

## Gastro-Enteritis in the Newborn

### Case Report

Presented by Doctor Tay Kah Seng.

CASE 1: Registered No. 19158 was that of a Chinese, who was admitted into Kandang Kerbau Hospital having had diarrhoea for 1 day. The bowels moved about 7 to 8 times: The stools were watery, but did not contain mucus or blood. On physical examination, the patient was dehydrated. Temperature — 100.4° Fahr., Pulse — 94, Blood Pressure—130/80. The heart, lungs and abdomen were normal.

The uterus was about the size of full term; the foetus was in the vertex L.O.A. position, the foetal heart was heard.

The patient's dehydration was corrected by intravenous therapy and the diarrhoea was treated. Twenty-six hours after admission a live female baby weighing 4 pounds 9 ounces was delivered normally.

The baby was well until the 16th day when she vomited twice and passed 6 loose stools; temperature was 99°. No parenteral infection was present.

The baby was isolated. Stools were sent for culture and sensitivity tests. The stomach was washed out. Intra-muscular injections of penicillin 50,000 units every 6 hours and streptomycin 45 mgm. b.d. were given.

The next day, she passed 10 diarrhoeal stools. Milk feeds were discontinued and dextrose (5%)—saline (0.2%) only given for 24 hours. Oral streptomycin 0.5 grams a day in divided doses was also given.

Stool culture report: Pathogenic strain of *Bc. Coli* isolated.

Sensitivity:

Chloromycetin ++	Achromycin +
Terramycin +	Streptomycin —
Aureomycin +	Penicillin —

Three other babies developed gastro-enteritis in the same ward. The progress of the baby under discussion is shown in the chart below.

Oral streptomycin was continued as it seemed effective in vivo in spite of the adverse in vitro sensitivity report.

Abbreviations: E.B.M. = Expressed Breast Milk.

M/St.L. = Medium Strength Lactogen.

Day of Life	Feeds	Amount in Ounces	No. of Feeds	Body Weight Lbs. Ozs.	Stools per Day	Character of Stool	Treatment/Remarks
4	E. B. M.	1½	8	4 5	3	Normal	—
8	M/St. Lact.	2	8	4 7	2	Normal	—
12	M/St. Lact.	2½	7	4 5¾	4	Normal	—
16	M/St. Lact.	2½	7	4 1½	6	Loose	Vomited twice. Temperature 99deg. injection penicillin: Streptomycin × 3
17	Dextroe Saline	2	8	—	10	Watery	Oral streptomycin 0.5 gm/day.
18	¼ St. Lact.	2	8	—	2	Loose	„
19	½ St. Lact.	2	8	—	3	Formed	„
20	¾ St. Lact.	2	8	4 2¾	4	Loose	„
21	¾ St. Lact.	2	8	—	5	Formed	„
22	M/St. Lact.	2	8	—	1	Formed	„
24	M/St. Lact.	2½	7	4 2	3	Formed	„
26	M/St. Lact.	2½	7	4 5	2	Formed	„
30	M/St. Lact.	2½	7	4 8	4	Formed	„
31	M/St. Lact.	2½	7	4 9	1	Formed	Discharged

She was discharged well on the 31st day, weighing 4 pounds 9 ounces.

CASE 2: Registered No. P. 59 was that of a premature baby delivered outside Kandang Kerbau Hospital, who was admitted into the Premature Nursery 2 hours after birth. Birth weight was 3 pounds. She made good progress in the nursery. On the 29th day, she weighed 4 pounds  $\frac{1}{2}$  ounce. She was feeding well and was fit for discharge.

On the 30th day, she developed gastro-enteritis, and passed 7 watery stools.

Stool culture report: Pathogenic B. Coli isolated.

Sensitivity: Chloromycetin	+
Streptomycin	+
Terramycin	+
Aureomycin	+
Achromycin	+

The gastro-enteritis was controlled following treatment similar to the first case. Milk feeds were gradually increased. She was discharged 1 week later weighing 4 pounds 3 ounces, and feeding well.

## Discussion

Doctor Tay, in opening the discussion, summarised the two cases he had presented. The causative organisms isolated were a strain of pathogenic B. Coli. The first baby probably caught its infection from the mother. The second baby contracted it from a contact in the ward where there was a mild epidemic of gastro-enteritis. The two cases responded well to oral streptomycin and chloromycetin respectively. Early control of the disease is essential. Isolation of the infected case minimises spread to other infants. Treatment in the first 24 hours of the disease reduces the risk of severe dehydration, ketosis and collapse. In Kandang Kerbau Hospital, facilities for isolation are unsatisfactory. The sister's office is used as a nursery. The ward lavatories are about 80 feet away. The ward verandahs are screened off for isolation purposes. It is fortunate that the incidence of gastro-enteritis is not higher. During 1956, there have been two epidemics of gastro-enteritis.

