 Paediatrica Indonesiana 18 : 332 — 358. Nov. — Dec. 1978.

LITERATURE REVIEW

Diarrhoeal Disease of Children in Indonesia

by

SUNOTO, ADNAN S. WIHARTA and J. SULIANTI SAROSO

(Department of Child Health, Medical School, University of Indonesia, Jakarta and National Institute of Health Research and Development, Ministry of Health)

Abstract

Diarrhoeal disease in infants and children up till now is still becoming a major problem with its high morbidity and mortality.

There are too many factors which can play a role in causing this disease. But by giving Oral-glucose electrolyte Solution as soon as possible the case fatality rate can be reduced as low as possible. Whereas decreasing the morbidity still needs a very long time, since it has very multi-complex factors i.e. socio-economic condition, environmental and personal hygiene and sanitation, life style of people, belief, etc.

The study on epidemiology, the influence of improvement of environmental sanitation and socio-anthropology is still very few, besides there is no satisfactory vaccin produced to prevent this disease. Meanwhile the worse of the case is that there is a tendency of decreasing breast-feeding in the big cities and to substitute it with bottle-feeding.

Presented at the Third Advisory Committee on Medical Research, WHO-SEARO, Sri Lanka, 4 - 7 April 1977.
Received 28 Sept. 1977.

Introduction

Diarrheal diseases in Indonesia and other developing countries up to now still presents itself as one of the major causes of morbidity and mortality in children under five years of age. By diarrhea is meant the changes of constitution of stools either watery, mucous, bloody or greenish or the increased frequency of stools numbering 5 times or more per 24 hours.

The following 5 most prevalent disease entities are mentioned below in the order of frequency as observed among patients attending the out-patient clinic of the Department of Child Health, Medical School, University of Indonesia, Jakarta (Sutejo et al., 1968; Sutejo, 1974; Tumbelaka, 1969) :

1. Upper Respiratory Tract Infections, especially acute naso-pharyngitis;
2. Gastrointestinal Tract Disorders, mainly due to gastroenteritis;
3. Protein Energy Malnutrition (PEM);
4. Tuberculosis;
5. Vitamin A Deficiency.

A similar disease pattern was found in a nation wide househol sample survey undertaken by the National Institute of Health Research and Development in 1972.

The incidence of diarrheal disease among persons in Indonesia is estimated at around 50 - 70 per 100 population per year of which 70 - 80% occur in children under the age of 5 years, with the highest incidence in children below 2 years of age. Ono Dewanoto et al. (1968) found the highest incidence during the rainy season, i.e. during November to February; the lowest during the dry seasons, i.e. in April to June. Others, however, found no correlation between incidence and seasons (Oma Rosmajadi, 1976).

The order of magnitude of diarrheal disease can also be judged from the number of hospitalized patients with diarrhea. In the Department of Pediatrics in the General Hospital Jakarta the percentage of patients admitted with gastroenteritis dehydration during 1971 — 1975 was 30% (Sutoto et al., 1974; Sunoto et al., 1976). Similar figures were found in hospitals elsewhere in Indonesia.

The case fatality rates in various hospital, departments of pediatrics in Indonesia since 1959 until 1974 were still above 15%. Kwari Satjadibrata and D. Poesponegoro (1959) reported a case fatality rate of 62.2% of 778 patients with gastroenteritis dehydration with shock admitted to the Department of Pediatrics, General Hospital Jakarta. After introducing a modified treatment, Sutejo et al. (1961) were able to reduce the case fatality rate. The experience in the departments of pediatrics of other hospitals was more or less the same.

After the Rehydration Seminar held in Jakarta in August 1974 a Rehydration Programme was started with a standardized treatment of Ringer's lactate

and oral rehydration, which resulted in a dramatical decline of the case fatality rate.

The case fatality rate of acute gastroenteritis with dehydration in hospitals decreased to less than 10%. In 1975 this rate could be lowered to 9.1% (Adnan S. Wiharta and Suharjono, 1976), and 6% (Sunoto et al., 1976) in the Department of Child Health, Medical School, University of Indonesia. In other Departments of Child Health the figures were as follows: Sutjiningsih et al. (1976) in Denpasar, Bali, 11.3%; Sudaryat 14% (1975) and 6% (1976); Harry Hartoyo (1976) 2.5%; Moenginah et al., in Yogyakarta, 6% (1975), and 2.8% (1976); Rusdi Ismail in Palembang (1976) 3%; Wiyati Donhuijsen in Bandung 3.7% (1976).

The case fatality rate in cholera (see table 1) varied between 0 - 5% as shown by Suharjono et al. (1976) 0%, Adnan S. Wiharta and Sutejo (1976) 0%, H. Santosa et al. (1976) 0%, Moenginah et al. (1976) 2.8%, Ruskandi Martaatmadja and Wiyati Donhuijsen (1976) 3.6%, and Nassir Abbas et al. (1976) 0%. In peripheral hospitals the mortality rate is also reduced to less than 5% as reported by Sutomo Talkah and Rusdi Ismail (1976) 3.6%, and Harry Hartoyo (1976) 2.5%.

Etiology

A great number of factors may be related to the incidence of diarrheal disease in children, such as ignorance, taboos, hot and humid climate, low purchasing power, poor housing conditions, inadequate water supply, lack of personal hygiene, improper environmental sanitation, high incidence of malnutrition and infections, over-crowding, many children under 5 years of age in one household, food poisoning, food and milk allergy, lactose intolerance, etc.

It is very difficult to determine a single cause etiology among these multicomplex factors. The most important predisposing factors in Indonesia may be :

1. Poor environmental sanitation and personal hygiene;
2. Prevalence of malnutrition and infections and
3. Malabsorptions.

Enteral as well as parenteral infections can cause diarrhea in children. (see diagram 1).

Ono Dewanoto et al. (1968) found enteral infections in 69.8% and parenteral infection in 20.9% of cases suffering from diarrhea. Sunoto et al. (1976) found acute diarrhea in 80% of pediatric patients admitted for other diseases, such as upper respiratory tract infection, otitis, bronchitis, measles, and PEM.

Bacterial infections

The most common pathogenic bacteria as cause of enteral infections are EPEC (Enteropathogenic E. coli), Salmonella sp., and Shigella sp. (Tumbelaka, 1965; Suprapti Thaib, 1968; Djohan Kurnia, 1973; Brotowasisto, 1974; Effek

Diagram 1: Infection which may cause diarrheal disease in children.

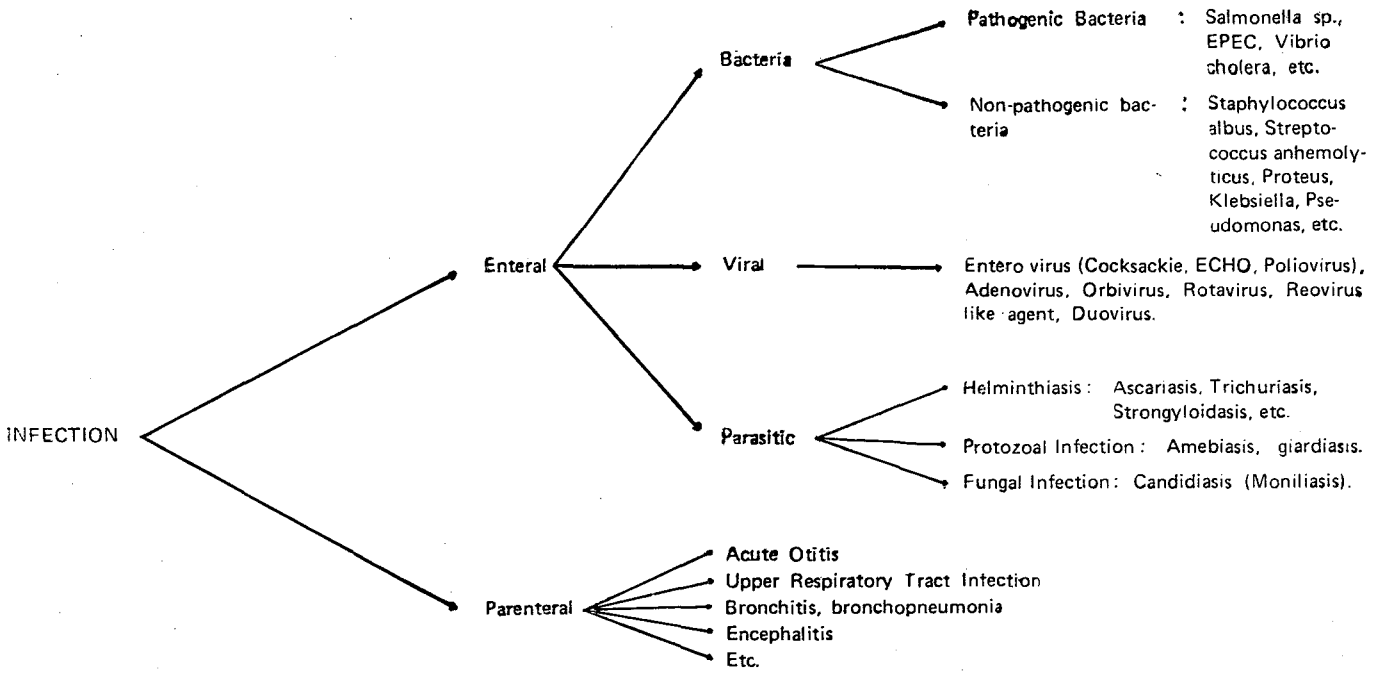
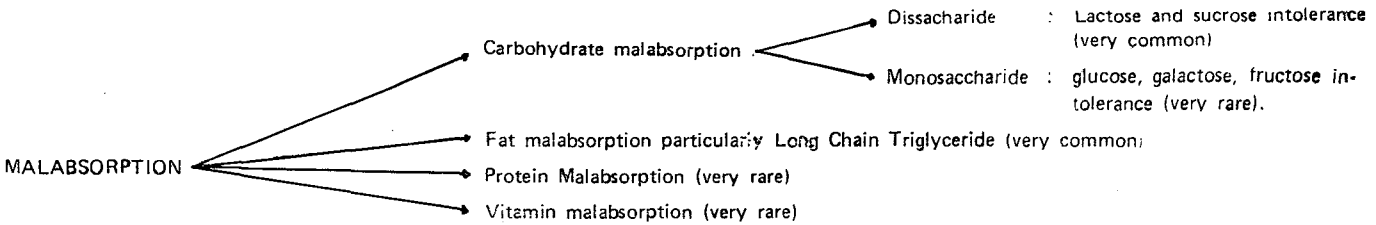


