Journal of Current and Advance Medical Research
January 2021, Vol. 8, No. 1, pp. 44-48
http://www.banglajol.info/index.php/JCAMR
ISSN (Print) 2313-447X
ISSN (Online) 2413-323X
NLM Catalog ID 101673828
DOI: https://doi.org/10.3329/jcamr.v8i1.52594

ORIGINAL ARTICLE

Immediate Appearance of Different Clinical Features Depending On the Serum Potassium level among Acute Gastroenteritis Children: A Hospital Based Study

Nevis Wadia[1], AFM Salim[2], Nobo Krishna Ghosh[3], Gouri Saha[4], Aditi Chowdhury[5], Sayeema Kabir[6]

[1]Specialist (NICU & PICU), Universal Medical College & Hospital, Dhaka, Bangladesh; [2]Professor, Central Hospital Dhaka, Bangladesh; [3]Associate Professor, Dr. MR Khan Shishu Hospital & Institute of Child Health, Dhaka, Bangladesh; [4]Junior Consultant, Sheikh Russel National Gastroliver Institute & Hospital, Dhaka, Bangladesh; [5]Medical Officer, Sheikh Russel National Gastroliver Institute & Hospital, Dhaka, Bangladesh; [6]Junior Consultant, National Institute of Traumatology & Orthopedic Rehabilitation, Dhaka, Bangladesh

[**Received on:** 1 November 2020; **Accepted on:** 20 December 2020; **Published on:** 1 January 2021]

Abstract

Background: Serum potassium is a very sensitive serum electrolytes. **Objective:** The purpose of the present study was to see the immediate appearance of different clinical features among children depending on the serum potassium level. **Methodology:** This cross-sectional study was conducted in the Department of Pediatric Medicine at Institute of Child Health (ICH), Mirpur, Dhaka, Bangladesh from September 2011 to February 2012. Every consecutive child with both sexes admitted with acute watery diarrhea and vomiting of less than 14 days duration were enrolled in this study. The clinical manifestations that were observed in this study were neck flop, weakness of limbs, abdominal distention, diminished or absent bowel sounds. Serum potassium was measured from the venous blood. **Result:** A total number of 126 children were recruited for this study. Majority of the children (64.3%) were 2 to 12 months old followed by 13 to 24 months old children (27.0%). The abdominal distension was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.2 mmol/L. The neck flop was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.0 mmol/L. The diminished or absent bowel sound was first developed at potassium level 3.4 mmol/L. **Conclusion:** In conclusion abdominal distension, neck flop, diminished/absent bowel sound and muscular weakness are developed immediately after the changes of serum potassium level among the children presented with acute gastroenteritis. [*Journal of Current and Advance Medical Research, January 2021;8(1):44-48*]

Keywords: Immediate appearance; clinical features; serum potassium level; acute gastroenteritis children

Correspondence: Dr. Nevis Wadia, Specialist (NICU & PICU), Universal Medical College & Hospital, Dhaka, Bangladesh; Cell no.: +8801957964548; **Email**: nevis.wadia@gmail.com

Cite this article as: Wadia N, Salim AFM, Ghosh NK, Saha G, Chowdhury A, Kabir S. Immediate Appearance of Different Clinical Features Depending On the Serum Potassium level among Acute Gastroenteritis Children: A Hospital Based Study. J Curr Adv Med Res 2021;8(1):34-38
Funding: This study has been performed without any funding from outside else.
Conflict of Interest: There was no conflict of interest to any of the authors of the study.
Contributions to authors: Questionnaire development, Data collection: Wadia N, Salim AFM; Data analysis: Wadia N; Manuscript writing: All authors are involved; Manuscript revised: Ghosh NK, Saha G, Chowdhury A, Kabir S
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Introduction

