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## ORIGINAL ARTICLE

# Hypopotassemia in Infantile Diarrhoea Treated With Half Strength Ringer's Lactate in Dextrose 2.5o/o

*by*

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**Abstract**

*From October 15 until December 15, 1978, 13 children with acute enteritis admitted to the Pediatric ward, Pirngadi Hospital Medan and treated with i.v. half strength Ringer's lactate in Dextrose 2,5% had been evaluated for hypopotassemia. Criteria used were a serum potassium level of less than 4 mEq/l and the typical ECG pattern.*

*Out of the 13 patients, 10 (79,6%) developed hypopotassemia during i.v. therapy. It is concluded that in cases of Pediatric gastroenteritis treated with half strength Ringer's lactate in Dextrose 2,5% the possibility of hypopotassemia should be seriously borne in mind.*

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## Introduction

In infantile enteritis with moderate to severe dehydration i.v. fluid administration is mandatory. However a uniform treatment schedule is still wanted.

Vaughan and Mckay (1975) recommend as initial therapy a sodium containing fluid with an osmolality and sodium concentration similar to that of normal blood.

Sodium chloride 0,9% (Na and Cl both 154 mEq/1) is an alternative especially in patients with metabolic alkalosis. In acidosis, a suitable solution can be made by adding 28 ml of 7.5% sodium bicarbonate solution to 750 ml of 0.9% sodium chloride and increasing the final volume to 1 liter with 5% Dextrose in water. This solution contains 140 mEq of sodium, 115 mEq of chloride and 25 mEq of Bicarbonate per liter.

This solution should be started immediately and the volume given should equal 20 - 30 ml/kg of body weight. If necessary a second infusion or rarely a third infusion of 20-30 ml/kg body weight can be given.

Potassium should not be given at this stage unless the patient is known to suffer severely from hypopotassemia; it should be given only after it is established that the kidneys are functioning (Vaughan and McKay, 1975). The concentration of potassium in intravenous solution should not exceed 40 mEq/l.

Glucose should be included in all fluids, since the sick infant is susceptible to hypoglycaemia.

An alternative scheme is to give Ringer's lactate 20 ml/kg body weight in the first hour, there after a solution containing 400 ml of 5% to 10% glucose in water and 600 ml of Darrow's solution is given with a volume equal to 100 ml/kg body weight in 8 hours (Vaughan and McKay, 1975).

The deficit solution advocated by Iyngkaran (1979) consists of 5% Dextrose, ½ normal saline with appropriate amounts of 8.4% Na $HCO_3$.

Potassium chloride 1 gram should be added to the infusate once the child passes urine. As maintenance solution, 5% Dextrose, 1/5 normal saline so lution with 1 to 2 gram KCl in each liter of solution will meet the maintenance needs.

Holdaway (1978) recommend a solution consisting of 0.18% sodium chloride in 41% Dextrose. In shock the initial infusion of 20 ml/kg body weight of plasma is often lifesaving.

After satisfactory urinary flow has been established, potassium can be added to the i.v. fluid in a maintenance dose of 2.5 ml mol/kg/day.

Pierce and Hirschhorn (1977) recommend a polyelectrolyte solution such as Ringer's lactate or DTS (diarrhoea treatment solution). The amount given is 100 ml/kg body weight, half given rapidly (30-60 minutes) and the remainder in 3 — 6 hours. If half strength Darrow's solution with 2.5% glucose is used, 150 ml/kg should be given.

At the Department of Child Health Pirngadi Hospital initial therapy in acute infantile enteritis consists of half strength Ringer's lactate solution in 2.5% Dextrose solution. In the first 4 hours, 60 ml/kg is given followed by 10 ml/kg body weight/hour for the subsequent 20 hours.

Darrow's solution or potassium chloride is used when hypopotassemia ensues.

The objective of this trial is to determine the percentage of infants developing hypopotassemia when treated with the above mentioned half strength Ringer's lactate solution in Dextrose 2.5%.

Hypopotassemia can be diagnosed from clinical findings, the serum level and from the ECG pattern.

Signs and symptoms of hypopotassemia includes :

1. Neuromuscular disturbances such as hyporeflexia, and flaccid paralysis
2. CNS signs
3. Meteorism or paralytic ileus
4. Polydipsia, alkalosis and arrhythmia's, increased sensitivity to digitalis administration and loss of renal concentrating ability (Costrini and Thomson, 1978).

The normal serum potassium level is usually quoted as between 4 and 5 mEq/l (Vaughan and McKay, 1975). Costrini and Thomson (1978) defined hypopotassemia when the serum potassium level is below 3.8 mEq/l.

In this trial hypopotassemia is diagnosed when serum potassium level is less than 4 mEq/l co-existing with a typical ECG pattern, i.e. prolonged QT interval, flat T waves, prominent U waves and depresed ST segment (Nadas and Fyler, 1973; Kempe and Silver, 1974).



## Materials and methods

The present study was conducted at the department of Child Health Medical School of North Sumatera University/ Pirngadi Hospital Medan from October 15 to December 15, 1978. During this period there were 203 cases with infantile enteritis admitted in the Pediatric ward, all of them were given i.v. fluid consisting of half strength Ringer's lactate in Dextrose 2.5%.

In the first 4 hours 60 ml/kg body weight was given (rehydration). In the next 20 hours the amount of fluid given was approximately 10 ml/kg body weight/hour.

In 13 patients an ECG was simultaneously done with serum potassium level examination.

The patients were selected based on the ability to pay for the test. Of these 13 enteritis patients, 5 had also pneumonia; tonsillitis was found in 3 and febrile convulsions in 2 patients (Table 1).

TABLE 1 : *Accompanying diseases*

| | |
|---|---|
| Bronchopneumonia | 5 |
| Tonsillitis | 3 |
| Febrile Convulsion | 2 |

Hypopotassemia was diagnosed if a typical ECG pattern (ST depression, T. inversion, QT prolongation with or without a U wave) coexisted beside a serum potassium level below 4 mEq/l.

Stool culture and examination of electrolyte composition had not been performed due to lack of funds.

## Results

Of the 13 patients a low serum potassium (less then 4 mEq/1), was found in 10 patients (76,92%).

All of them also had an ECG pattern consistent with hypopotassemia.

## Discussion and Conclusion

The stool in infantile diarrhoea contains 25 mEq/l of potassium (Pierce and Hirschhorn, 1977).

Rehydration fluid used in infantile diarrhoea therefore should at least contain this amount of potassium. Rehydration with half strength Ringer's Lactate is thought to be able to cause hypopotassemia because half strength Ringer's Lactate only contains 2 mEq/1 of potassium (Table 2).

TABLE 2 : *Electrolyte Composition of Stool and Rehydration Fluid*

| | ½ Strength R.L. Solution | Diarrhoea treatment solution | ½ Strength Darrow Sol. | Infantile Diarrhoea |
|---|---|---|---|---|
| Na | 65 mEq/l | 118 mEq/l | 61 mEq/l | 65 mEq/l |
| K | 2 | 13 | 17,5 | 25 |
| Cl | 54,5 | 83 | 52 | 55 |
| HC03 | 14 | 48 | 26,5 | 14 |
| Ca | 1,5 | — | — | — |

Out of the 13 patients examined, 10 had been found to have hypopotassemia during treatment with half strength Ringer's Lactate in Dextrose 2.5%. It is concluded therefore that treatment of infantile diarrhoea with half strength Ringer's Lactate solution poses a danger for the development of hypopotassemia. As soon as diuresis occurs, the i.v. fluid should be changed to half strength Darrow's solution or potassium supplement should be given either i.v. or orally.

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