ORIGINAL ARTICLE

Treatment of Acute Infantile Gastroenteritis Dehydration Acidosis with Ringer's Lactate and Glucose-Electrolyte Solution

by

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Abstract

Fifty patients hospitalized with severe gastroenteritis — dehydration with acidosis were investigated. The age average was 8 months with the range of 1 - 18 months. The amount of the Ringer's lactate solution given was as follows:

1st hour : 30 ml/kg b.w.
the following 7 hours : 70 ml/kg b.w. or 10 ml/kg b.w./hour.

After 8 hours on parenteral treatment, the child was given oral solution, either glucose-electrolyte solution or milk formula in ¼ dilution.

The mortality rate was 6% (3 out of 50 patients) i.e. one due to seizures suspected encephalitis, one due to potasium deficiency (K = 2.1 mEq/l) and the third due to dehydration itself because the child was admitted already in a moribund stage (subvinum vitae).

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Introduction

Acute infantile gastroenteritis in Indonesia and other developing countries is still one of the major causes of morbidity and mortality in children. The 5 leading diseases in children in the Department of Child Health, Medical School, University of Indonesia are (Sutejo et al., 1968):

1. Upper respiratory tract infection.
2. Gastroenteritis.
3. Protein Calorie Malnutrition (PCM).
4. Vitamin A deficiency,and
5. Tuberculosis.

The incidence of gastroenteritis in developing countries is estimated as 50 - 70% per 100 population per year and 70 — 80% out of them are children under 5 years of age, particularly below 2 years (Brotowasisto, 1974). The number of hospitalized patients with gastroenteritis— dehydration with acidosis in the Department of Child Health, Medical School, University of Indonesia, Jakarta, in 1975 was 1.127 (22.8%) out of 4.938 total admissions (Sunoto et al., 1976).

This figure is more or less similar to other developing countries like Malaysia (Abraham and Tan, 1974), India (Naruka et al., 1974), Puerto Rico (Ortiz, 1974), etc.

The mortality rate in hospitals is still very high, and varies from 10 — 20% (Sutoto et al., 1974; Naruka et al., 1974), whereas in developed countries the mortality is 1% (Walker Smith, 1972; Biddulph, 1972).

The cause of this high mortality in developing countries may be due to:

1. The severity of the disease caused by delayed admission to the hospital.
2. The inappropriate treatment due to lack of facilities in the peripheral hospital and health centres.
3. The ignorance of the parents, for example they withdraw food or fluid which they think could increase the diarrhoea.

The primary and most important step in the treatment of acute gastroenteritis is restore the fluid loss (Ironside, 1970; Rohde, 1974; Santhana Krishnan et al., 1974), as the majority of cases of acute gastroenteritis is considered as a self-limiting disease (Tumbelaka, 1965; Brotowasisto, 1974; Rohde, 1974).

At the beginning Ringer's lactate solution was used in the treatment of cholera, but according to Mahalanabis et al. (1972), Ringer's lactate can be used also in the treatment of acute non cholera diarrhoea. The purpose of this study is to prove the efficacy of Ringer's lactate solution (the cheapest and the only available solution in the peripheral hospital and rural health centres) in the treatment of acute gastroenteritis with severe dehydration and acidosis as a parenteral solution.

Materials and Methods

Fifty patients with acute infantile gastroenteritis with severe dehydration and acidosis were hospitalized in the

Department of Child Health Medical School, University of Indonesia/Dr. Cipto Mangunkusumo General Hospital, Jakarta. They consisted of 32 boys and 18 girls (Table 1). The age average was 8 months with the range of 1 — 18 months (Table 2). The nutritional state and accompanying diseases can be seen in tables 3 and 4. Sometimes in one patient there are 2 or more accompanying diseases.

To estimate the degree of dehydration, the scoring system by Maurice King (1974) was used as follows :

Part of the body examined	Score for signs and symptoms observed		
	0	1	2
General condition	Healthy	restless, apathetic, sleeping or malaise	delirium, stupor or coma
Elasticity of the skin	Normal	decreased	very decreased
E y e	Normal	sunken	very sunken
Fontanelle	Normal	sunken	very sunken
M o u t h	Normal	d r y	very dry or cyanotic
Pulse rate per minute	strong, less than 120	120 — 140	more than 140

The sum of the scores of the above signs and symptoms could be categorized as follows :

0 - 2: mild dehydration (5% deficit).

3 - 6: moderate dehydration (8% deficit).

7 - 12: severe dehydration (10% deficit).

Laboratory examinations

Routine stool examination and screening test for fat and sugar intolerance were done in the Department of Child Health. Blood gas analysis and electrolyte examination were done in the Department of Clinical Pathology, Medical School, University of Indonesia/Dr. Cipto Mangunkusumo General Hospital. Blood gas analysis and electrolyte examination were done twice, i.e. before and after treatment.

Method of the treatment.

The amount of the Ringer's lactate (RL) given was as follows :

— 1st hour : 30 ml/kg bw

— the following 7 hours: 70 ml/kg b.w or 10 ml/kg b.w./hour.

