taken in chemistry tube. After half an hour, when clot was formed in tube, sample was centrifuged for 10-15 minutes at speed of 2000 rpm. Serum obtained was stored in aliquots and Mg level was determined and hypomagnesaemia was labeled as in operational definition.

Data was entered in the computer and analyzed by using statistical software SPSS-26.0. Descriptive statistics was applied to analyze the data. The proportion of hypomagnesaemia was analyzed in acute diarrhea. The effect modifier and confounding variables were controlled through stratification of data on duration of illness less as < 14 days and more than 14 days, age as

< 2 year or > 2 year and weight as < 2SD or > 2SD on weight for age chart. Chi square test was applied considering p value < 0.05 as significant.

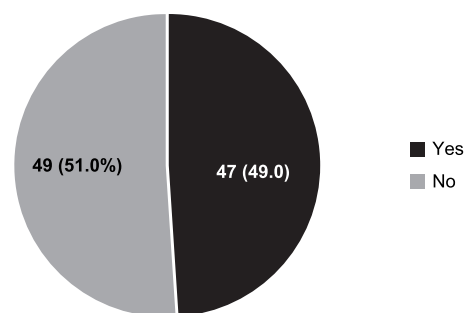
## RESULTS

Out of 96 study cases, 62 (64.6%) were boys and 34 (35.4%) were girls. Mean age was  $19.25 \pm 15.71$  months. Majority of study cases i.e. 70 (72.9%) belonged to age group of less than 2 years of age. Mean weight was  $9.56 \pm 3.01$  kg (ranging from 4.9 kg to 18 kg). Mean duration of illness was  $5.74 \pm 3.26$  days (ranging from 1 day to 12 days). In majority of cases, duration of illness was less than 7 days i.e. 55 (57.3%). Table-I is showing characteristics of the cases enrolled.

Characteristics	Number (%)
Gender	Male 62 (64.6%)
	Female 34 (35.4%)
Age (years)	<2 70 (72.9%)
	>2 26 (27.1%)
Weight for Ag	<2 SD 14 (14.6%)
	>2 SD 82 (85.4%)
Disease Duration (days)	<7 55 (57.3%)
	>7 41 (42.7%)

**Table-I. Characteristics of the study cases. (n=96)**

Mean serum magnesium level was  $1.63 \pm 0.32$  mg/dl (ranging from 1.0 mg/dl to 2.8 mg/dl). Hypomagnesaemia was present in 47 (49%) cases while 49 (51%) cases had normal serum magnesium levels as shown in Figure-1.



**Figure-1. Frequency of hypomagnesaemia among study cases.**

Hypomagnesaemia was stratified with regards to gender, age, duration of disease and weight for age.

No significant relationship of hypomagnesaemia was noted with study variables except duration of disease > 7 days ( $p=0.002$ ).

Study Variables		Hypomagnesaemia		P-Value
		Yes (n=47)	No (n=49)	
Gender	Male	28 (59.6%)	34 (69.4%)	0.394
	Female	19 (40.4%)	15 (30.6%)	
Age (years)	<2	33 (70.2%)	37 (75.5%)	0.648
	>2	14 (29.8%)	12 (24.5%)	
Weight for Ag	<2 SD	8 (17.0%)	6 (12.2%)	0.572
	>2 SD	39 (83.0%)	43 (87.8%)	
Disease Duration (days)	<7	19 (40.4%)	36 (73.5%)	0.002
	>7	28 (59.6%)	13 (26.5%)	

**Table-II. Distribution of study variables with respect to frequency of hypomagnesaemia among study cases.**

## DISCUSSION

Diarrhea is among the leading causes of childhood mortality especially in the developing countries.<sup>4,5</sup> Some of the commonest risk factors for childhood diarrhea are age, gender, geographical locations, drinking water from the contaminated water supplies, improper breast-feeding practices.<sup>11-13</sup> The need is increasing ever more to document and study the socio-demographical correlations of diarrhea to form policies and plan timely interventions to reduce the prevalence and burden of diarrhea. Hypomagnesaemia is a frequently noted abnormality among hospitalized patients and affects around 12% of admitted cases whereas in patients admitted in intensive care units (ICUs), prevalence of hypomagnesaemia is estimated to be between 60-65% and factors like malnutrition, diuretics, hypoalbuminemia and aminoglycosides are thought to play major roles in these patients.<sup>14-17</sup> Hypokalemia, hypocalcemia and metabolic alkalosis are some of the important biochemical disorders responsible for depletion of magnesium in the human body. Because of these reasons, it is difficult to attribute conditions related to complications of hypomagnesaemia to a sole entity.<sup>18</sup>

In the present study, 62 (64.6%) cases were

boys and 34 (35.4%) girls. Ansari et al analyzing children having acute diarrhea found 64.2% of the cases to be male which is quite close to what we noted.<sup>19</sup> de Rocha MGS et al from Brazil evaluated children having acute diarrhea and found similar findings.<sup>20</sup>

Mean age was noted to be  $19.25 \pm 15.71$  months (ranging from 6-60 months). It was evident that 70 (72.9%) cases in this study were aged less than 2 years. Researchers from Iran found mean age of children with acute diarrhea to be  $18 \pm 2$  months which is close to the present findings.<sup>21</sup> Rafi S et al in a local study found mean age of the children with acute watery diarrhea to be 14.7 months.<sup>22</sup> Mahmood R et al have also reported similar findings.<sup>23</sup>

Mean duration of illness in our study cases was  $5.74 \pm 3.26$  days (ranging from 1 to 12 days). Our study results indicated that in majority of cases duration of illness was less than 7 days i.e. 55 (57.3%). Yilgawan et al<sup>24</sup> reported  $4 \pm 3.2$  days mean duration of diarrhea in a study from Nigeria which is similar to our study results.<sup>24</sup>

Deficiency in serum Mg levels is characterized in different clinical states. The most common in children are gastroenteritis (acute and persistent), with malabsorption syndrome, malnutrition, kidney disease occasionally in newborns and in patients with renal tubular dystrophies. In this study, mean Serum Magnesium level was  $1.63 \pm 0.32$  mg/dl (ranging 1.0 to 2.8 mg/dl). Hypomagnesaemia was present in 47 (49%) of our study cases while 49 (51%) of our study cases had normal serum magnesium levels. Paul FM et al reported 47% frequency of hypomagnesaemia in children with acute diarrhea.<sup>10</sup> Vekariya NP et al<sup>25</sup> observed 55% of the cases with acute diarrhea to have hypomagnesaemia at the time of admission which is again highlighting that frequency of hypomagnesaemia is quite high among cases having acute diarrhea.

## CONCLUSION

High frequency of hypomagnesaemia was observed in children under 5 years of age having acute diarrhea. Duration of illness had






significant impact on hypomagnesaemia. Serum magnesium levels must be regularly monitored in children with acute diarrhea.

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2	Farrukh Saeed	Drafting, Data analysis.	
3	Muhammad Anwar	Proof reading, Discussion.	
4	Sanuallah Khan	Data collection, Literature review.	
5	Seemi Habib	Literature review, Discussion.	
6	Shahla Tariq	Literature review, Introduction.	