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Research Article

**CLINICAL MANIFESTATION OF HYPOCALCEMIA IN
SEVERELY MALNOURISHED CHILDREN****Dr Rashida Javed¹, Dr Sanaullah Khan², Dr Farrah Naz³, Dr Ayesha Sabir⁴,
Dr Safoora Khalid⁵**¹Senior Registrar at Arif Memorial teaching Hospital²Assistant Professor at Arif Memorial teaching Hospital³Associate Professor at children Hospital, Lahore⁴Senior registrar at Jinnah Hospital Lahore⁵Senior Registrar at Children Hospital Lahore**Abstract:**

Aims and Objectives: To see the frequency of clinical manifestations of hypocalcaemia in severely-malnourished children aged 6 months to 5 years. **Method:** This is a cross-sectional study done in Children Hospital and Institute of Child Health, Lahore after taking informed consent from parents. The continuous variables like age were revealed as mean and standard deviation. The qualitative variables like gender and demonstration of hypocalcaemia, AWD, vomiting and convulsion were presented as frequency and percentage. **Results:** The mean age of the patients was 34.67±15.72 months. Regarding sex distribution, 104 (52%) patients were male and 96(48%) patients were females. Mean value of calcium level of the patients was 5.55±1.45. Frequency of clinical manifestation of hypocalcaemia stood as follows: acute watery diarrhea in 167(83.5%) patients, vomiting in 59(29.5%) cases and convulsion in 39(19.50%) cases. **Conclusion:** In conclusion, the present study displayed that the frequency of clinical manifestation (ADW, Vomiting & convulsion) of hypocalcaemia was 83.5%, 29.5% & 19.50% respectively in severely-malnourished children aged 6 months to 5 years.

Keywords: Acute Watery Diarrhea, Severe, Malnutrition, Children, Hypocalcaemia

Corresponding author:**Dr Rashida Javed,**

Senior Registrar at Arif Memorial teaching Hospital.

E-mail: rashdajaved91@gmail.com.

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INTRODUCTION:

Malnutrition is defined as a pathological state resulting from relative or absolute deficiency of one or more fundamental nutrients.¹ Around 19 million children under five are affected by severe acute malnutrition (SAM) which is defined as a weight-for-height z-score of <-3 .² One of the reasons for malnutrition is inadequate intake of carbohydrates, protein, vitamins and mineral supply to the cells of the body to satisfy the physiological requirements.³ Protein energy malnutrition usually presents early in children between 6 months and 2 years of age and is associated with early weaning, delayed introduction of complementary foods, a protein poor diet and frequent infections.

Severe malnutrition is evidenced by wasting, edema or both that occurs almost exclusively in children. Marasmus is defined as severe wasting, whereas marasmic kwashiorkor as severe wasting in the presence of edema and kwashiorkor as malnutrition with edema. In under developed countries, around one-third of children are under nourished.⁴ Recently, the humanitarian organization Save the Children warned that “chronic malnutrition affects 178 million children in the World and is the third leading cause of all childhood deaths worldwide”.⁵ In India, incidence of severely wasted under-five children is 2.8. In 2003, the United Nations children’s Fund (UNICEF) estimated sixty thousand children to be severely malnourished in Ethiopia.⁴ The National Nutritional Survey of 2011 assessed that 31.2% of Pakistani children less than 5 years are underweight, 15.1% wasted and 43% are stunted.⁶ In 2010, protein-energy malnutrition had resulted in 600,000 deaths as compared to 883,000 deaths in 1990.⁷

Hypocalcemia is a very common in our country due to many reasons like low socio-economic status, nutritional insufficiency, malabsorption, multiple pregnancies and vitamin D deficiency.⁸ It has been endorsed that hypocalcemia should be treated timely in order to prevent life-threatening complications such as laryngospasm, tetany, seizures and cardiac abnormalities.

The plasma level of calcium is adjusted with normal total calcium of 2.2-2.6mmol/L (9-10.5mg/dL) and normal ionized calcium of 1.1-1.4mmol/L (4.5-5.6mg/dL).⁹ Whereas hypocalcemia is defined as serum total calcium level less than 8.5mg/dL or ionized calcium less than 4.7 mg/dL.¹⁰ The reported prevalence of hypocalcemia varies significantly in different studies due to

differences in the population studied and the cutoff values used is around 55%.¹¹

Hypocalcemia is often related with severe consequences, such as seizures and death especially in children with severe malnutrition. Thus, the shortage of adequate supply of calcium in severely malnourished children may impede and/or delay recovery from the potential consequences of hypocalcemia in such children. A study carried out in Bangladesh displayed the prevalence of hypocalcaemia among severely-malnourished under-five children was 26%.¹² The incidences of clinical manifestations found in this study are acute watery diarrhea 86%, vomiting 23% and convulsions 13%.¹².

