

# Water-borne Disease





# Content

1. Amoebic Dysentery
2. Bilharzia (*Schistosomiasis*)
3. Cholera
4. Campylobacteriosis (*campy*)
5. Leptospirosis (*Weil's disease*)
6. Hepatitis A
7. Girdiasis
8. Gastroenteritis (*gastric flu*)
9. Cryptosporidiosis (*crypto*)
10. Malaria
11. Poliomyelitis (*Polio/infantile paralyses*)
12. Shigellosis (*Shiggela dysentery*)
13. Trachoma
14. Swimmers itch (*non-human bilharzia*)
15. Typhoid fever



# Amoebic Dysentery

## What is Amoebic Dysentery?

- Amoebic dysentery is a diarrhoeal disease.
- It is caused by the **parasite** *Entamoeba histolytica*.
- In 90% of infection cases, there are no symptoms.
- If symptoms occur, it appears within 3 days to 3 months after infection.
- Typical symptoms:
  - bloody diarrhoea
  - abdominal tenderness
  - nausea
  - weight loss.
- Life-threatening complications:
  - intestinal perforation
  - spreading to liver or other organs.

## How is Amoebic Dysentery transmitted?

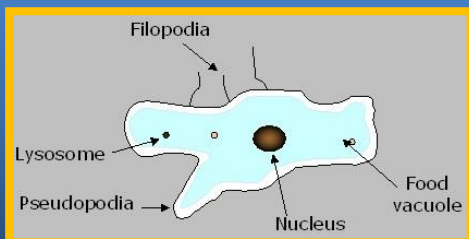
- Via the **faecal-oral route**, comprising of excretion by the infected individual and subsequent drinking of infected water or consumption of infected food.
- **Person-to-person** spread under unhygienic conditions.
- Eating of raw fruit or vegetables, which have been irrigated with contaminated water.
- Outside the human body, the organism remains viable in a cyst in moist soil for long periods.

## How can Amoebic Dysentery patients be treated?

- Anti-parasitic medication for symptom treatment.
- Surgical intervention may be necessary where complications occurred.

## How can Amoebic Dysentery be prevented?

- Always wash fresh fruits and vegetables with uncontaminated fresh water before consumption.
- Practice strict hygienic principles after using the toilet and before preparing the food.
- Do not drink contaminated water.
- Disinfect water with 1 teaspoon of domestic bleach to 20 litres of water and wait for 1 hour before drinking. Cloudy water can be disinfected with 2 to 4 teaspoons of domestic bleach.



# Bilharzia (*Schistosomiasis*)

## What is Bilharzia?

- Bilharzia is an infection by a parasitic flatworm (blood-fluke).
- In South Africa there are 2 kinds of flatworms:
  - *Schistosoma haematobium*, causing urinary and bladder bilharzia.
  - *Schistosoma mansoni*, causing intestinal bilharzia.
- Adult flatworms can live and deposit eggs for many years in the small blood vessels, lining the bladder or the large intestine. These eggs are trapped in the tissues, where they eventually calcify or are passed out with the urine or stool.
- The symptoms range from weakness or fatigue to the presence of blood in the last few drops of urine passed.
- Some people can also develop a life-threatening systemic allergy (Katayama fever) due to these parasites.
- Heavy bilharzia infection can eventually cause bladder cancer.

## How is Bilharzia transmitted ?

- Humans are the primary host and freshwater snails the secondary host of the bilharzia parasite.
- The life cycle of the flatworm is maintained when infected humans urinate or defecate in or near water bodies.
- The flatworm eggs hatch in the water and the larval stage (miracidium) enters the water snails, where they mature.
- These snails then release free-swimming larvae (cercariae), which can survive in the water for up to 48 hours and then penetrate the human skin within seconds of contact. In humans, bilharzia affects the liver, lungs, spleen, intestines and the bladder.

