



A Paediatric Case Study Report of Cholera in an Endemic Area of Cebu Province of Philippines

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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Case Study

ABSTRACT

ZD, 2 years old male child from Cebu city Philippines with chief complaint of loose watery stools was admitted by his mother to a tertiary hospital. Five days prior to the admission, onset of the disease with three episodes (approximately 100 ml each) of non-foul smelling loose watery (yellow) stools was observed with moderately severe dehydration. However, it was observed that the patient was playful and with a good appetite. He was given 1 pack per day Vivalyte rehydration solution hence, the episode reduced to one time. One night prior to admission, an increase in bowel movement frequency was noted. The stool colour changed to yellowish to greenish with mucus. The patient turned anorexic and weak with sunken eyeballs. In the morning of the admission, the patient had another 2 episodes of the stools with formed particles. Patient also had 3 episodes of non-projectile vomiting (approximately 30 ml/ episode) irrelevant to the food intake timings. At the Emergency Room, the patient was treated with IV Fluids of Normal Saline Solution (60 cc/ kg/ day); CBC showed thrombocytosis with neutrophilic predominance, serum electrolytes revealed hyponatremia and hypokalaemia. Stool Culture was done. Medications started were Zinc Sulphate at 20 mg per day and Oral rehydration solution. The patient was referred to an infectious specialist care with a primary impression or consideration of Cholera thus Erythromycin was started at 50 mg/kg/day (3 doses/ day).

Since the patient was under developed or did not match with the normal developmental milestones like no teething, open anterior fontanel, and deviation in the weight height ratio had developed as

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significant deviation in head circumference, chest circumference and abdominal girth due to the infused fluid volume overload. There might be chances of making wrong clinical diagnosis like viral diarrhoea complicated to give rise meningitis by primary care givers in absence of a confirmed laboratory results, an immediate initiation of an empirical treatment with fluid resuscitation and antibiotics undertaken, hence, the patient was referred to the care of a specialist of the infectious diseases for further evaluation and treatment.

At ward, the patient was observed awakened, irritable, without respiratory distress and tachycardia, with moderate dehydration and a positive fluid balance of 210 ml. Stool exam results showed 55-65 WBC per high power field. Intra Venous (IV) Fluid to correct the imbalance of electrolytes and medications were continued. Following days, the patient had 4 episodes of loose watery stools amounting to 100 - 200 ml per episode with passage of *Ascaris*. Patient was slightly irritable, with still sunken eyeballs, otherwise with good turgor, mobility and strong pulses. IV Hydration was continued. Albendazole (400 mg/ tab) single dose was given. Electrolyte imbalance was already corrected. However, the stool culture was positive for *Vibrio cholerae*. On the fifth hospital day, the patient got normal for all the symptoms and signs. Erythromycin was prescribed for 3 days at the rate of 50 mg/ kg/ day (3 doses/ day). Further, Zinc Sulphate tablets (20 mg/ tab) twice a day was also prescribed and then the Patient was discharged.

In absence of teething, Doxycycline as the drug of choice for the Cholera treatment might have been prescribed for a fast recovery. However, doxycycline is contraindicated in children less than 8 years of age due to the risk of yellow tooth discolouration and dental enamel hypoplasia. Generally, *V. cholerae* often becomes drug-resistant against multiple antibiotics through its enzymatic functions (HGT) that modify antibiotics chemically. Hence changing the antibiotic regimen remains the best strategy to get the best prognosis if the previously administered antibiotic doesn't work properly. Another, before discharging, the condition of the patient might also have confirmed as normal through the required laboratory exams even if the patient was tolerating orally well. Moreover, the patient might have been referred to a paediatrician or called for an early follow up to reassess him and prescribe probiotics and other growth regulatory supplements for complete well-being of the patient.

Keywords: Cholera; perfused diarrhoea; loose watery stools; dehydration due to infective diarrhoea or blue death.

