EPIDEMIOLOGY OF CHOLERA 14&16-11-2023

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CHOLERA

- Is an acute diarrhoeal disease caused by Vibrio Cholerae.
- Cases range from symptomless to severe infections

- Typical cases are chracterized by the sudden onset of profuse, effortless, watery diarrhoea followed by vomiting, rapid dehydration, muscular cramps and suppression of urine.

- Unless there is rapid replacement of fluid and electrolytes, the case fatality may be high as 30 to 40 %

Case definition

- **Acute watery diarrhoea** is an illness characterized by three or more loose or watery (non-bloody) stools

within a 24-hour period.

- **Suspected cholera case**

In areas where a cholera outbreak has not yet been declared:

any person 2 years of age or older

presenting with acute watery diarrhoea and severe dehydration or dying from acute watery diarrhoea.

- In areas where a cholera outbreak has been declared, any person presenting with or dying from acute

watery diarrhoea.

EPIDEMIOLOGICAL FEATURES

- Cholera is both an epidemic and endemic disease.

- The epidemicity and endemicity of the disease depends on characteristics of the agent and the prevailing environment.

- The characteristics of the agent influencing its distribution include its ability to survive, its virulence, average number of organism required to cause infection.

- Epidemics of cholera are characteristically abrupt and can cause an acute public health problem.

- The epidemics have potentials to reach a peak and subside gradually as the force of infection declines.

- Often times by the time control measures are instituted the epidemic has already reached its peak and is waning.

- Thus a cholera epidemic in a community is self limiting.

- This is attributed to the acquisition of temporary immunity as well as due to occurrence of a large number of clinical cases.
- The force of infection is composed of force of infection through water and force of infection through living contacts.

- Therefore the elimination of contaminated water does not immediately bring an outbreak to an end as the tail of epidemic is produced due to continuation of transmission through contacts.

- In areas where cholera is endemic it does not show a stable endemicity.

- It undergoes seasonal fluctuations as well as epidemic outbreaks.

EPIDEMIOLOGICAL DETERMINANTS

- AGENT FACTORS
- HOST FACTORS
- ENVIRONMENT FACTORS.

AGENT FACTORS

- The agent that causes cholera is named as Vibrio cholerae.

- Vibrio cholerae are killed within 30 min by heating at 56 deg C, or with in a few seconds by boiling.

- They remain in ice for 4 – 6 weeks or longer.

- Drying and sunshine will kill them in a few hours.

- **Bleaching powder (6 mg/lit) instantly kills the organism.**

TOXIN PRODUCTION

- The vibrios multiply in the small intestinal lumen and produce an exotoxin (enterotoxin).
- This toxin produces diarrhoea through its effect on the adenylate cyclase-cyclic AMP system of the mucosal cells of the small intestine

- The endotoxin has no effect on other tissues except the intestinal epithelial cells

RESEVOIR OF INFECTION

- The human being is the only known reservoir

- The individual may be a case or a carrier

- Cases range from inapparent infections to severe ones

- Individuals with low immunity (undernourished children, people with HIV) are at a greater risk of death if infected

- It is the mild and asymptomatic cases that play a significant role in maintaining endemic reservoir

- Carriers are usually temporary, rarely chronic

- They make an important contribution to the reservoir of infection

INFECTIVE MATERIAL

- The immediate source of infection are the stools and vomit of cases and carriers

- Large number of vibrios (10^7-10^{10} vibrios /ml of fluid) are present in watery stools of patients

- An average patient excretes 10-20 litres of fluid

- Carriers excrete fewer vibrios than cases (10^2-10^5 vibrios / ml stool)

INFECTIVE DOSE

- Cholera is dose related

- Infection occurs when the number of vibrios ingested exceeds the dose that is infective for the individual

- Experiments suggests that in a normal person a very high dose – 10^{11} organism is required to produce clinical disease

PERIOD OF COMMUNICABILITY

- A case of cholera is infectious for a period of 7-10 days

- Convalescent carriers are infectious for 2-3 weeks and chronic carrier state may last from a month upto 10 years or more

CARRIERS IN CHOLERA

- A cholera carrier may be defined as an apparently health person who is excreting V.cholerae

- Four types of cholera carriers have been identified

- **PRECLINICAL or INCUBATORY CARRIERS**:The incubatory carriers are potential patients (since the incubation period of cholera is short ;1-5 days, incubatory carriage is of short duration)

- **CONVALESCENT CARRIERS:**
  Patients who have recovered from an attack of cholera may continue to excrete vibrios during the convalescence period for 2-3 weeks