Diagram 2: Malabsorption Syndrome



Alamsjah et al., 1975; Gracey et al., 1973; Sunoto et al., 1976). Besides pathogenic bacteria, overgrowth of non-pathogenic bacteria may also play a role in causing diarrhea of childhood (Gracey et al., 1973).

1. *Enteropathogenic Escherichia coli*

EPEC is a well-known pathogenic bacteria which can cause endemic or epidemic diarrhea in neonates and infants. Bintari Rukmono (1965) in a study of 99 infants living in a crowded area of Jakarta isolated EPEC in the majority of the infants with or without diarrhea. The serotypes 0 111 B 4 was regarded as the most pathogenic serotype followed by 0 125 B 15, 0 55 B 5, and 0 127 B 8.

Ono Dewanoto (1968) found EPEC in 163 (36.2%) out of 448 patients with diarrhea of which 110 were mono-infections and 53 were mixed infections. Suprapti Thaib (1968) found EPEC in 164 (37.1%) out of 442 infants; the most frequently isolated serotypes were 0 126 B 16, 0 125 B 15, 0 127 B 8, and 0 124 K 86. During an outbreak of diarrhea in the neonatal and low birth weight infant wards, Poey et al. (1969) found positive EPEC in 39 (58%) out of 67 neonates and 16 (64%) out of 25 low birth weight infants. The serotypes were 0 119 K69, 0 127 K63, 0 126 K71, and B 1810 in neonatal ward, and 0 119 K 69, 0 142 K 86, 0 111 K 58, 0 126 K 71, 0 55 K 59, and B 1810 in infant ward.

Djohan Kurnia (1973) found 36.0% EPEC as the causative agent of diarrhea in a community study in Ujung Pandang. Gracey et al. (1973) found 35.0% EPEC in 20 malnourished children with diarrhea, while Effek Alamsjah et al. (1975) found EPEC in 23.4% out of 60 patients with acute infantile diarrhea. The most common serotype isolated was 0 119 B 14. Azhali et al. (1972) in a 5-year study of EPEC infections in the Department of Pediatrics, Dr. Hasan Sadikin Hospital, Bandung, found EPEC in 497 cases ranging in age from 0 - 12 years.

The highest incidence was found in the 0 - 3 months age group; 72.7% were found in cases under 1 year of age; boys were more involved than girls. The frequency of serotypes varied by years, i.e. 0 125 in 1964, 0 126 in 1966, 0 26 in 1967, and 0 126 in 1968. The peak time incidence of all infections differed from year to year, i.e. July in 1964, November in 1965, October in 1966, April in 1967, and July in 1968. The most common cause of death was serotype 0 128. Rosmajudi et al. (1976) found EPEC in 47.71% of 1.625 pediatric gastroenteritis with dehydration admitted to the hospital, 34.09% of them were children below 1 year of age.

In the meantime a question arises whether this EPEC is really the cause of diarrhea, since it is found also in diarrhea and non-diarrhea children. The ETEC (Enterotoxigenic E. coli) may be more important as the cause of diarrhea

than EPEC in Bangladesh and Indonesia (Teluk Sebodo et al., 1977).

2. *Salmonella species*

Salmonella species as an associate bacteria in children with diarrhea seem to be increasing lately. Tumbelaka (1965) in Jakarta found Salmonella sp. as a cause of diarrhea in 2%. Ono Dewanoto et al. (1968) and Suprapti Thaib et al. (1968) in Bandung found Salmonella sp. in around 2.5%, Djohan Kurnia (1973) in Ujung Pandang 2.8%, Effek Alamsjah et al. (1974) 8.3%; and Komalarini and Sanborn (1976) in Jakarta 6.7%.

Sunoto et al. (1976) found Salmonella sp. in 34 (17%) out of 202 acute infantile diarrheal cases visiting the children out-patient clinic of the General Hospital in Jakarta. Hence more attention should be paid in the future to Salmonella sp.

3. *Shigella species*

Gambiro (1961) in a study of epidemic diarrhea in the Regency of Pemalang, from late 1960 through 1962, found 9% of the stool samples Shigella positive, most of them Shigella shigae and Shigella flexneri. Tumbelaka (1965), Gracey et al. (1973), Effek Alamsjah et al. (1974), and Sunoto et al. (1976) reported Shigella sp. in the Department of Pediatrics of the General Hospital, to be 5%, 5%, 3.3%, and 4% respectively of all diarrheal cases admitted during that year of study.

Komalarini and Sanborn (1976) found 7.9% in the Department of Pediatrics, Sumber Waras Hospital, Ono Dewanoto (1968) and Suprapti Thaib (1968) in Bandung found 10.3% and 11.2% respectively, Djohan Kurnia (1973) in Ujung Pandang found 4.5% and Moenginah et al. (1976) and Teluk Sebodo et al. (1977) in Yogyakarta reported 6.7% of diarrheal cases positive for shigella.

4. *Vibrio species*

Vibrio cholera has become endemic in Indonesia since 1970. In 1970, 1971, 1972, and 1974 respectively 6,500; 23,000; 43,000; and 45,000 cases of cholera were reported (Brotowasisto, 1974). Djohan Kurnia (1973) found V. cholera Eltor in as many as 10% of diarrheal cases in Lingkungan Layang Ujung Pandang, while Sudigbia and Anggoro Djawabaru found Vibrio cholera in 45.0% out of 358 gastroenteritis cases with dehydration admitted to the Department of Pediatrics of Dr. Kariadi Hospital in Semarang. V. cholera El Tor type was firstly reported in Makassar by de Moor in 1939.

Jeni Iswandari (1973) found 20.2% cases positive for V cholera Eltor out of 328 infants and children admitted to the Department of Pediatrics, Sumber Waras Hospital. In the last 4 years, cholera and paracholera Eltor have been reported also in children below 2 years of age. Haroen Noerasid et al. (1975) reported 56 (10.98%) out of 510 patients showing positive para cholera Eltor. All

these children are bottle fed. Budi Santoso et al. (1976) reported a case of V. cholera in a 2-month-old baby. Komalarini and Sanborn (1976) and Suharjono et al. (1976) also found Vibrio cholera in children below 2 years of age among their cholera cases.

Viral infections

During the last few years virus as a probable cause of diarrhea has been already proven by several authors in developed countries (USA, Australia, Great Britain etc.). Several of the virus isolated from patients with acute gastroenteritis were orbivirus, rheovirus, rotavirus and duovirus. All these are the same virus with different names (except Norwalk agent) and still to be proved that these viruses cause diarrhea. In collaborative studies between Jakarta and Perth, and between Yogyakarta and Melbourne, duovirus were also found in Indonesia as a cause of diarrhea in children in 47.7% and 14% respectively (Gracey et al., 1975; Moenginah et al., 1976; Teluk Sebodo et al.,1977).

Intestinal parasites

Helminthiasis of the gut may play a role also in causing diarrheal disease of children (Tumbelaka, 1965; Sunoto, 1972, 1976). The most common helminthiasis of the gut in causing diarrhea are ascariasis and trichuriasis.

1. *Ascariasis*

Ascariasis is the commonest worm found in children; its frequency is very high and varies from 30 - 90%.

Jo Kian Tjay et al. (1968) reported from Medan, North Sumatera, the incidence of 15.4% in infants, 48.6% of them in children above 1 year of age. Ono Dewanoto et al. (1968) in Bandung and Suprapti Thaib et al. (1968) reported the incidence of 25% in a study of children between 0 - 2 years of age with diarrhea. Sjamsir Daily (1972) in Padang, Nurhajati and Sunarno (1973) reported the incidence of ascaris in Yogyakarta 53.0%, whereas in Surakarta it is 33.5%. Budining Wirastari et al. (1976) in Jakarta, and Nassir Abbas and Palada (1976) in Ujung Pandang, South Sulawesi, reported 34.2%, 43.1%, and 51.3% respectively. Many of them sometimes have 1 or more kinds of worms, usually ascariasis + trichuriasis. These findings, of course, are not conclusive of diarrhea being caused by ascaris.

