

Types of dehydration from diarrhoea in children in Karbala

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Abstract

Background: Dehydration as a result of diarrhoea continues to be a leading cause of death in children, especially in developing countries and in these countries, diarrhea outbreaks are more often linked to contaminated water supplies, person to –person contact in places such as child – care centres, or food poisoning. This study has focused on children under 3 years of age who have been admitted to Karbala pediatric hospital with diarrhoea and dehydration from January to July 2008 and the types of dehydration from diarrhoea for these children were studied with relation between these types and different ages and types of feeding with the level of serum sodium concentrations.

Objective: To evaluate which types of dehydration is common between children with diarrhoea in Karbala.

Materials and Methods : We present the results to retrospective analysis of the types of diarrhoea dehydration in 150 cases admitted to Karbala paediatric hospital in 6 months period in summer 2008 in Karbala in relation to age and nutritional state of children, of 150 children 27(18.1 %) were hypernatremia ; 122(81.9 %) were isonatramia .and we divided the children into three groups age the first age group from (1-12), the second age group (13-24) and the third age group (25-36)

Results: There are a significant in the level of serum sodium concentration among the children with breast , artificial and mixed feeding ; while there are no significant between the artificial and mixed feeding. However There are a significant in the level of serum sodium concentration among the children in the three age groups; and there are a significant in the two types of dehydration status moderate and severe.

Conclusion: It has been deduced that there are two kinds of dehydration from diarrhoea in this study in Karbala, hypernatramic and isonatramic from total sample, while no signs lead to existence hyponatramic type.

الخلاصة

تمهيد: يعتبر الجفاف كنتيجة للإسهال احد أسباب الوفاة لدى الأطفال خصوصا في البلدان النامية حيث يكون من ضمن الأسباب هناك حالات تفشي الإسهال نتيجة المياه الملوثة أو اتصال الطفل بالأماكن الملوثة أو يكون الإسهال نتيجة لتسمم غذائي فيسبب الجفاف لدى الأطفال. وقد شملت الدراسة 150 طفلا تحت عمر 3 سنوات مصابين بالإسهال الذين أدخلوا لمستشفى كربلاء التعليمي للأطفال في محافظة كربلاء خلال فترة 6 أشهر (كانون الثاني-حزيران) سنة 2008. ودرست أنواع الجفاف المتسبب عن مرض الإسهال لهؤلاء الأطفال وبحثت علاقة هذه الأنواع في مختلف الأعمار ونوعية التغذية للأطفال مع تركيز مستوى الصوديوم في مصل الأطفال المصابين .

الهدف من الدراسة: لمعرفة أي أنواع الجفاف أكثر شيوعا بين الأطفال المصابين بالإسهال في محافظة كربلاء المواد وطرق العمل :شملت العينة 150 طفل مصاب بالإسهال ولديه جفاف الذين أدخلوا لمستشفى الأطفال التعليمي في كربلاء ومن ضمن مجموع 150 طفل كانت نسبة النوع عالي الجفاف (18.1%) بينما نسبة النوع متوسط الجفاف (81.9) % . وقد قسمت العينة إلى ثلاث مجاميع عمرية المجموعة العمرية الأولى من عمر (1-12) شهر والمجموعة الثانية بعمر (13-24) شهر ، أما المجموعة العمرية الثالثة بعمر (25-36) شهر .