- Convalescent state has been reported among patients who have not received effective antibiotic treatment

- The convalescent carriers can often become chronic or long term carriers

- **CONTACT HEALTHY CARRIERS**: This is the result f sub clinical infection contracted through association with a source f infection (in case of an infected environment)

- The duration of contact carrier state is usually less than 10 days. The gall bladder is not infected and stool culture is frequently positive for vibrios

- CHRONIC CARRIERS: A chronic carrier state occurs infrequently

- The gall bladder is infected in this state. In such case antibody titre against V.cholerae 01 raises and remains positive as long as the person harbours the organism

HOST FACTORS

- AGE & GENDER: Cholera affects all age and both gender

- In endemic areas attack rate is highest in children

- Gastric ACIDITY : Is an efective barrier

- The vibrio is destroyed at an acidity of pH 5 or lower. Condition that affect gastric acidity may influence individual susceptibility

- **POPULATION MOBILITY:** Movement of population (pilgrimage, marriages, fairs & festivals) results in increased risk of exposure to infection

- In this jet age cases and carriers can easily transfer infection to other countries

1st case registered in 1000 AC

- ECONOMIC STATUS: Incidence of cholera tends to be highest in the lower socio economic groups which could be attributed to poor hygiene

- IMMUNITY: An attack of cholera is followed by immunity to re infection, but the duration and degree of immunity are not known

- Vaccination gives only partial immunity

ENVIRONMENTAL FACTORS

- Vibrio transmission is highly possible in a community with poor environmental sanitation

- The environmental factors of importance include contaminated water and food

- These comprise certain human habits favouring water and soil pollution, low standards of personal hygeine, lack of education and poor quality of life

MODE OF TRANSMISSION

- Transmission occurs from man to man via faecally contaminated water, contaminated food and drinks and by direct contact

- **FAECALLY CONTAMINATED WATER: Uncontrolled water sources such as wells,ponds,lakes, streams and rivers pose a great threat.**

- CONTAMINATED FOOD AND DRINKS: Ingestion of contaminated food and drinks have been associated with the outbreak of cholera

- Bottle feeding could be a significant risk factor for infants

- Fruits and vegetables washed with contaminated water can also be a source of infection

- Cooked foods can get contaminated by contaminated human handling and by flies

- DIRECT CONTACT: In developing countries considerable number of cases may result from secondary transmission
- (person to person transmission through contaminated fingers while carelessly handling human excreta or vomitus of patients & through contaminated linens and fomites

INCUBATION PERIOD

- Incubation period ranges from a few hours upto 5 days, commonly 1-2 days

CLINICAL FEATURES

- The severity of cholera depends on the rapidity and duration of fluid loss
- A typical case of cholera shows three stages:

1.Stage of evacuation

2. Stage of collapse

3. Stage of recovery

- **STAGE OF EVACUATION: The onset is abrupt with profuse, painless, watery diarrhoea followed by vomiting. The patient may pass as many as 40 stools in a day. The stools may have rice watery appearance**

