

**Case Definitions
and Standard Procedures
for Collection and Transportation of
Human Infectious Disease's Samples
including Prevention & Control
Measures**

**Disease Early Warning System
(DEWS)**

Updated in June 2009

**A joint program of
the Ministry of Health,
the National Institute of Health and
the World Health Organization**

Foreword

Prevention and Control of Communicable Diseases remains a daunting challenge for the healthcare systems across the globe. In addition to the commonly prevalent illnesses in various geographical regions, the emerging and re-emerging diseases call for a really concerted and coordinated effort on part of all stakeholders.

The Infectious diseases may be airborne (diphtheria, measles, whooping cough, influenza, SARS and meningococcal meningitis), some spread through contaminated food or water (poliomyelitis, typhoid fever, acute watery diarrhoea/cholera and hepatitis A&E), some by insects (malaria, classical dengue fever and plague), while others are transmitted through parenteral routes (hepatitis B & C and HIV) or mainly by contamination with infected blood as in Crimean Congo Haemorrhagic Fever. Sexual contact is another route for infectious disease' transmission as is the case for HIV and hepatitis B infections. Utilization of devices contaminated with infected soil or dirt may also constitute a source of infection from tetanus. Considering their potential harmful impact, all of the above mentioned diseases are included in the Disease Early Warning System with specific case definitions in this handbook.

The hallmark of the infectious diseases is their ability to cause outbreaks rendering populations vulnerable to increased morbidity and mortality. Their effective control depends upon improved detection, early recognition and warning through notification, outbreak verification and effective response. Such national and joint efforts indeed form an effective partnership to investigate and contain those outbreaks that could spread wide and require concerted action. WHO is assisting several priority disease control programmes in Pakistan and lends technical support for the national disease surveillance & response initiatives so as to reduce the significant burden attributed to these infections. This brief publication is part of the joint efforts aimed at improving the case detection and management capacity of the health professionals. The use of definitions is a necessary step in providing accurate and timely information about important disease outbreaks. The National Institute of Health and the Ministry of Health, Government of Pakistan are commended for this field guide on case definitions that will contribute both to the specificity of case reports as well as the cost-effectiveness of disease control strategic interventions.

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Introduction

Being in a stage of epidemic transition, Pakistan is faced with the public health challenges posed by the communicable as well as non-communicable diseases. Despite improvements in the recent years, the prevalent illiteracy, limited access to safe water and sanitation facilities, continued environmental degradation, non-equitable health resources and infrastructure demand great deal of vigilance on part of healthcare professionals working at all levels of the healthcare delivery system in order to mitigate the associated public health threats.

The handbook “Case Definitions and Standard Procedures for Collection / Transportation of Human Infectious Disease Samples” is an improved version of the Case Definitions Booklet published by the Epidemic Investigation Cell, Public Health Laboratories Division, National Institute of Health as an integral component of the Disease Early Warning System (DEWS) tools in order to assist the healthcare professionals in timely recognition, reporting and management of epidemic prone diseases. Based on the operational needs of the public health field staff, significant additions have been made to the earlier editions printed in 2001, 2002, 2005 and 2006. The current 5th addition also includes two new diseases i.e. Severe Acute Respiratory Syndrome (SARS) and Scabies. SARS is a new viral respiratory disease that made its global appearance in 2002 whereas Scabies has emerged as a major problem particularly in the situations involving internal displacement of the population. Additionally, pertinent information has also been added to assist in timely and proper collection and transportation of human samples, which would greatly help in accurate lab results for appropriate interventions.

For expedient detection and reporting of outbreaks, this booklet should be used in conjunction with the DEWS manual and the Weekly Watch Chart. According to the definitions herein, the newly reported case of a disease can be suspected, probable or confirmed. When immediate laboratory confirmation is not available, it is recommended that the “syndromic-based” suspected and / or probable case definitions must be used for outbreak detection and response without waiting for laboratory results. Whenever laboratory investigations are required, utmost care must be undertaken to collect appropriate sample followed by its efficient transmission. The necessary epidemiological

information must invariably be conveyed along with the request form enabling the laboratory staff to process the patient's sample without delay.

It is earnestly hoped that this document would augment the good judgment of physicians and other health officials and serve to reduce morbidity and mortality associated with the epidemic prone diseases in Pakistan.

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Acute Watery Diarrhoea / Cholera

Infectious agent:

Bacterium - *Vibrio cholerae*

Mode of transmission:

Faecal-oral route, contaminated water and food.

Incubation period:

Usually between 1 and 5 days

Alert Threshold:

One case of suspected AWD/ Cholera is an alert must be investigated.

Outbreak threshold

One confirmed case of Cholera is an outbreak.

Case Definition:*Suspected case:*

- In an area where the disease is not known to be present: severe dehydration or death from acute watery diarrhoea in a patient aged 5 years or more.
- For management of cases of acute watery diarrhoea in an area where there is a cholera epidemic, cholera should be suspected in all patients with acute watery diarrhoea.

Confirmed case:

Any suspected case confirmed by laboratory through isolation of *Vibrio cholerae* 01 or 0139 from stool in any patient with diarrhoea.

Specimen Collection:

- Collect at least two rectal or fresh stools sample /swabs during active diarrhoea period (preferably as soon as possible after onset of illness).
- Transport in Cary-Blair transport medium or alkaline peptone water or cold chain.
- Each sample accompanying a complete lab request form with brief history of the patient may be sent by overnight mail.

Management:

- Cholera can be treated by immediate replacement of the fluid and salts, which are lost throughout diarrhoea period.
- Patients can be treated with ORS, a pre-packaged mixture of sugar and salts in water and drunk in large amounts.

- Even in cholera, intravenous electrolyte solutions should be used only for the initial rehydration of severely dehydrated patients, including those who are in shock. Ringer's lactate solution (Hartmann's solution for injection) is the preferred fluid for intravenous rehydration. Its composition is suitable for treating patients of all ages and with all types of diarrhoea. Plain glucose solutions are ineffective and should not be used.
- After vomiting stops, 500 ml fluid should then be given orally every hour. Total fluid requirements can be in excess of 50 litres over a period of 2-5 days.
- Food should be given after 3-4 hours of treatment, when rehydration is completed. Breast-feeding of infants and young children should be continued.
- The choice of antibiotic should take into account local patterns of resistance to antibiotics. The sensitivity patterns in Pakistan show that *Vibrio cholera* 01 is sensitive to Doxycycline, Ciprofloxacin, Norfloxacin, Tobramycin, and Tetracycline.

Methods of control:

a) Preventive measures:

The only sure means of protection against severe GE including cholera epidemics is ensuring adequate safe drinking water supply and sanitation. To make water safe for drinking, when the water source has been contaminated, either boil the water or chlorinate it. Bringing water to a vigorous, rolling boil and keep it boiling for one minute will kill *Vibrio cholera* 01 and most other organisms that cause diarrhoea.

Making water safe by chlorination:

To make water safe by chlorination, first make a stock solution of 33 gm (3 tablespoons) of bleaching powder in one litre of water and store it in a brown bottle. Then put 3 drops (0.6 ml) of stock solution in one litre of water or 6 ml in 10 litres of water or 60 ml in 100 litres. Wait 30 minutes before drinking or using the water.

Sanitation:

Good sanitation to avoid the contamination of clean water sources can markedly reduce the risk of transmission of intestinal pathogens, including *cholera vibrios*. High priority should be given to observing the basic principles of sanitary human waste disposal at appropriate distance from water source and supply. When large groups of people congregate for fairs, funerals, religious festivals,

etc., particular care must be taken to ensure the safe disposal of human waste & provision of adequate facilities for hand washing.

Hygiene and Food Safety:

- Wash hands thoroughly with soap after defecating, or after contact with faecal matter, and before preparing or eating food, or feeding children.
- Handle and prepare food in a way that reduces the risk of contamination (e.g. cooked food and eating utensils should be kept separate from uncooked foods and potentially contaminated utensils and crockery).
- Avoid raw food, except those undamaged fruits and vegetables from which the peel can be removed in a hygienic manner.
- Cook food until it is hot throughout.
- Eat food while it is still hot, or reheat it thoroughly before eating.
- Wash & thoroughly dry all cooking & serving utensils after use.

Breast feeding:

- Continue breast-feeding in ill children as it may reduce the severity of gastroenteritis.

b) Control of patient, contacts and the immediate environment:

- Report of epidemic to the local health authority.
- Investigation of contacts and source of infection should be sought out in certain high-risk populations and antigen excretors in outbreak situation.

c) Epidemic measures:

- Search for vehicles of transmission and source on epidemiological basis.