## How can Bilharzia patients be treated?

- Anti-bilharzia medication destroys the flatworms in the body. Katayama fever is treated with allergy suppressing medication.
- Medical treatment of bilharzia can cure the patient from infection, but damage to body tissues cannot be cured.

## How can Bilharzia be prevented?

- Avoid contact with contaminated water. Do not swim in or drink it.
- Install treated water supplies.
- Proper sanitation, recreational and laundry facilities.
- Screening and treating people for bilharzia will diminish the source of parasites introduced to the water body





# Cholera

## What is Cholera?

- Cholera is a diarrhoeal disease, caused by the **bacterium** *Vibrio cholerae* and has a very sudden onset. Stools look like rice water.
- Symptoms appear within 2 to 4 days after ingestion of the bacteria.
- Dehydration because of **vomiting** and **diarrhea** are the main symptoms.
- Severe **dehydration** can be fatal, as quickly as within 6 hours, if untreated.

## How is Cholera transmitted?

- By eating and drinking contaminated food or water, you can contract cholera bacteria.
- Faecal excretions into water sources introduce the bacterium into the water, where it can live for at least 3 weeks, if the water is warm, saline or alkaline. These bacteria can also survive in food, especially seafood.
- As much as 70% of people, who drink contaminated water, can become carriers, with little or no symptoms. These people can excrete the bacteria for up to a few weeks.

## How can Cholera patients be treated?

- Rehydration by replacing water and salts are essential and the most effective treatment of cholera.
- Sports drinks with all the essential salts and minerals or a weak solution of sugar and salt can be drunk to replace lost fluids and salts.
- Vaccination against cholera offers little protection for up to 6 months, but does not prevent infection and subsequently also not transmission.
- Although antibiotics may help by shortening the duration of the diarrhoea, it will not prevent fatal dehydration, which can only be treated by rehydrating the patient orally or intra-venous with fluids.

## How can Cholera be prevented?

- Do not drink untreated water and Practice proper personal hygiene.
- Disinfect the water by adding 1 teaspoon of domestic bleach to 20 litres of water and leave for at least one hour before drinking. Cloudy water can be treated with an extra 2 to 3 teaspoons of bleach. Where bleach is not available, water must be boiled for at least 3 minutes continuously. Take care of burning.
- Install and maintain sanitation infrastructure.
- Use clean water containers and prevent recontamination of stored water by refraining from inserting your hand or contaminated objects into the water.

# Campylobacteriosis (*campy*)

## What is Campylobacteriosis?

Campylobacteriosis (*campy*) is a diarrhoeal disease of the intestines caused by the **bacterium** *Campylobacter jejuni*.

Slight infections may have mild symptoms such as slight to severe diarrhoea, which may be bloody (dysenteric), together with abdominal cramps, fever and in severe cases, vomiting and convulsions.

Symptoms generally appear 3 to 5 days after infection.



## How is Campylobacteriosis transmitted?

- This disease is mostly transmitted through the **faecal-oral route**.
- **Pets, poultry and cattle** are the most common animals that serve as reservoirs of the bacterium. Therefore impeccable hygiene is required when preparing poultry for cooking in order to prevent contamination of other foods and drinks.
- **Faecal excretion of animals** into water sources causes contamination. All raw water should therefore be chlorinated before it is consumed.
- **Humans** can also transmit the bacterium for a week or two after the infection has subsided.
- **Milk** can also cause infection. Do not drink unpasteurised milk.

## How can Campylobacteriosis patients be treated?

Firstly, the patient must be **rehydrated** with fluids and salts.

If the infection is severe, **antibiotic medication** will shorten the duration of the infection.

**Children, the elderly and HIV positive patients** are most susceptible to and may recover much slower from the disease.

