ORIGINAL ARTICLE

Frequency and Outcome of Hypoglycemia in Acute Watery Diarrhea Complicated by Dehydration in 6-59 Months Children

MASOOD MAZHAR[1], IQBAL AHMAD[2], ASIF KARIM[3]

ABSTRACT

Aim: To determine the frequency of hypoglycemia in 6-59 months old children with acute watery diarrhea complicated by dehydration.
Study design: Descriptive case study
Place and duration of study: Pediatric Unit BV Hospital Bahawalpur March, 2015 To March, 2016
Methods: A total of 129 children of 6 to 59 months of age suffering from acute watery diarrhea, having severe dehydration needing intravenous fluid at time of admission, were considered. Frequency of hypoglycemia, age groups (6-23 months) and (24-59) months. Sex, presence of vomiting, duration of diarrhea (less than 72 hours and 72 or more hours) and intravenous fluid within last 6 hours prior to admission were noted. Effects of all the variables were noted
Results: Out of 129 children, 13 (10.1%) were having hypoglycemia at the time of admission. Majority of the children, 73 (56.6%) were male, 101 (78.3%) were between the age of 6-23 months, 78 (60.5%) under 10 kg, 73 (56.6%) having diarrhea for $\leq$ 72 hours at the time of admission. There were 51 (39.5%) children who presented with vomiting at the time of admission. Only 7 (5.4%) children were given IV fluid within last 6 hours prior to admission. During the study period, 5 children (3.9%) died during the study period. Outcome was significantly associated with hypoglycemia (p value < 0.001) whereas all other variables were statistically insignificant.
Conclusion: The frequency of hypoglycaemia in acute watery diarrhoea complicated with dehydration in children under 5 years of age is high. Hypoglycemia is associated with significantly high mortality outcome as compared to normoglycemic children. Routine assessment of blood glucose at the time of hospital admission is advocated and empirical treatment should be done for hypoglycaemia to improve the outcome during hospital stay.
Keywords: Hypoglycemia, dehydration, diarrhea,

INTRODUCTION

Diarrheal diseases are the second most common life threatening condition worldwide among all infectious diseases in children younger than 5 years old. Globally, 1.3 billion episodes occur annually, with an average of 2 to 3 episodes per child[1]. During last decades, mortality caused by diarrhea has been decreased worldwide because of improved hygiene, but morbidity attributable to diarrhea remains high[2]. Hypoglycemia refers to low blood glucose. So, the blood glucose concentration less than 50mg/dL represents hypoglycemia[3]. The clinical features of hypoglycemia are; hypothermia, lethargy and fits[4] and difficult to differentiate clinically from dehydration.

The pathogenesis of hypoglycemia in children with acute watery diarrhea along with dehydration involves the depletion of glycogen stores due to the inability to consume substrate. The longer a child is effectively nill per oral, the more likely the child will become hypoglycemic[6].

[1]Assistant Professor Paediatric, Ibn e Siena Hospital Multan
[2]Assistant Professor Paediatrics, Shahida Islam Medical, College Lodhran
3Paediatrician, THQ Hospital, Lodhran
Correspondence to Dr. Masood Mazhar
Email: masoodmazhar112@gmail.com Cell: 0333 6126612

However, it is prudent that the clinician should aggressively search for the diagnosis of hypoglycemia to avoid the neurological injury[5].

The incidence of hypoglycemia in acute diarrhea varies not only in different studies conducted at different centres but also in the same centre. The incidence of hypoglycemia was 4% in the study by Ntia et al[7] from Nigeria while 9.2% in the study by Reid and Losek[8] in Minnesota USA. The study conducted at Dahka (Bangladesh) by Bennish et al[9] reported prevalence of hypoglycemia 4.5% while the study conducted in the same centre by Huq et al[10] reported as 11%. The mortality associated with hypoglycemia is high. Huq et al[10] reported 28% while Ntia et al[7] reported 33.3% case mortality among children with acute diarrhea with hypoglycemia

MATERIALS AND METHODS

Anticipated frequency 9.2% was taken from a study conducted at Pediatric Emergency Medicine, Children's Hospitals and Clinics, St. Paul, Minnesota, USA[8]. 5% was taken as absolute precision and the design affect was taken as the sample size was calculated as 129 through sample size software. Non probability, consecutive sampling.