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Crimean Congo Haemorrhagic Fever

Infectious Agent:

Nairovirus group, Bunyaviridae family

Mode of transmission:

Tick-borne (*Hyalomma* genus); also direct contact with blood / tissue of infected people, blood / tissue of infected domestic animals (butchering) or the grinding of infected ticks.

Incubation period:

Incubation period is usually 1 to 3 days, with a maximum of 9 days. The incubation period following contact with infected blood or tissues is usually 5 to 6 days, with a documented maximum of 13 days.

Alert Threshold:

One probable case is an alert and requires an immediate investigation.

Outbreak threshold

One confirmed case is an outbreak

Case Definition:

Suspected Cases:

Patient with sudden onset of illness with high-grade fever over 38.5°C for more than 72 hrs and less than 10 days, especially in CCHF endemic area and among those in contact with sheep or other livestock (shepherds, butchers, and animal handlers). Note that fever is usually associated with headache and muscle pains and does not respond to antibiotic or anti-malarial treatment.

Probable case:

Suspected case with acute history of febrile illness 10 days or less, AND any two of the following: thrombocytopenia less than 50,000 /mm³, petechial or purpuric rash, epistaxis, haematemesis, haemoptysis, blood in stools, ecchymosis, gum bleeding, other haemorrhagic symptom - AND no known predisposing host factors for haemorrhagic manifestations.

Confirmed case:

Probable case with positive diagnosis of CCHF in blood sample, performed in specially equipped high bio-safety level laboratories. Positive diagnosis includes any of the following:

- Confirmation of presence of IgG or IgM antibodies in serum by ELISA or any method.

- Detection of viral nucleic acid by PCR in specimen or isolation of virus.

Specimen Collection:

- Collect 5 ml of blood and separate serum for analysis of CCHF virus after centrifuge, observing strict safety precautions. If centrifuge is not available, store the blood specimens in a refrigerator until a clot is formed; then remove the serum and pipette it into an empty sterile tube (using a Pasteur pipette).
- Transport serum specimens to the lab in triple packing with ice packs or frozen with dry ice along with a prominent Bio Hazard label and complete lab request form with brief history of the patient.

Management:

- A suspected case of CCHF should be managed by diagnosing and treating for other likely causes of fever. If there is no response to anti-malarial and antibiotic treatment, the patient's platelet count should be checked and examined in view of the criteria mentioned above for "probable CCHF". All specimens of blood or tissues taken for diagnostic purposes should be collected and handled using universal safety precautions.
- If the case meets the criteria for probable CCHF, begin isolation precautions, alert health facility staff, report the case immediately, draw blood samples for CCHF diagnostic confirmation and start treatment protocol below without waiting for confirmation. Patients with probable or confirmed CCHF should be isolated and cared for using barrier-nursing techniques – masks, goggles, gloves, gowns and proper removal and disposal of contaminated articles.

Treatment Protocol

General supportive therapy is the mainstay of patient management in CCHF. Intensive monitoring to guide volume and blood component replacement is recommended. If the patient meets the case definition for probable CCHF, oral ribavirin treatment protocol needs to be initiated immediately with the consent of the patient/ relatives and strictly in consultation with the attending physician.

Oral Ribavirin: 2 gm loading dose
 4 gm/day in 4 divided doses (6 hourly) for 4 days
 2 gm/day in 4 divided doses for 6 days

Please note that pregnancy should be absolutely prevented (whether female or male partner is victim) within six months of completing a course of ribavirin.

Prophylaxis Protocol

- In case of known direct contact with the blood or secretions of a probable or confirmed case such as needle stick injury or contact with mucous membranes such as eye or mouth, do baseline blood studies and start the person on the ribavirin protocol above in consultation with physician.
- Household or other contacts of the case who may have had the same exposure to infected ticks or animals, or who recall indirect contact with case body fluids should be monitored for 14 days from the date of last contact with the patient or other source of infection by taking the temperature twice daily. If the patient develops a temperature of 38.5° C or greater, headache and muscle pains, he/she would be considered a probable case and should be admitted to hospital and started on ribavirin treatment as mentioned above.

Methods of control:

a) Preventive measures:

- Educate public about the mode of transmission through tick bites, handling ticks and handling and butchering animals and the means for personal protection.
- Tick control with acaricide (chemicals intended to kill ticks) is a realistic option for well-managed livestock production facilities. Animal dipping in an insecticide solution is recommended.
- Avoid tick-infested areas when feasible. To minimize exposure, wear light colored clothing covering legs and arms.
- Persons who work with animals in the endemic areas should take practical measures to protect themselves. They include the use of repellents on the skin (e.g. DEET) and clothing (e.g. permethrin) to prevent tick bites and wearing gloves or other protective clothing to prevent skin contact with infected tissues or blood.
- In case of death of CCHF patient, family should be informed to follow safe burial practices. Please see EIC Publication: Guidelines for Management, Prevention and Control of CCHF.
- Hospitals should maintain stock of Ribavirin.
- Bio-safety is the key to avoid nosocomial infection. Patients with suspected or confirmed CCHF should be **isolated** and cared for using barrier-nursing techniques to prevent

transmission of infection to health workers. Please see EIC Publication: Guidelines for Management, Prevention and Control of CCHF.

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Dengue Fever

Classical and Haemorrhagic

Infectious Agent:

Flavivirus group

Mode of transmission:

Bite of infective mosquitoes, principally *Aedes aegypti* (day biting species)

Incubation period:

From 3 to 14 days

Alert Threshold:

One probable case is an alert and requires an immediate investigation.

Outbreak threshold

One confirmed case is an outbreak

Case Definition:*Suspected case:*

Any person with acute febrile illness of two to seven days duration AND two or more of the following symptoms: Headache, retro-orbital pain, myalgia, arthralgia, rash, haemorrhagic manifestations and leucopenia.

Probable Case:

Any suspected case, which occurs in an area where an outbreak of Dengue exists, with laboratory-confirmed cases and presence of the vector.

Confirmed Case:

Any suspected case confirmed by laboratory isolation of the virus or by the IgM-ELISA test or by PCR.

Probable Dengue Haemorrhagic Fever:

A probable or confirmed case of dengue AND any two of the following: thrombocytopenia less than $100,000 /\text{mm}^3$, petechial or purpuric rash, epistaxis, haematemesis, haemoptysis, blood in stools, ecchymosis, gum bleeding, other haemorrhagic symptom - AND no known predisposing host factors for haemorrhagic manifestations.

Specimen Collection:

- Collect 5 ml of blood 5 days after onset of fever and separate serum for analysis after centrifuge.

- Transport serum specimens along with complete lab request form with brief history of the patient.

Management:

- Supportive treatment - there is no specific therapeutic agent.
- Severe pains can be relieved by paracetamol but occasionally opiates are required.
- Prevent access of day biting mosquitoes by screening patient or using a bed net.
- Fluid replacement and corticosteroids are indicated in the haemorrhagic variety.
- Take universal safety precautions to prevent contamination with blood or secretions.
- Investigate contacts - determine place of residence of patient for 2 weeks before onset of illness.

Prevention:

- Conduct community survey to determine density of vector mosquitoes and identify and destroy mosquito larval habitats and breeding sites such as old tyres, old water containers, etc.
- Protect against day biting mosquitoes including use of screening, protective clothing and repellents.

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Diphtheria

Infectious agent:

Bacterium: *Corynebacterium diphtheriae*

Mode of transmission:

Contact (usually direct, rarely indirect) with the respiratory droplets of a case or carrier; or

In rare cases, the disease may be transmitted through foodstuffs (raw milk has served as a vehicle).

Incubation period:

Usually 2-5 days, occasionally longer.

Alert Threshold:

One suspected, probable or confirmed case is an alert and requires an immediate investigation.

Outbreak threshold

One confirmed case is an outbreak

Case Definition:*Probable case:*

An acute illness characterized by an adherent membrane on the tonsils, pharynx and/or nose and any one of the following: laryngitis, pharyngitis or tonsillitis.

Confirmed case:

A confirmed case is a probable case who has been laboratory confirmed or linked epidemiologically to a laboratory confirmed case. At least one of the following criteria is used for diagnosing a confirmed case:

- The isolation of *Corynebacterium diphtheriae* from a clinical specimen; or
- A four fold or greater rise in serum antibody (but only if both serum samples were obtained before the administration of diphtheria toxoid or antitoxin).

Note that asymptomatic persons with positive *C. diphtheriae* cultures (i.e. asymptomatic carriers) should not be reported as probable or confirmed diphtheria cases.

