

CLINICAL MANIFESTATIONS OF HYPOKALEMIA

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ABSTRACT

OBJECTIVE: To observe the clinical manifestations of hypokalemia resulting from acute watery diarrhoea.

DESIGN: A descriptive study.

SETTING: Paediatrics department, Isra University Hospital Hyderabad, Sindh from April 2004 to April 2005.

PATIENTS AND METHODS: Children less than 5 years of age with acute watery diarrhoea and vomiting who were found to have hypokalemia were included in this study. Children with chronic diarrhoea (more than 14 days duration) or hypokalemia of any other cause such as Barter's syndrome etc. were excluded. Children with paralytic ileus due to other causes such as anti-diarrhoeal drugs etc. were also excluded. Serum potassium levels were checked at Isra University research laboratory by the standard ion selective electrode method. Hypokalemia was defined as serum potassium level of less than 3.5 mEq/l. The clinical presentations of children with hypokalemia were recorded and statistically analysed.

RESULTS: During study period, 350 children with acute watery diarrhoea were admitted. Of these, 130 (37.14 %) were hypokalemic and were included in this study, whereas 220 (62.85 %) children were normokalemic (normal serum potassium level) and therefore were excluded from study. Abdominal distention was the commonest manifestation in 110(84.61%) children followed by head flop in 90(69.23%) cases, diminished bowel sounds in 55(42.30%), paralytic ileus in 30 (23.07%), inability to sit, stand or walk in 45(34.61%) and aphonia or dysphonia in 15(11.53%) children. Five children (3.84%) with hypokalemia had no clinical manifestation. Examination revealed weakness of limbs in 35 children, out of which 30 children had quadriparesis and 5 had paraparesis.

CONCLUSION: Hypokalemia is an important electrolyte disturbance with acute diarrhoea. It may have serious clinical manifestations like abdominal distention, paralytic ileus, and can even lead to cardiac arrhythmias and arrest. Although, it can have fatal morbidities, timely intervention yields encouraging results.

KEY WORDS: Diarrhoea. Hypokalemia. Abdominal distension.

INTRODUCTION

Diarrhoea is a leading cause of illness and death among children in developing countries, where an estimated 1.3 thousand million episodes and 4 million deaths occur each year in under-five children. An average of 3.3 episodes each year per child occur worldwide, but in certain areas this average exceeds nine episodes each year. In these areas, young children may spend more than 15% of their days with diarrhoea. About 80% of deaths due to diarrhoea occur in the first two years of life. The main cause of death from acute diarrhoea is dehydration, which results from the loss of fluid and electrolytes in diarrhoeal stools.¹ Diarrhoea is an intestinal disorder characterized by abnormal fluidity and increased frequency of faecal evacuation, generally the result of increased motility in the intestine.² Hypokalemia is one of the manifestations of diarrhoea and diarrhoea is one of

the most common causes of acute potassium depletion from the body. Other causes include diabetic keto-acidosis, severe gastrointestinal losses from vomiting, dialysis and diuretic therapy.² Serum potassium (K^+) concentration in human beings is maintained by a balance between intake, excretion and distribution of potassium between the intra cellular and extracellular spaces. Potassium is present in most of the foods in varying amount. The average daily K^+ intake in diet is about 70 milli equivalents under normal conditions. Excretion equals intake, with approximately 90% of K^+ excreted in the urine and vast majority of the remainder in the stool.³ Approximately 98% of the K^+ in body is present in the intracellular space. Intracellular K^+ averages about 120 – 140 mEq/L, largely as a result of active K^+ uptake by $Na^+ K^+ATP$ -ase pump. Consequently, small changes in the distribution of K^+ between the intra and extra cellular fluid spaces

result in proportionally large change in extracellular K⁺ concentration. Therefore, even small losses of potassium from the body may result in hypokalemia. The reference range for serum potassium level is 3.5-5 mEq/L, with total body potassium stores of approximately 50 mEq/kg (i.e. approximately 3500 mEq in a 70-kg person). Although, the mortality is reported as rare, short-term morbidity is commonly present in children with hypokalemia. This may manifest as gastrointestinal hypo-motility or ileus, cardiac dysrhythmia, QT prolongation, appearance of U wave that mimic atrial flutter, T wave flattening or ST segment depression and muscle weakness or cramping.⁴⁻⁶

The aim of this study was to observe clinical manifestations of hypokalemia in our set up.

PATIENTS AND METHODS

This descriptive study was carried out in paediatric unit of Isra University Hospital Hyderabad, Sindh from April 2004 to April 2005. During study period, a total of 350 children were admitted with acute watery diarrhoea of less than 14 days of duration. The age of these subjects ranged from 2 months to 5 years. Serum potassium was estimated in all these children with ion selective electrode method. Hypokalemia was defined as serum K⁺ of less than 3.5 mEq/L.⁷ It was graded as mild (serum K⁺ level of 3 – 3.5 mEq/ L), moderate (serum K⁺ level of 2 – 3 mEq/L) and severe (serum K⁺ level of less than 2 mEq/L).⁸ The clinical manifestations observed in this study included neck flop (A child unable to hold neck, who had head control previously), abdominal distention (fullness of abdomen in which bowel sounds are audible normally or may possibly faster), paralysis of limbs, diminished bowel sounds (0 or 1 per minute), ability of child to sit, stand or walk noted (in those who previously done so) and paralytic ileus (hypokalemia with signs of ileus). Relevant investigations like X ray abdomen, ECG, stool virology and nerve conduction were also carried out in selected cases. Children with chronic diarrhoea (more than 14 days duration) or children with hypokalemia of any other cause like periodic paralysis, Bartter’s syndrome and children with paralytic ileus due to anti-diarrhoeal drugs were excluded.