2. *Trichuriasis*

Trichuriasis may cause chronic diarrhea with bloody and mucous stool in childhood, sometimes causing prolapse of anus (Sunoto et al., 1972; Alisah Naoemar, 1976; Subianto et al., 1976). The incidence of trichuriasis in Indonesian children was reported by several authors, among others were Jo Kian Tjay et al. (1968) in Medan who reported 3.4% in infants, 32.2% in children above 1 year of age; Suprapti Thaib et al. (1968) in Bandung 10.0%; Sjamsir Daily et al. (1972) in Padang 21.1%; Nurhajati and Sunarno (1973) reported the incidence in Yogyakarta and Surakarta, 60.3% and 26.2% respectively.

Budining Wirastari et al. (1976) in Jakarta 9.7%; Nassir Abbas and Palada (1976) in Ujung Pandang 13.2%. This worm is usually very rarely found as a single cause of diarrhea. The presence of trichuris is usually accompanied with ascaris, amoebiasis, shigellosis, or giardiasis (Alisah Naoemar and Sri S. Margono, 1976).

3. *Protozoal infections*

a. Amoebiasis

Amoebiasis is an endemic disease in many parts of Indonesia usually causing chronic diarrhea with blood and mucous in the stool. Studies done in various villages of Indonesia showed a 10 - 12% cyst-carrier rate (Poedjiadi, 1971). Two cohort studies done in one of the most crowded slum areas in Jakarta during 1960 — 1963 (Bintari Rukmono and Widodo Talogo, 1969) revealed 22% of cases of amoebiasis among toddlers, 48% among school-children, and 54% among adults, but not a single case among infants. Jo Kian Tjay et al. (1968) in Medan reported a prevalence rate of 7.3% out of 768 children and 1.4% out of 258 infants.

b. Giardiasis

Giardiasis as a cause of acute and chronic diarrhea is not clearly predominant in Indonesian children. Its frequency is relatively low compared with other etiologic agents (bacterial, viral, helminthes, and fungal infection). Ono Dewanoto et al. (1968) found a percentage of 6.5%, Jo Kian Tjay et al. (1968) 9.1%, and Suprapti Thaib et al. (1968) 2.7%.

4. *Fungal infections*

Several factors may be related to the high incidence of fungal infections in Indonesian children, such as poor environmental and personal hygiene, high incidence of PEM and wide usage of antibiotics in the treatment of infectious diseases.

The most common fungal infections are oral thrush and intestinal candidiasis. In a study of candida species isolations in malnourished children with diarrhea 19 (70.4%) out of 27 children were found positive for candida species (Gracey et al., 1974). They consisted of 16 Candida parapsilosis, 6 C. albicans, and 6 C. tropicalis cases.

Without identification of the species, in a study of microbial contamination of the gut in 20 malnourished children 9 (45%) of them were found harboring candida sp. (Gracey et al., 1973). Other findings of some authors revealed 38.2% (Ono Dewanoto et al., 1968), 38.1% (Suprapti Thaib et al., 1968), 53% (Teluk Sebodo et al., 1977) positive for candida sp.

Malabsorption syndrome (see diagram 2)

Malabsorption syndrome in Indonesia is commonly associated with gastroenteritis, PEC, Low Birth Weight infants,

and post bowel surgery (Suharjono et al., 1974).

The most important are :

— Carbohydrate malabsorption, particularly lactose and sucrose intolerance;
— Fat malabsorption;
— Carbohydrate intolerance.

Carbohydrate or sugar intolerance as one of the causes of diarrhea in children was investigated for the first time in 1970 by Sutejo by sending a questionnaire to Indonesian doctors; it revealed that 20.4% of 215 respondents had encountered intolerance to cow's milk.

1. *Lactose intolerance*

During a 2-years study on sugar intolerance in the Department of Child Health, Medical School, University of Indonesia, Jakarta, in 838 infants and children with chronic diarrhea, 22 children with PEM, 50 "healthy" preschool-age children, and 32 neonates with post bowel surgery, sugar intolerance was found in 52.8%, 86.4%, 72.0%, and 21.8% respectively (Sunoto et al., 1971; 1973; Suharjono et al., 1971, 1972; Sutejo et al., 1971; Halimun et al., 1973; Faried Bakry et al.,1973).

Achmad Surjono in Yogyakarta in a study of lactose tolerance test (LTT) of 70 newborn infants, found that 31.4% had an abnormal response to LTT as shown by a flat sugar curve. Pitono Suparto et al. (1974) found in Surabaya lactose intolerance in 48.6% of 107 infantile gastroenteritis cases. More detailed investigations on 86 patients during the diarrheal stage comprising 23 neonates, 47 infants below 1 year of age, and 16 children above 1 year of age revealed lactose intolerance in 21.7%, 42.5%, and 56.3% respectively. During convalesence 48.8% of the patients still suffered from lactose intolerance. This suggests the possibility that lactose intolerance occurring during the diarrheal stage continues to be present in the convalesence period.

Immanuel Mustadjab and Muzief Munir (1974) in a study of 38 infantile diarrhea also found 63.2% with lactose intolerance by lactose loading test. San Diego and Agus Iskandar (1974) in Sumatera found 54% of 200 subjects suffering from lactose intolerance. Garna et al. (1976) in Bandung found lactose intolerance in 16.6% of 36 neonatal diarrhea cases by paper chromatography method. Intestinal biopsy of PEM children and gastroenteritis patients revealed notably varying degrees of villous atrophy (Suharjono et al., 1971; Yati Soenarto et al., 1974, 1976). Unfortunately, enzyme assays have not yet been undertaken in Indonesia due to lack of facilities.

2. *Sucrose intolerance*

Pitono Suparto et al. (1976) in a study of 86 patients found 26% of cases during the diarrheal stage suffering from intolerance to sucrose. They consisted of 4 (21%) out of 19 neonates, 15 (33.3%) out of 45 infants below 1 year of age, 4 (18.2%) out of 22 child-

ren above 1 year of age. Subijanto et al. (1976) reported a frequency of 16% of sucrose intolerance among acute infantile gastroenteritis cases.

3. *Fat malabsorption*

The high prevalence of PEM, LBW. and gastroenteritis in Indonesian children may be related to the high frequency of fat malabsorption. Twenty six out of 35 malnourished children with diarrhea showed fat malabsorption. The percentage of fat malabsorption in LBW infants is even higher, i.e. 89.5% out of 76 patients, while in the fullterm it is 60.9% out of 121 and in infants above 1 month of age it is 57.9% out of 31 (Suharjono et al., 1976). This high percentage of fat malabsorption may be due to insufficiency of the organs of pancreas, liver, and intestines which occurred in PCM, LBW, and gastroenteritis patients.

It is also suggested that overgrowth of bacteria in the gut might cause deconjugation of the bile salts, which could impair fat malabsorption. Diagnosis of fat malabsorption was based on macroscopic and microscopic findings of the stool and Lipiodol Absorption Test (Gracey et al., 1974).

Mixed etiology

Like in other developing countries, the etiology of diarrheal diseases is most probably a mixed one, i.e. with :

— Parenteral infection;
— PCM;
— PCM + parenteral infection;
— Malabsorption syndrome;
— Parasitic infection such as intestinal worms, intestinal candidiasis, amebiasis, giardiasis, etc.

Sometimes 2 or more mixed infections occur in one child (Sunoto et al., 1976). Ono Dewanoto et al. (1968) in Bandung in a study of 288 patients with enteral infection found 41.2% with mono-infections, and 19.4% with mixed infection of which 15.4% were double infections, 3.8 triple infections, and 0.2%. quinta infections. In 81% of the patients undernutrition and PCM were found.

Suprapti Thaib et al. (1968) reported 65% with single infection, 29.7% double infection, and 5.3% triple infections, Taslim Soetomenggolo (1967) in a study of 1,345 infantile diarrhea found 61.4% of the patients with undernutrition and PCM. Oma Rusmajudi (1976) reported 11.55% accompanied with PCM, parenteral infection 29.56%, and parasitic diseases 2.61%.

Treatment

Reducing the morbidity of diarrheal disease is a long term process requiring much financial support for activities comprising :

— improvement of socio-economic condition;
— improvement of environmental hygiene and sanitation system, especially adequate water supply;

— improvement of personal hygiene and sanitation by health education;
— promotion of breast feedings, if possible of prolonged breast feeding, better nutrition etc.

Because of this long term process the first step in diarrheal disease control in Indonesia has been directed to shortening the duration of disease and reducing the case fatality rate by treatment.

I. PRIMARY TREATMENT WITH FLUID THERAPY.

In the treatment of diarrheal disease the most important factor is fluid since death from diarrhea is mainly due to loss of fluid (dehydration), irrespective the cause of the diarrhoea.

Four points should be kept in mind in treating a patient with gastroenteritis dehydration i.e.

— Composition and tonicity of the fluid;
— Route of administration;
— Amount of fluid given;
— Rate of administration.

