

**Research Article**

## **Frequency of Serum Magnesium Level in Children Presenting With Acute Severe Malnutrition**

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### **ABSTRACT**

**Aim:** to record frequency of serum magnesium level in children presenting with acute severe malnutrition.

**Methods:** In this study, a total of 100 cases  $\leq 5$  years of either gender, diagnosed as severe malnourished on the basis of weight (history of weight loss within 6 months assessed on history from mother) 3 Standard Deviation below the mean world health organization reference value while those with acute diarrhea ( $> 3$  loose stools,  $< 14$  days), already diagnosed/under treatment of hypomagnesemia were excluded from the study. All these cases were enrolled from Pediatric Department, DHQ Hospital Gujranwala. After detailed history and physical examination, 2 ml blood samples were collected for measurement of fasting serum magnesium. On arrival of reports, we analyzed the presence/absence of hypomagnesemia (Serum magnesium level  $< 1.5$ mg) in children with severe malnutrition was noted, and if the children found with hypomagnesemia was treated according to the departmental protocols.

**Results:** We recorded that 61% (n=61) were between 1-3 years of age while 39% (n=39) were between 4-5 years of age, mean $\pm$ sd was calculated as  $3.11 \pm 2.57$  years. Regarding gender 58% (n=58) were male and 42% (n=42) were females. Serum magnesium levels (mg) was calculated as  $1.69 \pm 0.87$ mg. Frequency hypomagnesaemia in children with acute severe malnutrition was recorded in 17% (n=17).

**Conclusion:** Evaluation of serum magnesium levels in children with acute severe malnutrition is helpful and it may have therapeutic and prognostic implications in acute severe malnourished children.

**Keywords:** Malnourished children, hypomagnesemia, pediatric population.

### **INTRODUCTION**

Globally, malnutrition in children below five years of age is a challenging health issue.<sup>1</sup> The rate of malnourished children is more than 50% in South Asian countries, while an alarming magnitude of this morbidity is reported from Pakistan, Bangladesh and India.<sup>2</sup> The significance of adequate nutrition in early years of life may not be denied as the nutrition has a higher effect on mental, physical, intellectual and social development of a children. Assessment of malnourished cases at the time of admission in ICU is supportive.<sup>3</sup> Magnesium (Mg) is inevitable for usual cellular functions.<sup>4</sup> For electrolyte

hemostasis it acts as co-factor, it is inevitable for division of cells and membrane stability.<sup>5</sup> Deficiency of magnesium causes in clinical illness.<sup>6-7</sup> It may also be responsible for adverse clinical outcome and mortality rate.<sup>7</sup>

Previous data from pediatric ICUs estimated 20% to 60% hypomagnesemia on arrival of cases while cases outside ICU are reported having hypomagnesemia with malignancy while around 15% of the cases are managed for malnutrition.<sup>8</sup> However, variation of hypomagnesemia exists in malnourished children being reported as 8.1%<sup>9</sup> and 36%.<sup>10</sup>

Keeping in view above, in this trial we planned to investigate the rate of hypomagnisemia in children presenting with acute severe malnutrition. The results will add the magnitude from surrounding areas of Lahore, Pakistan.

**PATIENTS AND METHODS**

In this study, a total of 100 cases  $\leq 5$  years of either gender, diagnosed as severe malnourished on the basis of weight (history of weight loss within 6 months assessed on history from mother) 3 Standard Deviation below the mean world health organization reference value while those with acute diarrhea ( $> 3$  loose stools,  $< 14$  days), already diagnosed/under treatment of hypomagnesemia were excluded from the study. All these cases were enrolled from Pediatric Department, DHQ Hospital Gujranwala. After detailed history and physical examination, 2 ml blood samples were collected for measurement of fasting serum magnesium. On arrival of reports, we analyzed the presence/absence of hypomagnesemia (Serum magnesium level  $< 1.5$ mg) in children with severe malnutrition was noted, and if the children found with hypomagnesemia was treated according to the departmental protocols.

**RESULTS**

We recorded that 61%(n=61) were between 1-3 years of age while 39%(n=39) were between 4-5 years of age, mean $\pm$ sd was calculated as 3.11 $\pm$ 2.57 years. (Table No. 1) Regarding gender 58%(n=58) were male and 42%(n=42) were females. (Table No. 2) Serum magnesium levels(mg) was calculated as 1.69 $\pm$ 0.87mg. (Table No. 3) Frequency hypomagnesaemia in children with acute severe malnutrition was recorded in 17%(n=17) while rest of 83%(n=83) had magnesium levels  $> 1.5$ mg. (Table No. 4)

**Table 1** Age Distribution (n=100)

Age(in years)	No. of patients	%
1-3	61	61
4-5	39	39
Mean $\pm$ SD	3.11 $\pm$ 2.57	

**Table No. 2** Gender Distribution (N=100)

Gender	No. of patients	%
Male	58	58
Female	42	42

**Table No. 3** Mean Serum Magnesium Levels (n=100)

Serum magnesium levels(mg)	Mean	SD
	1.69	0.81

**Table No. 4** Frequency Hypomagnesaemia In Children With Acute Severe Malnutrition (N=100)

Hypomagnesemia	No. of patients	%
Yes	17	17
No	83	83

**DISCUSSION**

In this study, we recorded that 61%(n=61) were between 1-3 years of age while 3, 9%(n=39) were between 4-5 years of age, mean $\pm$ sd was calculated as 3.11 $\pm$ 2.57 years 58%(n=58) were male and 42%(n=42) were females, serum magnesium levels(mg) was calculated as 1.69 $\pm$ 0.87mg. Frequency hypomagnesaemia in children with acute severe malnutrition was recorded in 17%(n=17) while rest of 83%(n=83) had magnesium levels  $> 1.5$ mg.

