A Retrospective Assessment of Different Types of Biochemical Alterations and Electrolyte Disturbances in Cases of Acute Diarrhoea among Children

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Abstract

Aim: The aim of the present study mainly focuses on the different types of biochemical alterations and electrolyte disturbances in cases of acute diarrhoea among children.

Material & Methods: A retrospective study was done at Department of Paediatrics IGIMS, Patna, Bihar, India from December 2016 to November 2017. All cases of acute diarrhoea attending with signs and symptoms of moderate and severe dehydration were included. Clinical history and necessary biochemical investigations including serum electrolytes were performed.

Results: In the present prospective study, 200 cases were enrolled with male predominance (120/200, 60%) and females (80/200, 40%). The most common age group in the study population was between 1 month to 5 years with 68 cases (34%) with males accounting for 40 and females 28 followed in order by >5 years -<10 years (64 cases, 32%), >10 years - <15 years (40 cases, 20%) and least >15 years -18 years (28 cases, 14%). Fever and Tachypnoea were observed in 48% of cases in the study. Increased thirst and sunken eyeball were seen in 35% of cases. Less commonly observed was altered sensorium, only in 10% of cases in the study. Grading of PEM was done as per IAP classification and majority were observed with Grade-1 (MILD) (17%) followed in order by grade-II (MODERATE) (12%), Grade-III (9%) and severe Grade-IV only in 3% of the cases in the study. Isolated Hypokalemia was observed in 27% of cases in the study, isolated Hypernatremia in 10% of cases, Hyponatremia with hyperkalemia in 8%, hypernatremia with hypokalemia in 7% of cases in present study. No cases of isolated hyperkalemia were observed in present study.

Conclusion: Diarrhoeal disorders can be easily prevented with proper hand hygiene practices, health awareness programmes, increased breast-feeding practices and proper disinfection of water. Hyponatremia, hypokalemia, combined Hyponatremia and hypokalemia are major electrolyte abnormalities in cases of diarrhoea.

Keywords: Dehydration, Diarrhoea, Hypokalemia, Hyponatremia

Introduction

Diarrhoea is one of the commonest clinical entities encountered regularly in clinical practice. World health organization defines diarrhoea as the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual (WHO, 2007) Diarrhea has received much attention in recent years due to its biodegradable properties that having the second leading cause of death in children under age 5 years according to the World Health Organization (WHO, 2013). [1] In India, at least 1.5 million children die due to acute diarrhoea per year explaining the importance of the clinical condition. As per the estimates of WHO, 1 child dies due to diarrhoea per every six seconds. [2]

Acute diarrhoea, the passage of stools with abnormal consistency and frequency in a day (e.g. more than three times) which lasts for less than two weeks, is a syndrome that is frequently not subject to differential diagnosis in medical practice. [3] More incidences of diarrheal deaths in developing countries is attributed to the higher rates of malnutrition among children, lack of hygienic practices, poor education, increased vulnerability to infections and early substitutes for breast milk. Reports of decreasing trend of breast feeding and faulty practice of early bottle feeding play a pivotal role in diarrhoeal deaths in developing countries. [4] More than 90% of cases of acute diarrhoea are due to infectious agents, which may be bacterial or viral. Most of the deaths in acute diarrhoea are due to excessive fluid loss and electrolyte loss that result in dehydration and acidosis, thus majority of deaths in diarrhoea are avoidable as long as fluid and electrolytes are replaced regularly and properly.

However, it has been found to be too important learning complications of dehydration include shock, organ damage, and coma. One way to toughen diarrhea is to incorporate of electrolytes imbalance which plays a vital role in maintaining homeostasis within the body. [5] They help to regulate heart and neurological function, fluid balance, oxygen delivery, acid-base balance and much more. However, it has been found to be the major causes are local irritation of the intestinal mucosa by infectious or chemical agents (gastroenteritis). This combination of two mechanistically distinct of the disease formed to incorporation of significantly increased diarrhea or vomiting (gastroenteritis) can lead to electrolyte disturbances along with dehydration and anaemia. [6]

Hence the present study mainly focuses on the different types of biochemical alterations and electrolyte disturbances in cases of acute diarrhoea among children.

Material & Methods

A retrospective study was done at Department of Paediatrics IGIMS, Patna, Bihar, India from December 2016 to November 2017. All cases of acute diarrhoea attending with signs and symptoms of moderate and severe dehydration were included. Clinical history and necessary biochemical investigations including serum electrolytes were performed.

Inclusion Criteria

• Children between age group of 1month to 18 years were included in the study.

Methodology

Detailed history of the patient was taken from the parents or associated persons regarding frequency of

stools, consistency and history of urine output in last 24 hours were noted. Detailed clinical examination was performed by a senior paediatrician with special attention to severity of dehydration, altered sensorium, and grade of PEM was noted. Severity of dehydration was assessed as per the WHO criteria.

Cases with moderate/ severe dehydration, passage of loose stools, large frequent stools, and vomiting, altered sensorium were taken into study. History of administration of oral rehydration salt was taken or not, if not its volume given after each loose motion. Patients with blood in stools or rehydrated by Intravenous administration or ORS were excluded from the study. Blood samples of the cases were obtained before rehydration and sent for clinical biochemistry laboratory. Details of the study were clearly explained to all the parents or cases or guardians and written informed consent was obtained from all the cases in the study. Basal Haematological investigations including Hb%, ESR, Total cell counts, and platelet counts were done. Basic biochemical investigations including basal blood sugar, urea and serum electrolytes including calcium, sodium, potassium and serum creatinine was estimated. The details of the cases enrolled were entered in a separate predesigned questionnaire sheet and analyzed. All the cases were treated as per the WHO guidelines and discharged. Cases that were not followed till the discharge and discharged against advice, not consented for study were excluded from the study.