1. *Composition and tonicity of the fluid.*

Tumbelaka (1965) reported isotonic, hypotonic, and hypertonic dehydration in 77.8%, 12.7%, and 9.5% respectively. Sadikin Darmawan et al. (1972) also found that most cases were either iso-or hypotonic dehydration. Achmad Surjono et al. (1972) in a study of 98 children suffering from acute and severe dehydration secondary to diarrhea revealed 47.96% isotonic, 41.84% hypotonic, and 10.2% hypertonic. From these findings, it was agreed that the routine solution for the treatment of patients with gastroenteritis dehydration was isotonic solution used in Indonesia, such as :

a. 3a's solution comprising 1/3 NaCl 0.9% + 1/3 dectrose 5% + 1/3 sodium lactate N/6. This solution up to now is still being used as a routine treatment for initial infusion in severe gastroenteritis dehydration with acidosis with satisfactory results. Unfortunately, this solution is very expensive, available only in large hospitals, cannot be kept for a long time. and contains no potassium.
b. Darrow's glucose solution comprises 1/3 Darrow and 2/3 glucose 5 — 10%. This solution is usually administered for maintenance.
c. 2a's solution consists of ½ NaCl 0.9% + ½ glucose 5%. This solution is used in the treatment of dehydration without acidosis. For correction of acidosis sodium bicarbonate should be used.
d. Half-strength Darrow in 2.5% glucose. This solution is the ideal solution, because it can be used for the treatment of cholera, non cholera diarrhea, and gastroenteritis accompanied with PCM and it contains potassium. But this solution is also very expensive and cannot be kept for very long.

e. 4 : 1 solution, consists of 4 parts glucose 5 - 10% and 1 part NaCl 0.9% or $NaHCO_3$. This solution is good for LBW and neonates with gastroenteritis dehydration.

f. Ringer's lactate solution. This solution is a widely used fluid for the treatment of gastroenteritis dehydration because of its availability in large hospitals as well as in rural health centers in Indonesia. It is also the cheapest and can be stored for long periods. This solution can be used for the treatment of cholera and non-chalera patients.

Several results of fluid therapy has been studied in Indonesia. Before 1961, parenteral 3a's solution was used as fluid therapy for gastroenteritis dehydration in the Department of Child Health. In cases of shock whole blood or plasma 10 - 20 ml/kg b.w/day was added. Case fatality rate was very high, i.e. 62.2% (Kwari Satjadibrata and Sudjono D. Pusponegoro, 1959). With the modification of Sutejo et al. (1961) by giving Darrow's glucose solution ($^1/_3$ Darrow's solution $+^2/_3$ glucose 5%) after 8 hours on 3a's solution, mortality could be reduced from 100% to 85.7% in the low birth weight infants and from 36.2% to 14.3% in fullterm infants.

Kho et al. (1963), in a study of 200 children below 2 years of age and 48 children between 2-12 years, found that addition of plasma or whole blood had no significant effect on case fatality. Sutoto et al. (1975) in a study of blood gas analysis of children suffering from gastroenteritis and severe dehydration and treated with half-strength Darrow's solution in 2.5% glucose, found that this solution could be used as a single solution for gastroenteritis and dehydration with mild to moderate acidosis. For severe acidosis the 3a's solution still seemed to be better, since this solution contained more base corrector.

Hernawan et al. (1976), in treating 50 patients suffering from gastroenteritis dehydration with Ringer's lactate solution for maintenance, found a mortality rate of 6%. For cholera, several solutions have been used with results as shown in Table 2. Recently, after the Rehydration Seminar held in Jakarta in 1974 and the standardization of treatment of cholera, especially with "ROSE" system (Suharjono, 1976), the mortality of cholera could be reduced almost to nil in large hospitals and less than 5% in rural hospitals, health centres and even in emergency field treatment centres. "ROSE" system indicates the four principles in the treatment of diarrhoea with dehydration, i.e.: rehydration, continuation in administration of sugar (glucose if possible) and electrolyte or oralyte, simultaneous rehydration, i.e. intravenously and orally at the same time, education of the parents.

2. *Route of administration.*

There are 4 routes of administration for fluid replacement in dehydration :

a. parenteral or intravenous fluid drip (ivfd);
b. intraperitoneal;
c. intragastric;
d. oral.

Parenteral or ivfd is very effective in treating patients with severe dehydration and shock, this can be done either by cutting the veins (v.c) or by using a scalp needle (wing needle). The latter is preferred since no vein will be injured. For treatment of shock sometimes 1 or 2 peripheral veins are used. Kovacks apparatus as proposed by Achmad Surjono and Ismangoen (1971) can also be used.

Intraperitoneal administration was suggested by Pierce (1971) during the WHO Rehydration course in Surabaya for the treatment of moderate and severe dehydration without shock, but up to now it is still not popular in Indonesia because of fear of complication, particularly septicemia (Haroen Noerasid et al., 1975).

Intragastric administration can be used in the treatment of mild to moderate dehydration (Ig. Sudigbia and Anggoro Djawabaru, 1976).

Oral rehydration has become very popular in the last few years, especially after the Rehydration Seminar held in Jakarta in August 1974. Significant results with a dramatic reduction in mortality have been obtained by several investigators (Sunoto et al., 1976; Suharjono, 1976; Suharjono et al., 1976; Adnan S.W. and Sutejo, 1976; H. Santosa et al., 1976; Djoeanda and Wijati Donhuijsen, 1976; Soetomo Talkah and Rusdi Ismail, 1976; etc.). Ig. Sudigbia (1971) has reported success treatment of children with mild gastroenteritis. Since 1974 oral rehydration has become a very important feature in the national diarrheal diseases control programme in Indonesia.

The most widely used composition of the oralyte has been NaCl 3.3 gm/1., $NaHCO_3$ 2.5 gm/1., KCl 1.2 gm/1., and glucose 22 gm/1., resulting in an electrolyte composition of Na 85 mEq/1., K 15 mEq/1., Cl 70 mEq/1., HCO_3 30 mEq/1., and glucose 120 mMol/1.

Moenginah et al. (1974) used RC III with the following composition NaCl 2 g/1, HCO_3 24 mEq/1 and glucose 167 mMol with good results.

3 *Amount of fluid.*

The amount of fluid for treatment of gastroenteritis dehydration is calculated from previous water loss (PWL) + normal water loss (NWL). The amount of fluid given in infantile gastroenteritis is usually tabled as follows:

	P W L (ml./kg. Bw/ day)	C W L (ml./kg. Bw/ day)	N W L (ml./kg. Bw/ day)	Total (ml./kg. Bw/ day)
M i l d	50	25	100	175
Moderate	75	25	100	200
Severe	125	25	100	250

For older children, the amount of fluid given was calculated from the body weight of the child :

Body weight	P W L (ml./kg. Bw/ day)	C W L (ml./kg. Bw/ day)	N W L (ml./kg. Bw/ day)	Total (ml./kg. Bw/ day)
3 — 10	125	25	100	250
10 — 15	100	25	80	205
15 — 25	80	25	65	170

Since the amounts are very difficult to be determined by doctors and paramedical personnel, usually a simple formula is used: for initial infusion — give 10% of body weight in high speed between 0 - 4 hours and for the maintenance about 150 - 200 ml/kg. BW/day in divided doses.

For cholera the difference is in the amount of CWL, which is usually estimated as 80 - 100 ml/kg. BW/day for children less than 2 years of age and 100-200 ml. for children above 2 years of age.

4. *Rate of administration.*

In the conventional treatment with 3a + DG solution the rate of administration Sutejo et al. (1961) indicated the following schedule;

— first 4-hour period : 3a solution 15 ml/kg. BW/hour;

— second 4-hour period : 3a solution 7.5 ml/kg. BW/hour;

— next 16-hour period : DG solution 7.5 ml/kg. BW/hour;

The Seminar of Rehydration held in Jakarta in 1974 recommended the treatment with Ringer's lactate as follows :

first hour : 30 ml./kg. BW
following 7th hour : 70 ml./kg. BW
next 16-hour : oral rehydration ad libitum or if impossible continued ivfd with ringer's lactate dextrose with a rate of 10 ml./kg. BW/hour.

For cholera the rate of ivfd should be faster, or the use of ROSE system is preferable (Suharjono, 1976).

II. SECONDARY TREATMENT.

Beside fluid therapy, other therapy, although of secondary importance, comprises :

— anti bacterial drugs ;
— anti parasitic drugs;
— anti fungal drugs;
— dietetic treatment.

1. *Anti bacterial drugs.*

E P E C

Up till now neomycin is still widely used for EPEC-diarrhoea, but resistance to neomycin from year to year seems to be increasing. EPEC has been found still highly sensitive to nitrofurantoin derivatives (fultrexin, furadantin, urfadyn), gentamycin, minocin, cephalosporin, and colistin (Effek Alamsjah et al., 1974; Suharjono, 1976; Pitono Suparto et al., 1976).

Salmonella sp. and Shigella sp.

The drug of choice for treating salmonella sp. and shigella sp. infections in Indonesia is still chloromycetin followed by ampicillin although resistance to these drugs has been reported (Suharjono et al., 1976; Sunoto et al., 1976). Derivative nitrofurantoin (fultrexin, furadantin, etc.), trimethoprimsupha-methoxazole, gentamycin, and kanamycin are still highly effective (Sunoto et al., 1976).

Vibro sp.

For vibrio cholera Eltor and paracholera Eltor, tetracyclin is still the drug of choice followed by chloromycetin. Satisfactory result was also found in treating cholera Eltor with trimethoprim-sulphamethoxazole (Komalarini and Jeni Iswandari, 1975).

2. *Viral infection.*

For viral infections up to the moment no antiviral therapy has been given because usually viral diarrhea is a self-limiting disease.

3. *Anthelminthic drugs.*

Several anthelminthic drugs are used for the treatment of intestinal helminthiasis in Indonesia. Usually giving good results. They are tetramisole (Thienpont et al., 1970), pyrantel pamoate (Runizar Rusin, 1976), and mebendazole. For multiple infections, pyrantel pamoate and mebendazole are preferred. Piperazine is also used (Djauhar Ismail et al., 1971, 1976).