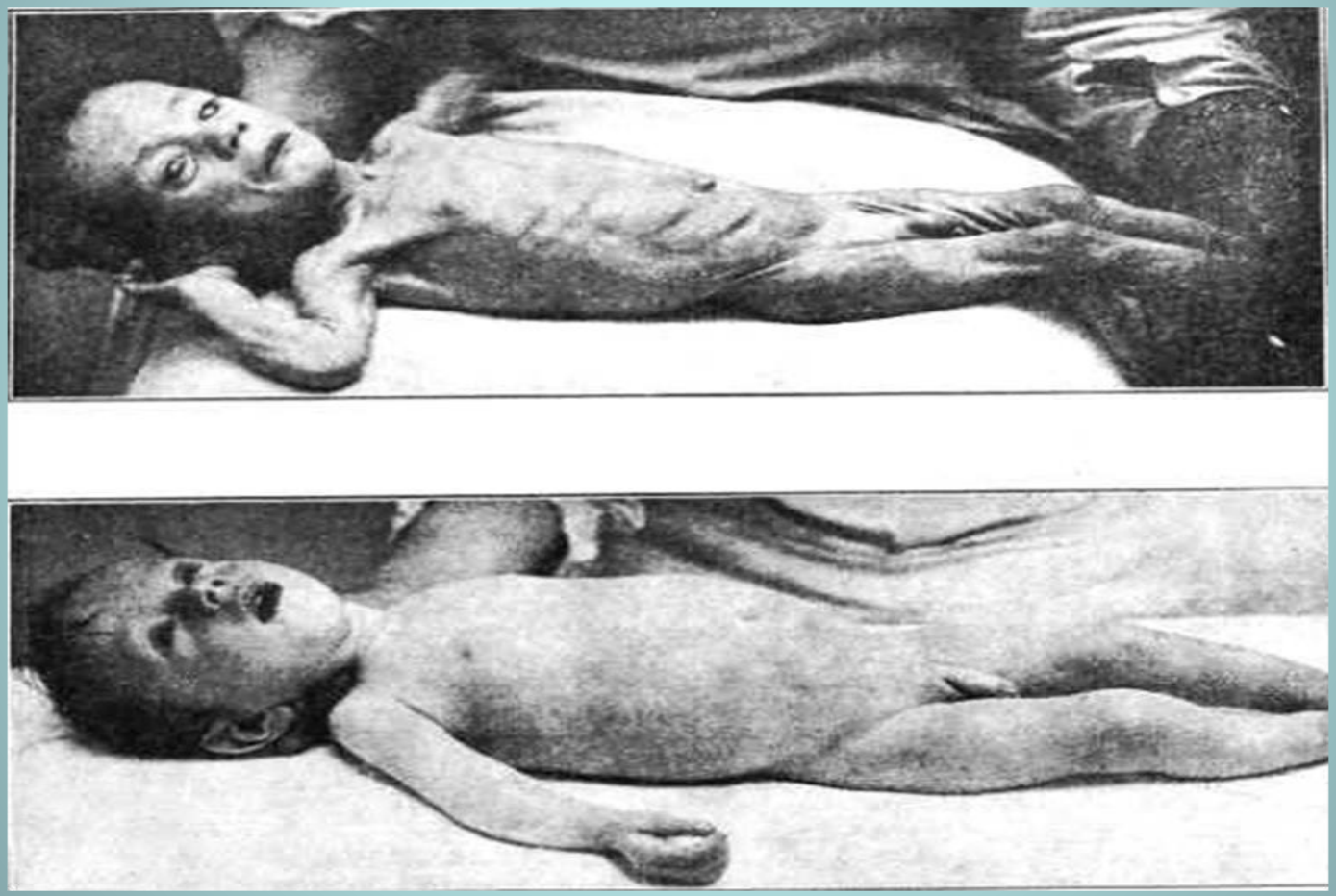
Rice-water Stool of Cholera

Source: Tropical Medicine and Parasitology, 1995

- **STAGE OF COLLAPSE:** The patient then passes into the stage of collapse because of dehydration.

- The classical signs are sunken eyes, hollow cheeks, scaphoid abdomen, sub normal temperature, washer man's hands and feet, absent pulse, unrecordable blood pressure, loss of skin elasticity, shallow and quick respirations.

Infant with Cholera



Skin turgor

- The output of urine decreases and may ultimately cease. The patient becomes restless and complains of intense thirst and cramps in legs and abdomen.

- Death may occur at this stage, due to dehydration and acidosis resulting from diarrhoea

- STAGE OF RECOVERY: If death does not occur then patients begin to show signs clinical improvement

- The blood pressure begins to raise, the temperature returns to normal and urine secretion is re establishd. If anuria persists, the patient may die of renal failure

LAB DX

- 1. STOOL EXAM.
- 2. STOOL CULTURE.
- 3. PCR.
- 4. RAPID TEST(LOW SENSITIVITY &specificity)(DIP STICK)

LAB DIAGNOSIS

- Lab methods of diagnosis are required to confirm the diagnosis

- COLLECTION OF STOOLS: a fresh specimen of stools should be collected for laboratory examination