1. INTRODUCTION

Present case study was initiated during the first week of March, 2021 as an independent investigator to bring out a complete scientific document on the Cholera in paediatric population aged from 1 to 5 years old children in Cebu city Philippines. The emphasis was made on illustration of the adoption of a correct, timely and sequentially, health care delivery mechanism right from the primary caregivers to tertiary hospital. Moreover, it focuses upon the adoption of an efficient clinical approach and methods to arrive quickly or timely at a correct diagnosis. The primary case data was collected from the hospital (an associate hospital UV Gullas College of Medicine, Cebu city Philippines) recorded by our preceptor upon an advice of the Chief of Clinics at the UV Gullas College of Medicine, Cebu city Philippines and made available for the research review; case analysis, appraisal and presentation during clinical succession in the paediatric department. The name of the patient has been abbreviated to respect his privacy and all necessary consents were taken by the

authorities in the queue. So there is no conflict or dispute of interest of any for the publication of the research study.

This was a deadly disease caused by *Vibrio cholerae* (gram negative bacteria) called cholera. It occurs in all age and sex groups in its endemic areas. According to Anna Lena Lopez, et al. [1], Cholera is endemic in the Philippines however data on cholera in the country remained sparse, until 2008 when surveillance was strengthened. From 2008 to 2013, 42,071 suspected and confirmed cholera cases were reported in 87% of provinces and metropolitan areas in the country, confirming the endemicity of cholera in the Philippines.

WHO [2] had estimated that the officially reported cases represented only 5–10% of the actual number occurring annually worldwide of the estimated 3 to 5 million cases, about 100 000 to 120 000 people die of that [3]. Researchers have estimated that every year, there are roughly 1.3 to 4.0 million cases, and 21 000 to 143 000 deaths worldwide due to cholera [4]. New, more

virulent and drug-resistant strains of *V. cholerae* [5] often emerge and result in outbreaks with high case fatality ratios that impose a heavy burden on the timely health care delivery system hence it needs early detection, prevention and access to timely health care at the time of an outbreak.

There are many types of diarrhoeas, Cholera is only one among them but it has a global significance due to its inclusion in the WHO Communicable Disease Surveillance and Response (CSR) list.

A patient who is infected with bacteria *V. cholerae* by eating contaminated food or drinking contaminated water and other sources develops its symptoms within a few days with a median of 1.4 days (95% CI, 1.3–1.6). Five percent of cholera cases develop symptoms by 0.5 days (95% CI 0.4–0.5), and 95% by 4.4 days (95% CI 3.9–5.0) after infection [6]. The primary symptoms of cholera include profuse diarrhoea (Loose watery stools due to hyperactive bowel movements) and vomiting of clear fluid, sunken eyeballs, dry lips and mouth and positive skin pinch test [7]. Most cases of cholera can successfully be treated with rehydration (oral & normal saline fluid infusion) therapy [8] with administering an adequate dose regimen of zinc that is highly effective. Moreover, according to CDC (Centre for Disease Control) Recommendations available on its website [10, 14], the drug of choice for it is tetracycline or doxycycline or ciprofloxacin in adulthood while azithromycin in paediatric patients.

Cholera is a pathological condition that arises from an infection of the small intestine. The etiological or infective agent is a gram negative bacterium called as "*Vibrio cholera*" manifests as deadly profuse watery diarrhoea or loose watery stools [8, 12].

It is too tough to ascertain who actually discovered or characterized firstly the cholera. Most people believe that the discovery of cholera was done by Robert Koch (1843-1910), the famous German scientist. Further, nonetheless, the first successful isolation of the *V. cholerae* was an important milestone in the history of medicine to open the door of its successful treatment development.

A drop in blood pressure leads to circulatory shock (hypovolemic) due to subsequent loss of fluid volume [8]. In absence of treatment, the

patient becomes progressively weaker, sometimes reaching the point of death within 24 hours of the onset of the disease, otherwise, the patient survives and in that case, the infection usually remains for 1-5 days [8].

It occurs commonly in those places or habitats where people live with poor sanitation, overcrowded, war and famine areas. Its endemic areas are in Africa, South Asia and Latin America [8].

The primary symptoms usually start with a sudden onset even in half a day to five days after ingestion of the bacteria. Due to an abnormally increased frequency of the diarrhoea, it can quickly cause dangerous fluid loss — as much as a quart (about 1 litre) an hour [9]. It is described as "rice water" type in nature and sometimes has a fishy odour, often with a pale, milky appearance that resembles water in which rice has been rinsed [9, 13].