4. *Anti-fungal drugs.*

Since the most common fungal infection as a cause of diarrhea in childen is candida sp., nystatin and fungilin have been most commonly used with satisfactory results. No case of resistance has been reported for intestinal candidiasis (Suprihatin et al., 1969; Achmad Surjono et al., 1971.

5. *Anti-amoebic drugs.*

Several trials with anti-amoebic drugs such as mexaform and entobex (Jo Kian Tjay et al., 1969), Intestopan (Pudjiadi et al., 1969), dehydro-emetine and metronidazole (Jo Kian Tjay et al., 1971, 1972, 1974 and tiberal (Pudjiadi et al., 1972; Sunoto et al., 1974) showed good to excellent results. The drug of choice used for amoebiasis in Indonesia up to now is metronidazole with the dose of 50 mg./kg. BW/day for 3 - 5 days.

6. *Dietetic treatment.*

Dietetic treatment or refeeding after rehydration period seems to be as important as the rehydration period itself. Many patients suffered repeatedly from gastroenteritis dehydration after rehydration treatment due to ignorance of physicians. This may happen due to the high incidence of lactose and sucrose intolerance during or after the diarrheal episode as mentioned above. For lactose intolerance, several trials with low-lactose milk formula has been tried with good to excellent results (Sunoto et al., 1971; Suharjono et al., 1972, 1974; Sidik et al., 1975; Ismangoen et al., 1975; Pitono Suparto et al., 1975; Bagdadiji et al., 1975).

In fat malabsorption, MCT-milk formula (caprilon and capricid, Nutricia, Holland) has been used effectively in increasing the body weight and stopping the diarrhea (Suharjono et al., 1976). In breast-fed infants breast feeding is recommended to be continued even though there is lactose intolerance (Abdurachman Sukadi et al., 1975; Suharjono, 1976). Early feeding is also very important in the rapid recovery of the children (Suprapto et al., 1976).

Prevention of morbidity

Successful prevention of diarrheal disease in Indonesia will take sometime. As mentioned before it needs improving the socio-enonomic condition, environmental sanitation and personal hygiene. Up till now no vaccin is available which produces a satisfactory immunity. Environmental pollution with microorganisms which may play a role in causing diarrheal disease in children has been investigated by Gracey et al. (1976) in Jakarta. Djohan Kurnia (1973) found in a study area in Ujung Pandang, South Sulawesi that improvements of the environmental sanitation resulted in a decrease of the incidence of diarrhea by 53.4% after one year and by 57% after two years whereas in the control area the decrease was only 12.9% after one year and 23.4% after two years. The incidence of cholera decreased by 53.8% in the 2nd year and 15.4% in the 3rd year of the study. In the control area no decrease was observed in the incidence of cholera during the 3 years of study.

By establishing rooming-in of newborns, Ruskandi Martaatmadja et al. (1976) reduced the frequency of diarrhea amongst newborns from 22.6% to 3.3%. By rooming-in is meant that the

newborn infant stays in the same room with his mother so that no transmission of micro organisms takes place between newborns. The role of aseptic method of the paramedical personnel is also very important in reducing the morbidity and mortality of gastroenteritis (Purnomo Suryantoro et al., 1976). To reduce the microbial contamination on the environmental surfaces of the wards antiseptic drugs can be used (Gracey et al., 1976). Besides, it is well-known and without doubt that breast-feeding may reduce the frequency of diarrhea in infants.

Bell et al. (1974) showed that breast-milk of Indonesian mothers contains enough IgG, IgM, IgA, antibodies against E. coli, staphylococcus, and is only rather low in the lactoferrin content. Therefore, to prevent diarrheal disease, breast feeding should be promoted vigorously.

TABLE 1: *Kind of fluid, author/hospital and case fatality rate of pediatric cholera*

Author/hospital	Cases	Kind of fluid	Mortality
1. Dr. Sutomo Hospital Surabaya (1962)	163	Saline + Glucose 5% (2a) or Ringer + Saline + glucose 5% (3a)	29 %
2. ditto (1965)	160	ditto	46.2%
3. Lim Hok Nio, Semarang (1961).	14	Ringer-glucose	28.6%
4. Erwin Suratman et al., Bandung (1965)	60	3a + Glucose solution	16.0%
5. San Lazaro Hospital Philippines (1961)	?	3 L Saline + 1 L Na-HCO_3 2%	17.0%
6. ditto	526	Ringer's lactate	3.2%
7. Dr. Sutomo Hospital Surabaya (1965)	129	1 L Saline + 1/3 L $NaHCo_3$ 3.75% + glucose 5%	6.2%
8. Subagyo Martodipuro et al., Surabaya (1971)	153	Modified PCRS	3.9%
9. Ruskandi Martaatmadja and Wiyati Donhuijsen et al., Bandung (1976)	105	ROSE — System	3.6%
10. Sutomo Talkah + Rusdi Ismail, Palembang (1976)	156	ROSE — System	3.6%
11. Nassir Abbas et al., Ujung Pandang (1976)	23	Ringer's lactate	0%
12. Suharjono et al., Jakarta (1976)	95	Ringer's lactate + COS (ROSE System)	0%
13. Adnan S.W. + Sutejo Jakarta (1976)	70	Ringer's lactate + COS (ROSE System)	0%
14. Hendra Santosa et al., Denpasar (1976)	20	ROSE System	0%
15. Moenginah P.A. et al., Yogyakarta (1976)	?	ROSE System	0%

REFERENCES

1. ABDURACHMAN SUKADI; P. DJOEANDA and WIYATI DONHUIJSEN : Refeeding with Breast Milk after Rehydration. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.
2. ACHMAD SURJONO; TELUK SEBODO and ISMANGOEN : Tonicity of severe dehydration secondary to diarrhoea in children. Asian J. Med. 8 : 482 - 484 (1972).
3. ACHMAD SURJONO; P. SURYANTORO; TONNY SADJIMIN and ISMANGOEN : Lactose Tolerance Test in Indonesian newborn infants. Paediatr. Indones. 13 : 14 - 16 (1973).
4. ACHMAD SURJONO; TELUK SEBODO; YATI SOENARTO and MOENGINAH, P.A. : Lactose Intolerance among healthy adult. Paediatr. Indones. 13 : 49 - 54 (1973).
5. ACHMAD SURJONO; TONNY SADJIMIN and ISMANGOEN : Pengobatan Candidiasis mulut pada bayi dengan Fungillin. Maj. Kedok. Indones. 21 : 478 - 483 (1971).
6. ACHMAD SURJONO dan ISMANGOEN : Alat Kovacks/Rapid Fluid Infusion Syringe. Berk. I. Kedok. Gajah Mada 3 : 153 - 156 (1971).
7. ACHMAD SURJONO dan MOENGINAH, P.A. : Pengobatan cholera pada anak-anak. Berk. II Kedok. Gajah Mada 1 : 39 - 42 (1972).
8. ACHMAD SURJONO; MOENGINAH, P.A.; YATI SOENARTO dan TELUK SEBODO : Intoleransi terhadap air susu sapi (lactose?) pada mahasiswa Kedokteran Universitas Gajah Mada. Berk. I. Kedok. Gajah Mada 3 : 259 - 261 (1971).
9. ADNAN, S.W. and SUTEJO : Sistem 'ROSE" dalam penanggulangan wabah gastroenteritis akut ke-II di Jakarta tanggal 25 - 30 Mei 1976. Maj. Kedok. Indones.
10. ALISAH NAOEMAR, S. dan SRI S. MARGONO : Infeksi berat cacing usus khususnya cacing Trichuris trichiura. Malam Klinik I Perkumpulan Gastroenterologi Indonesia, Jakarta, 28 Nopember 1976.
11. ANNA ALISYAHBANA; TIEN SUMARTINI; SAMBAS WIRADISURIA and SUGIRI : Salmonellosis in infants and children in Bandung. Paediatr. Indones. 10 : 67 - 77 (1970).
12. AZHALI, M.S.; WIDJAJA, S.B. and ALISYAHBANA, A. : A 5 year survey on enteropathogenic Escherichia coli infections in the Department of Child Health, General Hospital, Bandung. Paediatr. Indones. 12 : 499 - 509 (1972).
13. BACHTIN, M.; NELWAN; SUPRAPTO; TELUK SEBODO and ISMANGOEN : The use of antibiotics in childhood diarrhea. Presented at the 2nd Asian Congress of Pediatrics, Jakarta 3 - 6 August 1976.
14. BELL, R.G.; TURNER, K.J.; GRACEY, M.; SUHARJONO and SUNOTO : Serum and Small Intestinal immunoglobulin levels in undernourished children. Am. J. Clin. Nutr. 29 : 392 - 397 (1973).
15. BINTARI RUKMONO; WIDODO TATOLO, R. and SIE TING HWAY : Enteropathogenic Escherichia coli infections among infants in diarrheal and non diarrrheal cases. Paediatr. Indones. 5 : 656 - 665 (1965).
16. BROTOWASISTO : Epidemiologi Penyakit Diare. Proceedings Seminar Re-

hidrasi, Jakarta, 25 - 29 Agustus 1974, halaman 20 - 26.

17. BUDINING WIRASTARI; TRI RUSPANDJI; SUNOTO and SUHARJONO : Penyakit cacing pada anak. Malam Klinik I Perkumpulan Gastroenterologi Indonesia, 28 November 1976.

