



ORIGINAL RESEARCH PAPER

Paediatrics

THE FREQUENCY OF HYPONATREMIA AND HYPOKALEMIA IN MALNOURISHED CHILDREN WITH ACUTE DIARRHEA AT TERTIARY CARE HOSPITAL JHALAWAR (RAJASTHAN)

KEY WORDS: - IAP, Malnutrition, Diarrhoea

Dr. Aditi Makkar

PG Resident (MD), Department of Pediatrics, Jhalawar Medical College, Jhalawar.

Dr. Pankaj Kumar*

PG Resident (MD), Department of Pediatrics, Jhalawar Medical College, Jhalawar. *Corresponding Author

ABSTRACT

BACKGROUND- Malnutrition is a major global health problem, with the major burden being in South Asia and Sub-Saharan Africa. The study was undertaken to determine the frequency of hyponatremia and hypokalemia in malnourished children with acute diarrhea.

METHODS- Hospital based prospective study was conducted at Dept. of Pediatrics, Jhalawar Medical College and Hospital, Jhalawar. 110 children between the age group of 6 months to 5 years presenting with acute diarrhea were included in the study.

RESULTS- Hyponatremia was observed in total 18 (16.36%) cases of diarrhea. Regarding the grade of malnutrition, hyponatremia was observed in only 3.45% in grade 1, 10.00% in grade 2, 50% in grade 3 and 70.00% in grade 4 malnutrition respectively. Hypokalemia was noticed in 10.00% cases (11 out of 110) with acute diarrhea. The frequency of hypokalemia was 3.45% in grade 1, 6.67% in grade 2, 25.00% in grade 3 and 40.00% in grade 4 malnutrition respectively.

CONCLUSION- Electrolyte disturbances are often subclinical in malnourished children, but become obvious during the episode of acute diarrhoeal disease. Hence serum electrolytes of every malnourished child with acute diarrhoea should be estimated in order to do immediate correction and avoid serious life threatening outcome.

INTRODUCTION

Malnutrition is a major global health problem, with the major burden being in South Asia and Sub-Saharan Africa.¹

Many metabolic and electrolyte abnormalities are common in malnourished children which become more marked if accompanied by diarrhea. Severe malnutrition accounts for 2 million deaths annually with diarrhea being the most common complication.²

The prevalence of diarrhoea is 5-7 times more in malnourished as compared to normal children and its severity is 3 to 4 times greater in malnourished children as compared to normal children.³

Among various electrolyte abnormalities observed in malnourished children, the sodium (Na) and potassium (K) abnormalities are commonest. Total body potassium is decreased in all malnourished children, due to decreased intake and poor muscle mass. The serum sodium is reduced in most children with malnutrition masking the sodium overload due to sodium retention. The association of diarrhea is known to worsen these abnormalities in malnourished children.⁴ Hence early correction of hyponatremia and hypokalemia in malnourished patients with diarrhea can significantly reduce the mortality and morbidity. The study was undertaken to determine the frequency of hyponatremia and hypokalemia in malnourished children with acute diarrhea.

MATERIAL AND METHODS

Study Design: Hospital based prospective study

Study Place: Dept. of Pediatrics, Jhalawar Medical College and Hospital, Jhalawar

Study Population:

All the children between the age group of 6 months to 5 years presenting with acute diarrhea were included in the study.

Sample Size:

Sample size of 105 patients required at 80% study power and alpha error 5%. It is rounded to 110 patients for present study expecting approx. 5% drop when Koli C et al was found that Hypokalemia detected in 8.73% cases of diarrhea.

Sampling Method: Simple random sampling

Inclusion Criteria:

All the children between the age group of 6 months to 5 years presenting with acute diarrhea were included in the study.

Exclusion Criteria:

Children under 6 months or above 5 years, Children suffering from chronic renal disease, cystic fibrosis, cardiac diseases, chronic diarrhea and those receiving diuretics were excluded from study.

Data Collection:

A detailed history was obtained from parents. A thorough physical examination was done to assess the grade of dehydration. Anthropometric measurements such as weight, height, head circumference and mid arm circumference were taken. Their nutritional status was graded as per Indian Academy of Pediatrics (IAP) classification using weight for age as the reference. The blood sample was drawn for serum electrolytes under aseptic measures and were sent to laboratory.

Data Analysis:

All data were analyzed on EPI-info statistical software. Qualitative data were expressed in the form of proportion. Quantitative data were expressed in mean ± SD. Qualitative data were compared by Chi square test. Unpaired t test was used to infer the difference in means. For significance, following at the level of "p" value was taken-

- P > 0.05 = Not significant
- P = 0.05 = Just significant
- P < 0.05 = Significant
- P < 0.001 = Highly significant.

RESULTS

Out of the 110 patients with acute diarrhea, 58 cases had grade 1 malnutrition, 30 cases had grade 2 malnutrition, 12 cases had grade 3 and 10 cases had grade 4 malnutrition respectively. Among 110 patients with acute diarrhea, 62 cases were boys and 48 cases were girls.

Hyponatremia was observed in total 18 (16.36%) cases of

diarrhea. Regarding the grade of malnutrition, hyponatremia was observed in only 3.45% in grade 1, 10.00% in grade, 50% in grade 3 and 70.00% in grade 4 malnutrition respectively. Hypokalemia was noticed in 10.00% cases (11 out of 110) with acute diarrhea. The frequency of hypokalemia was 3.45% in grade 1, 6.67% in grade 2, 25.00% in grade 3 and 40.00% in grade 4 malnutrition respectively.