A diarrheal output may reach 10 to 20 litres (3 to 5 US gal) in a day if the patient remains untreated. A loss of 10% or more of body weight indicates severe dehydration [9]. The lethality of the severe cholera can be understood by the fact that it may kill about half of the affected individuals (WHO, 2031). Moreover, the ratio of asymptomatic to symptomatic patients with infection has been estimated from 3 to 100 [2]. Cholera is also known as "blue death" because of a person's skin colour that may turn bluish-grey due to an extreme loss of fluids from the body.

Most cases of cholera can successfully be treated with rehydration (oral in non-severe while rapidly normal saline fluid infusion in moderate to severe patients) therapy. According to WHO [2] ORS standard sachet should be dissolved in 1 litre (L) of clean water. Adult patients may require up to 6 L of ORS to treat moderate dehydration on the first day. Additionally, an adequate dose regimen of zinc that is highly effective may be necessary. Moreover the drug of choice for its treatment is tetracycline or doxycycline or ciprofloxacin in adulthood while azithromycin in paediatric patients [10].

2. CASE PRESENTATION: PROTOCOL

2.1 General Data

ZD, 2 years old male child, single, Filipino, Roman Catholic, born on January 28, 2018 at

VSMCC, was then residing at Cogon Pardo Cebu City. Patient was admitted for the first time on December 22, 2020 at 3:45pm to a tertiary hospital.

The pertinent findings included dry skin with positive skin pinch test, both lips and tongue dried, sunken eyeballs, strong pulses with good perfusion, increased head circumference (HC), increased chest circumference (CC) & increased abdominal girth (AG), weakness, irritability, loose watery stools, deviation in weight length ratio for the age: +3SD (Z Score), open anterior fontanelle with no teething, mild tachypnea, flat abdomen, invisible peristalsis and pulsations, hyperactive bowel sounds, tympanic in all quadrants with (-) shifting dullness and brown faecal stain on rectal exam.

Informant & Reliability: the source of information was the child's mother. The interview was conducted on December 29, 2020 with a reliability score of 95%.

2.2 Chief Complaint

Loose watery stools

2.3 History of Present Illness

Five days prior to admission, the patient had an onset of diarrhoea with yellowish watery, non-bloody and non-foul smelling stools. He had 3 episodes of passing the stool, approximately 100 ml per episode moderately soaking the patient's diaper each time. Patient had no other associated symptoms like fever, abdominal pain, vomiting and tenesmus. He was playful and had a good appetite thus there was no consultation sought. He was given Vivalyte rehydration solution one pack per day, to which the patient tolerated. 2 days prior to admission, the patient still had 1 episode of approximately 100 ml watery stool with the same characteristics mentioned earlier.

One night prior to admission, an increase in bowel movement frequency was noted. The stools were still approximately 100 ml per episode, characterized by yellowish to greenish in colour, non-blood tinged, non-foul smelling, admixed with mucus. The condition was already associated with a decreased appetite, and sunken eyeballs. The patient was also noted to be weak. Still no consultation was done.

In the morning, prior to admission, the patient had another 2 episodes of yellowish watery stools with formed particles and no blood elements. This time, the patient also had 3 episodes of non-projectile vomiting approximately 30 ml/ episode that was unassociated with the timing of the food intake. Lastly the urine output was not noted by the mother due to difficulty in distinguishing it from the stools in the diaper.

2.4 Prenatal History

Patient was born to a 28 year old G4P1 (1021) mother. The first prenatal check-up was done at 3 months of gestation at a Clinic following other 3 check-ups. No maternal illnesses were noted. No medication was taken during the pregnancy.

2.5 Natal History

The patient was delivered at term through a Normal Spontaneous Delivery (NSD) in a healthcare institution under care of an Obstetrician. It was noted that the patient had a good cry and activities. He weighed 3000 grams at his birth.

2.6 Postnatal History

Since delivery the patient was on mixed feeding, and was purely kept on feeding on the milk formula for 4 months of his age. New-born Screening and Hearing test was done with unremarkable symptoms and signs.