He said that a special culture medium is now available in the Department of Pathology for the isolation of the patho-

genic B. Coli. This has facilitated control of the ward infections.

For the benefit of the new house-doctors present, Doctor Tay discussed briefly the management of the mild case of gastro-enteritis. He said that diarrhoea is one of the common presenting symptoms in newborn babies. The infecting organisms are diverse. In addition to infections due to organisms of the Salmonella, dysentery and B. Coli group, parenteral infections such as pyelitis and mastoiditis, faulty feeding and metabolic steatorrhoea can give rise to diarrhoea in babies. A virus has been isolated from some epidemics in newborn nurseries.

In a maternity hospital as large as the Kandang Kerbau Hospital, it was most important to detect early, isolate and treat the early case of neonatal diarrhoea. The consequences of an epidemic of gastro-enteritis could be catastrophic because the disease is highly infectious. The management of an early case of gastro-enteritis is demonstrated in the cases shown today. Diarrhoea for which no obvious cause can be found should be assumed to be due to gastro-enteritis. The baby should be isolated and stools taken for culture for pathogenic organisms and sensitivity tests. He next discussed the management of feeds. Milk feeds were discontinued for 24 hours and Dextrose (5%) Saline (0.25%) or Hartmann's solution instituted. 0.25% saline was given to decrease the loss of electrolytes, and dextrose to prevent ketosis. Milk feeds were introduced gradually,  $\frac{1}{4}$  strength,  $\frac{1}{2}$  strength,  $\frac{3}{4}$  strength on successive days. Of the antibiotics used, neomycin has been found to be one of the most useful in combination with kapectate.

Chloromycetin was effective but this drug has been reported to have caused bone marrow depression. Oral streptomycin was very useful against some strains. It was not absorbed by the gut, and had no toxic effects. The dosage used was 0.5 gms. a day in divided doses.

The severe case of gastro-enteritis was best removed from an obstetric hospital and treated in a paediatric department. The metabolic disturbances follow the loss of fluid and fixed base in the stools. There was haemoconcentration and a reduction of alkali reserve. Due to inadequate urine

flow there was a retention of acid products. The incomplete combustion of fat by the liver which is deprived of glycogen, resulted in ketosis. Furthermore, there was also an imbalance of electrolytes following loss of sodium, chloride and particularly potassium in the stool.

Mild dehydration if the baby does not vomit could be corrected by 2 hourly dextrose-saline feeds. Fluids given via subcutaneous route using Hartmann's solution or 0.5% normal saline could be used as a supplement. If clear fluids were vomited intravenous therapy was essential. Hartmann's solution or 0.5% normal saline was used to replace the loss of sodium and chloride and potassium chloride given orally or Darrow's solution I.V. in measured amounts. Glucose 5—10% was usually added to combat ketosis.

Doctor Tay added that prevention was still the best method of dealing with the disease. Breast feeding was a valuable safeguard. In premature nurseries, where artificial feeding was used, all the equipment should be clean and free from contamination by dirt and flies.

Doctor Field said that it was her special request that these two cases of gastro-enteritis were presented because in the care of the new born, a thorough understanding of the commoner problems was essential before considering the more recent and interesting problems such as exchange transfusions etc. The latter were not really the cause of our high mortality. The common problems in the care of the newborn included prevention of diseases—that applied to all paediatrics — but most particularly to the newborn.

She then referred to the 2 cases presented and commented that they were of interest because the etiology was slightly different. In the first case, there was not much doubt that the child contracted the disease from the mother who had diarrhoea. The cause of her diarrhoea apparently was never discovered, but anyone having diarrhoea may excrete pathogenic B. Coli. Many symptom free adults excrete pathogenic B. Coli, but such organisms are very harmful to the premature and newborn child. In this case the Pathogenic B. Coli may not have been the cause of the mother's diarrhoea, she probably excreted them and infected the child. In recent years it has been shown

that the etiology of gastro-enteritis in the new born and young infant is most commonly a pathogenic Bact. Coli. Several types have been isolated and described in epidemics three of which are designated Esch. Coli 0.111(B4) 0.127(B8) 0.55(B5). In some epidemics no pathogenic B. Coli has been isolated and a virus infection has been suggested. Extensive research however has failed to produce any real evidence, and there is still doubt as to whether a virus infection can cause epidemics.

In the second case described here the etiology must have been from the nursery itself. There had been a mild epidemic of gastro-enteritis in the new nurseries, and the baby contracted it just about that time. It was of interest that symptoms did not occur until the 30th day. The incubation period varies from 7-14 days but it depends on how soon the child contracts the infection and how long it takes to multiply in the gut.