1. Age 6 months to 59 months.
2. Suffering from acute watery diarrhea
3. Having severe dehydration needing intravenous fluid at time of admission.
4. Those children whose parents/guardian did not give consent to enter the study.
5. Cases with diarrhea lasting for 14 or more days.
6. Children with severe acute malnutrition (weight-for-height/length <-3SD or midupper arm circumference < 115 mm).

Children with a documented disorder that would predispose to hypoglycemia (e.g., a primary hypoglycemic disorder, insulin therapy, liver disease, adrenal insufficiency, hypothyroidism, hypopituitarism, malignancy, sepsis, or ingestion of an oral hypoglycemic agent, a beta-blocking agent, a salicylate, or alcohol.

All children coming either from outpatient department or through emergency were included in the study after scrutinized by inclusion criteria and verbal consent from parents/ guardian.

Researcher herself took proper history from the mother/guardian and entered the demographic and clinical data on a specially designed proforma. Demographic data included name, age and gender. Clinical data included history of intravenous fluid within last 6 hours prior to admission, presence of vomiting and duration of diarrhea (less than 72 hours and 72 or more hours).

At time of receiving prior to treatment, Patient's index finger was cleaned with sprit swab and tip of the finger was pressed with the help of two fingers of left hand and then tip was pricked with the help of specialized disposable needle in the right hand. Drops of blood were collected directly over the dextrstix (strip number 1362) already inserted in the glucometer (model: Lever Chek). Glucometer will show reading in 5-6 seconds. After maintaining IV line, 3ml blood sample was drawn in disposable syringe that was sent to the pathology laboratory of Bahawal Victoria Hospital (All children investigations were free of cost) to confirm hypoglycemia, and for remaining investigations. Patients were divided in two groups. Group A who had hypoglycemia and the rest were labeled as Group B. Patient were be managed accordingly and checked time to time. Outcome (mortality) was noted at 48 hour.

SPSS-10.0 will be used for statistical data analysis. Frequency of hypoglycemia, age groups (6-23 months) and (24-59) months. sex, presence of vomiting, duration of diarrhea (less than 72 hours and 72 or more hours) and intravenous fluid within last 6 hours prior to admission on hypoglycemia and mean $\pm$ SD were calculated for age, duration of diarrhea and weight of patients were calculated. Children of both groups were compared to see the effect of age, weight, sex, presence of vomiting, duration of diarrhea (less than 72 hours and 72 or more hours), intravenous fluid within last 6 hours prior to admission and outcome. Chi-square test was applied and level of significance was used as 5%.

RESULTS

Out of 129 children, 13(10.1%) were having hypoglycemia at the time of admission so labeled as Group A while 116(89.9%) children did not have hypoglycemia (Group B). Majority of the children, 73(56.6%) were male and 56(43.4%) female. In children with hypoglycemia, 5(38.5%) were males and 8(61.5%) females. There was no statistical difference regarding sex between patients of both groups with a p value= 0.164 (Table 1). There were 51(39.5%) children who presented with vomiting at the time of admission. Vomiting was found to be statistically insignificant with a p value of 0.933 when children of both groups were compared (Table 5). Only 7(5.4%) children were given IV fluid within last 6 hours prior to admission. There was statistically no significance between both groups of patients with a p value of 0.704 (Table 6).