2.7 Immunization History

The patient was vaccinated as follows 1 dose of BCG, 1 dose of hepatitis B, 3 doses of DPT, 3 doses of OPV, 3 doses of Hib, 1 dose of Pneumococcal and 2 doses of MMR.

2.8 Nutritional History

The Patient was on mixed feeding for 4 months and thereafter, he was purely fed with formula milk. The Formula milk was described as 'Bonna' and given at 1:2 dilution, consuming 30 ml per feeding at every 3 hours. Supplementary feeding was also started at 6 months of age with porridge. Present diet of the patient included 3 meals and 1-2 snacks daily. The daily meals included egg, soup and vegetables. Source of the food was mostly market purchases as there was no refrigerator in their house.

2.9 Past Medical History

There was no hospitalization prior to the admission. However there was a recent history of admission of the patient's brother due to diarrhoea and vomiting.

2.10 History of Allergies

No allergies

2.11 Family History

There was a family history of hypertension of both parents.

2.12 Personal and Social History

The patient was the second child among 3 siblings. Family was living in a room made up of concrete materials with 5 household members. The entire house was shared with two other families. A common comfort room shared with the families which was located 2 meters away. During the rainy season, their portion used to flood with the street canal water. The water source was MCWD (Public Unit) for washing while for drinking it was from the Refilling Station (Automatic Water Fetching Machine). The mother was the primary caregiver to the patient. Father was a promodiser and was the breadwinner for the family. Monthly family income was between 6 and 7 thousand pesos.

3. REVIEW OF SYSTEMS

• Genera

O (+) weakness

o (-) fever

o (+) Irritable

• Skin

o (-) pruritus

o (-) rash

o (+) dryness

• Head

o (-) seizure

o (-) injury and trauma

• Eyes

o (+)Sunken eyeballs

o (-) eye redness

o (-) eye discharge

o (-) pain and itchiness

• Ears

o (-) ear pain

o (-) ear drainage

• Nose and Sinuses

o (-) nasal stuffiness and congestion

o (-) epistaxis

• Throat (Mouth)

o (-) dysphagia

o (-) hoarseness

o (-) oral ulcers

o (+) dry lips and tongue

• Neck:

o (-) pain

o (-) stiffness, swelling

• Respiratory

o (-) cough

o (-) dyspnoea

o (-) pain on breathing

• Cardiovascular

o (-) colour changes with feeding

o (-) chest pain or discomfort

o (-) shortness of breath

• Gastrointestinal

o (-) difficulty swallowing

o (+) Vomiting

o (-) abdominal pain

o (-) regurgitation and retching

o (+) loose watery stool

• Urinary

o (-) urinary incontinence

o (-) polyuria, nocturia, dysuria

o (-) history of UTI

• Peripheral Vascular

o (-) claudication

o (-) leg cramps

• Endocrine and Metabolic

o (-) heat and cold intolerance

o (-) excessive sweating, thirst or hunger

• Musculoskeletal

o (-) muscle weakness

o (-) limitation of movement

o (-) muscle pain and joint pain

o (-) stiffness and gout

o (-) backache and cramping

• Nervous System

o (-) memory loss

o (-) fainting, seizures

o (-) tingling sensation

o (-) tremors

• Hematologic

o (-) easy bruising

4. PHYSICAL EXAMINATION

4.1 General Survey

The patient was examined as awakened, conscious, coherent and not in respiratory distress.

4.2 Physical Exam Data at Emergency

Heart rate (HR) - 112 bpm (Normal: 98 - 140)
Respiration rate (RR) - 38 cpm (Normal: 22 - 37)
Temperature (TEMP) - 37 Degree Centigrade (Normal: 36.5 - 37.5).

Weight (WT) - 10 kg (Normal: Average weight for a 24-month-old is 26.5 pounds for girls and 27.5 pounds for boys, according to the World Health Organization, more precisely 12 kg for a girl child).

Height (HT) - 88 cm (Normal: 31.5 to 36 inches or 85.5 cm in female while 32 to 37 inches in male).

Oxygen saturation (O2SAT) - 93% (Normal: 97 - 99%).