النتائج: أشارت النتائج إلى وجود فرق معنوي بين مستوى تركيز الصوديوم في المصل بالرضاعة الطبيعية مع كل من الرضاعة الصناعية والمختلطة، لكن لا توجد فروق معنوية بين كل من الرضاعة الصناعية والمختلطة، ومن مجموع 150 طفل كان حجم العينة لنوع عالي الجفاف (hypernatremia dehydration) في المجموعة العمرية الأولى (16%) ومتوسط الجفاف (isotratramia dehydration) (81%)، أما المجموعة العمرية الثانية كان حجم العينة لنوع عالي الجفاف (8%) ومتوسط الجفاف (37%)، وفي المجموعة العمرية الثالثة كان حجم العينة لنوع عالي الجفاف (3%) ومتوسط الجفاف (4%)، وقد وجد فروق معنوية بين المجاميع العمرية الثلاثة. وقد وجد أيضا وجود نوعين من شدة الجفاف كان حجم العينة لنوع متوسط الجفاف (moderate dehydration) من مجموع 150 طفل (133) 89.3% وحجم العينة (17) لنوع شديد الجفاف (severe dehydration) 10.7%. وقد وجدت فروق إحصائية بين نوعي الجفاف. الاستنتاجات: من خلال هذه الدراسة نستنتج بأن هنالك نوعين من الجفاف المتسبب عن الإسهال نوع عالي الجفاف hypernatremia ونوع متوسط الجفاف isotratramia، بينما لم توضح الدراسة وجود نوع hyponatramic.

Introduction

Diarrhoea is a medical term used to describe a condition in which a child's bowel movements increase in frequency, liquidity and volume and it is diarrhoea usually describes loose, watery stools, and patients may also experience abdominal pain, abdominal cramping, fever, nausea or blood in the stool⁽¹⁾.

Diarrhoea is one of the leading causes of mortality and morbidity in the developing countries, and death in that countries due to mainly to severe electrolyte disturbances and to hypovolaemia. there is frequently minimal inflammatory change in the stomach and small bowel. However In areas where infant malnutrition is prevalent, acute gastroenteritis is common and there is at tendency towards serious complications⁽²⁾.

Dehydration as a result of diarrhoea continues to be a leading cause of death in children, especially in developing countries in which countries, diarrhoea outbreaks are more often linked to contaminated water supplies, person to –person contact in places such as child – care centres, or food poisoning⁽³⁾.

Although in some areas, the various types of dehydration have been studied in small numbers, hypernatremia is frequently recorded in diarrhoea with a higher mortality rate^(3,6).

The incidence of specific types of dehydration in developing countries where malnutrition is prevalent has not been well documented nevertheless; a few reports indicate a higher incidence of hyponatremia which is associated with malnutrition^(7, 10). Hypernatremia is reportedly rare in developing countries possibly because of the high prevalence of malnutrition^(7, 8).

Materials and Methods

A total of 150 child with diarrhoea were admitted to Karbala paediatric hospital with dehydration a result of diarrhea during a six months from January to July 2008 and the types of dehydration from diarrhoea for these children were studied with relation between these types and different ages and types of feeding with the level of serum sodium concentrations. The ages of children were from (1-36) months at time admission, A complete medical history was obtained from the parents for each child and a physical examination was performed. Measurement of serum electrolytes, stool microscopy were done with other routine laboratory examinations, blood urea, blood sugar were done. Blood for electrolytes estimations was taken on admission and serum electrolytes measured on an I-L flame photometer⁽¹²⁾. Our biochemistry laboratory uses a quality control system of samples from

World Health Organisation ⁽¹¹⁾. The weight and the type of feeding and the economical status and educational level for parents and there residence, dehydration status and the type of fluid were recorded.

The types of dehydration were defined as hyponatraemic (serum sodium concentration < 130 mM/l), hypernatramic (serum sodium concentration > 150 mM/l); and

isonatraemic (serum sodium concentration 130-150 mM/l). ⁽¹³⁻¹⁴⁾

Results

From the 150 children, 27(18.1%) were hypernatramia dehydration; we find 122(81.9 %) isonatramia dehydration from the children with diarrhoea in various ages as shown in figure (1).