18. DIET SADIAH; PONPON, I. dan WIYATI, D. : Percobaan Pemeriksaan Sugar Intolerance dengan Chromatographi kertas pada bayi dan anak-anak dengan gastroenteritis dehidrasi. Diajukan pada Pertemuan Ilmiah Tahunan ke-IV BKGAI, Denpasar, Bali, 3 - 4 Desember 1976.

19. DJAUHAR ISMAIL; TELUK SEBODO and DRADJAT BOEDIMAN : Pengobatan Ascariasis pada anak-anak dengan piperazine. Berk. I. Kedok. Gajah Mada (1971).

20. DJAUHAR ISMAIL and TONNY SADJIMIN : Oral dehydroemetine in the treatment of amoebic dysentry in children. Asian J. Med. 8 : 371 - 372 (1972).

21. DJAUHAR ISMAIL; UTOMO; SUGENG YUWONO and NOERHAYATI, S. : The use of Anthelmintics in the treatment of Ascariasis. Paediatr. Indones. 16 : 391 - 395 (1976).

22. DJOEANDA, P. and WIYATI DONHUIJSEN : Oral Rehydration with glucose electrolyte solution on infants and children in "Dr. Hasan Sadikin" General Hospital, Bandung. Presented at the 2nd Asian Congress of Pediatrics, Jakarta, 3 - 6 August 1976.

23. DJOHAN KURNIA : Penelitian Pengaruh Sanitasi lingkungan terhadap insidens Diare dan Kholera di Kodya Ujung Pandang. Diajukan pada Pertemuan Ilmiah Tahunan ke-IV BKGAI, Denpasar, Bali, 3 - 4 Desember 1976.

24. D. THIENPONT; J. BRUGMANS; K. ABADI and S. TANAMAL : Evaluation of tetramisole in the treatment of Nematode infestations in man. Paediatr. Indones. 10 : 98 - 108 (1970).

25. EFFEK ALAMSJAH; PARMA OEMI ASNIL; ASWITHA BUDIARSO; SUNOTO and SUHARJONO : Pathogenic enterobacteriae in infantile gastroenteritis in Jakarta. Paediatr. Indones. in print (1977).

26. FARIED BAKRY; SUHARJONO; SUNOTO and HENTYANTO HENDARDJI : The severity of lactose intolerance in Indonesian children. Paediatr. Indones. 13 : 185 - 190 (1973).

27. GAMBIRO: Shigellosis in a rural area in central Jawa. Paediatr. Indones. 5 : 443 - 451 (1965).

28. GRACEY, M.; SUHARJONO; SUNOTO and DELYS E. STONE : Microbial contamination of the gut; another feature of malnutrition. Am. J. Clin. Nutr. 26 : 1170 (1973).

29. GRACEY, M.; DELYS E. STONE; J. PAPADIMITRIOU; SUHARJONO and SUNOTO : Duovirus in Malnourished children. Communication. Paediatr. Indones. July — August (1975).

30. GRACEY, M.; DELYS E. STONE; SUTEJO; SUHARJONO and SUNOTO : A Preliminary report on the use of antiseptic Resiguard (R). Presented at the 2nd Asian Congress of Pediatrics, Jakarta, 3 - 6 August 1976. Asian J. Infect. Dis. (1977).

31. GRACEY, M.; DELYS E. STONE; SUHARJONO and SUNOTO : Isolation of Candida species from the gastrointestinal tract in malnourished children. Am. J. Clin. Nutr. 27 : 345 - 349 (1974).

32. HALIMUN, E.M.; SUNOTO and SUHARJONO : Sugar intolerance in post neonatal Surgery. Paediatr. Indones. 13 : 289 - 292 (1973).

33. HARRY HARTOYO : Peranan oralit dalam pencegahan dan pemberantasan Penyakit Gastroenteritis dan cholera di Jakarta. Diajukan pada Pertemuan Ilmiah Tahunan ke-IV BKGAI, Denpasar, Bali, 3 - 4 Desember 1976.

34. HAROEN NOERASID; PITONO SOEPARTO; BING SUDIANTO; SUGENG SUGIJANTO; ABDUL HAMID and A. SARASWATI : Intraperitoneal fluid therapy in children. Paediatr. Indones. 15 : 211 - 218 (1975).

35. HAROEN NOERASID; PITONO SOEPARTO; BING RUDIANTO; MOH. SJAIFULLAH NOER and MOH. ADNAN : Incidence of cholera in children under two years of age at the Dr. Soetomo Hospital, Surabaya, Paediatr. Indones. 15 : 219 - 288 (1975).

36. HAROEN NOERASID; PITONO SOEPARTO; BING RUDIANTO; HANANTO WIRJO; YULIANTI and SUHARJONO PADMODIWIRYO : Paracholera El Tor in infants below 2 years of age as seen in private and hospitalized patients. Presented at the 2nd Asian Congress of Pediatrrics, Jakarta, 3 - 6 August 1976.

37. HERNAWAN; SUNOTO; TITUT S. PUSPONEGORO and SUHARJONO : Ringer's lactate in the treatment of acute infantile gastroenteritis. Presented at the 2nd Asian Congress of Pediatrics, Jakarta, 3 - 6 August 1976.

38. ISMANGOEN; YATI SOENARTO; TELUK SEBODO; UTOMO and ACHMAD SURJONO : Low Lactose Milk (LLM — Sari Husada) used for refeeding children with gastroenteritis. Diajukan pada Malam Klinik IDAI, Jakarta 26 Oct. 1975.

39. JATI SOENARTO; ACHMAD SURJONO; MOENGINAH, P.A.; TELUK SEBODO; RADJIMAN and LAHMUDIN, D. : Morfologi mukosa usus pada anak dengan gastroenteritis akuta. Diajukan pada Kongres Nasional Ilmu Kesehatan Anak ke-III, Surabaya, 1 - 6 Juli 1974.

40. JENI ISWANDARI; HELENA ERAWAN; S. KOMALARINI and SHINTA NJOTOSISWOJO : Cholera El Tor enteritis in Jakarta. Paediatr. Indones. 13 : 55 - 62 (1973).

41. JO KIAN TJAIJ; NOERSIDA RAID and TJOET IRAWATI : Mexaform and entobex therapy in Amebic dysentery. Paediatr. Indones. 9 : 203 - 209 (1969).

42. JO KIAN TJAIJ; NOERSIDA RAID and A.H. SUTANTO : Clinical studies of oral dehydro-emetine tablets (Ro 1-9334/10) in Amebic dysentery in children. Paediatr. Indones. 10 : 139 - 148 (1970).

43. JO KIAN TJAIJ; NOERSIDA RAID and A.H. SUTANTO : Flagyl (Metronidazole) in the treatment of intestinal Amoebiasis. (Part One). Paediatr. Indones. 11 : 1 - 12 (1971).

44. JO KIAN TJAIJ; NOERSIDA RAID and A.H. SUTANTO : Flagyl (Metronidazole) in the treatment of intestinal Amoebiasis. (Part Two). Presented at the XIIIth International Paediatric Congress, Vienna (1971).

45. JO KIAN TJAIJ; NOERSIDA RAID and A.H. SUTANTO; Flagyl (Metronidazole) in the treatment of intestinal Amoebiasis. (Part Three). Paediatr. Indones. 12 : 82 - 86 (1972).

46. JO KIAN TJAIJ; A.H. SUTANTO and JUSTIN SIMATUPANG : Flagyl (Metronidazole) in the treatment of Intestinal Amoebiasis. (Part Four). Paediatr. Indones. 16 : 412 - 414 (1976).

47. KHO, L.K.; MAEMUNAH, B. AFFANDI and WIDODO TALOGO : Plasma transfusion in the treatment of diarrhoeal disorders with dehydration. Paediatr. Indones. 3 : 676 - 681 (1963).

48. KOMALARINI, S. and W.R. SANBORN : Diarrhoeal disorders of bacterial origin. Presented at the 2nd Asian Congress of Pediatrics, Jakarta, 3 - 6 August 1976.

49. KOMALARINI, S. and J. ISWANDARI : Treatment of cholera El Tor with Bactrim. Paediatr. Indones. 15 : 207 - 210 (1975).

50. KURNIAWAN, L.; MARGONO, S.S.; ROESIN, R. and MARWOTO, H.A. : Soil - Transmitted Helminthic Infection and its Treatment in children in Indonesia. Presented at the 2nd Asian Congress of Pediatrics, Jakarta, 3 - 6 August 1976.

51. KWARI SATJADIBRATA dan SOEDJONO D. PUSPONEGORO : Sindroma dehidrasi (Toksikosis) dan pengobatan pada anak-anak di Jakarta. Maj. Kedok. Indones. 2 : 9 - 73 (1959).

52. MOENGINAH, P.A.; ACHMAD SURJONO; TELUK SEBODO; SURYANTORO and YATI SOENARTO : Penyelidikan intoleransi terhadap laktose di Yogyakarta. Laporan Penelitian Proyek Peningkatan Mutu Perguruan Tinggi U.G.M., 1971 (1972).

53. MOENGINAH, P.A.; SUPRAPTO; YATI SOENARTO; M. BACHTIN; D.S. SUTRISNO; SUTARYO and JON E. ROHDE : Sucrose electrolyte solution for oral rehydration in Diarrhoea. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.

54. MOH. SIDIK; ABDURACHMAN SUKADI; HARDJANTI OMAN and SOEGIRI : Low Lactose Milk (LLM - Sari Husada) in Healthy infants in Bandung; Presented at the Vth Asian Pacific Cong-ress of Gastroenterology, Singapore 23 - 29 May 1976.