Head circumference (HC) - 40.3 cm (The average new-born's head measures 13 3/4 in (35 cm). In two years girl child it should range from 40.5 cm - 46 cm. Generally, a new-born's head is about half the baby's body length in cm plus 10 cm.)

Chest circumference (CC) - 42 cm (Normal: 40.5-46)

Note: A new-born's head is usually about 2 cm larger than the chest size. Between 6 months and 2 years, both measurements are about equal.

Abdominal girth (AG) - 54 cm (Normal: Mean abdominal circumference in ELBW group was 18, 70 cm (SD=0, 84) in boys and 18, 67 cm (SD=1, 40) in girls, VLBW group was 22, 20 cm (SD=1, 42) and 21, 94 cm (SD=1, 29) in boys and girls, respectively. More precisely its 50.7 cm in a two year old girl child).

Note: A specific formula for estimating normal abdominal circumference was developed: $y = 0.0053x + 14.83$ (y = abdominal circumference in cm; x = body weight in g; 0.0053 = regression coefficient; 14.83 = regression constant).

Mid-upper arm circumference (MUAC) - 14.5 cm (Normal: MUAC of between 125 mm (12.5 cm) and 135mm (13.5 cm), YELLOW COLOUR, indicates that the child is at risk for acute malnutrition and should be counselled and followed-up for Growth Promotion and Monitoring (GPM). MUAC over 135mm (13.5 cm), GREEN COLOUR, indicates that the child is well nourished).

WT/Length for age: +3SD (Z SCORE) (Normal: Average weight for a 24-month-old is 26.5 pounds for girls and 27.5 pounds for boys, according to the World Health Organization. How tall is the average 2-year-old? Average height for a 24-month-old is 33.5 inches for girls and 34.2 inches for boys).

4.3 Course at the Emergency

At the Emergency Room prior to the admission to the ward, in addition to maintenance fluids, the patient's treatment was started promptly administering an IV Fluids that was a normal saline solution (NS) for hydration at the rate of 60 cc/ kg/ day. Simultaneously, blood sample was collected for CBC and serum electrolytes. The CBC results showed thrombocytosis with neutrophilic predominance, whereas the results for Serum Electrolytes revealed hyponatremia and hypokalaemia. The Stool Exam was done and Stool sample was collected for culture.

Note: the only way to make a definite diagnosis of cholera is to do a rectal swab test and or in remote areas in the absence of a diagnostic laboratory a rapid 'dipstick' tests of the stools. In remote areas where cholera is widespread but there are few laboratories, a rapid "dipstick" can be used to test a stool sample [11].

In accordance with the Global Cholera Control Taskforce guidelines [15], medications [15] started were Zinc Sulphate at the rate of 20 mg per day and oral rehydration solution. Then, the patient was referred to the care of a specialist for infectious diseases with a consideration of Cholera and Erythromycin was also started at the rate of 50 mg/ kg/ day divided into 3 doses.

The differential diagnosis for Cholera was made considering the followings:

4.3.1 Rota viral diarrhoea

The most common symptoms of rotavirus are severe watery diarrhoea, vomiting, fever, and/or

abdominal pain, decreased urination, dry mouth and throat, feeling dizziness when standing up, crying with few or no tears and, unusual sleepiness or fussiness.

4.3.2 Nora viral diarrhoea

If someone comes down with a norovirus infection, probably goes from feeling completely healthy to absolutely miserable within a day or two after being exposed. Typical symptoms include nausea, vomiting (more often in children), watery diarrhoea (more often in adults), and stomach cramps.

4.3.3 E. coli diarrhoea

Watery or bloody diarrhoea, severe abdominal cramps, nausea, tiredness and fever [16].

4.3.4 Amoebic dysentery

Abdominal pain, fever and chills, nausea and vomiting, watery diarrhoea, which can contain blood, mucus, or pus, the painful passing of stools, fatigue and intermittent constipation.

4.3.5 Giardiasis

Abdominal cramps, low energy (malaise), lots of intestinal gas, an enlarged belly from the gas, loss of appetite, nausea and vomiting and sometimes a low-grade fever.