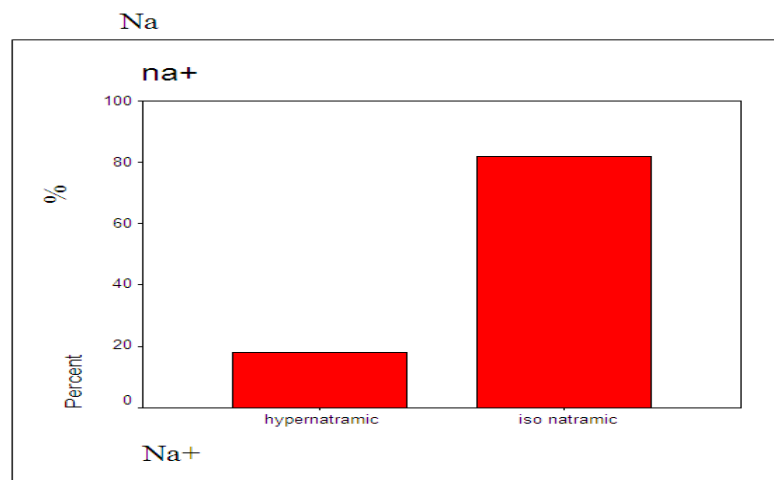


Figure 1. The incidences of the different types of dehydration at various ages

The study shows that the mean serum sodium concentration (\pm SD) in the two groups of dehydration were (152.3 ± 1.58) mM/l in hypernatramic type and (142.49 ± 6.2) mM/l in isonatramic

dehydration type in the various ages as shown in figure(2). And at 150 children, 68(45.6 %) were breast feed ,44(28.9 %) artificial feed and 38(25.5 %) with mixed feeding.

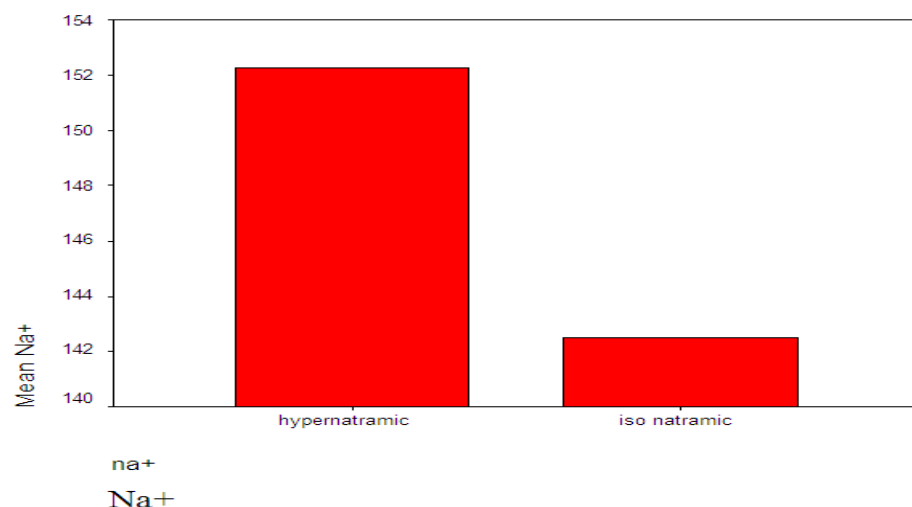


Figure 2. The incidence of the mean serum sodium concentration in different types dehydration at various ages

The mean serum sodium concentrations (\pm SD) in the types of dehydration in the children of study with breast feeding is (142.42 ± 7.19) 130 mM/l , artificial feeding is (145.05 ± 5.63) 130 mM/l and mixed feeding is (146.68 ± 6.52) 130 mM/l . The difference in mean serum sodium concentrations

between the breast feeding with all of artificial and mixed feeding was significant at the(0.05 level),but there are no significant in mean serum sodium concentrations between the artificial and mixed feeding ages as shown in figure (3).