Table 1 Sex between children of Both Groups

Sex	Group A	Group B	Total
Male	5 (38.5%)	68 (58.6%)	73 (56.6%)
Female	8 (61.5%)	48 (41.4%)	56 (43.4%)

Chi square = 1.934 P value = 0.164

Table 2: Age Distribution between Both Groups

Age (months)	Group A	Group B	Total
6-23	12 (92.3%)	89(76.7%)	101(78.3%)
24-59	1 (7.7%)	27(23.3%)	28(21.7%)

Chi square = 1.670 P value = 0.196

Table 3: Weight Distribution between Both Groups

Weight (kg)	Group A	Group B	Total
$\leq$10	10 (76.9%)	66 (56.9%)	76 (58.9%)
>10	3 (23.1%)	50 (43.1%)	53 (41.1%)

Chi square = 1.937 P value = 0.164

Table 4: Distribution of duration of diarrhea between both groups

Duration of diarrhea (hrs)	Group A	Group B	Total
$\leq$72	7 (53.8%)	66 (56.9%)	73(56.6%)
>72	6 (46.2%)	50 (43.1%)	56(43.4%)

Chi square = 0.044 P value = 0.833

Table 5: Distribution of vomiting between children having hypoglycemia and normoglycemics

Vomiting	Group A	Group B	Total
Yes	5 (38.5%)	46 (39.7%)	51 (39.5%)
No	8 (61.5%)	70 (60.3%)	78 (60.5%)
Total	13	116	129

Chi square = 0.007 P value = 0.933

Table 6: Distribution of IV fluid within last 6 hours before the admission between both groups

IV Fluid	Group A	Group B	Total
Yes	1 (7.7%)	6 (5.2%)	7 (5.4%)
No	12 (92.3%)	110(94.8%)	122 (94.6%)
Total	13	116	129

Chi square = 0.145 P value = 0.704

DISCUSSION

Acute diarrhoea in children is a major public health burden causing considerable health costs for families as well as public health organisation and programs[12]. Although, significant improvement have been made in the accessibility of health services, diarrhoeal illness is still one of the leading cause of deaths in children, mainly in developing countries[13].

In the current study, the frequency of hypoglycaemia at the time of admission was found to be of under-five year children presenting with acute diarrhoea was 10.1%. Our findings were higher than the 4% and 4.5% reported from Nigeria[7] and Bangladesh[9] respectively. Another study from Bangladesh found that 11% children were having hypoglycemia at the time of admission with diarrhea.[10] The higher frequency in the current study compared to the previous studies might be due to the differences in definition of hypoglycaemia used in the previous studies. In the present study, a higher cut-off (<50mg/dl) was used in defining hypoglycaemia whereas <40 mg/dl was used as cut-off in the Nigerian Study partly accounting for the higher prevalence observed in the present study. Studies have shown that the risk of hypoglycaemia is higher in under-five children compared to older children[14].

In this study, majority of the children, 73(56.6%) were male. Our findings are consistent with those of Onyiriuka et al, who found that 54.1% children with acute water diarrhea were male. No relation of different sex was found in the findings of Onyiriuka et al as the odds ratio was noted to be 1.1 for children with acute diarrhea having hypoglycemia. Mitra et al[15] suggested that the delay in presentation tohospital of females is due to the fact that males are the pillars of the family, so get the preference over females to be counted at hospitals.

Majority of the children, 101(78.3%) were between the age of 6-23 months. The trend was consistent in children with hypoglycemia or normoglycemia. Our results are similar to those of reported earlier which showed that diarrhoea is more common in children aged less than 24 months[7,16] Many reasons have been stated for high incidence in children less than 24months including causative agent that is common in this age group. The current study did not assess the causative agent. Weaning food and poor hygiene have also been associated with this age group for a high prevalence of diarrheal diseases[7].

When children having hypoglycemia were compared with normoglycemics in the current study, outcome was significantly associated with hypoglycemia (p value <0.001), as 4(30.8%) out of 13 children with hypoglycemia died. Our findings are very similar to those of Ntia HN et al,[7] where 33.3% children with diarrhea and hypoglycemia died during the study period. Our data showed a little higher fatality outcome as compared to Huq et al[10] who noted 28% children. Our analysis shows that hypoglycaemia must be identified earlier and treated in children with diarrhea to ensure positive outcome.

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