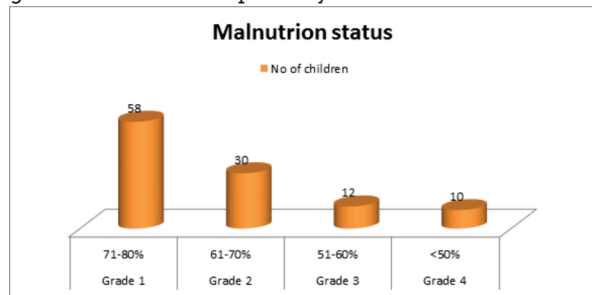


Table 1: Hyponatremia And Hypokalemia In Relation To Nutritional Status

Malnutrition grade (As per IAP)	Weight for age	No of total children	Hyponatremia present	Hypokalemia present
Grade 1	71-80%	58	2(3.45%)	2(3.45%)
Grade 2	61-70%	30	3(10.00%)	2(6.67%)
Grade 3	51-60%	12	6(50.00%)	3(25.00%)
Grade 4	<50%	10	7(70.00%)	4(40.00%)
Total		110	18(16.36%)	11(10.00%)

DISCUSSION

Diarrhoea and malnutrition are serious health problems in the children of developing countries. Fatality rate in a case of diarrhea increases when superimposed upon malnutrition. Various studies have shown that malnutrition is associated with increased incidence and duration of acute diarrhoea. It is also a risk factor for acute diarrhoea and respiratory mortality.⁶⁻¹²

A study conducted by Sameen I et al showed that diarrhoea (50.%) was the most common infection and hyponatremia (22.6%) the most common electrolyte abnormality in severely malnourished patients.¹³ only one case of diarrhoea without malnutrition had hyponatremia and the percentage of hyponatremia increased with the grade of malnutrition. Hyponatremia was noticed in 50% cases with Grade III and 66.6% cases of grade IV malnutrition having diarrhoea.¹³ Similar observations were made by Samadi AR and Memon Y et al. They also observed direct relation of hyponatremia to the degree of malnutrition.^{14,15} In our study none of the patients had hypernatremia. Memon et al. found hypernatraemia in 1.5% cases with acute gastroenteritis and malnutrition. Hypernatraemia could be due to inadequate free water intake by the patients or increased intake of sodium through improperly prepared oral rehydration solution. Hypernatremia in association with malnutrition and diarrhoea is associated with risk of neurological damage and high mortality¹⁴

CONCLUSION

Electrolyte disturbances are often subclinical in malnourished children, but become obvious during the episode of acute diarrhoeal disease. Hence serum electrolytes of every malnourished child with acute diarrhoea should be estimated in order to do immediate correction and avoid serious life threatening outcome.

REFERENCES

1. UNICEF WHO. Child growth standard and the identification of severe acute malnutrition in infants and children. Geneva:WHO;2009
2. Mesham AR, Chatterjee M. Wasting away: The crises of malnutrition in India. Washington DC: The World Bank 1999.
3. Mubarak A, Atta-ullah M, Abid H. Acute hypokalemic flaccid paralysis in malnourished children. Pak Paed J 2003;27(4):166.
4. Jospe N, Forbes G. Fluid and electrolytes clinical aspect. Pediatric Rev 1996;17(11):395-403

5. Koli C S, Bhat M, Joshi S. The frequency of hyponatremia and hypokalemia in malnourished children with acute diarrhea. *PARIPEX*, 2018;12(7):21-22.
6. Scoharling JB, McAuliffe JF, Desouza MA, Guerrant RL. Malnutrition is associated with increased diarrhoea incidence and duration among child in an urban Brazilian slum. *Int Epidemiol* 1990;19(3):728-35.
7. Bairagi R, Chowdhury MK, Kim YJ. The association between malnutrition and diarrhea in rural Bangladesh. *Int J Epidemiol* 1987;16(3):447-81.
8. Bhutta ZA, Nizami SQ, Thbani S, Issani Z. Risk factor for mortality among hospitalized children with persistent diarrhea in Pakistan. *J Trop Paediatr* 1997;43(6):330-6.
9. Yoon PW, Black RE, Moulton LH. The effect of malnutrition on the risk of diarrhea and respiratory mortality in children <22 year of age in Cebu, Philippines. *Am J Clin Nutr* 1997;65(4):1080-1.
10. Fagundes- Neto U, de Andrade JA. Acute diarrhoea and malnutrition: lethality risk in hospitalized infant. *J Am Coll Nutr* 1999;18(4):303-8.
11. Mahalanabis D, Alam AN, Rahman N, Hasnat A. Prognostic indicators & risk factors, for increased duration of acute diarrhea and for persistent diarrhea in children. *Int J Epidemiol* 1991;20(4):1064-72.
12. Shah RH, Javdekar BB. Management of children with severe acute malnutrition: experience of nutrition rehabilitation centre at Baroda, Gujarat. *Int J Contemp Pediatr*. 2014 May; 1(1):3-6
13. Sameen I, Moorani KN. Morbidity patterns of severely malnourished children at tertiary care hospital. *Pak Paed J* 2014;38:3-8.
14. Samadi AR, Waheed MA, Islam MR, Ahmed SM. Consequences of hyponatremia and hypernatremia in children with acute diarrhea in Bangladesh. *Br Med J (Clin Res Ed)*. 1983;28:286(6366):671-3.
15. Memon Y, Majeed R, Ghani MH, Shaikh S. Serum electrolyte changes malnourished children with diarrhea. *Pak J Med Sci* 2007; 23: 760-4. 18. Paul AC, Ranjini K, Muthulakshmi, Roy A, Kirubakaran C. Malnutrition and hypernatremia in breast fed babies. *Ann Trop Paediatr* 2000;20(3):179-83