55. NASSIR ABBAS : Situasi Gastroenteritis yang dirawat di Bagian Anak R.S.U. Ujung Pandang. Buku Proceedings Seminar Rehidrasi, Jakarta 26 - 29 Agustus 1974, halaman 278 - 285.

56. NASSIR ABBAS and NIKARTIN PAKAYA : Some obsercation on severe gastroenteritis. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.

57. NASSIR ABBAS dan P. PALADA : Efek Nematocide pada gastroenteritis akuta. Diajukan pada Pertemuan Ilmiah Tahunan ke-IV BKGAI, Denpasar, Bali, 3 - 4 Desember 1976.

58. ONO DEWANOTO; ALISYAHBANA; SURATMAN ERWIN and SOEGIRI : Diarrhea in children between the age of 0 - 2 years in Bandung. Paediatr. Indones. 8 : 45 - 60 (1968).

59. PEDRO C. SAN DIEGO and AGUS ISKANDAR : Lactose Intolerance in an Indonesian closed community. Paediatr. Indones. 14 : 92 - 105 (1974).

60. PITONO SOEPARTO; HAROEN NOERASID and KWARI SATJADIBRATA : Carbohydrate intolerance in infants with chronic recurrent diarrhoea. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.

61. PITONO SOEPARTO; HAROEN NOERASID; M.S. SUBIYANTO; ISMUDIYANTO and PRAPTO SUTJIPTO : Disaccharide intolerance in Infants during the Diarrhoeal stage of Acute Gastroenteritis. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29, 1976.

62. PITONO SOEPARTO; ISMUDIYANTO; M.S. SUBIYANTO; BING RUDIYANTO and BUDHIANTO SUHADI : Modified oral electrolyte solution for infantile diarrhoea. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.

63. PITONO SOEPARTO; SUBIYANTO, M.S.; HANANTO WIRYO; YULIANTI, S.; HARJONO, P. dan RATNA T.S. : Pengobatan Colistin P.O. pada anak-anak dengan gastroenteritis di bawah 2 tahun. Proceedings Pertemuan Ilmiah Tahunan ke- IV BKGAI, Denpasar. Bali, 3 - 4 Desember 1976.

64. PITONO SOEPARTO; SUBIYANTO, M.S. and KWARI SATJADIBRATA : Low Lactose Milk (LLM — Sari Husada) on refeeding infants with gastroenteritis. Paediatr. Indones.

65. PUDJIADI, S.H.; SRI MULYANI DARMAWAN and S. MUSLICHAN : Intestopan in the treatment of intestinal Amoebiasis. Paediatr. Indones. 9 : 137 - 142 (1969).

66. PUDJIADI, S.H.; SUNOTO; SUHARJONO and NARTONO KADRI : A new oral Amoebicid (Ro 7-0207) in the treatment of intestinal Amoebiasis. Paediatr. Indones. 13 : 113 - 119 (1973).

67. POEY, S.H.; GAUTAMA, J.W.; MAKSUM, M. and ILAHUDE, H. : A new outbreak of infantile diarrhoea caused by pathogenic E. coli. Paediatr. Indones. 9 : 247 - 254 (1969).

68. RAJIMAN; LAHMUDDIN, D.; MOENGINAH, P.A.; ACHMAD SURJONO; YATI SOENARTO dan TELUK SEBODO : Villi Intestinales Anak. Berk. Kedok. Gajah Mada (1973).

69. RANTI, I.S.F.; KWEE TIEN BOH; THIO IN LIANG and TAN ENG HOEY : Coconut water for intravenous fluid therapy. Paediatr. Indones. 5 : 782 - 792 (1965).

70. ROSMAJUDI, O.; S. DIBJOSUBROTO and H. PERMADHI : Tinjauan Pola Penyakit dari penderita yang dirawat di Sub Bagian Gastroenterologi selama tahun 1975. Diajukan pada Pertemuan Ilmiah Tahunan ke-IV BKGAI, Denpasar, Bali, 3 - 4 Desember 1976.

71. RUSKANDI MARTAATMADJA dan WIYATI DONHUIJSEN : Tinjauan penderita cholera El Tor yang dirawat di Bagian Ilmu Kesehatan Anak R.S.-H.S. Bandung dari Januari sampai dengan Juni 1976. Diajukan pada Pertemuan Ilmiah Tahunan ke-IV BKGAI, Denpasar, Bali, 3 - 4 Desember 1976.

72. RUSKANDI MARTAATMADJA; P. DJOEANDA; and A. ALISYAHBANA : The advantage of Rooming-in Nursery in Decreasing the Frequency of enteritis in Neonate. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.

73. RUSTAMADI and WIDODO TALOGO, R. : Public opinion of diarrhoea in breast fed and artificial fed infants in Jakarta. Paediatr. Indones. 4 : 55 - 61 (1964).

74. SADIKIN DARMAWAN; RETNO ISWARI; RETNO TRENGGONOWATI; ASWITHA DAMAYANTI and ROBERT UTJI : Ampicillin in the treatment of dysenteri-form diarrhea. Paediatr. Indones. 10 : 131 - 138 (1970).

75. SADIKIN DARMAWAN and SRI ROCHANI SUDJARWO : Indones. 11 : 167 - 172 (1971).

76. SADIKIN DARMAWAN; WIRJA MULIADI; NAFSIAH MBOI and RETNO TRENGGONOWATI : The values of some important blood constituents, particularly serum electrolytes, in dehydrated children due to gastroenteritis. Paediatr. Indones. 12 : 68 - 72 (1972).

77. SANBORN. W.R. and KOMALARINI. S. : Antibiotic resistance in bacteria from Pediatric Diarrhoea. Presented at the 2nd Asian Congress of Pediatrics, Jakarta, 3 - 6 August 1976.

78. SJAMSIR DAILI; EMIL JAHYA; A. AZIZ SJOEIB; MARTONO and Mrs. MARTONO : Frequency of intestinal parasites infestation and infection in in-

fants and children in Padang area, West Sumatra (Preliminary report). Paediatr. Indones. 12 : 87 - 91 (1972).

79. SOEPRAPTI THAIB; NAFSIAH and MIEN ROEMINI: Microbiological considerations of infantile diarrheal disease in Bandung, Indonesia. Paediatr. Indones. 8 : 133 - 147 (1968).

80. SOETRISNO, R.; DJAUHAR ISMAIL dan TONNY SADJIMIN : Kesehatan anak dalam community medicine di Daerah Istimewa Yogyakarta. Proceedings' Community medicine p. 14 - 47 (1972).

81. SUBAGYO MARTODIPURO; I.G. SUWENDA; R.H. SARDJITO DJOJOHADIPRINGGO and HAROEN NOERASID : Modified fluid therapy in cholera El Tor (A preliminary report). Paediatr. Indones. 12 : 251 - 262 (1972).

82. SOEPIJANTO, M.S.; ISMUDIJANTO; PITONO SOEPARTO; I. SUPIT; SJAIFULLAH NOER and PRAPTO SUTJIPTO : Sucrose Intolerance among infants suffering from acute gastroenteritis. Presented at the nd Asian Congress of Pediatrics, Jakarta, 3 - 6August 1976.

83. SUBIYANTO, M.S.; PARTANA L.; and PITONO SOEPARTO : Chronic Bloody mucous Diarrhoea in children with gastroenteritis. Presented at the 4th Scientific Annual Meeting of Coordinating Board of Indonesian Paediatric Gastroenterology, Denpasar, Bali, 3 - 4 December 1976.

84. SUDARJAT SURAATMADJA; HENDRA SANTOSA dan I. KOMANG KARI : Gastroenteritis pada anak-anak berumur di bawah 2 tahun. Dokumentasi Bagian Ilmu Kesehatan Anak, Fakultas Kedokteran Universitas Udayana, Denpasar, Bali.

85. SUDIGBIA, I. dan ANGGORO DJAWABARU : Pengalaman pengobatan cairan pada gastroenteritis dan cholera dengan dehidrasi di Bagian Ilmu Kesehatan Anak R.S. Dr. Karyadi, Semarang. Buku Proceedings Seminar Rehidrasi, Jakarta 26 - 29 August 1974. p. 27 - 30.

86. SUDIJANTO : Gastroenteritis as a social problem. In proceeding's book of Seminar on Rehydration, Jakarta, 26 - 29 August 1974. p. 27 - 30.

87. SUHARJONO; ADNAN, S.W. and SUTEJO : Rehydration Centre (R.C.) in the out-patient section, Department of Child Health, University of Indonesia, during a short cholera outbreak after floods in Jakarta from 6th till 15th February 1976. Paediatr. Indones.

88. SUHARJONO; EFFEK ALAMSYAH; PARMA OEMI ASNIL; SUNOTO and TUMBELAKA, W.A.F.J. : Drug resistance of pathogenic enterobacteriae in Indonesian children in Jakarta. Paediatr. Indones.

89. SUHARJONO; SUNOTO; ASWITHA BUDIARSO and SUTEJO : Lactose malabsorption in "Healthy" Indonesian pre-school children. Paediatr. Indones. 15 : 251 - 254 (1971).

90. SUHARJONO; SUNOTO; ASWITHA BOEDIARSO; SUTOTO and DADI, E.M. : Low Lactose Milk (LLM) on refeeding of infantile diarrhoea. Paediatr. Indones. 15 : 247 - 254 (1975).