Cholera should also be differentiated from some non-infectious causes of diarrhoea such as VIPoma, Tubulivillus Adenomas and food poisoning.

5. PHYSICAL EXAM DATA OBTAINED IN THE PEDIATRIC WARD

Pulse Rate: 119 beats/minute
Respiratory Rate: 27cycles/minute
Temperature: 36.5 °C, left axilla
Oxygen saturation: 100%
Height: 86 cm
Actual Weight: 9 kg
Head circumference: 46cm
Chest circumference: NA
Abdominal circumference: NA
MUAC: 14.5 cm
WT/Length for age: NA

SKIN

Inspection

Skin Colour: brown
No jaundice, pallor and cyanosis

No bruises and lesions

Dry Skin

Palpation

Good skin turgor
Skin was warm, dry and soft
Capillary refill: <1 sec
Note: In healthy children, a CRT of 2 seconds or less should be expected when measured on the finger. If the foot or chest is used for assessment, CRTs of 4 seconds or less should be considered normal.

HEENT

Head

Inspection

Hairs were smooth and evenly distributed Scalp was neither scaly nor had pustules and eczema

Palpation

Skull was normocephalic with open anterior and closed posterior fontanel (It might already be closed at birth. The anterior fontanelle usually closes sometime between 9 months and 18 months. The closure of the sutures and the fontanelles is needed for the infant's normal brain growth and development).
No lumps and lesions was detected
No sign of tenderness was observed

Eyes

Inspection

Sunken eyeballs

Symmetrical eyebrows and eyelashes
Able to fully close eyelids
Anicteric sclerae
Pinkish palpebral conjunctivae
No lid lag and ptosis

Special Tests

Pupils were equally rounded and briskly and reactive to light and accommodation
Pupil size 4 mm
(+) Direct and Consensual light reflex
Intact corneal reflex in both eyes
Visual fields full by confrontation

Extra ocular movements: able to move in 6 cardinal directions

Ears

Inspection

Symmetric auricles
No deformities, skin lesions, and lumps
No discharges, foreign bodies and swelling of the ear canal
Tympanic membrane was pearly grey, no swelling and cone of light seen

Palpation

No signs of tenderness
No lumps or masses

Nose and Sinuses

Inspection

No Alar flaring
Symmetric external nose
Nasal septum in midline
Pinkish nasal mucosa and turbinates
No discharges
No bleeding and swelling

Palpation

No signs of sinus tenderness

Mouth and Pharynx:

Inspection Lips were pink but dried and cracked, acyanotic
Pinkish oral mucosa with no ulcerations and lesions
Pinkish gums with no lesions and bleeding

No teeth

Uvula and Tongue at midline with no deviation and lesions
Tonsils were not swollen

Neck:

Inspection

Supple neck
Neck veins were not distended
No lesions and swelling

Palpation

Trachea in the midline
Non palpable thyroid gland and lymph nodes
No masses and signs of tenderness
(-) lymphadenopathies

CARDIOVASCULAR

Inspection

Adynamic precordium
PMI was not visible

Palpation

Apex beat at 4th ICS and mid clavicular line
No palpable thrills
(-) heave
No tenderness

Auscultation

Regular heart rate and rhythm
Distinct heart sounds
No murmurs

CHEST AND LUNGS

Inspection:

Symmetrical chest
No retractions
No use of accessory muscles

Palpation

No signs of tenderness
Equal chest expansion

Percussion

Resonant on both lung fields

Auscultation

(-) Rales on lung area

ABDOMEN

Inspection

Abdomen was flat
No visible veins
No visible peristalsis and pulsations

Auscultation

Hyperactive bowel sounds
No bruits

Percussion

Tympanic in all quadrants
(-) shifting dullness

Palpation

No tenderness on light and deep palpation

No rebound tenderness
Smooth liver contours
Non palpable spleen and kidneys

Direct Rectal Exam: no skin tags, no lesions, smooth and intact rectal vault, brown faecal stain, no blood on examining finger

GENITOURINARY

Inspection

No lesions, masses, and discharges

Palpation

(-) CVA tenderness

MUSKULOSKELETAL

Inspection

Good muscle bulk and tone
No atrophy of muscles
No deformities, clubbing, and joint swelling

Palpation

No signs of joint and muscle tenderness
Good range of motion on all joints

COURSE INSIDE THE WARD

Upon admission, patient was awakening, irritable, with no signs of respiratory distress and tachycardia. Pertinent physical findings were as dry skin and skin pinch that goes back slowly, dry lips and tongue, sunken eyeballs, strong pulses and good perfusion.