## How can Campylobacteriosis be prevented?

- Good personal hygiene, such as washing hands before eating and after going to the toilet, changing nappies or touching animals.
- Never eat any poultry that is undercooked, especially microwave-cooked poultry. Knives and cutting boards must be cleaned very thoroughly with soap and warm water after preparing poultry for cooking.
- Do not drink untreated water.
- Disinfect the water by adding 1 teaspoon of domestic bleach to 20 litres of water and leave for at least one hour before drinking. Cloudy water can be treated with an extra 2 to 3 teaspoons of bleach.





# Leptospirosis (*Weil's disease*)

## What is Leptospirosis?

- Leptospirosis is a common zoonotic diseases, i.e. a disease that can be spread from animals to humans.
- It is a systematic infection by one of more than 200 serotypes of the spirochaete (**bacteria** with a spiral or corkscrew shape) *Leptospira interrogans*.
- Mild infections are often confused with "influenza" and asymptomatic cases of Leptospirosis are common.
- The incubation period is a few days to 3 weeks after infection.
- Typical symptoms are fever, muscle aches and fatigue.
- Severe and often fatal Leptospirosis infections are referred to as Weil's disease, where the symptoms are jaundice, kidney and liver failure and haemorrhages.

## How is Leptospirosis transmitted?

- Wild animals, such as rodents are the natural hosts of Leptospirosis, in which case the spirochaeta is excreted in the urine of the infected animal. Domestic animals can act as intermediate hosts, when infected by wild animals.
  - Humans can contract this disease by:
    - Skin contact with animal urine, e.g. through an open skin wound or eyes.
- Ingestion of contaminated water, food or moist soil.
- Leptospirosis is a common occupational infection in e.g., miners, rice farmers, water sport enthusiasts, sugar cane workers, veterinarians, sewer workers or anyone working in a watery environment that is contaminated with rodent urine.
- Spirochaetes can live in fresh water or moist soil for several months, but are eradicated by drought.

## How can Leptospirosis patients be treated?

- Leptospirosis is not easily suspected or diagnosed, except in severe cases as in Weil's disease. It should be suspected if fever occurs in patients that had close contact with rodents.
- Specific antibiotics are available to combat infections.
- Most patients recover, but professional clinical follow-up examinations are recommended as symptoms can linger for many years.

## How can Leptospirosis be prevented?

- Avoid skin contact with contaminated water, especially when you have an open skin wound. Wear protective clothing in contaminated water.
- Rodent control and proper hygiene and sanitation in food storage areas. Prevent water contamination by fencing of recreational aquatic areas.
- Do not drink contaminated water before disinfecting it with domestic bleach.

# Hepatitis A

## What is Hepatitis A?

- Hepatitis **A** is a **viral** disease that causes inflammation of the liver.
- The incubation period can be two to six weeks.
- The symptoms are fatigue, loss of appetite, sensitive and tender liver, dislike of fatty foods, chalk white stools, yellow discoloration of the skin and the whites of the eyes (jaundice) and sometimes diarrhoea.
- Some cases of Hepatitis A are completely without symptoms, but such patients can still be infectious. In such cases diagnosis is made on blood tests.
- Most patients recover completely and chronic infections occur rarely and usually does not suffer from long-term effects.

## How is Hepatitis A transmitted?

- Transmission is mainly through:
  - the faecal-oral route
  - drinking contaminated water
  - eating contaminated food
  - close personal contact.

## How can Hepatitis A patients be treated?

- Symptoms can be treated with appropriate medicine, good bed rest and by avoiding alcohol until the liver has fully recovered.
- In acute cases, hospitalisation may be necessary.

## How can Hepatitis A be prevented?

- Do not drink untreated water.
- Disinfect water by adding one teaspoon domestic bleach to 20 litres of water and waiting one hour before drinking. If water remains cloudy, add another 2 to 3 teaspoons of bleach.
- If bleach is not available, cook water vigorously for 5 minutes and simmer afterwards for 15 minutes, to disinfect the water.
- Proper personal hygiene and superb cleanliness in the kitchen is essential when preparing food.
- Proper and effective sanitation practices.
- Vaccinations are available and vaccination with immune globulins within 2 weeks of contact with an infected person may prevent infection.
- Practice safe sex.