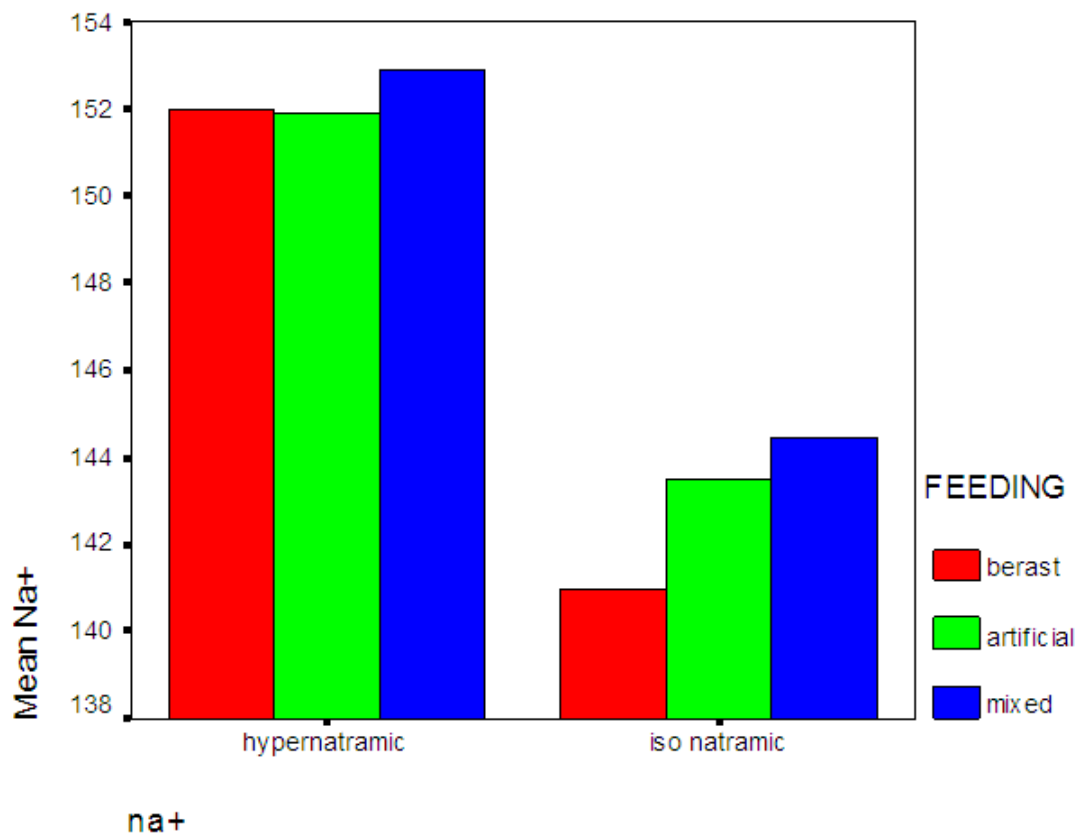


Figure 3. The incidence of different types dehydration by feeding state

The difference in mean serum sodium concentrations in the first age group of children(1-12) months, in the second age group (13-24) months and third age group (25-36) months were significant at ($p < 0.01$).

The difference in mean serum sodium concentrations (\pm SD) in the first age group of children(1-12)months (152.06 ± 1.38) in hypernatramic type, (142.06 ± 6.4) in isonatramic type ;in the second age group (13-24)months was (152.25 ± 1.75) hypernatramic, (142.97 ± 5.91) isonatramic and (153.66 ± 2.08)

hypernatramic, (146.75 ± 1.25) isonatramic in the third age group (25-36) months. as shown in figure (4). Of the 150 children,($n=16$) of hypernatramic type, ($n=81$) of isonatramic type in the first group age of children (1-12)months; in the second group age of children (12-24) months($n=8$) of hypernatramic, ($n=37$) of isonatramic type and in the third group age of children (24-36) months were ($n=3$) of hypernatramic type, ($n=4$) of isonatramic type.