On reassessment by the specialist, the patient was still having moderate dehydration and a positive fluid balance of 210 ml. The stool exam showed 55-65 WBC per high power field.

IV Fluid and medications were continued and the electrolyte imbalances were corrected.

On the following days at the ward, patient had 4 episodes of loose watery stools amounting to 100 - 200 ml per episode; the stool was yellowish in colour, non-foul smelling, non-blood tinged and mixed with a mucoid material. The passage of Ascaris along with the stool was also seen. The patient was slightly irritable, with sunken eyeballs, otherwise with good skin turgor, mobility and strong pulses. IV Hydration was continued. Deworming was done administering

Albendazole 400 mg/tab single dose. Electrolyte Imbalances were already corrected. Stool culture was positive for *Vibrio cholerae*.

On the fifth Hospital Day, there were both any symptoms and signs of neither the recurrence of loose stools nor passage of Ascaris observed. Dehydration was resolved. Erythromycin was given for 3 days. The patient got normal and discharged with take home medication of Zinc Sulphate.

6. DISCUSSION

Pertinent physical findings at the time of the admission to the emergency room were as follows:

- Dry skin and skin pinch that goes back slowly,
- Dry lips and tongue,
- Sunken eyeballs, with strong pulses and good perfusion.
- Increased HC, CC, AG
- Weakness, irritability, and loose watery stools
- WT/Length for age: +3SD (Z SCORE) and open anterior fontanelle and no teeth
- Mild tachypnea,
- Abdomen flat with no visible peristalsis and pulsations
- Hyperactive bowel sounds, tympanic in all quadrants with (-) shifting dullness
- Brown faecal stain on rectal exam

However, at the Emergency Room patient was diagnosed firstly for infective diarrhoea thus the treatment started promptly with infusion of IV Fluids (Normal Saline Solution) for his hydration at the rate of 60 cc/ kg/ day in addition to maintenance fluids.

Work up was done which included:

- CBC results showed thrombocytosis with neutrophilic predominance; and
- The results of Serum Electrolytes revealed hyponatremia and hypokalaemia.
- Stool Exam and Stool Culture were also done.

Medications started were Zinc Sulphate at the rate of 20 mg per day in addition to the oral rehydration solution.

Patient was referred to Infectious specialist already with a consideration of Cholera thus

Erythromycin was started at the rate of 50 mg/kg/day (divided into 3 doses).

On reassessment by the specialist on the admission to the ward, patient was still having moderate dehydration and a positive fluid balance of 210 ml. The stool exam showed 55-65 WBC per high power field.

IV Fluid and medications were continued and the electrolyte imbalances were corrected.

On the following days at the ward, patient had:

- 4 episodes of loose watery stools amounting to 100 - 200 ml per episode;
- The stool was yellowish in colour, non-foul smelling, non-blood tinged and mixed mucoid material with passage of Ascaris.
- Patient was slightly irritable, with sunken eyeballs, otherwise with good skin turgor, mobility and strong pulses.

Thus, the specialist had continued infusion of IV fluid until the electrolyte imbalance got corrected and also administered Albendazole 400 mg/ tab single dose for her deworming.

- Stool culture was positive for *Vibrio cholerae*.

On the fifth Hospital Day, there was no recurrence of loose stool and passage of Ascaris. Dehydration was resolved. Erythromycin was given for 3 days. Patient was improved and discharged with take home medication of Zinc Sulphate.

Since the patient was not having teeth, Doxycycline as the drug of choice for the Cholera for a fast recovery might have prescribed. However, doxycycline is contraindicated in children less than 8 years of age because of the risk of yellow tooth discolouration and dental enamel hypoplasia.