Specimen Collection:

- Collect nasopharyngeal samples by using alginate swabs and throat culture by using cotton swabs.

- Collect 5ml of clotted blood or serum (acute and convalescent phase) for serological diagnosis.
- Transport in routine bacteriological transport media (Amies transport medium).

Case Management:

Patients:

- Do not wait for laboratory results before starting treatment/control activities.
- Diphtheria antitoxin I/M (20 000 to 100 000 units) in a single dose, immediately after throat swabs have been taken; **plus** Procaine penicillin G I/M (25 000 to 50 000 units/kg/day for children; 1 200 000 units/kg/day for adults in 2 divided doses) or parenteral erythromycin (40-50 mg/kg/d with a maximum of 2 g/d) until the patient can swallow; **then**;
- Oral penicillin V (125-250 mg) in 4 doses a day, or erythromycin (40-50 mg/kg/day) in divided doses. Antibiotic treatment should be continued for total of 14 days.
- Note: Clinical diphtheria does not necessarily confer natural immunity, and patients should thus be vaccinated before discharge from a health facility with either primary or booster doses.

Contacts:

- All close contacts, regardless of vaccination status, should have nose and throat cultures, receive a single dose of benzathine penicillin I/M (600 000 units for children < 6; 1.2 million units for 6 or older) or a 7-10 day course of erythromycin (PO), and remain under surveillance for 7 days. Those who handle milk or work with school children should remain at home until culture results are available. If culture is positive, give antibiotics as for patients above.

Prevention and control:

- Give priority to immunization of population at risk in areas not yet affected where the outbreak is likely to spread. Repeat immunization one month later to provide at least 2 doses to recipients.
- Vaccine containing diphtheria toxoid (preferably Td – tetanus-diphtheria) should be given.
- To ensure safety of injection during immunization, employ proper techniques, use auto destroyable syringes and safety boxes for safe disposal of used sharps.

- Vaccination consists of DPT 3 doses of 0.5 ml each/IM administered to the children less than one year of age according to the following schedule: 1st dose at age six weeks; 2nd dose at age ten weeks; 3rd dose at age fourteen weeks.

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Acute Viral Hepatitis

Infectious agent:

Hepatitis means inflammation of liver and the most common cause of acute hepatitis is infection with one of 4 viruses, called hepatitis A, B, C, and E.

Mode of transmission:

- Hepatitis A virus (HAV) is spread through faecal-oral route, especially contaminated water and food. It is usually a mild, self-limited disease but may cause relapsing hepatitis for up to one year in 15% of cases. Infections occur early in life in areas where sanitation is poor and living conditions are crowded.
- Hepatitis E virus (HEV) is transmitted by faecal-oral route similar to hepatitis A with faecally contaminated drinking water being the usual vehicle. HEV causes generally a mild self-limiting illness with no long-term sequelae, infecting mainly young adults, 15 to 30 years of age. However, the disease is especially severe in pregnant females in the third trimester with a case fatality reaching 20% in this group. It may also cause abortion, premature delivery, or death of a live-born baby soon after birth. HEV is a major cause of outbreaks and sporadic cases of viral-infections.
- Hepatitis B virus (HBV) is transmitted by contact with blood or body fluids of an infected person in the same way as human immunodeficiency virus (HIV). Modes of transmission for Hepatitis B virus are vertical (from mother to baby at the time of delivery); unsafe injections (use and re-use of un-sterilized needles/syringes/drips etc.); blood transfusions, and sexual or household contact with an infected person. Chronic infection develops in about 90% of infants infected during the first year of life and 40% of children infected between 1 to 4 years of age. In Pakistan HBV is endemic and is one of the major causes of chronic hepatitis, liver cirrhosis and liver cancer.
- Hepatitis D virus (HDV) mechanisms of transmission are similar to those of hepatitis B virus. HDV affects only those who have hepatitis B virus either as co-infection or super-infection of HBV and increases risk of severe acute disease and progression to chronic hepatitis.
- Hepatitis C virus (HCV) is transmitted primarily by direct contact with human blood through un-screened transfusions, re-use of inadequately sterilized needles, syringes or other

medical equipment, or through needle-sharing among drug-users. Sexual and perinatal transmission may also occur, although less frequently as compared to HBV. In Pakistan HCV is also endemic in some areas and contributes to chronic hepatitis, liver cirrhosis and primary liver cancer.

- All of the hepatitis viruses can cause an acute disease with symptoms lasting several weeks including yellowness of the skin and eyes (jaundice); darker colour of urine; extreme fatigue; nausea; vomiting and abdominal pain. It can take several months to a year for a patient to feel fit again.

Incubation period:

Hepatitis A (15 to 50 days, average 30 days), Hepatitis B (45 to 180 days, average 75 days, as short as 2 weeks to the appearance of HBsAg), Hepatitis C (2 weeks to 6 months, most commonly within 2 months), Hepatitis D (approximately 2-10 weeks) and Hepatitis E (2 to 9 weeks).

Alert Threshold:

A cluster of 3-5 cases in one location is an alert and requires investigation.

Outbreak threshold

A cluster of 8-10 cases in one location is an outbreak

Case Definition

Suspected case viral hepatitis syndrome:

An acute illness with discrete onset of symptoms of jaundice, dark urine, anorexia, malaise, extreme fatigue, and right upper quadrant tenderness OR elevated serum alanine aminotransferase level >2.5 times the upper limit. Note: Most early childhood infections and a variable proportion of adult infections are asymptomatic.

Confirmed case:

A suspected case that meets the clinical case definition AND is laboratory confirmed for:

- Hepatitis A: Anti-HAV IgM antibodies (anti-Hepatitis A virus immunoglobulin M) positive
- Hepatitis B: Positive test of any: HBsAg (Hepatitis B surface antigen), Anti-HBs, Anti-HBc (antibody to Hepatitis B core antigen), HBeAg (Hepatitis B e antigen, indicates infectivity of patient), or Anti-HBe.
- Hepatitis D: HDV-Ag (Hepatitis D antigen) positive

- Hepatitis C: Anti-HCV (anti-Hepatitis C virus antibodies) positive
- Hepatitis E: Anti-HEV immunoglobulin M (IgM) positive
- For Hepatitis A only: a case compatible with the clinical description, in a person who has an epidemiological link with a laboratory-confirmed case of hepatitis A, e.g., household contact with an infected person during the 15-50 days before the onset of symptoms.

Specimen Collection:

- Collect 5 ml blood during acute phase of illness observing all safety precautions.
- Separate serum by centrifugation technique or keep the blood sample refrigerated until the clot is formed and retracted completely. Separate serum in a tube.
- Transport serum specimens either refrigerated (for serology) or frozen (for antigen detection by PCR) with complete lab request form. Specimens can be refrigerated by placing them in an insulated box with ice or frozen refrigerant packs. Frozen specimens can be kept frozen by shipping them on dry ice.
- Batch the specimens and send by overnight mail.

Management:

There is no specific management for acute uncomplicated hepatitis but general supportive measures can be helpful in the earlier recovery of the disease like bed rest, fluid replacement, nutritional support etc. It is also important to avoid all the hepatotoxic drugs during the illness. Alpha interferon and Lamivudine are available therapeutic options for patients with chronic hepatitis B and C. However, it is important to note that the management of chronic hepatitis requires specialist consultation.

Prevention:

Hepatitis A and E:

- While no vaccine is available yet against Hepatitis E, an effective inactivated hepatitis A vaccine is available both for adults and children aged 2 years or older. The vaccine is administered I/M with a recommended vaccination schedule of 0, 1, and 6-12 months.
- As almost all HAV and HEV infections are spread by the faecal-oral route, good personal hygiene including frequent and proper hand washing after bowel practices and before food preparation, avoiding drinking water and/or ice of

unknown purity and avoiding eating uncooked fruits or vegetables that are not peeled, high quality standards for public water supplies and proper disposal of sanitary waste are important measures to reduce the risk of disease transmission. For HAV post-exposure prophylaxis of non-vaccinated people, the passive administration of IG can modify the symptoms of infection, provided it is given within 2 weeks of exposure.