# Giardiasis

## What is Giardiasis?

- Giardiasis is a mild diarrhoeal disease, caused by a **parasite**, *Giardia lamblia*.
- Symptoms of Giardiasis can vary from none to flatulence, bloating, "stomach" cramps and loose greasy stools.
- Diarrhoea usually lasts for a few days to one week, but in severe cases can take longer and result in weight loss.

## How is Giardiasis transmitted?

- Infected humans excrete the parasite and it can also occur in the excretions of animals.
- Infection occurs through drinking contaminated water. Water is contaminated by poor sanitation.
- Infection can also occur by means of person-to-person contact, when personal hygiene is poor. Poor personal hygiene can also lead to the contamination of drinking water and food.

## How can Giardiasis patients be treated?

- Prescription medicine is available for the effective treatment of Giardiasis.
- HIV patients may require more extensive medical treatment.

## How can Giardiasis be prevented?

- Good personal hygiene, such as washing your hands thoroughly with soap and warm water after changing nappies or using the toilet.
- Infected people, that handle food, must be booked of.



# Gastroenteritis (*gastric flu*)

## What is Gastroenteritis?

- **Symptoms** of gastroenteritis have a sudden onset and comprise of vomiting, watery diarrhoea, as well as mild fever and stomach cramps.
- The **incubation period** for gastroenteritis is very short, between 8 and 48 hours.
- Several microbial **bacteria** (*Salmonella enteritis* and *E. coli* O157) and viruses (rotaviruses, enteroviruses and adenoviruses) can cause gastroenteritis.
- Healthy people can recover from such an infection within a few days, but for advanced HIV patients, infants and the elderly, it can be fatal, due to dehydration.

## How is Gastroenteritis transmitted?

Gastroenteritis is transmitted by:

- Eating contaminated food or drinking contaminated water.
- The faecal oral route, under unhygienic circumstances.
- Sharing the same eating utensils.
- Consuming contaminated ice cubes, since these micro-organisms can survive freezing.

## How is Gastroenteritis patients be treated?

- Immediate and urgent rehydration therapy, especially in infants and the elderly.
- Antibiotic medication is not recommended, unless in the cases of very old or infantile patients, or in the presence of fever and or bloody stools.
- Vaccination is not possible, due to the large variety of pathogens.
- Sports drinks or a weak solution of salt and sugar (get more information from your local clinic) can be consumed to prevent dehydration.

## How can Gastroenteritis be prevented?

- Do not drink untreated water and always use clean drinking water containers.
- Water can be disinfected by adding one teaspoon of domestic bleach to 20 litres of water and waiting at least one hour before drinking.
- If no bleach is available, water can be boiled vigorously for at least 5 minutes and simmered afterwards for at least 15 minutes, before drinking.
- Some essential preventative actions are:
  - Good personal hygiene, such as washing your hands after using the toilet.
  - Proper cleaning of soiled linen.
  - Proper sanitation facilities.
  - Prevent contamination of drinking water, by treating wastes and controlling flies.

# Cryptosporidiosis (*crypto*)

## What is Cryptosporidiosis?

- Cryptosporidiosis is a gut infection, caused by the **parasite**, *Cryptosporidium parvum*.
- The symptoms appear within 1 to 12 days after infection and mainly consist of watery diarrhoea and stomach pains.
- Other symptoms are vomiting and slight fever.
- Healthy people can recover from such an infection after 1 to 2 weeks.
- For HIV positive patients the recovery period may be much longer and the infection can even be fatal.
- Anyone with a poor immunity system will be more prone to catch the disease.

## How is Cryptosporidiosis transmitted?

- Infection occurs with ingestion of contaminated drinking water and contaminated food, as well as through person-to-person contact.
- Sometimes animals can serve as a bacterium reservoir and transmission can then be via the animal faeces.