Clinical manifestations of hypokalemia vary with the degree and the rate of potassium loss[1]. Patients with hypokalemia often have no symptoms, particularly when the disorder is mild; however, mild potassium deficit manifests as weakness and cramping of skeletal muscles[2]. In more severe depletion, when potassium concentrations are lower than 2.5 mEq/L (2.5 mmol/L), leg, arm, and finally diaphragmatic paralysis may ensue[3]. Other consequences of hypokalemia include constipation or ileus, urinary retention, arrhythmias, and myocardial cell necrosis[4]. The likelihood of symptoms appears to correlate with the rapidity of the decrease in serum potassium. In patients without underlying heart disease, abnormalities in cardiac conduction are extremely unusual, even when the serum potassium concentration is below 3.0 mmol per liter[2]. In patients with cardiac ischemia, heart failure, or left ventricular hypertrophy, however, even mild-to-moderate hypokalemia increases the likelihood of cardiac arrhythmias[5]. Hypokalemia increases the arrhythmogenic potential of digoxin. Potassium depletion and hypokalemia increase both systolic and diastolic blood pressure when sodium intake is not restricted, presumably by promoting renal sodium retention[6].

Hypokalemia is rarely suspected on the basis of clinical presentation; the diagnosis is made by measurement of serum potassium; furthermore, a low serum potassium concentration indicates disruption of normal homeostasis, with one very rare exception[7]. In some patients with leukemia and markedly elevated white cell counts, potassium is taken up by the abnormal cells if the blood is left at room temperature for several hours. More commonly, hypokalemia in patients with leukemia is the result of renal potassium wasting[8].

Hypokalemia is almost always the result of potassium depletion induced by abnormal losses of potassium[9]. More rarely, hypokalemia occurs because of an abrupt shift of potassium from the extracellular compartment into cells. In either case, drugs prescribed by physicians are the most common causes of hypokalemia[10]. The purpose of the present study was to see the immediate appearance of different clinical features among children depending on the serum potassium level.

Methodology

This was a descriptive cross-sectional study which was conducted in the Department of Pediatric Medicine at Institute of Child Health (ICH), Mirpur, Dhaka, Bangladesh. Total study period was six months commencing from September 2011 to February 2012. The first 2 months were spent for literature search and review and approval of the protocol. Then data was collected for 3 months. Then the last month was spent for data compilation, analysis, report writing, printing and binding. Every consecutive child with both sexes admitted with acute watery diarrhea and vomiting of less than 14 days duration who were fulfilled the exclusion and inclusion criteria were enrolled in this study. The age ranged from 2 months to 5 years, children with diarrhoea and vomiting of less than 14 days duration, children of both sex presented with clinical features of hypokalemia were included as study population. Children with chronic diarrhoea more than 14 days duration, children with hypokalemia of any other cause like periodic paralysis, Bartter's syndrome, children with paralytic ileus due to anti-diarrhoeal drugs or children with severe malnutrition were excluded from this study. Systematic random sampling was applied for collection of sample. Hypokalemia was defined as serum potassium concentrations 3.5 mEq/L or less[2]. The written informed consent from parental or legal guardians was obtained by the study physician to participate in the study. The proposal was submitted to and approved by Ethics Review Committee of Bangladesh College of Physicians and Surgeons (BCPS) for ethical clearance. Data were collected by face to face interview in a structured questionnaire. The clinical manifestations that were observed in this study were neck flop, weakness of limbs, abdominal distention, diminished or absent bowel sounds. Weakness of limbs was judged on the basis of the child's responsiveness and 5 point scale for grading of muscle strength. Abdominal distention and bowel sounds were assessed purely on clinical examination. Blinding was done by keeping the observer unaware of potassium status. About 2 ml of venous blood was taken on admission before any fluid therapy started. To prevent hemolysis as far as possible, every caution was taken, to take blood directly from vein without squeezing the puncture site. To prevent contact with air, the blood was kept under liquid paraffin, centrifuged immediately and the plasma was transferred to a separate tube and potassium level was estimated. For estimation the Smartlyte Electrolyte Analyzer (Diamond Diagnostic inc., Holliston, MA USA 01746) was used. Hypokalemia was defined as plasma potassium level lower than 3.5 mEq/L[2]. The degree of hypokalemia was graded as mild (3-3.5 mEql/l), moderate (2-2.9 mEql/l) and severe (<2 mEql/l)[1]. Stool specimens were routinely examined from all

patients using standard procedure as per protocol of the institute. All patients received the usual treatment for diarrhoea and potassium was supplemented orally or intravenously, when necessary. Analysis was performed by using a computer based statistical program SPSS version 12.0 for windows (Statistical Package for Social Sciences). Categorical variables were expressed as proportions (percentages) and numerical data was expressed as means (standard deviations), and ranges. Tables and graph were constructed according to the findings. Consultation and assistance was taken from a statistician as and when necessary.