Hepatitis B, C and D:

- Hepatitis B virus has become a vaccine-preventable disease and both serum-derived and recombinant hepatitis B vaccines are safe and immunogenic. This vaccine is available in Pakistan as an integral part of the EPI schedule, with a standard of administration as follows: three doses administered I/M to the infant concurrently with DPT vaccination at weeks 6, 10 and 14. This schedule is consistent with the insignificant risk of perinatal transmission in the country.
- No vaccines exist against HCV or HDV; however, vaccination against HBV of patients who are not chronic HBV carriers also provide protection against HDV infection. All measures aimed at preventing the transmission of HBV will prevent the transmission of hepatitis D and HBV-HDV co-infection or super infection.
- For the prevention of HBV and HCV, implement and maintain infection control practices in health care settings, including appropriate sterilization of medical and dental equipment, screening and testing of blood and organ donors, and virus inactivation of plasma derived products; promote behaviour change among the general public and health care workers to reduce overuse of injections, use safe injection practices and build public awareness for safe and protected sex. HBV, HDV and HCV are not spread by contaminated food or water, and cannot be spread casually in the workplace.
- For post-exposure prophylaxis or suspected perinatal transmission, Hepatitis B Immune Globulin (HBIG) 0.5 ml I/M is effective, followed by vaccine 1 and 6 months later.

Comment

Persons who have chronic hepatitis should not be reported as having acute viral hepatitis unless they have evidence of an acute illness compatible with viral hepatitis (with the exception of

perinatal hepatitis B infection). Up to 20% of acute hepatitis C cases will be anti-HCV negative when reported and will be classified as non-A, non-B hepatitis because some have not yet sero-converted and others remain negative even with prolonged follow-up. Available serologic tests for anti-HCV do not distinguish between acute and chronic or past infection. Thus, other causes of acute hepatitis should be excluded for anti-HCV positive patients who have an acute illness compatible with viral hepatitis.

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Human Immunodeficiency Virus (HIV)

Infectious Agent:

Human Immunodeficiency Virus (HIV)

Mode of transmission:

1. Sexual intercourse (vaginal or anal) with an infected partner, especially in presence of a concurrent ulcerative or non-ulcerative sexually transmitted infection (STI); or
2. Contaminated needles (injecting drug users, needle-stick injuries, injections),
3. Transfusion of infected blood or blood products; or
4. Infected mother to her child during pregnancy, labour and delivery or through breast-feeding.

Incubation period:

May be variable. On an average, time from HIV infection to clinical AIDS is 8 to 10 years, though AIDS may be manifested in less than 2 years or be delayed in onset beyond 10 years. Incubation times are shortened in resource poor settings and in older patients. They can be prolonged by provision of primary prophylaxis for opportunistic infections or anti-retroviral treatment.

Case Definition:

Suspected case:

Not applicable.

Note: Sentinel sites should focus on testing high risk groups which include patients seeking treatment for sexually transmitted diseases, users of intravenous drugs, commercial sex workers seeking health treatment, etc. Cases suspected at first level care facility should be referred to second level care facility for confirmation.

Confirmed case:

In 1997, UNAIDS and WHO issued revised recommendations for the selection and use of HIV antibody tests. For diagnosis of HIV infection following strategy is used

- If the sample is reactive with the first assay (A), test with second assay (B).
- If it is non reactive with the second assay, consider it to be "Indeterminate".
- If serum is reactive in the second assay, test with the third assay (C).

- If non-reactive in the third assay, consider it to be “Indeterminate”. If the serum is reactive in the third assay, report it to be HIV antibody positive.

Specimen Collection:

- Collect 5ml blood/serum sample observing all safety precautions.
- For sero-diagnosis the specimen can be refrigerated at 4°C and transported to lab.
- For antigen detection by PCR samples should immediately be freezed if delay is anticipated.
- Transport specimens with complete lab request form and BioHazard label and send by overnight mail.

Management:

In case of a confirmed case with HIV infection or AIDS, he/she should receive counselling and be referred to tertiary level care facility for treatment of virus and opportunistic infections such as TB and for follow up.

Prevention:

Primary Prevention:

Prior to development of HIV infection, prevention focuses on modifying the risk behaviours of persons in the community through “behaviour change communication” (BCC).

Secondary Prevention:

Counselling: HIV Positive individuals must be counselled to lead as normal a life as possible, but to take strict precautions regarding sexual intercourse, disposal of used needles and other sharps, and avoiding donating blood. Family and social contacts must be reassured that the infection does not spread by casual contact.

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Influenza

Infectious Agent:

Myxovirus group (Influenza virus) type A, B and C.

Mode of transmission:

Inhaling infected droplets from the air; spreads from person to person.

Incubation period:

24-28 hours.

Alert Threshold:

One suspected case is an alert and requires an immediate investigation.

Outbreak threshold

One confirmed case is an outbreak

Case Definition:*Suspected Case:*

Any person with sudden onset of fever greater than 39°C, AND sore throat or cough in the absence of another known cause. Headache, myalgias, and prostration are often present.

Confirmed Case:

Any suspected case with laboratory confirmation by isolation of virus in culture, by IFAT or by serologic test demonstrating a rise in specific antibody titer.

Specimen Collection:

- Collect throat and nasal swabs and nasopharyngeal aspirates from patient and tracheal aspirate or broncho-alveolar lavage fluid from intubated patients place immediately in Viral Transport Medium (VTM).
- Collect 5ml blood or serum for serology (acute and convalescent if possible).
- Transport specimens' bottles and tubes in upright position and secured in a screw cap container or in a rack in a transport box having enough absorbent paper around them to soak up all the liquid in case of spillage.

- Sample for virus isolation collected in VTM can be taken to lab within 4 days, kept at +4°C and frozen at -70°C on arrival in lab if stored.
- In the absence of freezers or VTM, ethanol preserved swabs are a possible alternative. Storage of such specimens at 4°C (in a standard refrigerator) is better than at room temperature.
- Blood/serum samples should be frozen at -70°C for PCR and at -20°C or lower for antibody determination but can also be stored at +4°C for about one week.
- Specimens for influenza virus isolation should not be stored or transported in dry ice unless they are sealed, taped and double plastic-bagged as CO₂ (dry ice) can rapidly inactivate the virus if it gains access to the specimens.

Management:

- The goal of treatment is to alleviate the symptoms. Antibiotics are not effective against viruses. Bed rest is advisable until the fever is subsided.
- A mild analgesic such as paracetamol 0.5 - 1 g every 4-6 hours usually relieves the headache and generalized pains and warm fluids help to relieve the discomfort of the symptoms.
- Pholcodine 5-10 mg 3-4 times daily may be used to suppress unproductive cough.
- Specific treatment of complications such as bronchitis and pneumonia may be necessary.

Prevention:

- Good ventilation of public buildings;
- Avoidance of crowded places during an epidemic;
- Encourage sufferer to cover their faces with a mask or handkerchief when coughing and sneezing;
- Annual winter vaccination (Anti influenza vaccine) is recommended for patients suffering from chronic pulmonary, cardiac or renal disease.
- For older individuals who have been exposed to the virus, the drug amantadine may be given to prevent them from actually getting the flu. This may also be used for treatment.

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Leishmaniasis

Infectious agent:

Protozoal parasites family Trypanosomatidae, genus Leishmania: L. donovani and L. infantum may cause visceral leishmaniasis while L. tropica and L. major may cause cutaneous leishmaniasis.

Mode of transmission:

Spread by the bite of the sandfly. The sand fly bites on the skin and the protozoan is transmitted to the blood stream. If animals are the primary host reservoir, it is called zoonotic leishmaniasis; if humans are the primary host reservoir, it is called anthroponotic leishmaniasis.

Incubation period:

Considered to be at least a week but may extend up to several months. For zoonotic type it is considered to be about 4 months and for the anthroponotic type it ranges from 6-12 months

Alert Threshold:

One suspected case is an alert and requires an immediate investigation.

Outbreak threshold

One confirmed case is an outbreak

Case Definition:

Two types of leishmaniasis occur in Pakistan: - cutaneous and visceral.

Suspected case

- In cutaneous leishmaniasis there are lesions on the face, neck, arms, and legs, which begin as nodules and turn into skin ulcers, eventually healing but leaving a depressed scar.
- In visceral leishmaniasis, the parasite invades the spleen, liver, bone marrow, and lymph nodes. Symptoms include mainly irregular fever, splenomegaly and weight loss; also fatigue, enlargement of the lymph nodes and the liver, secondary infections such as pneumonia, and it can be fatal if left untreated.

Confirmed case

Suspected cases with positive parasitological evidence from a stained smear by microscopy or culture from the lesion.

Specimen Collection:

Cutaneous Leishmaniasis:

- Skin biopsy is the standard dermatologic technique for obtaining specimen.
- Slit-skin preparation or aspiration from the edge of the lesion by a well-trained staff is the alternate.
- No preservatives are required for examining LD bodies in patient's sample or for leishmania culture.