No severe case of gastro-enteritis should remain in a premature unit. It was a real danger even if isolated from the other babies, and should be transferred to another hospital. The severe types of gastro-enteritis were not treated here. The present policy was prevention rather than waiting for the diarrhoea to develop. If more than 2-3 cases of gastro-enteritis occurred in a nursery, the infected infants should be removed right out of the nursery and preferably looked after by a different set of nursing staff. The next step was to take swabs from all the contacts. Fortunately Doctor da Silva now had the correct media for culturing the pathogenic B. Coli. A wet rectal swab was satisfactory but not quite so good as a specimen of stool. Special sera for typing were not available in Singapore, but it was helpful to know if pathogenic B. Coli had been isolated. All infants with a positive culture were treated immediately even if they were symptom free. In an epidemic about half the babies excreted pathogenic B. Coli and required treatment. Even this measure may not check the epidemic and so the latest policy was to treat every child admitted into an infected nursery.

The drugs used were: Neomycin was the best but expensive, but it had been used in small trials. Experience here has shown oral streptomycin to be a safe and very useful drug, and it was given in a

dosage of 0.5 gm. a day in the treatment of a mild case. In severe cases, chloromycetin was the drug of choice. Epidemics occurred in which the pathogenic B. Coli isolated were not sensitive to either drug. It was interesting to find that in the first case the B. Coli was not sensitive to streptomycin, although the drug seemed to have been effective in treatment. This may have been due to rapid change in the sensitivity of the organism or the general treatment alone may have been effective. It was important to realise that no one drug was effective in every epidemic.

Doctor Field then discussed the prevention of epidemics. In the construction of any hospital maternity unit, nurseries should be small. For premature infants, the recommendation is a unit no larger than 4 cots. Probably here in Malaya, 6 to a unit would be satisfactory, this means only 6 babies can contract the enteritis in one unit. In an ordinary maternity unit, the newborn babies, as far as possible, should be nursed by the side of their mothers. In this hospital about 10 babies from any one ward required to be observed in a nursery for one reason or another. No nursery should be larger than 10 cots, because of this danger of contracting infection. The great trouble in the existing nurseries was the overcrowding, and lack of fresh air with people going in and out repeatedly, and the proximity to the latrines. It would never be possible to keep these units free from gastro-enteritis. Sporadic cases occurred so that in order to prevent spread, it was essential to keep the numbers down in the nursery. It was an urgent necessity to find other accommodation for our infants if gastro-enteritis was to be prevented. The other factor of importance was that the milk feeds are made up in close proximity to the latrines which was anything but ideal! Doctor Field then asked if anyone would like to add to these any experiences of their own.

Professor Sheares: Previous to the advent of antibiotics and in the days when there was no paediatrician attached to Kandang Kerbau Hospital, the obstetrician had to treat his own cases of gastro-enteritis. At that time resort had to be made to kaolin for treatment of gastro-enteritis. The mortality rate was high. The Kandang Kerbau Hospital was designed in the 1920's without provision for a nursery and that was why the present

nursery was in the sister's office, and not very far from the water-closet. He asked Doctor Field for her opinion as to the best form of treatment in cases where there was loss of fluid and upset in the electrolyte balance of baby. Did the same principles apply as in the case of adults? In a hospital where there are no facilities for investigation into the fluid and electrolyte balance, should one use the hit and miss method of treatment or not?

Doctor Field replied that she purposely did not discuss the fluid and electrolyte therapy as it is a quite big subject and the severe cases are transferred to the Mistri Wing.

Briefly, the degree of dehydration is assessed first. With early treatment no parenteral therapy was required. If the child was vomiting, however, a stomach washout was very useful. Fluid requirements could be given by mouth to most babies. Very few infants here had required an intravenous drip except those transferred to the Mistri Wing. The type of fluid given by mouth does not matter a great deal except that all milk feeds should be discontinued. Plain boiled water, if nothing else was available, could be given. An adequate fluid intake was very important during the first 24 hours. The best way of getting a large amount of fluid retained was to give it in small frequent feeds; 2 hourly feeds were best, either boiled water or preferably a saline solution. She preferred oral Hartmann's solution because it contained a small quantity but not too much of potassium and other electrolytes necessary for the composition of serum. After 24 hours, if the progress was satisfactory, a dilute milk mixture was given; at first a  $\frac{1}{4}$  strength, then  $\frac{1}{2}$  strength, then  $\frac{3}{4}$  strength, and so on. Breast milk was ideal if available, if not the milk the child was on before should be given. In severe cases Eledon which was a butter-milk with a low fat content could be used. Infants with diarrhoea did not tolerate fat very well. Low fat and high protein tended to correct the diarrhoea. Intravenous therapy should not be used for too long as there was a real danger of producing an electrolyte imbalance which was difficult to correct. A drip was rarely advisable for longer than 2-3 days. Food by mouth should be introduced starting with weak milk solutions and slowly increasing the strength.

