

Symposium on Cholera

Introduction

By

Miss Assunta — *Chairman*

We are just coming to the end of an epidemic of cholera which broke out towards the end of July. It is over one month and we have had 140 patients with only three deaths.

Cholera is an acute communicable disease of the Tropics. Its incubation period is a few hours to five days. The portal of entry is the mouth and portal of exit is the alimentary and urinary tracts. Since one of the panel is going to tell us about the etiology and pathology of cholera, there is no need to say anything about it at the moment, but I would like to mention one thing that I have noticed. The books say that cholera has characteristic 'rice water' stools. We have observed here, that after a few stools, the patients were having brownish or rather bloody stools. This may have been due to mixing of blood that oozes out from the raw surface of the intestines from which the epithelium was shed.

The complications are : Cardiac failure
Suppression of urine
Pneumonia
Septic conditions of the mouth

Treatment and Nursing Care :

The patient should be isolated and kept warm with hot water bottles, blankets etc. to prevent and treat the shock. Hot sponging and drying the body with warm towels helps to relieve cramps in the abdomen and limbs. Atropine is also used intramuscularly for this purpose. We have not used these last measures here, since we were more eager to supply the fluids intravenously. When the patient gets enough fluid in the body cramps do not occur; so there is no need for hot sponging.

The Administration of fluids :

The administration of fluid is very necessary to replace the fluid loss that takes place in the body. For this we use :

Hypertonic saline

Alka saline

Normal saline

On admission, if the patient's blood pressure is low we start with 500 c.c. of hypertonic saline; this is followed by 500 c.c. of alka saline in order to combat acidosis. After this alka saline, if the B.P. is still below 90 (systolic), we give 500 c.c. of hypertonic saline which is followed by 1000 c.c. of normal saline I.V., or more if needed. For babies and small children we used sodium lactate and lactate ringer followed by normal saline. All the above are given intravenously.

As heart stimulants, coramine is used $\overline{q\overline{q}}$ 2hr or $\overline{q\overline{q}}$ 4hr as required and oxygen P. R. N.

Orally { Kaolin dram 1 $\overline{q\overline{q}}$ 2hr for 1 day
then $\overline{q\overline{q}}$ 4hr
Sulfaguanidine grs. $\overline{q\overline{q}}$ 4hr
Antidiarrhoea $\overline{s}$ opium 1
dose $\overline{q\overline{q}}$ 4hr
KMnO₄ tablets are given as
intestinal disinfectant.

In certain cases, we had to discharge the patients a little early, in order to make room for the new patients. In cases like this we discharged them with the following :

Sulfaguanidine grs. XXX $\overline{q\overline{q}}$ 4 hr $\times$ 2
or 3 days

Kaolin dram 1 $\overline{q\overline{q}}$ 4hr as indicated
Multi-vit- to supply adequate
vitamins.

We were extremely busy during

those days and only the splendid co-operation of the nursing staff, pharmacists and the Central Sterilizing Room personnel made it possible to care for so many. Here, I would like to pay tribute to Holy Family Hospital, Patna City, and Patna Medical College Hospital who supplied us with distilled water without which we could not have made our solutions, (we only have one still), and our patients would probably have died. The pharmacists were busy in preparing these solutions even during the night. The C.S.R. was ever ready with the sterile equipment such as I.V. tubing, needles and syringes etc. I say it once more, this union and co-operation of each individual not only made the task easier, but created in us an untiring spirit which enabled us to work for our brethren without regard to our personal inconveniences. This co-operation and devotedness of each and everyone has made many families happy which otherwise would have been mourning for their dearly beloved ones.

The Panel.

- I. Miss Philomena Rodricks will give us the *etiology and pathology*.
- II. Sister Judith Mary : information about Hypertonic Saline.
- III. Miss Aleyamma Cherian will cover Alka Saline.
- IV. Sister Perer Damian will tell us about Sulfaguanidine.
- V. Miss Rebecca Boidyo will explain the use of Normal Saline.
- VI. Sister Petritius : Lactate Ringer Solution.
- VII. Sister Mary Josephine : Sodium Lactate.
- VIII. Miss Rosamma Mathew will tell us about the heart stimulants.
- IX. Miss Mary George will detail the Pharmaceutical problems involved.