Visceral leishmaniasis:

- Collect 5ml clotted blood or serum for serologic studies.
- Splenic or bone marrow aspirate collected in a tube with anticoagulant is required for demonstration of amastigotes.
- Specimen can be transported at room temperature without delay.

Management:

Intra-lesional Treatment:

Intra-lesional treatment means carefully infiltrating the area around the lesion and the base, with a fine gauge (25g) needle and injecting the Glucantime / pentostam pentavalent antimony under pressure as the needle advances. Treatments are every week up to five times.

Patient's weight (kg)	Calculated dose (mg Antimony)	Recommended dose (mls) / day	
		Gluc	Pent
70	922	10	8.5
60	832	9	8
50	737	8	7
40	635	7	6
30	524	6	5
20	400	5	4
10	252	3	2.5
05	159	2.5	2

Systemic (intra-muscular) treatment:

Injections should be given daily (with a break of one day for a week-end) for 14 days into the upper, outer quadrant of the buttock, alternating sides. If the response is poor by the 14th day, the treatment can be continued for 7 more days. Here is a table showing the correct doses for Glucantime and Pentostam on a scale based on a simplified formula relating body weight to surface area whereby a 20 Kg child receives 20 mg/kg of antimony.

Prevention:

- Prevention of ACL is very similar to malaria, as sand flies bite at night and indoors, permethrin treated bed nets, etc.

Sandflies are generally more sensitive than mosquitoes to insecticide, i.e. residual spraying of indoor rooms (vector control).

- Use of insecticide is unlikely to work in prevention of Zoonotic Cutaneous, as the sand fly vector tends to bite outdoors, so the most effective strategy is to poison or dig up the burrows of reservoir rodents.
- For more information, please consult the MoH/NIH/WHO publication (2002) called "Guidelines for the treatment and prevention of Cutaneous Leishmaniasis in Pakistan".

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Malaria

Infectious agent:

Protozoan parasite Plasmodium falciparum which is the most life threatening form of the disease and Plasmodium vivax which causes the less severe form of the disease.

Mode of transmission:

Bite of infected female Anopheles mosquito. May also be rarely transmitted by injection of infected blood (transfusion malaria).

Incubation period:

Average incubation period for P. falciparum is 12 days and for P. vivax is 13-17 days

Alert Threshold:

1.5 times the mean of cases in the previous three weeks, by reporting sit, is an alert and requires investigation.

Outbreak threshold

Clustering of cases in a particular locality on alert investigation.

Case Definition:*Suspected case of uncomplicated malaria:*

- History of recent fever (may be continuous or irregular in beginning), chills, headache, body aches, weakness, anaemia, hepato-splenomegaly. (In falciparum infection the fever may be continuous with bouts of high peaks.)

Suspected case of severe or complicated malaria:

- Only Falciparum malaria can develop into severe malaria if not treated promptly, especially in children and pregnant women.
- History of fever with prostration (inability to sit), altered consciousness (lethargy, coma), generalized seizures (followed by coma), difficulty in breathing, low urinary output or dark urine, severe anaemia, abnormal bleeding, and hypoglycaemia. (The parasites may not be visible in peripheral smears, as they are sequestered in the capillaries).

Probable case:

A suspected case with history of same type of manifestation in other members of the household; or in the same patient in the past.

Confirmed case:

Clinical case, which is confirmed by:

- Laboratory diagnosis of malarial parasites in peripheral blood film.
- Parasite antigens by immunodiagnostic test kit.

Specimen Collection:

- Collect 3-5ml blood in a tube with anticoagulant (EDTA) for demonstration of malarial parasites in peripheral blood film.
- Sample may also be used to demonstrate parasite antigen by immunodiagnostic test kit.
- Transport the specimen at room temperature preventing sample spillage or damage to the tubes.

Management:

Early diagnosis and treatment especially in children and pregnant women is essential. The management requires the following steps:

Clinical Malaria:

First line drug: Chloroquine (each tab. Contains with 150 mg base + 5 ml syrup with 50 mg base), three-day course with the following doses: Day Zero, 10 mg/kg body weight, Day One, 10 mg/kg body weight and Day two, 5mg/kg body weight:

Second Line drug: Sulfadoxine + pyrimethamine, (each tab. or 5 ml. Syrup. contains 500 mg S, & 25mg P). Dose = 25 mg of Sulfadoxine /kg body weight (single dose) (up to maximum adult dose of 3 tabs).

Vivax Malaria:

First line drug: Chloroquine (no resistance has been reported to Chloroquine in vivax malaria).

Uncomplicated Falciparum Malaria: First line drug: Chloroquine (dose as above).

Second line drug: Sulfadoxine/ pyrimethamine (dose as above).

Third line: Quinine (each tab. with 600 mg. of the salt). Dose 10 mg /kg body wt. 3 times daily for 7 days

Severe or complicated Falciparum Malaria:

Give the first dose of Chloroquine or of quinine orally if possible, bring down the temperature and shift the patient to a hospital with intensive care facilities.

Radical Treatment:

Vivax: (for prevention of relapse) Primaquine tab. - 0.25 mg/kg daily for 5 days.

Falciparum: (as an anti-gametocide) Primaquine tab. - 0.25 mg/kg daily for 3 days.

Warnings:

- Do not give primaquine to pregnant women and children below 2 years of age, and it is advisable to do a Glucose 6-Phosphate dehydrogenase test before giving this drug. Give primaquine preferably after the patient has recovered from the acute illness.
- Do not give undiluted chloroquine or quinine by I/M or I/V route, as it can cause sudden cardiac arrest, especially in children.
- Do not give Sulfadoxine/ pyrimethamine to children below 2 months of age or during first trimester of pregnancy.
- Halofantrine (Halfan) is potentially a cardio-toxic drug and should be used under strict government control, according to WHO recommendations.

Prevention:

- Promote personal protection measures like wearing long sleeves and trousers outside the houses in the evening. Use of repellent creams and sprays. Avoidance of nighttime outside activities.
- Screen windows and use of mosquito nets.
- Use mosquito's coils or vaporizing mat containing a pyrethrin.
- Destroy breeding places of mosquitoes by filling in ditches where water stands or stagnates.
- Use bed-nets (preferably insecticide impregnated nets) in highly endemic area especially for high-risk groups (pregnant women & children).
- Control of anopheline mosquitoes, especially by spraying of houses with residual insecticides aerosol has reduced or abolished the risk of malaria.
- Insecticide spray, which is costly and hazardous to the environment, is recommended only in emergency situations with insecticides like Deltamethrine, and larvicides like Temephos.
- Prompt diagnosis and treatment of cases to prevent spread of the disease.

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Measles

Infectious agent:

Measles virus, a member of the genus Morbillivirus in the family Paramyxoviridae.

Mode of transmission:

Spread via airborne droplets or
Direct contact with nasal or throat secretions of an infected patients or
Direct contact with items infected with such nasal or throat secretions

Incubation period:

It is considered to be on an average of 10-12 days after exposure to infection with a maximum range of 7-18 days.

Alert Threshold:

One case of measles is an alert and requires an investigation.

Outbreak threshold

Five or more cases in one location is an outbreak

Case Definition:*Suspected Case*

A patient presenting with complaints of fever with rash should be investigated as a suspected case of measles.

Probable Case

A probable case is characterized by the following symptoms:

- Fever > 38.3°C (101°F)
- Cough, coryza (i.e. runny nose), or conjunctivitis (i.e. red eyes)
- Generalized maculopapular rash (non-vesicular type) for at least 3 days, usually lasting 5-6 days. The rash begins at the hairline, and then involves the face and upper neck. During the next three days, gradually proceeds downward and outward, reaching extremities last and being less pronounced on hands and feet. Rash fades in the same order that it appears, from head to feet.
- Koplik's spots may occur 1-2 days before rash to 1-2 days after rash. They appear as pinpoint, depressed blue white spots on bright red background on the buccal mucosa.