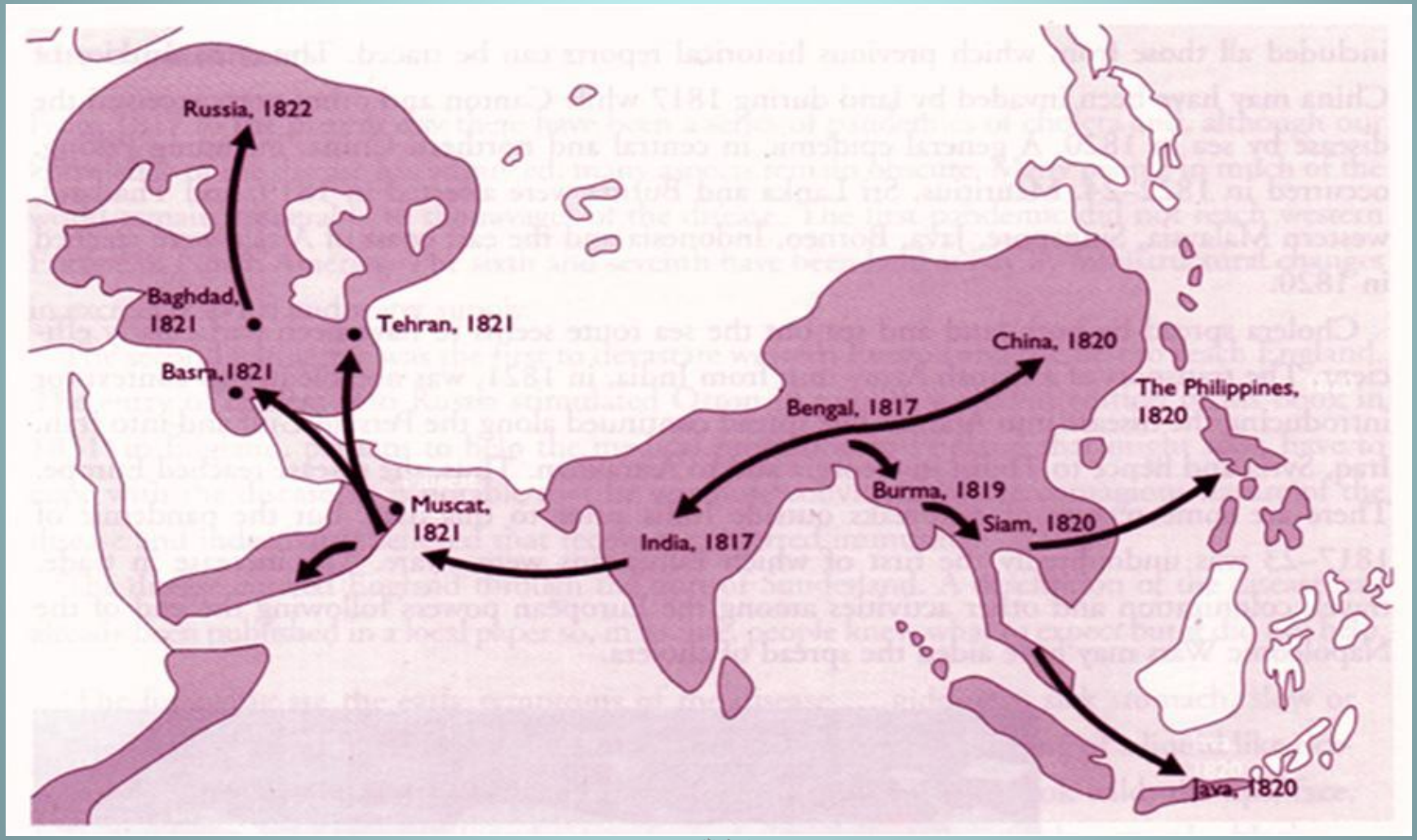
- Sample should be collected before the person is treated with antibiotics

- If suitable plating media are available (bile salt agar) at the bedside the stools should be streaked on to the media and forwarded to the lab with the transport media
- DIRECT EXAMINATION: If a microscope with dark field illumination is available it may be possible to diagnose about 80 percent of cases within few min

Pandemics and epidemics of cholera

- Seven cholera pandemics have occurred in the past 200 years from 1817 to 1961, according to a World Health Organization factsheet in March 2022.
- Additionally, there have been many documented major local cholera outbreaks