The rationale of this study is to ascertain the clinical manifestations of hypocalcemia such as acute watery diarrhea, vomiting and convulsion in patients presenting with severe malnutrition. A well understanding of clinical manifestations of hypocalcemia may improve the use of calcium, and simultaneously, may help diminish hypocalcemia-related morbidity and mortality and to treat and improve the outcome of hypocalcemia in malnutrition. By knowing the precise frequencies of the complications we can formulate guidelines to anticipate and prevent these complications.

METHODS:

This is a cross-sectional study carried out at the admitted patients at The Children’s Hospital and Institute of Child Health Lahore over a period of 6 months from November 2013 to April 2014. All patients aged 6 months to 5 years with diagnosis of severe malnutrition were enrolled. Severe malnutrition was defined as weight-for-height Z-score <-3 and Hypocalcemia was defined as serum calcium concentration <8.5 mg/dl. A total 200 cases with severe malnutrition were included. In this study in Children Hospital and Institute of Child Health, Lahore after taking informed consent from parents. All data were entered in a self-structured questionnaire. Demographic information including age, gender and hospital registration number was documented. All the collected data was entered and analyzed on SPSS version 20. The continuous variables like age were demonstrated as mean and standard deviation. The qualitative variables like gender and manifestation of hypocalcaemia, AWD, vomiting and convulsion were demonstrated as frequency and percentage.

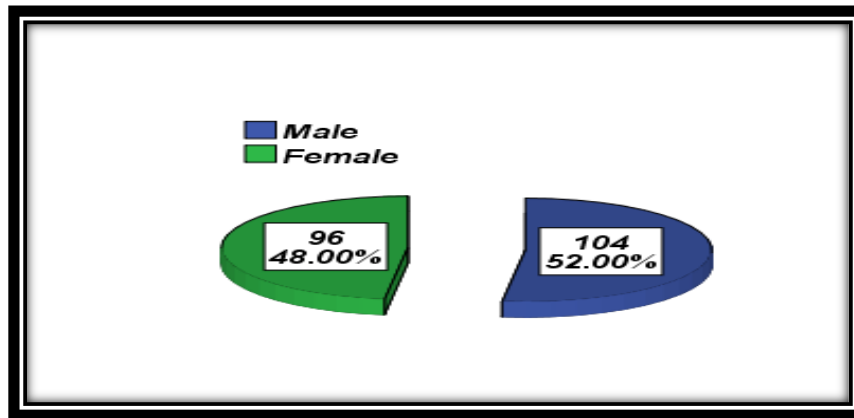
RESULTS:

The mean age of the patients was 34.67 ± 15.72 months with minimum and maximum ages of 6 & 60 months respectively. **Table#1.** In this study, 104(52%) patients were male and 96(48%) patients were females. The male to female ratio of the patients was 1.08:1. **Fig#1.** The study results showed that the mean

value of calcium level of the patients was 5.55 ± 1.45 with minimum and maximum value of 3 & 8 respectively. **Table#2.** Frequency of clinical manifestation of hypocalcaemia were as follows: acute watery diarrhea in 167(83.5%) patients **Table#3,** vomiting in 59(29.5%) cases **Table#4** and convulsion in 39(19.50%) cases **Fig#2.**

Table#1: Descriptive statistics of age (months)

Age (months)	N	200
	Mean	34.67
	SD	15.72
	Minimum	6
	Maximum	60

**Fig#1** Frequency distribution of gender**Table#2: Descriptive statistics of calcium**

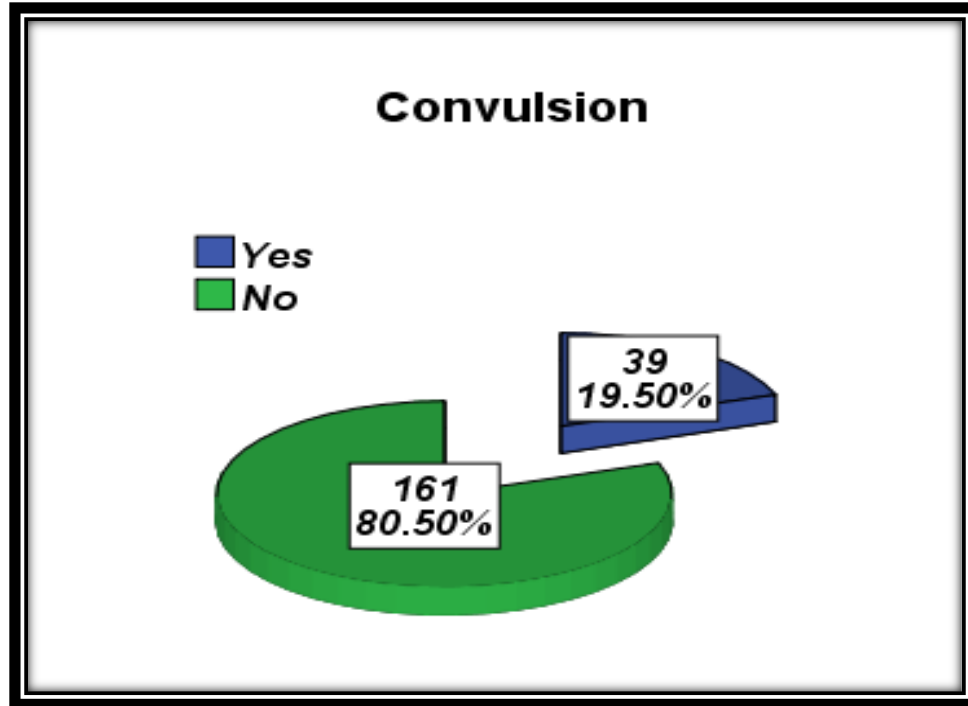
Calcium	N	200
	Mean	5.55
	SD	1.45
	Minimum	3.0
	Maximum	8.0