Confirmed Case

Measles case is confirmed by the laboratory, in the absence of recent (1-14 days) immunization with measles-containing vaccine, with one of the following:

- Isolation of measles virus from an appropriate clinical specimen OR
- Significant rise (about 4 fold) in measles specific antibody titer between acute and convalescent sera OR
- Positive serologic test for measles IgM antibody using a recommended assay

Clinical measles in a person who is epidemiologically linked to a laboratory-confirmed case is also considered to be a confirmed case

Specimen Collection:

- Collect throat swab in Viral Transport Medium (VTM) for detection of measles virus as soon as possible after the onset of rash and 5ml blood, centrifuged for serum separation at 3000 rpm for 5 minutes.
- Store serum at 4 to 8°C for not more than 48 hours. Do not freeze the whole blood.
- If centrifugation is not possible, blood should be kept in refrigerator until there is complete retraction of the clot from the serum.
- Carefully remove the serum and transfer aseptically to a sterile labelled vial.
- Transport the specimens in zip lock plastic bags with complete request form along with the cold chain

Management:

For uncomplicated cases:

Give Vitamin A and advise to treat the child at home if no complications develop (control fever, treat mouth ulcers, provide nutritional feeding)

For complicated cases:

- Refer to health facility
- Ensure that 2 doses of Vitamin A are given
- Clean eyes and treat with 1% tetracycline eye ointment
- Clean ear discharge and treat with antibiotics
- Treat malnutrition and diarrhoea with sufficient fluids and high quality diet

- Treat pneumonia with antibiotics
- Refer suspected encephalitis to hospital

Prevention:

- Immunize the population at risk as soon as possible. Children who are vaccinated against measles before 9 months of age must receive a second measles vaccination. This should be given at nine months with at least one month between first and second vaccination. Any child who received measles vaccine should also receive Oral Polio Vaccine.
- The priority is to immunize children 6 months to 5 years old, regardless of vaccination status or history of disease. Expansion to older children is of less priority and should be based on evidence of high susceptibility among this age group.
- All children 6 months - 5 years of age should also receive prophylactic Vitamin A supplementation. If evidence of clinical vitamin A deficiency in older age groups, treatment with Vitamin A should be initiated as per WHO guidelines.
- To ensure safety of injection during immunization, auto destructible syringes and safety boxes are recommended. Safe disposal of used sharps should be ensured.

Meningococcal Meningitis

Infectious agent:

Caused by diplococcal *Neisseria meningitidis* with serotypes A, C, Y, or W-135. Note that meningococcal meningitis is the main cause of epidemic meningitis. Majority of cases are in children under age five and case fatality is between 5-15%.

Mode of transmission:

It is transmitted by direct contact with respiratory droplets from nose and throat of infected people.

Incubation period:

Varies from 2 to 10 days, and most commonly is between 3-4 days.

Alert Threshold:

One case is an alert and requires investigation.

Outbreak threshold

Two confirmed cases from the same location is an outbreak.

Case Definition:

Suspected case

Any person with acute illness that demonstrates:

- Sudden onset of fever ($> 38.5^{\circ}\text{C}$ rectal or $> 38^{\circ}\text{C}$ axillary), AND one or more of the following: neck stiffness, altered consciousness, other meningeal sign or petechial or purpurral rash.
- In-patient under one year of age, when fever is accompanied by a bulging fontanelle.

Probable case

A suspected case of meningococcal meningitis with turbid CSF, OR, link to a confirmed case.

Confirmed case

A suspected or probable case with positive CSF antigen detection for *Neisseria meningitidis*; or,
A culture positive result from CSF and /or blood sample with identification of *Neisseria meningitidis*.

Specimen Collection:

- Collect 2-3 ml of CSF under aseptic measures through lumbar puncture in a sterile screw-capped container for chemical analysis, latex particle agglutination test and culture for *Neisseria meningitidis*.
- Blood samples should directly be inoculated in blood culture bottles.
- Transport the specimen immediately (within a maximum of one hour) to the lab. If delay is anticipated, sample should be inoculated in Trans Isolate Medium (TIM).

Management:

The following antimicrobial therapy must be started immediately:

- Penicillin G, 4 million. 6 hourly I.V. up to 24 million units/day in divided doses
- Ceftriaxone 2 grams I.V. b.i.d. per day.
- Chloramphenicol in penicillin allergic patients, 100 mg/kg/day I.V. up to 4 grams /day. Other antimicrobials should be considered depending upon availability of local sensitivity patterns.
- Mannitol I.V. can be used if signs of raised intra-cranial pressure are present.
- Sometimes systematic corticosteroids are also indicated.
- Treatment of convulsions with diazepam.
- General supportive measures are important.

Prevention:

- Household and other close contacts of patients with meningococcal infections, especially children, should be given Rifampicine 600 mg twice daily for 2 days. Children under one year are given 5-mg/Kg body weight 12 hourly and those over 12 months 10 mg/kg 12 body weight hourly. In case of contraindication, Ceftriaxone single dose of 250 mg for adults and 125 mg for children.
- An effective tetravalent capsular polysaccharide vaccines (containing A, C, Y and W-135 polysaccharides) is available to prevent meningococcal infections but is contraindicated in those under age 2 and pregnant women. Tetravalent vaccine should be administered to all intimate contacts of index cases at the start of chemoprophylaxis. Its immunity lasts for 3 years; a booster dose is advised every year.

- The risk of the disease is often seasonal; one subcutaneous injection is advisable at minimum.

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Pertussis (Whooping Cough)

Infectious agent:

Bacterium- Bordetella pertussis

Mode of transmission:

Primarily by direct contact with respiratory droplets of infected person by the airborne route. Most frequently the infection is brought within a home by an older sibling and sometimes by a parent.

Incubation period:

7-14 days

Case Definition:*Suspected case:*

A person with a cough lasting at least 2 weeks with one of the following:

Paroxysms (i.e. fits) of coughing; or

Inspiratory "whoop"; or

Post-tussive vomiting (i.e. vomiting immediately after coughing)

AND without other apparent cause

Confirmed case:

A confirmed case is a suspected case that is laboratory confirmed or linked epidemiologically to a laboratory confirmed case.

The criteria used for laboratory diagnosis are:

- The isolation of Bordetella pertussis; or
- The presence of IgG or IgA directed toward pertussis toxin (PT) or filamentous haemagglutinin antigen (FHA) or PCR positive.

Specimen Collection:

- Collect duplicate nasopharyngeal specimen using calcium alginate swabs on fine flexible wire.
- Bronchial or nasopharyngeal secretions/aspirates may provide superior specimens for culture.
- Collect throat swabs in addition to the nasopharyngeal swabs for isolation of organism on culture.
- Direct plating at bedside of the patients on a freshly prepared Bordet Gengou (BG) medium is the most reliable method for culturing Bordetella.

- In absence of direct plating the Reagan Lowe (RL) transport medium may be used for sample transportation, which is stable for 2 months if refrigerated.

Management:

Young infants particularly those younger than 6 months of age should be hospitalized and mild cases require only supportive treatment.

- Erythromycin 30-50 mg/kg body weight (in two to four divided doses) a day for 14 days to prevent bacteriologic relapse.
- Methadone (cough suppressant) may be helpful in controlling the severity of paroxysms

When the illness is of long duration and vomiting is frequent, skilled nursing will be required to maintain nutrition, especially in infants and young children. Seriously ill infants should be kept in a darkened, quiet room and disturbed as little as possible, since any disturbance can precipitate serious paroxysmal spells with anoxia. Specific attention must be devoted to the maintenance of proper water and electrolyte balance, adequate nutrition and sufficient oxygenation.

Prevention:

All household and close contacts, irrespective of age or immunization status, should receive chemoprophylaxis with erythromycin 40-50 mg/kg per day in four divided doses for 14 days.

Active immunization:

Vaccination consists of 3 doses of 0.5 ml each/IM administered to the children less than one year of age according to the following weeks interval in EPI: 1st dose at the age of six weeks; 2nd dose at the age of ten weeks; 3rd dose at the age of fourteen weeks. Passive immunization is unreliable and is not recommended.

Human Plague

Infectious agent:

Bacterium - Yersinia pestis

Mode of transmission:

Bite of infected fleas especially Xenopsilla cheopis (rat fleas). Person to person transmission is rare but possible through direct exposure to infected tissues, or respiratory droplets for the pneumonic form.

Incubation period:

Ranges from 1 to 7 days

Alert Threshold:

One probable case is an alert and requires an immediate investigation.

Outbreak threshold

One confirmed case is an outbreak

Case Definition:*Suspected case:*

A case characterized by rapid onset of fever, chills, headache, severe malaise, prostration together with the following symptoms, depending upon whether it is the bubonic or the pneumonic form:

- Bubonic form: Extreme painful swelling of lymph glands (buboes)
- Pneumonic form: Cough with blood-stained sputum, chest pain, difficulty in breathing

Probable case:

A probable case is a suspected case with:

- A positive FA test for Yersinia pestis in clinical specimen; or
- PHA test, with antibody titre of > 1:10, specific for the F1 antigen of Y. pestis as determined by HI; or an epidemiological link with a confirmed case.