## How can Cryptosporidiosis patients be treated?

- These parasites are not readily destroyed by medication.
- Only the symptoms can be treated. Anti-diarrhoeal medication can be taken to diminish the diarrhoeal phase and so restrict dehydration to the minimum.
- Once the diarrhoea is stopped, rehydration treatment to replace lost fluids and salts.
- Infections are usually self-limited in people with healthy immune systems.

## How can Cryptosporidiosis be prevented?

- Filter drinking water with an extremely small pore size filter (0,1 to 1.0 micrometer) or boil the water for at least one minute.
- Chlorination with household bleach does not kill the parasites.
- Only very strong UV light will kill the parasites.
- Good personal hygiene and proper sanitation are essential.
- People with poor immune systems, must always wash their fruit and vegetables well with clean or boiled and cooled water and they must refrain from touching animals, especially lambs and calves without washing their hands.





# Malaria

## What is Malaria?

- Malaria is a **parasitic** disease caused by one of four types of *Plasmodium* (*P. falciparum*, *P. vivax*, *P. ovale* and *P. malariae*), of which *Plasmodium falciparum* is the most common, but also the most dangerous in causing malaria in South Africa.
- Symptoms can appear within 1 to 4 weeks after being bitten by an infected mosquito or it can take as long as a year to surface.
- Typical symptoms, such as headaches, aching joints, fever and sweating followed by cold shivers occur intermittently at intervals of 1 to 3 days.
- Malaria is often misdiagnosed as “influenza”, gastroenteritis or viral hepatitis.
- Early diagnosis is vital with *Plasmodium falciparum*, as this form of malaria progresses quickly to the brain (cerebral malaria), causing coma and even death.
- Malaria is endemic to the warmer areas of South Africa (Northern Province, Mpumalanga and KwaZulu-Natal), but can be spread by people moving in vehicles from one area to the next.
- Malaria can have distorted atypical symptoms in patients that are partially immune or who used prophylactic medicine.

## How is Malaria transmitted?

- Malaria is transmitted:
  - Predominantly, by the bite of an anopheles mosquito.
  - Blood transfusions.
  - Via the placenta from a mother to her child.
  - Contaminated needles among intravenous drug users.
- Malaria is a water-vector disease.

## How can Malaria patients be treated?

- Early diagnosis is essential to treat malaria falciparum successfully, preventing dangerous complications.
- Diagnosis is best made by means of a microscopic examination of a blood smear.
- Anti-malarial medication is available.

## How can Malaria be prevented?

- Use mosquito repellents, especially in the evenings.
- Use mosquito bed-nets impregnated with residual insecticides.
- Use prophylactic medication. Consult a medical expert, as in certain areas; some malaria strains have developed immunity to anti-malarial medicine, some medicines have severe side effects, especially pregnant women).
- Drain water puddles where mosquitoes may breed and spray homes and surrounding areas with insecticides.





## **Poliomyelitis (*Polio/infantile paralyses*)**

### **What is Poliomyelitis?**

- Poliomyelitis is a **viral** disease, damaging in severe cases the motor nerves, which activate movement.
- It is characterised by acute flaccid paralysis (AFP – paralysis with a loss of motor movement, where the muscles are soft and limp and the limbs remain soft and supple) in severe cases.
- Incubation period is from 1 to 2 weeks.
- Symptoms are initially throat and gastrointestinal infections, resembling the early stages of influenza. 95 % of infections are without symptoms at all and patients recover completely from these mild and asymptomatic polio infections.
- In severe cases the next stage of muscle paralyses develop with symptoms such as muscle pain and stiffness in the back and neck.
- In some cases the polio virus can infect the muscle tissue that is necessary for breathing and this could be fatal.
- People that are most susceptible to the polio virus are children. Therefore the alternative name for polio is infantile paralyses.