The following covers the solutions and the preparations we have used.

Cholera

Miss Philomena Rodericks—

Etiology. Cholera exists endemically in India, China, and certain far Eastern countries. The causative

organism is vibrio cholera, or vibrio comma. H₂O transmission is an important mode of spread. When general H₂O becomes contaminated a sudden wide-spread outbreak follows. If wells or other local water supplies get infected, cases appear from day to day in the locality supplied.

Flies may also disseminate the disease by contaminating food, milk, etc. with infected faeces. Cholera vibrio occur in great numbers in 'rice water stools' but disappear rapidly. Both the cholera convalescent and the contact carriers lose vibrios within a few days of the termination of the attack or contact with the cholera case. The germ enters the body through the mouth and multiplies enormously in the intestine. The organism itself does not invade the body : its toxin, absorbed through the intestinal wall, causes the toxæmia.

Onset: The Onset is usually sudden with profuse diarrhoea and vomiting. In severe cases, even in the early hours of the disease, the patient passes copious watery stools which contain little flakes of epithelium from the mucous lining of the intestines, which give to the stools the characteristic appearance of 'rice water'.

Collapse soon sets in and dehydration causes severe muscular cramps in the abdomen, arms and legs. The skin of the hands becomes shrunk, the cheeks hollow and the eyes sunken. Excessive thirst and vomiting increases the patient's suffering.

Algid stage. In this stage the patient lies in a cold clammy sweat, practically lifeless. The pulse is feeble and often imperceptible. The temperature is subnormal. The urine is scanty. The mouth becomes dry and the voice is lost. This condition persists for 24 to 36 hours. At this stage the patient may die from toxæmia or collapse from circulatory failure.

Stage of Reaction. In the stage of reaction the symptoms of the algid

stage gradually subside and the stools become less frequent. The skin improves in colour and the temperature rises. In a few cases hyperpyrexia occurs.

Pathology. After death, rigor mortis sets in early. The blood is thick and tarry. The intestines are collapsed and shrunken, the mucosa is denuded of its epithelial lining, congested, and perhaps hæmorrhagic, and the lymphoid follicles are enlarged. The stomach and liver are congested and the gall bladder distended with viscid thick bile, difficult to expel; hence the absence of bile in the intestine. The kidneys show swelling, congestion and ecchymosis, the spleen is small and shrunken, and the lungs collapsed and dry.

The cholera vibrio is readily isolated from the contents of the small intestine and occasionally from the gall bladder. The vibrios undergo disintegration in the surface epithelium, especially of Lieberkula's glands with liberation of a powerful endotoxin. Denudation of intestinal epithelium, outpouring of fluid from the blood vessels into the lumen of the bowel, and absorption of toxin in the circulation—Result: The above mentioned things are found in autopsy.

Toxaemia and fluid loss underlie the pathological findings and clinical picture. Diarrhoea and vomiting lead to chloride depletion, to decrease in volume with increased viscosity of the blood, and to tissue dehydration.

Biochemical investigations show reduced blood chloride, diminished plasma alkalinity, phosphate retention and increased blood urea. Finally the weakened heart may prove incapable of pumping the viscid blood through the damaged kidneys and anuria results. Decreased filtration pressure is an important factor in the failure of renal secretion.

Hypertonic Saline

Sister Judith Mary—

500 c.c. of hypertonic saline

contains:

Sodium chloride 120 grs.

Potassium chloride 6 grs. with distilled water 500 c.c.

Calcium chloride 4 grs.

The chlorides of Sodium, Potassium, and Calcium ions are soluble in water at 20 degrees centigrade; it is given I.V. Changes in osmotic tension influence movements of fluids and diffusion of salt in the cellular tissues. Normal blood salt is 9%. Potassium ions play an important part in cellular metabolism.

Calcium is an essential element of the tissues and of the blood. In cholera these salts are lost by vomiting and diarrhoea. Therefore hypertonic saline supplies the chlorides, which are lost, and prevents the fluid from passing from the blood to bowel. Also the chloride combines with the cholera toxins in the blood and the product is excreted.