Confirmed case:

A confirmed case is a suspected or probable case laboratory-confirmed by:

- Isolation by culture of Y. pestis from buboes, cerebrospinal fluid or sputum; or

- PHA test demonstrating a four fold change in antibody titre, specific for F1 antigen of *Y. pestis* (HI test) in paired sera.

Note: Case report universally required by International Health Regulations.

Specimen Collection:

- Specimens best suited for culturing include: fluid aspirated from bubo, sputum and blood (multiple), lymph node, bone marrow and lung tissues
- Serum taken during the early and late stages of infection can be examined to confirm infection.
- Rapid dipstick tests have been validated for field use to quickly screen for *Y. pestis* antigen.
- The specimens (except blood/serum) may be placed in Cary-Blair (enteric) transport media. In the absence of CBT, any sterile container may be used for transportation to the laboratory as quickly as possible.

Management:

- Streptomycin is the most effective antibiotic against *Y. pestis* and the drug of choice for treatment of plague, particularly the pneumonic form.
- Standard patient-care precautions should be applied to management of all suspected plague patients. These include prescribed procedures for hand washing, wearing of latex gloves, gowns, and protective devices to protect mucous membranes of the eye, nose and mouth during those procedures and patient-care activities that are likely to generate splashes or sprays of blood, body fluids, secretions and excretions.
- Isolation is necessary only in case of pneumonic form

Prevention:

This largely depends on preventing biting by fleas carrying plague.

- Rats should be controlled.
- Powder containing 1.5% dieldrin or 2% Aldrin should be applied to household floor and blown into rat holes kill all the fleas and remain active for 9-12 weeks.
- In endemic areas people should avoid handling and skinning wild animals.

Patients should be isolated and attendants must wear gowns, masks and gloves. Health personnel conducting laboratory tests or post-mortem exam should take strict precautions.

Persons in close contact with pneumonic plague patients should receive antibiotic prophylactic therapy (tetracycline 2g daily or chloramphenicol for a week) within 6 days if they have:

- Been exposed to *Y. pestis*-infected fleas
- Had direct contact with body fluids or tissues of a *Y. pestis*-infected mammal
- Been exposed during a laboratory accident to known infectious materials

Immunization:

Worldwide, live attenuated and formalin-killed *Y. pestis* vaccines are available for human use. They however do not protect against primary pneumonic plague.

In general, immunizing communities is not feasible; further immunization is of little use during human plague outbreaks, since a month or more is required to develop a protective immune response.

The vaccine is indicated for persons whose work routinely brings them into close contact with *Y. pestis*, such as laboratory technicians in plague reference laboratories and persons studying infected rodent colonies.

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Poliomyelitis

Infectious agent:

Enterovirus subgroup, family Picornaviridae, having three related serotypes 1, 2 and 3, each capable of causing paralysis and infection with one does not confer protection against the other two strains.

Mode of Transmission:

Poliovirus is transmitted person-to-person most frequently through the fecal-oral route. It replicates after entry into mouth in pharynx, GI Tract and local lymphatics. Through viraemia, it reaches central nervous system and spread along nerve fibers.

Communicability:

Poliovirus is highly infectious and cases are most infectious from 7 to 10 days before and after paralysis onset

Incubation period:

10 - 21 days.

Reservoir:

Humans are the only known reservoir.

Alert Threshold:

One case is an alert requires an immediate notification and sample for confirmation.

Outbreak threshold

One confirmed case is an outbreak.

Case Definition:

Suspected case [acute flaccid paralysis (AFP)]:

Any child under 15 years of age with recent onset of floppy weakness of any cause including Guillian-Barre Syndrome or any person of any age with a paralytic illness, in whom poliomyelitis is suspected.

Confirmed Poliomyelitis cases as per Virological Classification

"An AFP case, from which, the wild poliovirus is cultured". This definition is applied if a country programme has non-polio AFP rate of 1/100,000 children under 15 years of age, two adequate specimens collected from at least 60% of all AFP cases and all specimens processed in a WHO-accredited laboratory. Adequate

stool specimens are two stools collected at least 24 hours apart, within 14 days of onset of paralysis, and arriving lab with proper documentation, maintained reverse cold chain, sufficient quantity for laboratory analysis without drying or leakage.

Compatible case:

A case of acute flaccid paralysis (AFP) in which a diagnosis of poliomyelitis cannot be excluded with confidence based on all available clinical and epidemiological information in the absence of good viral cultures, by the Expert Review Committee.

Discarded case:

A discarded case is an AFP case, which is neither diagnosed as confirmed nor compatible with a polio case definition.

Specimen Collection:

- Collect 2 stool samples about 8 grams each (about the size of the tip of thumb) at an interval of 24 to 48 hours for virus isolation as soon as possible or within 14 days of onset of illness in a clean, leak proof, screw-capped container, preferably in a transport medium like Minimal Essential Medium or Eagle's medium.
- Seal the container with tape.
- Place samples immediately after collection in refrigerator at 2-8°C or in a cold box with frozen ice packs.
- Transport specimens to the lab maintaining cold chain with duly filled request form within 72 hours after collection.
- The set of specimens from a single patient should be placed in a single plastic bag just large enough to hold both the containers.

Management:

Management depends on the severity of infection and includes recognition of disease and extent of damage it has caused. Management in different phases is as below: -

Inapparent Poliovirus Infection without symptoms (90-95% infections)

Infection is not apparent and there are no symptoms. Infected person with virus shed virus in stool, and are able to transmit the virus to others.

Abortive Poliovirus Infection (4.8% of infection)

This has non-specific illness with three syndromes observed usually: - upper respiratory tract infection (sore throat and low

grade fever), gastrointestinal disturbances (nausea, vomiting, abdominal pain, constipation or, rarely, diarrhoea), and influenza-like illness. These syndromes are difficult to distinguish from other viral illnesses. Treatment is symptomatic and recovery is rapid and complete.

Nonparalytic poliomyelitis (1-2% of poliovirus infection)

Non-paralytic aseptic meningitis may cause stiffness of neck, back and/or legs, usually following several days of prodromal symptoms. Increased or abnormal sensations can also occur. Symptoms last from 2 to 10 days and typically there is complete recovery.

Paralytic Poliovirus Infection (<1% of infection)

Poliovirus invades and replicates in motor neurons of the anterior horn and brain stem resulting in cell destruction and causing the typical clinical manifestations of poliomyelitis. The actual clinical signs depend on which region of the central nervous system is affected. There could be Spinal polio, most common, Bulbar Polio and Bulbo-spinal Polio. Of paralytic cases, as many as 5-10% is fatal, 10% recover completely and the remainder may have partial recovery with residual paralysis/ weakness

Spinal paralysis

Results from the infection of the lower motor neurons and typically affects only one leg having acute flaccid paralysis. Paralytic illness usually starts 1 to 10 days after prodromal symptoms. Progression to maximum paralysis is rapid (24 days). Paralysis is usually associated with fever and muscle pain and spasms that rarely continue after the temperature has returned to normal. Spinal paralysis is typically asymmetric (i.e. one side affected to a greater degree than the other), more severe proximally than distally, and deep tendon reflexes are absent or diminished. There is no sensory loss or change in cognition. Treatment includes bed rest, symptomatic treatment, Orthopaedic/ re-constructive surgery and rehabilitation physical and social.

Bulbar Poliomyelitis: -

This is more serious and involves neurons in the brainstem and, therefore, affects breathing. Encephalitis results from the infection of the brain itself; it makes up ~1% of all cases and is usually fatal. Treatment is artificial breathing, if breathing muscles affected and other treatment same as above for paralytic polio.

Prevention:

All children aged 0-59 months should be vaccinated with Oral Polio Vaccine (OPV) through routine and supplementary immunization activity, such as National Immunization days (NIDs) regardless of vaccination status.

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Severe Acute Respiratory Syndrome (SARS)

Infectious agent

Severe Acute Respiratory Syndrome (SARS) is an acute viral infection of respiratory tract, first recognized on 26th February 2003 in Hanoi, Viet Nam. Out of 8,447 persons infected that year, 811 died (9.6% CFR) in 33 countries in Asia, Europe, Middle East, North, Central and South America. The infectious agent has been presumptively identified as a novel Coronavirus, provisionally named as SARS-CoV.

Mode of transmission

SARS is primarily transmitted through inhalation of aerosol and/or droplet infection of an affected individual but also by direct contact through contaminated hands, surfaces and body fluids.