### **How is Poliomyelitis transmitted?**

- The polio virus is excreted in the throat secretions or the stools of infected people from just before the symptoms appear and until several weeks thereafter.
- It is highly contagious and transmitted by person-to-person contact.
- In cases of poor personal hygiene, it can spread through the faecal oral route.
- Drinking contaminated water rarely spreads polio.

### **How can Poliomyelitis patients be treated?**

- There is no cure for polio, only the symptoms can be treated.
- The best control of polio is through prevention.
- Immunisation is only effective if given prior to infection

### **How can Poliomyelitis be prevented?**

- Confer immunity by injection of inactivated polio vaccine or the oral intake of live attenuated oral polio vaccine.
- Do not drink untreated water.
- Polio viruses are easily destroyed by chlorination. Therefore, treat your drinking water by adding one teaspoon of domestic bleach to 20 litres of water, leave for at least one hour before drinking. Otherwise boil the water vigorously for 5 minutes and simmer for 15 minutes afterwards to disinfect the water.
- Maintain immaculate personal hygiene, proper sanitation and use clean drinking water containers



# Shigellosis (*Shigella dysenteriae*)

## What is Shigellosis?

- Shigellosis is a bacterial disease caused by amongst other Shigellosis species, the **bacterium** *Shigella dysenteriae*.
- Symptoms are a sudden onset of abdominal pain, cramps and diarrhoea, mucus and blood in stools and fever.
- In severe cases dehydration may occur, with a subsequent decrease in urine and kidney failure.
- The symptoms can last from a few days to one week.
- People can be infected, experience no symptoms and still spread the infection for a few weeks.
- *Shigella dysenteriae* is very infectious, especially among children in day care centres or institutionalised people. As few as 10 microbes can be an infective dose.

## How is Shigellosis transmitted?

- *Shigella* can be transmitted through the faecal oral route, person to person contact and the ingestion of contaminated food or water.
- Shigellosis can spread through ice cubes made from infected water.
- Shigellosis can be contracted from eating shellfish that was harvested from coastal areas situated close to sewage outfalls.

## How can Shigellosis patients be treated?

- To diagnose *Shigella*, stool samples have to be cultured.
- Prevent dehydration by rehydrating to recover lost fluids and salts.
- Antibiotic medicine can be used to shorten the infection period and for a quicker recovery.
- In case of kidney failure and rectal bleeding, hospitalisation might be essential.
- Day care workers and food handlers must be booked off from work until two consecutive stool samples are clean.

## How can Shigellosis be prevented?

- Always wash hands with soap and water after changing nappies, using the toilet and before preparing food.
- Do not drink untreated water and take care to use clean drinking water containers. Proper sanitation, provision of clean drinking water and fly control will prevent spreading of *Shigella*.
- Disinfect drinking water by adding 1 teaspoon of domestic bleach to 20 litres of water and waiting for 1 hour before drinking it. If the water is cloudy, add another 2 to 3 teaspoons of bleach. Otherwise boil the water for 5 minutes.



# Trachoma

## What is Trachoma ?

- Trachoma occurs on the surface (cornea and conjunctiva) of the eye.
- It is a chronic infection, caused by the micro organism *Chlamydia trachomatis*.
- If untreated, this disease can lead to blindness.
- It is most common in developing and rare in developed countries.
- The infection usually starts in childhood with symptoms such as sore, watering eyes.
- After repeated infections the symptoms can worsen to turning-in eyelashes, scarring, opacity of the cornea and finally blindness.

## How is Trachoma transmitted?

- It is most common among children, where it spread through hand and finger contact when they play.
- Trachoma is transmitted from one person to another by finger or hand contact with the eyes and or flies.
- Trachoma usually occurs in dry dusty areas, where there is a scarcity of water for regular washing of face and hands.
- It is found where unhygienic conditions occur through a lack of water in water-scarce areas.
- Handling of contaminated items, such as towels and face cloths, can also spread it.