Alka Saline

Miss Aleyamma Cherian—

Alka saline contains 160 grs. of sodium bicarbonate, 90 grs. of sodium chloride in 500 c.c. of distilled water. Chlorides and bicarbonates are soluble in water. In cholera there is a great loss of fluid along with alkalies by way of diarrhoea and vomiting. Hence the pH of the blood becomes less alkaline and there is a danger of going into acidosis. In this case we gave Alka Saline to raise the alkaline reserve of blood.

When sodium bicarbonate is heated to over 50°C it changes into carbonates which is a stronger alkali. Therefore during the administration of alkaline there is a danger of going into alkalosis. To prevent this condition the effect should be checked often.

Normal Saline

Miss Rebecca Boido—

Sodium chloride 9 gm.

Distilled water q.s. 1,000 c.c.

Normal saline is isotonic with blood and is useful in combating dehydration. It is also employed in cholera and diarrhoea and vomiting and in conditions where there is loss of salts. Normal saline is the most important salt for maintaining the osmotic tension of the blood and tissues. Hypotonic or hypertonic solution will cause pain if given intraperitoneally or subcutaneously, but they may be used intravenously if given slowly. In infants where there is difficulty in finding a suitable vein or in adults whose veins readily thrombose, normal saline may be administered subcutaneously in conjunction with hyaluronidase which facilitates the rapid absorption of the fluid. Normally, normal saline is given intravenously, and sometimes per rectum to patients who are unable to take fluid by mouth.

Sulfaguanidine

Sister Peter Damian—

Sulfa drugs are bacteriostatic rather than bactericidal. This is due to the similarity of their chemical structure to that of p-amino benzoic acid which is the end product of protein metabolism. P-amino benzoic acid is essential for the normal development of bacteria. Hence, if Sulfa drugs are present in greater concentration than P-amino benzoic acid, the bacteria will take this up and then become blocked and incapable of doing their work, gradually becoming weak and dying.

Sulfaguanidine is the drug of choice in bacillary dysentery and is used in cholera. It is desirable to have a very high concentration at the site of infection. As sulfaguanidine is not absorbed by the blood, it remains in the intestine. It can be given in large doses. Dosage of Sulfaguanidine: we usually give grs. XXX 4 hrly. until the disease subsides; also patients are given grs. XXX q 4hr for 3 days when being discharged.

The natural intestinal bacteria manufactured vitamins are killed during prolonged administration of Sulfaguanidine.

So some Vitamin B should be given to replace the loss of these vitamins.

Lactate Ringer Solution

Sister Mary Patritius—

This solution contains: Sodium lactate, sodium chloride, potassium chloride, and calcium chloride. In our body sodium chloride is the most important salt for maintaining osmotic tension of the blood and tissues, while potassium chloride plays an important part in cellular metabolism, and calcium is an essential element of the tissues of the blood, which contains 10 mgm. per 100 c.c.

Lactate Ringer Solution is mainly used in the treatment of dehydration with acidosis or alkalosis. In cholera there is a great loss of fluid with which the human body loses the alkaloids and goes into acidosis. Rapid dehydration takes place. In this case we give Lactate Ringer Solution to restore the tissue fluids and the calcium, potassium, sodium and chloride ions. Sodium Lactate acts as a buffer salt thus preventing the danger of acidosis or alkalosis. The great importance of this solution is: it is of such composition that even in the presence of severely damaged kidneys, the system can take what it needs for retention and excrete what it may not require. Even though Normal Saline is very useful in acidosis, in the presence of renal damage it is entirely non-effective. In acidosis when there is no renal damage Lactate Ringer Solution acts more quickly than Normal Saline.

	Children up to 1 yr.	250 cc
Dosage :	" 1 to 8 yr.	500 cc
	" over 8 yrs.	1,000 cc

In general the therapeutical dose is 20 to 30 cc (diluted) per kilogram of body weight. Injections should be repeated until dehydration is corrected.