Doctor Seah asked whether subcutaneous drips with hyalase, were used as recommended a year ago.

Doctor Field replied that she personally still advocated subcutaneous fluid for certain cases. It depended on the state of hydration of the baby. In the early days here it was used with considerable benefit. Some of the babies were difficult to hydrate by oral fluids, and they were not severe enough for intravenous therapy. It should not be continued too long, 1-2 days is long enough for hydration. The body could select the electrolytes as required from the subcutaneous fluid but, when given intravenously, there was no opportunity for selection so there was danger of creating an electrolyte imbalance. The method has many uses in the mildly dehydrated child. For the child that tends to vomit, and therefore cannot take much orally, and yet is not severe enough to put on an intravenous drip. Subcutaneous fluid with hyalase was very useful. 5% glucose-saline subcutaneously should never be given as it may produce inflammation and an abscess. 2½% glucose-saline was better tolerated. The danger of giving glucose subcutaneously was abscess formation. A continuous subcutaneous drip may produce an abscess and was safer given 2-3 times a day.

She next considered the more severe cases and said that they were real puzzles from the electrolyte point of view, and even in the Mistri Wing, serum estimation of electrolytes cannot always be done. A very severely dehydrated gastro-enteritis case was given an intravenous drip immediately. Normal saline could be used for the first pint and then 1/5 normal saline afterwards. Both of these solutions should contain 5% glucose. It was important to follow that on the second day by giving oral potassium when the kidneys were functioning. Kidneys function must be satisfactory first otherwise you will get toxic symptoms from the potassium. Further intravenous 1/5 normal saline with 5% glucose could be given indefinitely with oral KCl supplements. This was probably the safest treatment to recommend. An alternative method used quite extensively was intravenous Hartmann's solution which contains a very small quantity of potassium also MgCl, CaCl<sup>2</sup> and sodium lactate. It was quite useful but there was not enough K for the very severe case of

gastro-enteritis, and oral supplements should be given. Darrow's solution contained more potassium but she considered that serum electrolytes should be checked when using it.

Doctor Seah asked how much could be given in one day by the subcutaneous route.

Doctor Field replied that she had given as much as 2-3 ounces 4 hourly in a big baby. In small babies, 1-2 ounces 4 hourly would be tolerated.

When giving fluid intravenously it was important to know how much fluid was required as too much may drown the baby. It could be estimated as follows: 2½ ounces per pound of body weight per day was the fluid requirement of an infant. For the mildly dehydrated baby about ¼ pint extra was required, for moderate dehydration about ½ pint extra in the 24 hours, for an average baby up to about 6 months of age, depending on the size of the baby. The first half pint could be given fairly quickly to revive the baby from any shock resulting from the dehydration, but the rate should then be slowed down and worked out so that the child did not get more than the required amount of fluid in the 24 hours. In many cases when the fluid had been given too fast, the baby became puffy with oedema of the legs. If ¼ of the whole quantity ordered was given in the first few hours it caused trouble. The nurse must repeatedly watch the amount of the fluid very carefully.

If an epidemic cannot be controlled by these methods, then the nursery must be closed. The epidemic must not be allowed to smoulder on. All the windows must be opened, the floor washed and everything cleaned. If possible it should be closed for about one week otherwise a recurrence may occur when new babies were admitted. One of the premature wards in Kandang Kerbau Hospital was recently closed for about 3-4 days and this was satisfactory.

Professor Sheares asked if there was a separate closed unit for gastro-enteritis in the paediatric unit at General Hospital.

Doctor Field replied that there was, not a completely closed unit. These cases were nursed together in separate units.

The type of infantile gastro-enteritis described this afternoon was not infectious to the older child and a gastro-enteritis baby could be safely nursed between two older children. Cross infection was more likely if you place a lot of babies together—some having gastro-enteritis and some not. If there were small isolation units specially for gastro-enteritis then it was best to isolate babies in them. If there were no isolation units then one of the safest methods was to put the babies be-

tween older children over 5 years who do not contract the gastro-enteritis commonly affecting the infant.

Perhaps at a later date the whole subject might be reviewed again as views were changing from year to year. The subject has been stressed because it was so important in the care of the newborn. Its prevention was necessary to reduce a high neonatal mortality. This was the reason this subject was specially chosen for discussion today.

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