RESULTS

Total 350 cases with diarrhoea and vomiting were admitted during study period. Out of these, 130 were hypokalemic and fulfilled the inclusion criteria. Eighty-one children (62.30%) were between 2 months to 2

years of age and 49(37.69 %) were between 2 to 5 years of age. Two hundred and twenty (62.85%) were under 2 years age and 130 (37.14%) were between 2

5 years of age. Hypokalemia was found in 130 (37.14%) children whereas 62.85% children were normokalemic (serum potassium level normal). Eighty-two cases (63%) were moderately hypokalemic, whereas 36 (27.69%) and 12(9%) cases respectively were having severe and mild hypokalemia. Abdominal distention was the commonest manifestation, found in 110 (84.61%) children followed by head flop in 90 (69.23%), diminished bowel sounds in 55 (42.30%) and paralytic ileus in 30 (23.07%) cases (**Table I**). Five children (3.84%) with hypokalemia had no clinical manifestation. Examination revealed weakness of limbs in 35 children; 30 children with quadriparesis and 5 had paraparesis. Neurological deficits like quadriparesis and paraparesis were commonly seen in subjects with severe hypokalemia while abdominal distention and head leg with moderate hypokalemia. Cardiac arrhythmias and respiratory muscle paralysis were not noticed in this study.

**TABLE I:
FREQUENCY OF CLINICAL MANIFESTATIONS OF
HYPOKALEMIA**

| Manifestation | Number of Cases (%) |
|---------------------------------|---------------------|
| Abdominal distention | 110 (84.61) |
| Neck flop | 90 (69.23) |
| Diminished bowel sounds | 55 (42.30) |
| Weakness of limbs | 35 (26.92) |
| Inability to sit, stand or walk | 45 (34.61) |
| Paralytic ileus | 30 (23.07) |
| Dysphonia or aphonia | 15 (11.53) |
| No clinical manifestation | 05 (3.84) |

DISCUSSION

Gastrointestinal infections tend to be more common in infants and younger children. Younger children with emesis or diarrhoea are at increased risk of hypokalemia, as depletion of volume of fluid and electrolytes from gastrointestinal loss is relatively higher than that in older children and adults.^{9,10} Hypokalemia is commonly noted in our part of world with acute diarrhoea. In this study, 37% of children with acute diar-

rhoea were found to be hypokalemic. Sarfraz M in 1989 from Rawalpindi, Pakistan has reported hypokalemia in 25% of cases,¹¹ little lesser than present study. However, Majeed R from Hyderabad, Pakistan in 2001 had found 30% of children having hypokalemia with acute watery diarrhoea comparable with this study.¹² Gomber S, et al from India has reported neck flop as the commonest presenting clinical manifestation followed by abdominal distension.¹³ In this study, neck flop was second most common presentation. Meanwhile, Chhabra A, et al from India in 1995 found neck flop as the commonest (100%) clinical manifestation followed by diminished bowel sounds (82.6%), truncal weakness (52%), weakness of limbs (52%), lethargy (43%) and two cases of flaccid paralysis of both lower limbs.¹⁴ This is in contrast to our study and comparable to Gomber S's study which had smaller sample size of only 38 patients. Paralytic ileus was found in 30(23.07%) children in our study population whereas it was reported significantly higher by Murtaza A, et al.¹⁵ They have reported that 35% infants with acute diarrhoea showed abdominal distention and 12% had full clinical picture of paralytic ileus in 1989.¹⁵ Potassium deficiency alters functions of several organs and most prominently affects the cardiovascular and neurological systems, muscles and kidneys.² These effects ultimately determine the morbidity and mortality. It can also result in several muscle related complications. Hypokalemia hyperpolarizes the skeletal muscle cells impairing their ability to develop the depolarization, which is necessary for muscle contraction. It can also reduce blood flow to skeletal muscles. The combination of these effects may lead to muscle weakness, easy fatigability, cramping and myalgias. Paralysis is uncommon but can occur in cases of profound K⁺ deficiency.² Ortuno, et al has reported hypokalemic induced paraplegia secondary to acute diarrhoea in their case series.¹⁶ Kinik ST, et al has also reported a case of hypokalemic paralysis associated with acute gastroenteritis.¹⁷ In this study, children's examination revealed weakness of limbs in 35 cases, majority with quadriparesis but the complete paralysis was not observed in any children. However, Uysal G, et al in 2000 from Turkey has identified hypokalemia as a fatal risk factor among hospitalized children.¹⁸

CONCLUSION

Hypokalemia is one of the commonest electrolyte disturbances with acute diarrhoea. It has diverse as well

as serious clinical manifestations like abdominal distention, paralytic ileus, dysphonia or aphonia or inability to sit, walk or stand and can even lead to cardiac arrhythmias and arrest. Although, it can have fatal consequences, timely intervention yields encouraging results.

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