Sodium Lactate $\frac{M}{6}$ Solution

Sister Mary Josephine—

Sodium lactate is a solution used with great advantage in acidosis. By acidosis we mean a great decrease in the alkaline reserve in the blood brought about by :

1. Faulty metabolism of fat.
2. Excessive vomiting and diarrhoea, which is present in cholera.

Prompt administration of a sufficient amount of alkali is necessary. Sodium bicarbonate solution while having proved very effective when used expertly, has not gained universal favour chiefly for the following reasons :

1. In order not to precipitate uncompensated alkalosis, it has to be given cautiously in divided doses and its effects have to be checked often by frequent chemical examinations of the blood.
2. It cannot be sterilized by boiling or autoclaving without being converted into caustic carbonate.
3. Unless the sodium bicarbonate solution is sterile in isotonic strength and equilibrated with carbon dioxide to adjust its pH to approximately 7.4, it cannot be given intraperitoneally or subcutaneously without danger of infection or severe irritation.

It has been discovered that sodium lactate may be substituted for sodium bicarbonate overcoming its disadvantages, while retaining most of its good points and adding others. The conversion of sodium lactate into sodium bicarbonate, while rapid enough to be effective even in the most severe cases of acidosis, is also slow and gradual enough to prevent development of any serious degree of uncompensated alkalosis which tends to follow sodium bicarbonate administration.

Sodium lactate solution is stable

and it is readily sterilized by boiling or autoclaving. Its reaction is quite neutral. It is amphoteric and acts as a buffer solution.

Administration.

It is particularly advantageous in very dehydrated patients to give approximately 1/3 to 1/2 of diluted solution I.V. in order to restore blood volume and blood flow as quickly as possible.

Strength of solution.

1/6 molar solution which means 1/6 of the gram molecular weight, or 18.68 gm., has been dissolved in 1000 cc of distilled water.

Stimulants Used in Cholera

Miss Rosamma Mathew—

Nikethamide : Coramine.

Action and Uses.

Nikethamide is a respiratory stimulant, its site of action being the medullary centres of the brain ; it increases the rate and depth of respiration and produces slight peripheral vasoconstriction although in man it has little effect on the blood pressure. It is the opinion of our physician that any beneficial effect it has on the circulation is probably due to an improvement in the respiration. An increasing coronary flow has been demonstrated in animals, but there is no chemical evidence of the value of the Nikethamide in coronary and myocardial disease and there appears to be little justification for its use in cardiac conditions unless they are due to respiratory distress. Nikethamide is administered as a 25% aqueous solution subcutaneously, intramuscularly, or intravenously. It is doubtful if oral administration is of any value in emergencies. It should be given by slow intravenous injection. Doses as high as 2.5 gm are commonly employed. Convulsive movements occur before the tonic dose is reached.

Oxygen :

Oxygen may be obtained by the fractional distillation of liquid air, when it will contain a small proportion of argon and a trace of nitrogen or by the electrolysis of water, when it will contain a small proportion of hydrogen. It occurs as an odourless, tasteless, colourless gas. Oxygen contains not less than 98% of V/V. of O_2 .

Action and Uses :

Oxygen inhalation is indicated in anoxia, which may occur in lung disease, heart disease with failure, severe anaemia, surgical and traumatic shock, spinal anaesthesia, poisoning by drugs, particularly cerebral depressants, and hemolytic poisons and in asphyxia. Some specific indications for the use of oxygen are pneumonia, post-operative pulmonary complications, pulmonary oedema, shock, poisoning due to coal gas, barbiturates and other depressants, and congestive heart failure. It should be noted that once oxygen therapy has been commenced, the supply should be continuous so long as its use is indicated and the withdrawal of oxygen treatment should be gradual especially in cases of chronic cyanosis.

Oxygen is administered by means of oxygen tent, face mask or nasal catheter; if a catheter is used, the oxygen should be passed through a humidifier before inhalation. A flow of 5-8 litres per minute through a nasal catheter gives an oxygen concentration of 40% to 60%.

The Main Pharmaceutical Problems Involved during the Cholera Epidemic

Miss Mary George—

The main pharmaceutical problem in any epidemic is to keep the required medicine in stock, and the duty of the pharmacists is to keep the nurses supplied with the proper medication at all times.