Result

A total number of 126 children were recruited for this study after fulfilling the inclusion and exclusion criteria. Majority of the children (64.3%) were 2 to 12 months old followed by 13 to 24 months old children (27.0%). However, 5.5% children were in age group 25 to 36 months, 2.4% in 37 to 48 months and 0.8% in 49 to 60 months (Table 1).

Table 1: Distribution of the Patients by Age Group

Age Group	Frequency	Percent
2 to 12 Months	81	64.3
13 to 24 Months	34	27.0
25 to 36 Months	7	5.5
37 to 48 Months	3	2.4
49 to 60 Months	1	0.8
Total	126	100.0

The potassium level was measured at which different clinical features was first appear as well as at which highest number of patients were appeared the symptom. In this study 80 patients developed abdominal distension. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.2 mmol/L. The mean ±SD potassium level (mmol/L) of patients who developed abdominal distension was 3.11±0.25 mmol/L. About 49 patients developed neck flop. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.0 mmol/L. The mean ±SD potassium level(mmol/L) of patients who developed neck flop was 2.96±0.27 mmol/L. However, 47 patients developed diminished/absent bowel sound. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.0 mmol/L. The mean ±SD potassium level (mmol/L) of patients who developed diminished/absent bowel sound was 2.96±0.29 mmol/L. Furthermore, 47 patients developed muscular weakness. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.0 mmol/L. The mean±SD potassium level (mmol/L) of patients who developed diminished/absent bowel sound was 2.95±0.28mmol/L. Around 2 patients developed dysphonia at potassium level 2.8 mmol/L. The mean±SD potassium level (mmol/L) of patients who developed diminished/absent bowel sound was 2.45±0.49 mmol/L (Table 2).

Table 2: Potassium Level at Which Different Features First Appear, At Which Highest Number of Patients Appear the Symptom and mean±SD Potassium Level

Clinical Feature	Potassium Level (mmol/L)		Mean ±SD of Potassium Level (mmol/L)
	At Which Highest Number Of Patients Appear Symptom	At Which Feature First Appear	
Abdominal Distension	3.2	3.4	3.11±0.25
Neck Flop	3.0	3.4	2.96±0.27
Bowel Sound Diminished/Absent	3.0	3.4	2.96±0.29
Muscle Weakness	3.0	3.4	2.95±0.28
Dysphonia	2.8	2.8	2.45±0.49

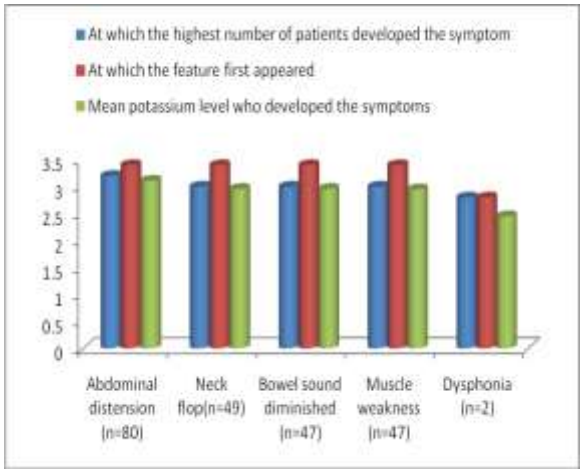

Figure I: Bar diagram showing the potassium level at which the feature first appeared, at which highest number of patients appear the symptoms and mean potassium level (mmol/L) of who developed different symptoms

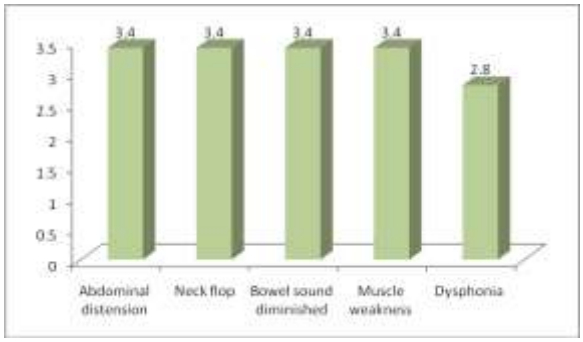

Figure II: Bar diagram showing potassium level (mmol/L) at which the symptoms appeared first

Discussion

One hundred and twenty six children, aged between 2 months to 5 years presenting with acute gastroenteritis and hypokalaemia are evaluated for clinical feature and serum level of potassium. The mean (±SD) age of the patients is 12.9(±8.79) months with a range of 3.5 to 60 month. In this present study it has been found that 91.3% children suffering from acute gastroenteritis belong to the age group 2 months to 2 years.