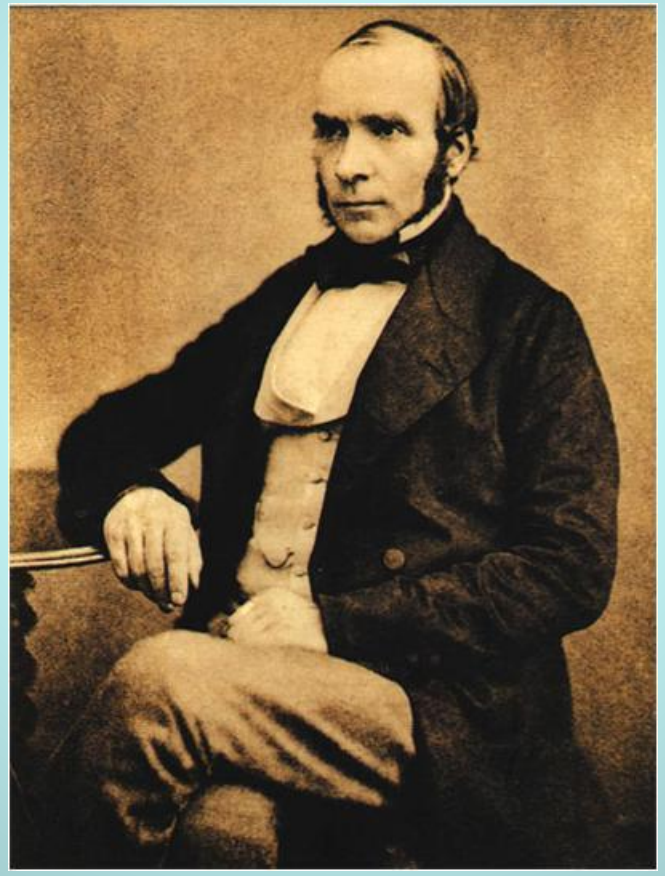
1ST PANDEMIC



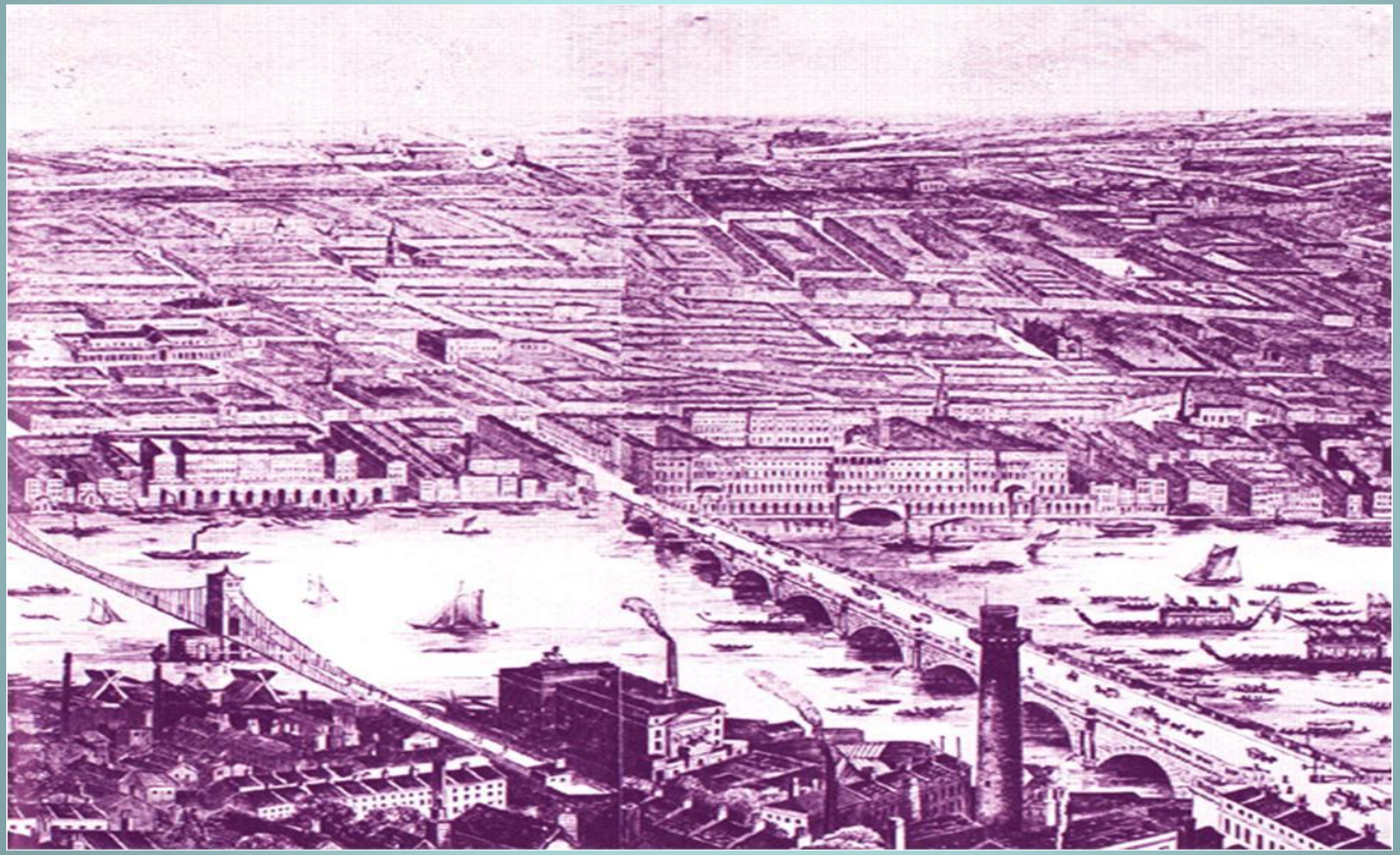
Cholera 1800s

Miasma

John Snow



London in the 1850's



London map chart

Water Supply London 1850's

DEATH'S DISPENSARY.