During this past epidemic of cholera in Mokameh, our problem has been to keep the I.V. solutions in stock and this has called for much careful planning and absolute co-operation between nurses and pharmacists, and the sacrifice of free time from both groups when needed. When the cholera patients began coming in we had our normal supply of distilled water, about 50 litres and enough Normal Saline, Hypertonic and Alkaline Saline, Sodium Lactate and Lactate Ringer etc. as usual. But these were exhausted within two days. On the first day of the epidemic, Sister gave orders for our still to be in operation daily, from early morning to late in the night, but even that was insufficient to meet the demand.

I was surprised when Sister told me to go to Patna to the Holy Family Hospital and bring distilled water. I thought that Sister had made a mistake as the almirah was full of solutions...it holds about 60 litre bottles. I left on the 7-30 a.m. train and returned at 3-30 p.m. As soon as I arrived I looked into the almirah and found it was completely empty. Besides my fellow-students were waiting with sodium chloride weighed out to prepare normal saline. We had a great help from the Holy Family Hospital but still we fell short of solutions.

Sister Florence Joseph went to the Superintendent of Health Services of Bihar in Patna and told him of our difficulties and he promised to see that we were supplied with sufficient distilled water from Patna General Hospital. The two hospitals combined and supplied us with sufficient water to take care of our needs.

Next we found that it was impossible to estimate just what solutions would be needed. We used too much distilled water in one solution and had nothing left for the other kinds. So we sent distilled water to the wards along with concentrates for the extemporaneous preparations of the

solution as needed. This made that angle of the solution problem easier.

The next problem was the inability to obtain sodium chloride either from Patna or Mokameh. Here we had an opportunity of applying our knowledge of Physics and Chemistry. We took ordinary cooking salt from the kitchen and purified it by repeated solution filtration and evaporation. Next we found that our Sodium Lactate was nearly out of stock; we had about a six months supply of it at the beginning of the epidemic but this was used within a few days. A rush order followed by a telegram, failed to bring sodium lactate from Bombay in time. So we had to figure out a way of making the chemical.

We knew that sodium lactate is prepared by the interaction of lactic

acid upon sodium hydroxide. One molecular weight of lactic acid plus one molecular weight of sodium hydroxide makes one molecular weight of sodium lactate plus one molecular weight of water. When the reaction is complete the solution is neutral. The neutrality can be tested by several indicators. We used bromothymol blue and phenol red which are the most sensitive ones. Bromothymol blue gives a yellow colour in acid, blue in alkaline and yellow in acid; while phenol red gives red in alkaline and pink in neutral and yellow in acid.

In this way we have been solving our problems. This epidemic has shown us how dependent one group is on another and the necessity of close co-operation.

MEDICINES USED IN CHOLERA

Lactate Ringer

Sodium Lactate 60%	...	12.9 gm.
Sodium chloride	...	15 gm.
Potassium chloride	...	0.75 gm.
Calcium chloride (anhydrous)	...	0.37 gm.
Distilled water Q.S. to	...	100 cc.
Given by intravenous injection		

Hypertonic Saline

Sodium chloride	...	120 grs.
Potassium chloride	...	6 grs.
Calcium chloride	...	4 grs.
Distilled water Q.S. to	...	500 cc.
Given by		

Alka Saline

Sodium bicarbonate	...	160 grs.
--------------------	-----	----------

Sodium chloride	...	90 grs.
Distilled water Q.S. to	...	500 cc.

Normal Saline

Sodium chloride	...	9 grs.
Distilled water Q.S. to	...	1000 cc.

Antidiarrhoea Adult's

Bismuth carbonate	...	15 grs.
Distilled water Q.S. to	...	30 cc.
Sulfa guanidine		
Kaolin		

Stimulants

Coramine	
Oxygen	

Note: The health authorities were notified so that the source of infection would be investigated.

Health teaching to the relatives, and later to the recovered patient included an explanation of the disease and the mode of infection. They were instructed to boil drinking water and milk; to steep such fruit and vegetables as tomatoes, lettuce, apples, grapes etc. in either a salt solution 1-40 or Condy's fluid (deep pink) for at least one hour.

That any infected patient should be brought to the hospital immediately. The importance of hand washing was emphasized.