Zaman et al[4] also enrolled 307 children under 5 years of age suffering from diarrhea in a rural center for diarrhea treatment in Bangladesh to find out the prevalence and signs of hypokalaemia. These findings of present study is consistent with the findings of Zaman et al[4]. They have found that 82.0% children suffering from diarrhea are less than 2 years old.

They have also found hypokalemia in mild dehydration. In the present study, we did not found any hypokalemia in mild dehydration. This is probably due to the fact that patients with mild dehydration are usually not admitted and they are treated with ORS at home. Therefore, the degree of hypokalemia is less in these patients. The present study found that moderate hypokalaemia was more prevalent (60.0%) in severe dehydration than in patients with moderate dehydration (15.8%). Patients with severe dehydration had more deficiency of potassium. Severity of dehydration showed significant association with degree of hypokalemia ($p<0.001$). The mean (±SD) potassium level was 3.08(±0.25) mmol/L with a range of 2.1 mmol/L to 3.4 mmol/L. Mild hypokalemia was present in 95(75.4%) and moderate hypokalemia was present in 31(24.6%) patients. These findings were consistent with the findings of Majeed et al[8] and Singhi et al[10].

Abdominal distension and neck flop was present in 80(63.5%) and 49(38.9%) cases respectively. Bowel sound was absent in 1(0.8) patient and diminished in 46(36.5%) patients. Muscular weakness was present in 47(37.3%) and dysphonia was present in 2(1.6%) cases. There was significant association between degree of potassium deficiency and presence of neck flop, diminished bowel sound, decreased muscle power and presence of dysphonia, however no association between degree of potassium deficiency and presence of abdominal distension. These findings are in accordance with the several other studies like Majeed et al[8], Singhi et al[10], Naseem et al[11] and Zaman et al[4].

In this study 80 patients developed abdominal distension. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.2 mmol/L. The mean±SD potassium level (mmol/L) of patients who developed abdominal distension was 3.11±0.25 mmol/L.

However, 47 patients developed diminished/absent bowel sound. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.0 mmol/L. The mean ±SD potassium level (mmol/L) of patients who developed diminished/absent bowel sound was 2.96±0.29 mmol/L. Majeed et al[8] explained that hypokalaemia may manifest as gastrointestinal hypo-motility or ileus, cardiac dysrhythmia and muscle weakness or cramping. In their study Singhi et al[10] found that hypokalaemia may be associated with serious adverse effects, and increased morbidity and mortality.

The potassium level was measured at which different clinical features was first appear as well as at which highest number of patients were appeared the symptom. In this study 80 patients developed abdominal distension. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.2 mmol/L. The mean ±SD potassium level (mmol/L) of patients who developed abdominal distension was 3.11±0.25 mmol/L. About 49 patients developed neck flop. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.0 mmol/L. The mean ±SD potassium level (mmol/L) of patients who developed neck flop was 2.96±0.27 mmol/L.

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The mean±SD potassium level (mmol/L) of patients who developed diminished/absent bowel sound was 2.95±0.28mmol/L. Around 2 patients developed dysphonia at potassium level 2.8 mmol/L. The mean±SD potassium level (mmol/L) of patients who developed diminished/absent bowel sound was 2.45±0.49 mmol/L. In this study 47 patients developed muscular weakness. It was first developed at potassium level 3.4 mmol/L and highest number of patient developed this feature at potassium level 3.0 mmol/L.

Conclusion

In conclusion abdominal distension, neck flop, diminished/absent bowel sound and muscular weakness are developed immediately after the minimum changes of serum potassium level among the children presented with acute gastroenteritis.

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