OPEN TO THE POOR, GRATIS, BY PERMISSION OF THE PARISH.

Broad street pump

Iraq outbreaks

- 1999 Baghdad 874 cases
- 2001 321 cases
- 2002 423 cases
- 2003 192 cases
- 2004 35 cases
- 2007 4567 cases in North
- 2008 644 cases mostly in Babelon

أبو غريب 2015

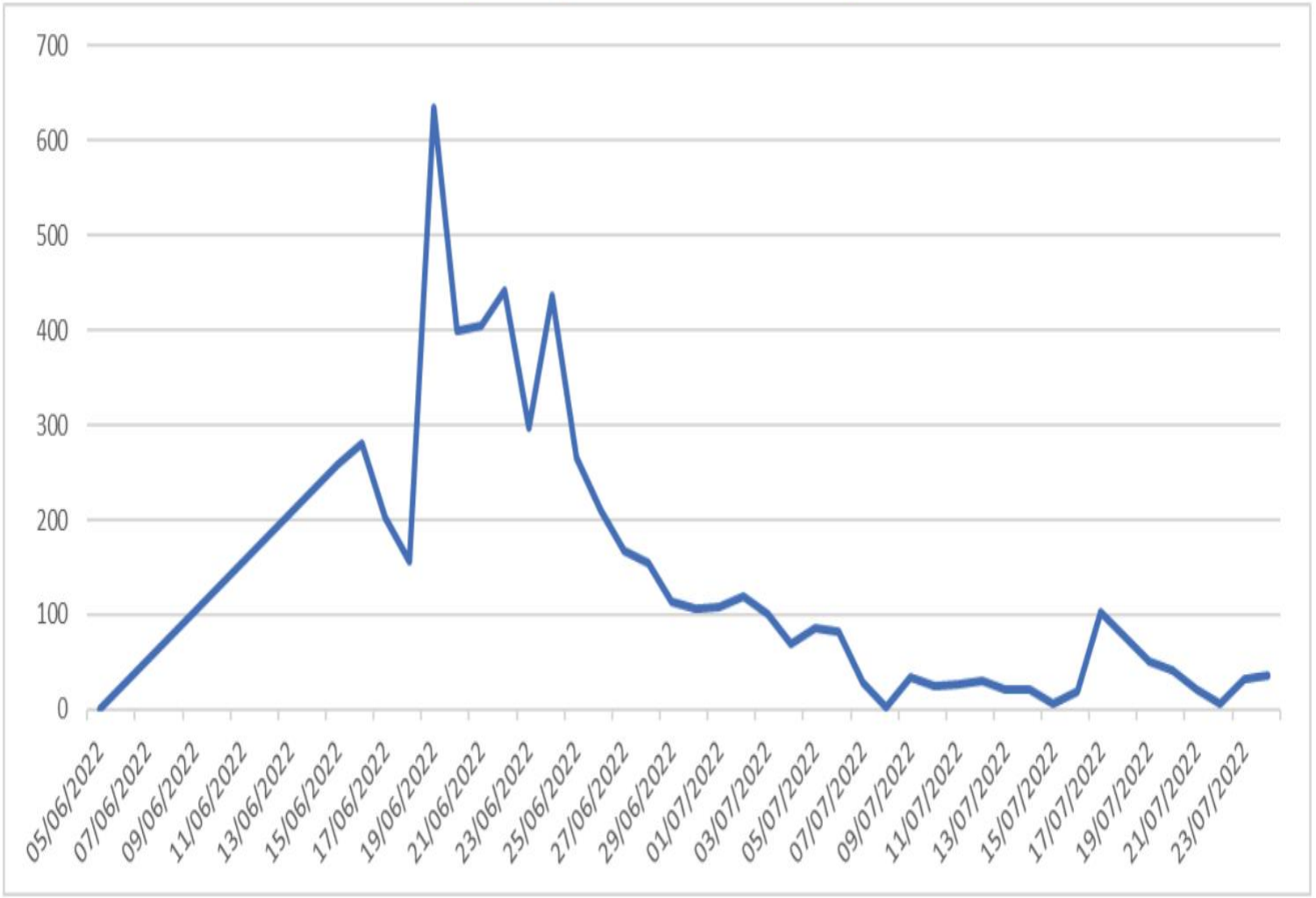
2810 cases till 22 nd of November 2015

- Confirmed cases – have a positive laboratory result (isolation of the causative agent or positive serological test). This case definition has high specificity.
- Probable cases – have the typical clinical features of the illness but without laboratory confirmation.
- Possible cases – have fewer or atypical clinical features. This case definition has high sensitivity.