Table#3: Frequency distribution of AWD

		Frequency	Percent
AWD	Yes	167	83.5
	No	33	16.5
	Total	200	100.0

Table#4: Frequency distribution of vomiting

		Frequency	Percent
Vomiting	Yes	59	29.5
	No	141	70.5
	Total	200	100.0



Fig#2: Frequency distribution of convulsion

DISCUSSION:

This present cross sectional study was carried out at Children hospital and institute of child health, Lahore to determine the frequency of clinical manifestations of hypocalcemia in severely-malnourished children aged 6 months to 5 years. AWD, convulsion on admission, and lethargy have been recognized as the independent predictors of hypocalcaemia in severe acute malnutrition children. Hypoglycemia, also known as low blood sugar, is defined by WHO as a blood glucose or blood sugar concentration of less than three milli moles per litre (mmol/l) or less than 54 milligrams per decilitre (mg/dl) in children with severe malnutrition.¹³

In our study the mean value of calcium level of the patients was 5.55 ± 1.45 , the acute watery diarrhea was noted in 167(83.5%) patients, vomiting condition was noted in 59(29.5%) patients and the convulsion was found in 39(19.50%) patients. Some of the studies are discussed below showing their results as

A study by Mohammad J. Chisti *et al*¹² resulted that the hypocalcemic children with severe malnutrition are at higher risk of deaths compared to those without hypocalcaemia. AWD, convulsions, and lethargy on admission may be used as predictors of hypocalcaemia

in severely-malnourished children and may help in decision-making for calcium supplementation, along with magnesium supplementation and other management following WHO guideline. They revealed the prevalence of hypocalcaemia among severely-malnourished under-five children was 26%. The occurrences of clinical manifestations found in this study are acute watery diarrhea 86%, vomiting 23% and convulsions 13%. The reported prevalence of hypocalcemia fluctuates significantly between studies due to differences in the population studied and the cutoff values used is around 55%.¹¹

In a few cases, severely-malnourished children may present with chronic severe hypocalcaemia and may remain asymptomatic.¹⁴ A study by E Mallet¹⁵ presented that the clinical manifestations of hypocalcaemia may be neurological disorders, such as seizures, respiratory disorders with possible laryngospasm or severe cardiac disorders that may result in sudden death. One study by David Goltzman¹⁶ demonstrated that the hypocalcemia may be related with a spectrum of clinical manifestations, ranging from few if any symptoms if the hypocalcemia is mild and/or chronic to severe life-threatening symptoms if it is severe and/or acute. Thus,

hypocalcemia management depends upon the severity of symptoms.

The World Health Organization (WHO) estimates that malnutrition accounts for 54 percent of child mortality worldwide, about 1 million children. Another estimate also by WHO states that childhood underweight is the cause for about 35% of all deaths of children under the age of five years worldwide.¹⁷⁻¹⁹ The National Nutritional Survey of 2011 estimated that 31.2% of Pakistani children less than 5 years are underweight, 15.1% wasted and 43% are stunted.⁶ In a small study of 19 infants, the reported incidence of early onset hypocalcemia was 37% by 12 hours, 83% by 24 hours, and 89% by 36 hours in very preterm infants less than 32 weeks' gestation. Among very preterm infants, the onset of hypocalcemia is earlier than in more mature at-risk neonates.²⁰

CONCLUSION:

In conclusion, the present study showed that the frequency of clinical manifestation (Acute watery diarrhea, Vomiting and convulsion) of hypocalcaemia was 83.5%, 29.5% & 19.50% respectively in severely-malnourished children aged 6 months to 5 years. So, awareness should be made to help improve the serious consequences of hypocalcemia in malnutrition.

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