After 8 hours on parenteral treatment, the child was given oral solution, either glucose-electrolyte solution or milk formula in ¼ dilution. If oral solution could not be given, parenteral treatment

TABLE 1 : *Sex Incidence*

Sex	Total
Male	32
Female	18

TABLE 2 : *Age Incidence*

Age (months)	Total
0 — 3	5
3 — 6	9
6 — 9	20
9 — 12	7
12 — 15	4
15 — 18	5
18 — 21	—
21 — 24	—

TABLE 3 : *Nutritional state*

	Total
— Normal	38
— Under weight	12
— Marasmus	—
— Marasmic kwashiorkor	—
— Kwashiorkor	—

was continued with Ringer's lactate in 5% Dextrose. Clinical evaluation was done including the general condition of the child, the rehydration, blood gas analysis and electrolyte examination. Complication were also noted if present.

Result.

Accompanying Diseases

Twenty seven (54%) out of 50 patients simultaneously suffered from other diseases. They were upper respiratory tract infection (5), Bronchitis (1), Otitis media acuta (9), Infection of the gut (5), Fat malabsorption (4), Sugar intolerance (2), Seizure (3) and V.S.D. (1). Sometimes in one patient there were 1, 2 or more accompanying diseases (table 4).

Blood gas analysis

Before treatment (IVFD), blood gas analysis showed severe acidosis. The average of the pH was 7.30 with the range of 7.04 to 7.48, whereas the average base excess was — 17 with the range of — 8 to — 26 mEq/l. After treatment pH was 7.40 with the range of 7.27 to 7.57 and the average base excess was — 4 with the range of — 11 to + 5 (table 6).

Electrolyte findings

Before IVFD, the average blood sodium concentration was 133 meq/l, potassium 3.1 meq/l and chloride ion 83 meq/l. After IVFD, improvement was obtained with the blood sodium averaging 136 meq/l. potassium 4.7 and chloride ion 100.5 mEq/l (table 7).

The results of the RL administration

The result of the RL administration was excellent in 44 (88%), good in 2 (4%) and poor in 4 (8%), as can be seen in table 5.

Complication

No clear complication such as overhydration and oedema occurred.

Discussion

Among our patients, there were more boys than girls (table 1).

This can be explained by the fact that usually boys are more active than girls, so that the possibility of boys to get infection is greater.

The age average was 8 months, with the range of 1 — 18 months. This can be understood, because at this age, usually the infant gets additional food, so that the possibility of contamination with microorganisms is greater.

Thirty patients (76%) were considered normal and 12 (24%) underweight. In this trial patient with P.C.M. were excluded due to the reason that in P.C.M. there are so many factors (lactose and fat intolerance, overgrowth of bacteria, infestation of parasites, etc) which can play an important and decisive role in causing diarrhoea.

After 8 hours on IVFD with RL as a parenteral solution, 44 patients (88%)

TABLE 4 : *Accompanying Diseases* *

	Total
— Upper Respiratory tract infection	5
— Bronchitis	1
— O. M. A.	9
— Infection of the gut	5
— Fat malabsorption	4
— Sugar intolerance	2
— Fungal infection	2
— S e i z u r e	3
— V. S. D.	1

* Sometimes there are more than 2 accompanying diseases in one patient.

TABLE 5 : *The results of the treatment*

	Total
Excellent	44 (88%)
G o o d	2 (4%)
P o o r	4 (8%)

TABLE 6 : *Blood gas analysis before and after treatment*

	Before treatment	After treatment
pH	7.30 (7.04 to 7.48)	7.40 (7.27 to 7.57)
BE	— 17 (— 8 to — 26)	—4 (— 11 to +5)

TABLE 7 : *Electrolyte findings before and after treatment*

	Before treatment	After treatment
Na	133 (117 — 160)	136 (130 — 148)
K	3.1 (1.7 — 6.8)	4.7 (2.1 — 6.5)
Cl	83 (70 — 115)	100.5 (82 — 115)

have obtained complete rehydration or have come into a state of only mild dehydration. IVFD was stopped and continued with glucose-electrolyte solution or milk formula in ¼ dilution.

Two patients (4%) still remained in severe dehydration after 8 hours, but after 24 hours of IVFD, rehydration finally occurred. This can be understood, because these 2 were in an underweight condition. Four patients (8%) still remained in dehydration after 24 hours of IVFD. One of them improved only after 5 days of IVFD. This can be explained that this case suffered from prolonged diarrhoea and vomiting due to cholera Eltor.

Three died, one due to encephalitis, one due to potasium deficiency (K = 2.1 mEq/l) and the third due to dehydration inself because this child was admitted already in a moribund stage. The above findings were more or less similar to the results of Mahalanabis et al. (1972).

From this trial, it can be concluded that RL solution can be used in the treatment of acute gastroenteritis with severe dehydration and acidosis as a parenteral solution particularly in areas where facilities and choice of parenteral fluids are limited.

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