Last Cholera outbreak in Iraq

- June 2022(Kurdistan, Kirkuk, Al Muthanna).
- 783 confirmed cases , 4 deaths, thousands of admissions due to acute diarrhea.
- Sewage water irrigation of vegetables(common practice) due to shortage of Tigris and Euphrates rivers.

Hospital admissions due to acute diarrhea, Sulaymaniyah, 5 Jun – 24 July 2022



Syria : cholera out break Sept. 2022

- 936 severe acute watery diarrhea
- 8 deaths.
- Source of infection :
- Drinking unsafe water from Euphrates river, contaminated water to irrigate crops resulting in food contamination.

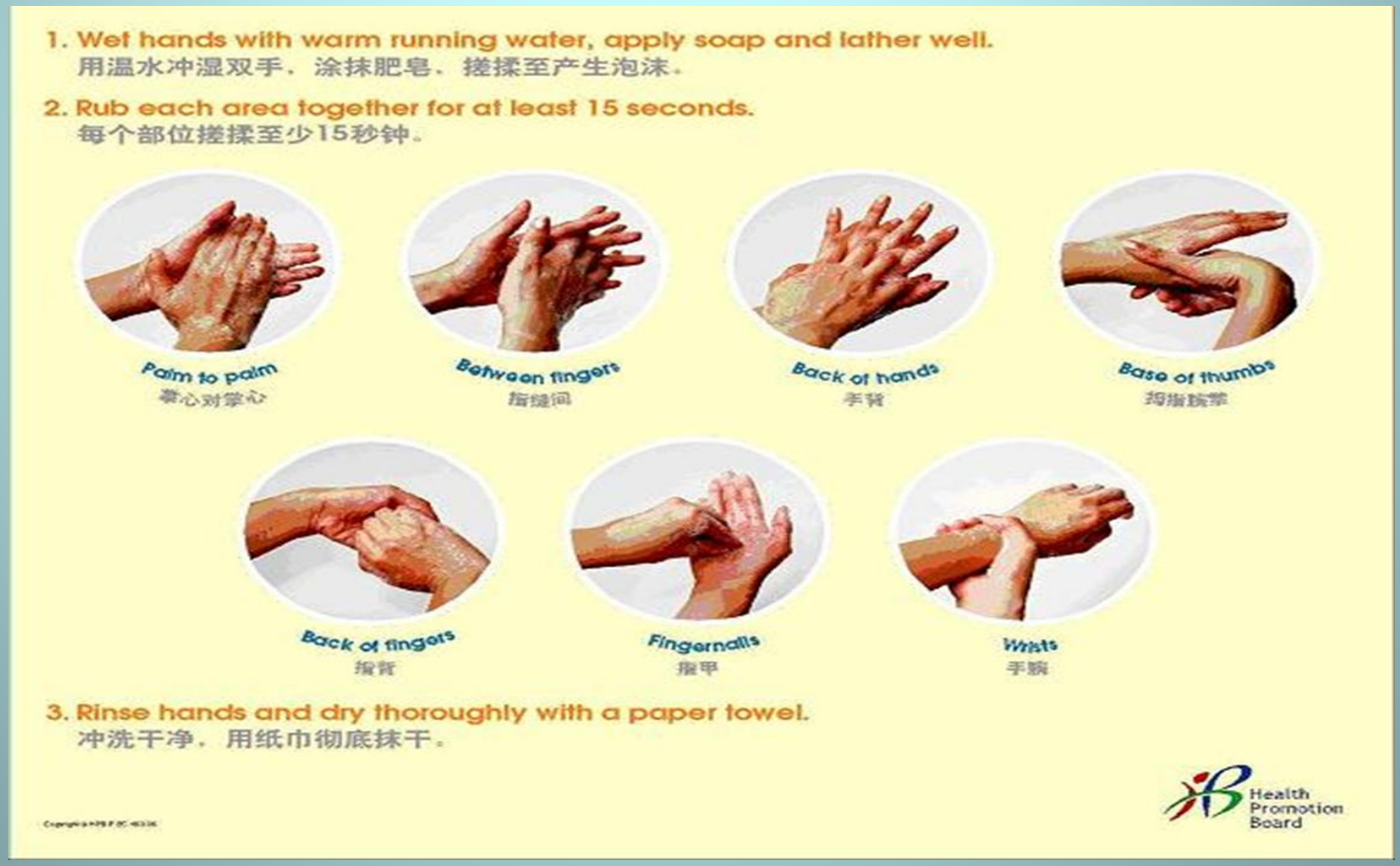
Methods of control

A. Preventive measures:

Prevention is based on access to safe water and proper sanitation as well as adhesion to safe food handling practices.