Studies in Pediatric ICUs have reported a 20% to 60% incidence of hypomagnesemia on arrival but are divided on its role in predicting mortality and length of ICU stay.<sup>6</sup> Outside of the ICU, hypomagnesemia has been reported in children with malignancy and in up to 15% of those being treated for malnutrition.<sup>11</sup> The finding of our study are in agreement with the above findings.

Ozturk CF and others<sup>8</sup> in a recent study recorded that serum magnesium levels were lower than normal value in 9 (36%) of 25 malnourished children, these findings are higher than our study. Another study by Kyohairwe and colleagues<sup>10</sup> recorded that 186 children admitted with severe malnutrition, among them 15(8.1%) had hypomagnesaemia.<sup>10</sup> These findings are also supporting our findings.

Another study prospectively evaluated 100 cases in Isfahan by Safavi and others revealed that 51% of children had magnesium level  $< 1.5$ . A

significant difference in mortality rates was reported i.e. (55% vs. 35%).<sup>12</sup> We agree with the view that undernourished children have significantly greater risk to develop severe infections secondary to compromised immune responses.<sup>13</sup>

Alterations in magnesium levels are variant according to demographic changes, however, it is essential to evaluate magnesium levels in these cases, as previous data<sup>12</sup> reveals higher mortality rate in those with magnesium level <1.5. Though, we did not include outcome of these cases in our study, but considering literature review, we are also in favour that evaluation of serum magnesium levels may have prognostic, and perhaps therapeutic, implications.

## CONCLUSION

- Evaluation of serum magnesium levels in children with acute severe malnutrition is helpful and it may have therapeutic and prognostic implications in acute severe malnourished children.

## REFERENCES:

1. Gopalan S. Malnutrition: Causes, consequences, and solutions. *Nutrition* 2000;16(7):556–8.
2. Bhutta ZA, Thaver D, Akram DS, Khan M. Situation and Program analysis of malnutrition among women and children in Pakistan. In: Bhutta ZA, editor. *Maternal and Child Health in Pakistan Challenges and Opportunities*. Pakistan: Oxford University Press;2004.
3. Hulst JM, van Goudoever JB, Zimmermann LJ, Tibboel D, Joosten KF. The role of initial monitoring of routine biochemical nutritional markers in critically ill children. *J Nutr Biochem* 2006; 17 (1): 57- 62.
4. Koch SM, Warters RD, Mehlhorn U. The simultaneous measurement of ionized and total calcium and ionized and total magnesium in intensive care unit patients. *J Crit Care* 2002;17 (3):203- 5.
5. Chernow B, Bamberger S, Stoiko M, Vadnais M, Mills S, Hoellerich V, et al. Hypomagnesemia in patients in postoperative intensive care. *Chest* 1989; 95 (2): 391- 7.
6. Ryzen E. Magnesium homeostasis in critically ill patients. *Magnesium* 1989; 8 (3-4): 201- 12.
7. Tong GM, Rude RK. Magnesium deficiency in critical illness. *J Intensive Care Med* 2005; 20 (1): 3- 17.
8. Raj KS, Keane-Miller C, Golden NH. Hypomagnesemia in adolescents with eating disorders hospitalized for medical instability. *Nutr Clin Pract*. 2012;27(5):689–94.
9. OzturkI CF, KarakelleogluI C, OrbakI Z, YildizIII L. The effect of serum magnesium levels and serum Endothelin-1 levels on bone mineral density in protein energy malnutrition. *West Indian Med J* 2012;61(3):213.
10. Kyohairwe, Musiime S. Prevalence and factors associated with hypomagnesaemia in severely malnourished children admitted to Mulago Hospital. Makerere University Institutional Repository. 2010;available at: <http://hdl.handle.net/10570/2917>.
11. Kaplinsky C, Alon US. Magnesium homeostasis and hypomagnesemia in children with malignancy. *Pediatr Blood Cancer*. 2013;60(5):734–40.
- 12.. Safavi M, Honarmand A. Admission hypomagnesemia--impact on mortality or morbidity in critically ill patients. *Middle East J Anesthesiol* 2007; 19 (3): 645- 60.
13. Rayhan I, Khan SH Factors causing malnutrition among under five children in Bangladesh, Asian Network for Scientific Information. *Pak J Nutr* 2006, 5(6):558–62