Statistical Analysis

All the collected data was entered in a Microsoft excel spread sheet and analyzed. Data was tabulated and mean, and median values were calculated for variables.

Results

Table 1: Age distribution of cases in the study

Age group	Male	Female	Total	%
1 month-5 years	40	28	68	34
>5 years-<10 years	34	30	64	32
>10 years-<15 years	26	14	40	20
>15 years-18 years	20	8	28	14
Total	120	80	200	

In the present prospective study, 200 cases were enrolled with male predominance (120/200, 60%) and females (80/200, 40%). The most common age group in the study population was between 1 month to 5 years with 68 cases (34%) with males

accounting for 40 and females 28 followed in order by >5 years -<10 years (64 cases, 32%), >10 years -<15 years (40 cases, 20%) and least >15 years -18 years (28 cases, 14%).

Table 2: Clinical symptoms associated with cases in the study

Symptoms	No.	%
Increased frequency of stool	200	100
Vomiting	144	72
Fever	96	48
Increased thirst	70	35
Altered sensorium	20	10
Tachypnoea	96	48
Dry tongue	136	68
Slow retraction of skin	124	62
Sunken eyeball	68	34
Tachycardia	44	22

Fever and Tachypnoea were observed in 48% of cases in the study. Increased thirst and sunken eyeball were seen in 35% of cases. Less commonly observed was altered sensorium, only in 10% of cases in the study.

Table 3: Grading of malnutrition of cases in the study

Grade of PEM	Number	%
Normal	118	59
Grade-I (mild)	34	17
Grade-II (moderate)	24	12
Grade-III (severe)	18	9
Grade-IV (very severe)	6	3

Grading of PEM was done as per IAP classification and majority were observed with Grade-1 (MILD) (17%) followed in order by grade-II (MODERATE) (12%), Grade-III (9%) and severe Grade-IV only in 3% of the cases in the study.

Table 4: Biochemical alterations among the cases in study

Type of Biochemical disturbance	Number	%
Isolated Hyponatremia	66	33
Isolated Hypokalemia	54	27
Isolated Hypernatremia	20	10
Isolated Hyperkalemia	0	0
Hyponatremia+ Hypokalemia	66	33
Hyponatremia+ Hyperkalemia	16	8
Hypernatremia+ Hypokalemia	14	7
Hypernatremia+ Hyperkalemia	0	0
Normal electrolytes	40	20

Isolated Hypokalemia was observed in 27% of cases in the study, isolated Hypernatremia in 10% of cases, Hyponatremia with hyperkalemia in 8%, hypernatremia with hypokalemia in 7% of cases in present study. No cases of isolated hyperkalemia were observed in present study.

Discussion

Diarrhoea is one of the commonest clinical entities encountered regularly in clinical practice. This condition is leading cause of death and illness among children in developing countries. In India, at least 1.5 million children die due to acute diarrhoea per year explaining the importance of the clinical condition. As per the estimates of WHO, 1 child dies due to diarrhoea per every six seconds. [7] Diarrhoea is defined as having loose or watery stools at least three times per day or more frequently than normal for an individual. 80% of the deaths occur in children below 2 years of life. According to the report of National institute of cholera and Enteric disease, Kolkata crude death rate due to diarrhoea in rural India is 9.3 per 1000 population and the diarrhoeal deaths account for 22% of rural deaths among 0 to 6 years age children. [8]

In the present prospective study, 200 cases were enrolled with male predominance (120/200, 60%) and females (80/200, 40%). The most common age group in the study population was between 1 month to 5 years with 68 cases (34%) with males accounting for 40 and females 28 followed in order by >5 years -<10 years (64 cases, 32%), >10 years -<15 years (40 cases, 20%) and least >15 years -18

years (28 cases, 14%). many studies universally indicating male preponderance. In the study of Behera et al the incidence was 48% which is higher than present study, the incidence of acute gastroenteritis varies from place to place and region to region in different parts of India based upon the hygienic conditions and public awareness. [9] Fever and Tachypnoea were observed in 48% of cases in the study. Increased thirst and sunken eyeball were seen in 35% of cases. Less commonly observed was altered sensorium, only in 10% of cases in the study. Grading of PEM was done as per IAP classification and majority were observed with Grade-1 (MILD) (17%) followed in order by grade-II (MODERATE) (12%), Grade-III (9%) and severe Grade-IV only in 3% of the cases in the study while similar result was observed in Shah GS et al with 84% of cases in his study. [10]

Isolated Hypokalemia was observed in 27% of cases in the study, isolated Hypernatremia in 10% of cases, Hyponatremia with hyperkalemia in 8%, hypernatremia with hypokalemia in 7% of cases in present study. No cases of isolated hyperkalemia were observed in present study. However study of Purohit KR et al [11] reported 39% of cases of isolated Hyponatremia in his study. Increased frequency of diarrhoea, increased thirst, more episodes of vomiting, altered sensorium were associated with Hyponatremia in present study, where similar clinical findings were reported in majority of cases universally. The incidence of hypokalemia was 27% in present study which was similar to the reports of Ahmed I et al in his study. [12] The incidence of hypernatremia in the study was 9.6% which was similar to the findings of Samadi AR et al who observed the incidence of hypernatremia in their study as 12%. [13]

Conclusion

Diarrhoeal disorders can be easily prevented with proper hand hygiene practices, health awareness programmes, increased breast-feeding practices and proper disinfection of water. Hyponatremia, hypokalemia, combined Hyponatremia and hypokalemia are major electrolyte abnormalities in cases of diarrhoea.

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