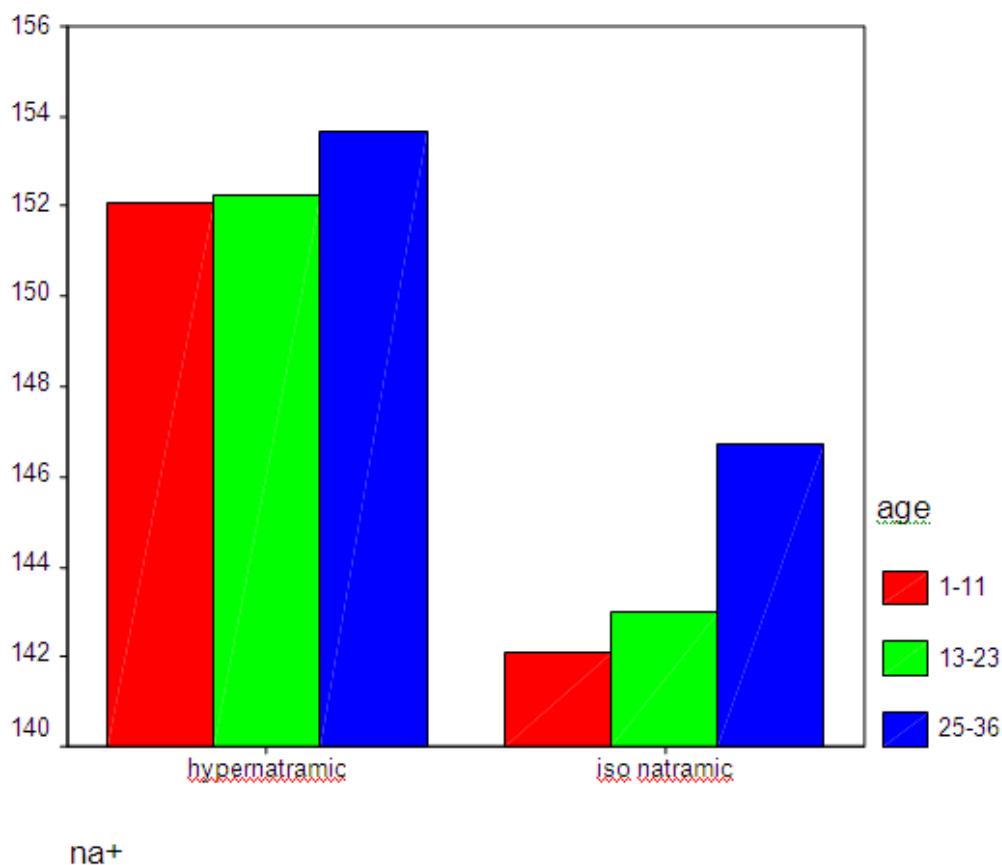


Figure 4. The incidences of the difference in the types of dehydration in the three types of ages

Of the 150 children, (n=16) of hypernatramic type, (n=81) of isonatramic type in the first group age of children (1-12) months as shown in table (1); in the second group age of children (13-24) months (n=8) of hypernatramic, (n=37) of isonatramic type as shown in table(2); and in the third group age of children (25-36) months were (n=3) of hypernatramic

type, (n=4) of isonatramic type as shown in table (3).

There are two degree of dehydration status at (n= 133), (89.3 %) moderate dehydration and (n=17), (10.7 %) severe dehydration. The difference in mean serum sodium concentrations between the two types of dehydration status were significant at (p< 0.01). as shown in figure (5).

Table1. The incidence of the mean serum sodium concentration in different types dehydration in the first age group (1-12)

na+	N	Mean	Std. Deviation	Std. Error Mean
Na+ hypernatramic	16	152.0625	1.38894	.34724
iso natramic	81	142.0617	6.42134	.71348

a. age = 1 - 12

Table 2. The incidence of the mean serum sodium concentration in different types dehydration in the second age group = 13-24

Group Statistics ^a				
na+	N	Mean	Std. Deviation	Std. Error Mean
Na+ hypernatramic	8	152.2500	1.75255	.61962
iso natramic	37	142.9730	5.91836	.97297

a. age = 13- 24

Table 3. The incidence of the mean serum sodium concentration in different types dehydration in the third age group (25-36)