91. SUHARJONO; SUNOTO; ASWITHA BOEDIARSO; HENTYANTO HENDARDJI and SUGIHARTO : Refeeding with free lactose milk (Al-110 NESTLE) in children suffering from gastroenteritis and dehydration. Paediatr. Indones. 15 : 191 - 197 (1973).

92. SUHARJONO; SUNOTO; ASWITHA BOEDIARSO and W.A.F.J. TUMBELAKA : Problem and Solving of malabsorption syndrome in Indonesian. Presented at the 2nd Asian Congress of Pediatrics, Jakarta, 3 - 6 August 1976.

93. SUHARJONO; SUPARNO, S.; TITUT, S.P.; ASWITHA BOEDIARSO; SUNOTO and SUTEJO, R. : Medium Chain Triglycerides (MCT) — Lactose Low Formula in Low Birth Weight infants with steatorrhoea and diarrhoea. Paediatr. Indones.

94. SUHARJONO; TITUT, S.P.; S. SUPARNO; ASWITHA BOEDIARSO; SUNOTO and R. SUTEJO : Medium Chain Triglycerides (MCT), Lactose Low Formula in malnourished children with Diarrhoea, Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.

95. SUHARJONO; WILA WIRYA, I.G.N.; SAMSUDIN; SUNOTO; Z. SULAIMAN dan R. SUTEJO : Effect of Low Lactose Milk Eiwit Melk (E.M.) on Protein Calorie Malnutrition. Paediatr. Indones. 15 : 255 - 261 (1975).

96. SUHARJONO; SUNOTO; ASWITHA DAMAJANTI; SADIKIN DARMAWAN and D.G. COTTOM : Small intestine biopsy in Protein Calorie Malnutrition and celiac children. Paediatr. Indones. 11 : 7 - 15 (1971).

97. SULIANTI, SAROSO J., SUPARNADI, RATNIWATI and MANIKORO : A longitudinal survey of diseases occurring in children under 5 years of age in Pondok Pinang, Jakarta, Pediatr. Indones. 12 : 469 - 478 (1972).

98. SUNOTO dan SUHARJONO : Masalah diare kronik pada bayi dan anak. Proceedings Muktamar Ikatan Dokter Indonesia ke-XII dan Kursus Penyegar dan Penambah Ilmu Kedokteran (KPPIK) FKUI ke-7, Jakarta, 23 Juli — 1 Agustus, halaman 564 - 570 (1972).

99. SUNOTO : Peranan Oralit pada program Rehidrasi di Indonesia. Penataran Rehidrasi, Jakarta, 1 - 5 September 1975.

100. SUNOTO; OTTY W. SONITYO; SUHARJONO dan ASWITHA BUDIARSO : Rehidrasi Oral di Puskesmas. Proceedings Kursus Penyegar dan Penambah Ilmu Kedokteran (KPPIK) FKUI ke-IX, Jakarta, halaman 64 - 72 (1976).

101. SUNOTO; ADNAN S. WIHARTA and W.R. SANBORN : Sensitivity Test of Salmonella and Shigella enteritis. Paediatr. Indones. in print.

102. SUNOTO; SUHARJONO; J. MANGIWA and SUTEJO : Lactose Intolerance in chronic diarrhea among Indonesian children. Paediatr. Indones. 11 : 1 - 6 (1971) Special issue.

103. SUNOTO; SUHARJONO; CYSCA, M. LEMBONG; ASWITHA BOEDIARSO and SAMSUDIN : Lactose Loading Test on Protein Calorie Malnutrition. Paediatr. Indones. 13 : 43 - 48 (1973).

104. SUNOTO; SUHARJONO and SUTEJO : Two years study on sugar Intolerance in Indonesian children. Paediatr. Indones. 13 : 241 - 249 (1973).

105. SUNOTO; SUHARJONO; Z. SULAIMAN and S.H. PUDJIADI : Clinical trial with Ro 7-0207 (Tiberal) in treatment of Intestinal Amoebiasis. (Part Two). Paediatr. Indones. 16 : 403 - 411 (1976).

106. SUNOTO; TITUT, S.P.; SUSILO SURACHMAD and W.R. SANBORN : Treatment of acute infantile gastroenteritis. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.

107. SUNOTO; TITUT S. PUSPONEGORO; SUSILO SURACHMAD and W.R. SANBORN : Oral Rehydration in the Treatment of Acute Infantile Gastroenteritis.

108. SUPRIHATIN, S.D.; D. KARTANEGARA; A. PAUNTU and ASWITHA DAMAYANTI : Nystatin in the treatment of Candidiasis. Paediatr. Indones. 9 : 13 - 16 (1969).

109. SUTAN ASSIN, M.; SUTEJO; TJIA KHIE and WIDODO TALOGO : The serum agglutinin titer of Healthy children after cholera Sec Immunization and its influence on paracholera El Tor, Paediatr. Indones. 5 : 629 - 635 (1965).

110. SUTEJO; GOEI GIOK KWA; ASIKIN HANAFIAH; WILAWIRJA, I.G.N. and SAMBAS WIRADISURIA : Modifikasi pengobatan "Dehydration with Acidosis". Maj. Kedok. Indones. 11 : 102 - 115 (1961).

111. SUTEJO : Cow's milk (Lactose?) intolerance among Indonesian doctors of the Dr. Cipto Mangunkusumo General Hospital and medical School, University of Indonesia. Paediatr. Indones. 11 : 43 - 46 (1971).

112. SUTJININGSIH; I. KOMANG KARI dan ABDUL HAMID : Mortalitas Penderita Gastroenteritis yang dirawat di Bagian Ilmu Kesehatan Anak RSUP Sanglah di Denpasar, Januari sampai dengan September 1976. Diajukan pada Pertemuan Ilmiah Tahunan ke-IV BKGAI, Denpasar, Bali, 3 - 4 Desember 1976.

113. SUTOMO TALKAH dan RUSDI ISMAIL : Out break cholera sekitar bulan Agustus — Oktober 1976 di Palembang. Evaluasi Penetrapan ROSE SYSTEM di Bagian Ilmu Kesehatan Anak RSUP Palembang/F-K. UNSRI Palembang. Diajukan pada Pertemuan Ilmiah Tahunan ke-IV BKGAI, Denpasar, Bali, 3 - 4 Desember 1976.

114. SUTOTO; DAHLAN, A.M.; TB BAGDADIDJI dan HENTYANTO HENDARDJI : Angka kematian penderita gastroenteritis pada bayi dan anak selama 3 tahun (1971, 1972 dan 1973) di Bagian Ilmu Kesehatan Anak R.S. Dr. Cipto Mangunkusumo, Jakarta. Buku Proceedings Seminar Rehidrasi, Jakarta, 26 - 29 Agustus 1974. Hal. 118 - 128.

115. SUTOTO; SUNOTO; BAMBANG, M. and SUTEJO : Blood gas analysis (ASTRUP) in children suffering from gastroenteritis dehydration with acidosis. Paediatr. Indones. 15 : 229 - 238 (1975).

116. SUTRISNO, D.S.; JATI SOENARTO; TELUK SEBODO; ISMANGOEN and NOERHAYATI, S. : Nitrimidazole (Naxogin) in the treatment of children with Intestinal amebiasis. Presented at the 2nd Asian Congress of Pediatrics, Jakarta, 3 - 6 August 1976.

117. TUBAGUS BAGDADIDJI; SUHARJONO; ASWITHA BOEDIARSO and SUNOTO : Effect of Low Lactose Milk "Eiwit Melk" (EM) on Low Birth Weight Infants with Diarrhoea. Paediatr. Indones. 15 : 198 - 206 (1975).

118. TELUK SEBODO; ACHMAD SURJONO; JATI SOENARTO dan MOENGINAH, P.A. : Lactose Tolerance Test pada post gastroenteritis akuta. Berk. I. Kedok. Gajah Mada 6 : 1 - 6 (1974).

119. TELUK SEBODO; SOETARYO; TONNY SADJIMIN; YATI SOENARTO; W.R. SANBORN : Study on the Etiology of Diarrhoea. Presented at the Vth Asian Pacific Congress of Gastroenterology, Singapore, 23 - 29 May 1976.

120. THAHER DJALIL, M. : Beberapa aspek dari gastroenteritis dengan dehydrasi dan pengobatannya di Bagian Anak R.S. Dr. Hasan Sadikin, Bandung. Buku Proceedings Seminar Rehidrasi, Jakarta, 26 - 29 Agustus 1974. Hal. 227 - 247.

121. TUMBELAKA, W.A.F.J. : Aspect of Pediatric Gastroenterology in Indonesia. Paediatr. Indones. 9 : 59 - 66 (1969).

122. TUMBELAKA, W.A.F.J.; RANTI, I.S.F.; TITI SUNARWATI and KHO, L.K. : Sodium and Potasium content of dehydrated children. Paediatr. Indones. 4 : 689 - 692 (1964).

123. TUMBELAKA, W.A.F.J. : Enteritis pada anak. Naskah lengkap Kursus Penyegar dan Penambah Ilmu Kedokteran (KPPIK) RKUI ke-III, Jakarta, halaman 505 - 514 (1965).

124. WIDODO TALOGO, R.; SITI ZOERAIDA and GAUTAMA, J.W. : Paracholera El Tor in Indonesian children. Paediatr. Indones. 3 : 78 - 85 (1963).