Before discharge he might also have confirmed his condition as normal through tests:

- CBC, ESR, C-Reactive Protein
- Routine Urine Analysis and output
- Urine & Stool Culture if (-) for *Vibrio cholerae* and other Nosocomial infections.
- If patient was tolerating orally

He might have been called for an early follow up to be reassessed and prescribed probiotics and other growth regulatory supplements for a

complete well-being or might have been referred to a paediatrician.

The course of condition was more or less adequate right from the primary caregivers to the specialist. However, there was a fluid volume overload at the primary level due to not calculation of the IV fluid in the customized capacity of the patient. However, for patients aged 1 year and older, should be given 100 ml/kg IV in 3 hours, as follows: - 30 ml/kg as rapidly as possible (within 30 minutes); then - 70 ml/kg in the next 22 hours.

The fluid volume overload was apparent through raised HC, CC and AG which might have been mistaken for mild generalized edema or encephalomeningitis. The patient was also having Ascariasis which generally gives rise to eosinophils in the blood.

The bacterial protein toxin of *Vibrio cholerae*, cholera toxin - an exotoxin that binds to the membrane of enteric cells and stimulates the adenylate cyclase system, causing the hyper secretion of chloride and bicarbonate ions, resulting in increased fluid secretion and the severe diarrhoea characteristic of cholera. Cholera toxin is a member of the AB toxin [16] family and is composed of a catalytically active heterodimeric A-subunit linked with a homopentameric B-subunit [16, 17].

Cholera toxin is produced by the bacterium *Vibrio cholerae*. It is a gram negative curved rod (hence vibrio) with a single polar flagellum. This flagellum allows the bacterium to be motile, thus it can "swim" against a current [16]. The flagellum can also be a tool of attachment to host tissues in some cases.

Tetracycline/ Doxycycline are the antibiotics of choice for the treatment of Cholera; there is the most clinical experiences and several clinical trials which have shown their efficacy [19]. And moreover, azithromycin as well as furazolidone, or ciprofloxacin has also been effective in reducing the duration and volume of diarrhoea.

Chemical modification of antibiotics by using enzymatic function of acquired genetic traits [18, 19] is the most common mechanism of drug resistance in pathogenic bacteria including *V. cholerae*. Generally, *V. cholerae* acquire such enzymatic functions through HGT and become resistant against multiple antibiotics. Hence changing the antibiotic regimen remains the best strategy to get the best prognosis if the

previously administered antibiotic does not work properly.

7. CONCLUSION

This case study was aimed at finding lacunae in health delivery mechanism, if any, right from the onset of the disease to the discharging of the patient. Moreover, to create an illustration of the correct diagnosis through adequate patient's history, physical exam, due consideration of the differential diagnosis and pertinent laboratory workup and treatment algorithm of Cholera, hence, this case study, imitated to conduct a research review for enrichment of the literature, has fulfilled its rationale. The review report was prepared, in the light of existing literature, with the thorough study of the infection caused by *V. cholerae* to the patient.

Its sign and symptoms included loose watery diarrhoea and vomiting had resulted in water loss from the body and caused a severe dehydration to the patient. Due to excessive loss of water from the body, the patient might feel weak. If the patient was not given proper and timely care and treatment, his death might occur. Rehydration therapy with Zinc was used for fast and early recovery of the patient. On Laboratory confirmation through the Stool test positive for Cholera, antibiotics were added to the therapy. Further, after observing a passage of *Ascaris* during the course, antihelmintics were also added to the treatment plan. Some measures to get good prognosis and prevention were also adopted. Although it was a fare mechanism of healthcare delivery it could still be improved.

8. RECOMMENDATIONS

- Oral or intravenous hydration is the mainstay of cholera treatment.
- Zinc supplement should be added to the therapy plan
- Along with hydration therapy, treatment with antibiotics is recommended for patients who are severely or moderately dehydrated and continue to pass a large volume of stool during rehydration treatment.
- Antibiotic treatment is also recommended for all patients who are hospitalized [20].

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline participant consent and

ethical approval has been collected and preserved by the authors.

ITS MAIN PREVENTION STRATEGIES CAN BE

- Take rehydration solution
- Avoid eating contaminated food
- Drink boiled or purified water
- Never delay in the treatment

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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