Group Statistics ^a				
na+	N	Mean	Std. Deviation	Std. Error Mean
Na+ hypernatramic	3	153.6667	2.08167	1.20185
iso natramic	4	146.7500	1.25831	.62915

a. age = 25 - 36

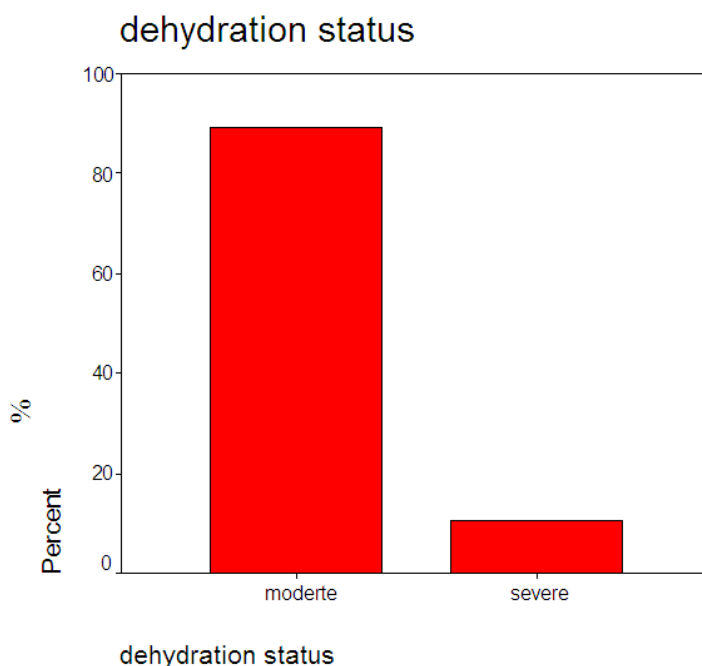


Figure 5. shows incidence of dehydration status

Discussion

Dehydration may develop in gastroenteritis rapidly due to the loss of body water and electrolytes (sodium chloride and potassium) in the stool and vomitus⁽¹⁶⁾.

Finberg (1979) reported that hypernatremia accounts for 20-25% of diarrhoeal diseases in patients admitted in North America hospital with a high

mortality⁽⁴⁾. In the research in Bangladesh they find the hyponatremia is more serious problem than hypernatremia or isonatremia dehydration⁽¹⁵⁾.

While if we compare that with our research there are two types of dehydration hypernatremia and isonatremia but we do not have cases with hyponatremia types.

There are a significant at ($p < 0.01$) in concentrations of mean serum sodium at the types of feeding in the different types of age. The explanation for these findings may be that the poor reserves of electrolytes and other nutrients in children patients can not compensate for accumulated loss of sodium⁽⁶⁾.

In isonatraemia dehydration haemo-concentration and hypovolemia are reflected in abnormally high levels of haemoglobin, red cells, packed-cells volume and serum proteins provided the infant has not previously been anaemic or severely undernourished. Metabolic acidosis is shown by lowered plasma bicarbonate, and in uncompensated cases by a lowered blood PH⁽¹⁷⁾.

In hypernatremia dehydration there are markedly raised levels of serum sodium and chloride, and of blood urea. The plasma osmolality is also high, and a severe metabolic acidosis is present in many cases. The increased plasma and extracellular osmolality is largely due to the high concentrations of sodium, chloride and urea. In the severely dehydrate infant periodic estimations of the serum electrolytes and frequent reassessment of the acid – base state can be valuable guide to treatment. Because the kidneys can compensate to a large extent for varying intakes of water and electrolytes, so that the composition of the body fluids will frequently return to normal provided an electrolyte solution of reasonable concentration is given in reasonable amount as described below^(18,19).

There is good evidence that 20% or more of mothers incorrectly prepare the dried-milk formula so that the sodium concentrations are at level which is risk the production of hypernatraemic dehydration^(5,12).

Conclusions

In our study it has been deduced that there are two kinds of dehydration from diarrhoea in this study in Karbala, hypernatramic and isonatramic from total sample, while no signs lead to existence hyponatramic type.

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