Methods of control

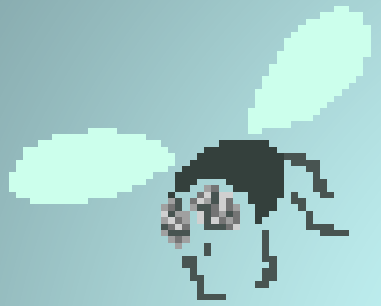
- 1.Educate the public regarding the importance of hand washing.



Safe water

Or chlorinate water(1%)

Fly control



Proper human feces disposal


مشروع الرستمية القديم
يناير 2022
تاريخ التقاط الصورة: يناير 2022
قد تكون الصور محمية بموجب حقوق النشر.
البنود
الخصوصية

avoid possible backflow connections between water and sewer systems.

Cholera vaccine

Characteristics of currently available vaccines

COMMERCIAL NAME	Dukoral® (WC/rBS)	Shanchol™ (BivWC)
Protection against	*V. cholerae* O1 for > 50% for 2 years Earliest onset of protection 7 days after 2nd dose	*V. cholerae* O1 and O139 for > 50% for at least 3 years Earliest onset of protection 7-10 days after 2nd dose
Exclusion criteria	Children < 2 years	Children < 1 year
Presentation	Oral suspension (vaccine) and effervescent granules (buffer)	Oral suspension (vaccine)
Shelf-life	3 years	30 months
Storage	Cold chain (+2 – +8 °C)	Cold chain (+2 – +8 °C)
Stability at ambient temperature	1 month at 37 °C	VVM type 14 (14 days at 37°C)
Administration course	2 doses minimum 1 to maximum 6 weeks apart	2 doses at an interval of 2 weeks
Amount of drinking water needed/dose	150 ml for adults and children > 6 years 75 ml for children aged 2–5 years	Administered without any buffer, to be followed by water ingestion
Current price (2013)	~ $ 4.7-9.4 per dose	~ $ 1.85 per dose

Vaxchora®(live attenuated)

- Has been reported to reduce the chance of severe diarrhea in people by 90% at 10 days after vaccination and by 80% at 3 months after vaccination.
- The safety and effectiveness of Vaxchora® in pregnant or breastfeeding women is not yet known.
- it is also not known how long protection lasts beyond 3 – 6 months after getting the vaccine.

Measures that inhibit or otherwise compromise the movement of people, foods or other goods are not epidemiologically

justified and have never proved effective to control cholera.

Control of patient, contacts and the immediate environment

1) Report to local health authority.

2) Isolation: Hospitalization with enteric precautions is desirable

for severely ill patients; strict isolation is not necessary.

3.Concurrent disinfection: Of feces,vomit and articles used by patients,

In communities with a modern and

adequate sewage disposal system, feces can be discharged

directly into the sewers without preliminary disinfection.

4) Quarantine: Not applicable.

Management of contacts

Chemoprophylaxis

Tetracycline

Doxycycline

Erythromycin

- Mass chemoprophylaxis of whole communities is never indicated

Specific treatment

The cornerstone of cholera treatment is timely and adequate rehydration.

Patients presenting mild dehydration can be treated successfully by oral rehydration therapy using ORS.

Only severely dehydrated patients need rehydration through intravenous routes to repair fluid and electrolyte loss through diarrhea.

C. Epidemic measures:

1) Educate the population at risk concerning the need to seek appropriate treatment without delay.

2) Provide effective treatment facilities.

3) ensure a safe water supply.

Chlorinate public water supplies, even if the source water appears to be uncontaminated.

4) Initiate a thorough investigation designed to find the vehicle

of infection and circumstances (time, place, person) of

transmission, and plan control measures accordingly.

وزارة التربية أوضحت أن التأجيل جاء كإجراء وقائي لحماية الأطفال من مرض الكوليرا ، ومن أجل منح فرصة مناسبة لوزارة الصحة لإكمال أستعداداتها وأجراءاتها الوقائية

WHO has mobilized 510 000 doses of oral cholera vaccine to help control cholera outbreak among high-risk groups in Iraq

Reference manual of control communicable diseases