## How can Trachoma patients be treated?

- Early treatment with antibiotic medicine can prevent scarring and blindness.
- Surgery might be necessary once the eyelids have turned in.
- Once corneal scarring occurs, corneal graft surgery might be necessary.

## How can Trachoma be prevented?

- Children should be trained to wash their faces and hands properly and often.
- Early diagnosis and treatment of eye infections can prevent scarring and blindness.



## Swimmers itch (*non-human bilharzia*)

### What is Swimmers itch ?

- Swimmer's itch is the result of free-swimming **parasitic** flatworms (blood flukes) that cause severe skin infection (schistosomal dermatitis).
- Severe rash on the skin is the main symptom. If untreated, scratching can draw blood.
- Sometimes allergic reaction occurs; either immediately after penetration or the allergy can build up to a maximum approximately 2 weeks after infection.
- The primary hosts of this parasite are geese, gulls or other animals, but sometimes the cercariae (larval form of the parasite) penetrate the human skin and subsequently an allergic reaction or local skin irritation.

### How is Swimmers itch transmitted?

- One can contract schistosomal dermatitis when you swim in water that is frequented by water birds. These birds are the source of blood flukes in the water. The cercariae penetrate the skin when water is allowed to evaporate from the skin.
- The transmission route is water-based (water contact).

### How can Swimmers itch patients be treated?

- Antibiotic medicine can be used to shorten the infection period and for a quicker recovery.
- Treat the rash with calamine lotion to lessen the itching.
- Use antihistamine medication. Recovery is spontaneous within 1 to 4 weeks.

### How can Swimmers itch be prevented?

- Do not swim in contaminated water.
- Prevent skin contact with infected water.
- Take a shower immediately after swimming.
- Rub the skin with towel directly after swimming to prevent water evaporation from the skin. Wash towel in warm water to disinfect it.
- Apply an astringent such as alcohol to skin directly after swimming to reduce fluke penetration





# Typhoid fever

## What is Typhoid fever ?

- Typhoid fever is caused by a bacterial infection of the bacteria *Salmonella typhi*.
- The incubation period lasts for 1 to 3 weeks after infection and the infection symptoms can last up to 3 weeks, sometimes even longer.
- Symptoms appear gradually and start with a headache followed, by fever and abdominal pain, followed by constipation and diarrhoea, the former being more common during the early stages of the disease.
- In the latter stages of the disease, bronchitis develops, accompanied by a loss of appetite and subsequent weight loss.
- Typhoid fever, when untreated, can develop into intestinal perforation or haemorrhage, contributing to a death rate of 30%. Asymptomatic infections do occur. In some cases rose-spotted rash can appear on the body.

## How is Typhoid fever transmitted?

- Typhoid bacilli is excreted in the stool of infected persons during and if untreated for 4 months after recovery from the disease.
- It is transmitted by the faecal-oral route.
- Flies can also contaminate food.
- In some cases a patient can recover, but some develop a chronic carrier state, whereby they continue to produce the bacterium in their stools.
- Typhoid fever is predominantly a water-washed disease, but may also be waterborne.

## How can Typhoid fever patients be treated?

- Antibiotic medication and bed rest during the early stages of the disease are essential to prevent fatal complications. Typhoid fever can be very dangerous, even lethal to HIV positive patients.
- Provision of sufficient water for personal hygiene and fly control.

## How can Typhoid fever be prevented?

- Do not drink untreated water. Water can be disinfected by adding one teaspoon of domestic bleach to 20 litres of water and waiting for at least one hour before drinking. If no bleach is available, water can be boiled vigorously for at least 3 minutes. If the water is turbid or cloudy, add 2 to 3 teaspoons of bleach.
- Proper personal hygiene and sanitation should be maintained.
- Fruit and vegetables must be peeled or washed before eating.
- People who are chronic carriers of the disease should not be allowed to work with food or in day-care centres. They should be treated with antibiotics until 3 consecutive stool cultures are negative for *Salmonella typhi*.



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