Incubation Period

Up to 10 days

Clinical picture

Initially flu-like symptoms, rapid onset of high-grade fever (>38°C) followed by muscle aches, headache, sore throat. In some cases, there may be bilateral pneumonia, progressing to acute respiratory distress requiring assisted breathing on respirator. It may be associated with other symptoms like loss of appetite, malaise, confusion, rash and diarrhoea. Early lab findings may include thrombocytopenia and leucopenia.

Case definition

Suspected case

1. A person presenting after 1st November 2002 with history of:

- High grade fever (>38°C) AND
- Cough or breathing difficulty AND
- One or more exposures during the 10 days prior to the onset of symptoms:
 - Close contact with a person who is a suspect or probable case of SARS
 - History of travel, to an area with recent local transmission of SARS
 - Residing in an area with recent local transmission of SARS

2. A person with an unexplained acute respiratory illness resulting in death after 1st November 2002, but on whom no autopsy has been performed AND

- One or more of the following exposures during 10 days prior to onset of symptoms:
 - Close contact with a person who is a suspect or probable case of SARS.
 - History of travel to an area with recent local transmission of SARS.
 - Residing in an area with recent local transmission of SARS.

Suggested laboratory investigations in a suspected case of SARS require the collection and safe transport of the following specimens to the reference laboratory;

- Throat and/or nasopharyngeal swab
- Bronchial lavage
- Blood culture
- Urine specimen
- Blood for complete examination and serology

Probable Case

- A suspect case with radiographic evidence of infiltrates consistent with pneumonia or respiratory distress syndrome (RDS) or chest X-ray.
- A suspect case of SARS that is positive for SARS coronavirus by one or more assays. ELISA, IFA and RT-PCR have been developed but have not been evaluated for routine use.
- A suspect case with autopsy findings consistent with the pathology of RDS without an identifiable cause.

Prevention and Control measures

Care and management of cases

- Good supportive care including intensive therapy has been shown to improve the prognosis.
- No vaccine or chemoprophylaxis is available yet.
- Antibiotics attributed no clinical improvement.
- Ribavirin, an antiviral agent, used intravenously in combination with corticosteroids clinically improved some critically ill patients in Hong Kong.

Management of suspected case

- Patients with suspected SARS symptoms should be isolated and cared for using barrier-nursing techniques and by providing surgical mask to the patient.
- Detailed clinical, contact and travel history including occurrence of acute respiratory diseases in contact persons during the last 10 days.
- X-ray chest (CXR) and complete blood count.
- If CXR is normal, discharge the patient with advice to seek medical care if respiratory symptoms worsen, use best personal hygiene, avoid public areas and transportation, confine at home until well.

If CXR demonstrates unilateral or bilateral infiltrates with or without interstitial infiltrations, see management of probable case.

Management of probable case

- Hospitalize under isolation or cohorted with other SARS patients.
- Lab investigation to exclude known cause of atypical pneumonia.
 - Urine examination.
 - Complete blood picture.
 - Blood for culture and serology. Specimens should be collected on alternate days and investigated in the laboratories with proper containment facilities (BL3).
 - Throat and/or nasopharyngeal swabs and cold agglutinin.
 - Bronchoalveolar lavage.
 - Post-mortem examination as appropriate.
- CXR as clinically indicated.
- Treat as clinically indicated (symptomatic treatment).
- Broad-spectrum antibiotics have not appeared to be proven effective in halting SARS progression to date.
- Intravenous Ribavirin in combination with corticosteroids has been shown effective in some cases.

Management of contact of suspected and probable cases

- Reassure.
- Record name and contact in detail.
- Advise to seek medical assistance in the event fever or respiratory symptoms worsen, and immediately report to the health authority.

- Do not report to the work until advised by the physician.
- Minimize contact with family members and friends.
- Avoid public places.

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Scabies

Infectious agent:

Sarcoptes scabiei mite

Mode of transmission:

Skin contact with an infected person or contact with towels, bedclothes and undergarments contaminated by infested persons within the last 4-5 days. The mites cannot jump or fly. Adult scabies mites can survive off the skin for up to 48 hours in indoor conditions.

Incubation period:

Ranges from 2 to 6 weeks before itching occurs in a person not previously exposed. Symptoms develop more quickly if a person is re-exposed, often within one to 4 days.

Alert Threshold:

Case count greater than 1.5 times the mean number of cases over the previous 3 weeks requires investigation.

Outbreak threshold

To be determined by trend.

Case Definition:

Skin infection characterized by rash or lesions and intense itching especially at night. Lesions prominent around finger webs, wrists, elbows, axillaries, beltlines, thighs, external genitalia, nipples, abdomen, lower portion of buttocks, head, neck, palm and soles of infants may be involved.

Management:

- Application of permethrin cream (2 days) or lotion (3 days) is treatment of choice.
- It should be applied to all cutaneous surfaces, particularly the hands, fingernails, waist and genitalia at bedtime after taking shower.
- Apply cream or lotion daily on whole of the body.
- Put on clean clothing daily.
- All bed linen and clothing should be washed in hot water and dried in sun and ironed on both sides. If not possible, place the plastic bag away from the family for 5 days.

- All members of the house including regular guests should be treated simultaneously.
- If secondary infection occurs, antibiotics may be indicated.

Prevention:

- Hygiene promotion and education about the disease is most effective means of prevention.
- General cleanliness including body washing and washing of clothes and bed linens.
- Bedding material such as mattresses, bed linens, blankets and clothing should be kept in sun (from 10:00 a.m. to 1:00 p.m.), which will kill the parasites.

Neonatal Tetanus

Infectious agent:

Bacterium - Clostridium tetani

Mode of transmission:

Contamination of wound with dust containing spores derived from animal excreta, if childbirth takes place in an unhygienic environment, tetanus neonatorum may result from infection of the umbilical stump or the mother may develop the disease by surgical procedure.

Incubation period:

From 3 days to 21 days, average 10 days.

Alert Threshold:

One case requires investigation for safe birth practices.

Outbreak threshold

None.

Case Definition:*Suspected case:*

Any neonatal death between 3 and 28 days of age, for which the cause of death is unknown; or

Any neonate reported as having suffered from neonatal tetanus between 3 and 28 days of age and not investigated.

Confirmed case:

- A confirmed case is any neonate with a normal ability to suck and cry during the first 2 days of life and who, between the ages of 3 and 28 days cannot suck normally and becomes stiff or has convulsions (i.e. jerking of the muscles) or both.
- Confirmation is entirely clinical and does not depend upon bacteriological confirmation.

Management:

- Debridement of any associated wound
- Tetanus immune globulin (Tlg) is given to neutralize the toxin.
- Inj: Penicillin 600mg-6 hourly IV for 7 days (metronidazole if allergic to penicillin) to kill the toxin producing C. tetani.
- Muscle spasms may be treated with muscle relaxants such as chlorpromazine (50-150 mg every 4-8 hours in adults) and

diazepam (2-20 mg/IV every 2-8 hours) to control spasms and convulsions.

- Bed rest with a non-stimulating environment is also recommended (dim light, reduced noise and stable temperature).
- Respiratory support with oxygen, endo-tracheal tube and mechanical ventilation may be necessary.
- General measures: Maintain hydration, nutrition and treat secondary infections.

Prevention:

Tetanus is completely preventable by active tetanus immunization, which begins in infancy as a series of DPT shots (D= diphtheria, P= pertussis and T= tetanus). Boosters are given to teenagers and older adults specially who have been injured.

The immediate danger of tetanus can be greatly reduced by the injection of 1200 mg of penicillin followed by 7 days course of oral penicillin.

Thorough cleaning of all injuries and wounds and the removal of dead or severely injured tissue (debridement) may reduce the risk of developing tetanus.

When the risk of tetanus is judged to be present, an injection of 250 units of Human Tetanus Antitoxin should be given and an intra-muscular injection of toxoid that should be repeated 1 month and 6 months later. For those already protected; only a booster dose of toxoid is required.

*In areas or countries where more than 85% of newborns with tetanus die, this definition will be practical for surveillance purposes even though children who survive will be excluded. Where the survival rate is higher, removing death as a criterion may modify the definition.

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Tuberculosis

Infectious agent:

Bacterium: *Mycobacterium tuberculosis*.

Mode of transmission:

Exposure to tubercle bacilli in airborne droplet nuclei produced by people with pulmonary or laryngeal tuberculosis during expiratory efforts, such as coughing and sneezing

Bovine tuberculosis results from exposure to tuberculous cattle, usually by ingestion of un-pasteurized milk or dairy products, and sometimes by airborne spread to farmers and animal handlers

Incubation period:

Incubation period is about 4-10 weeks, but latent infections may persist all life.

Alert Threshold:

An increase in number of cases in crowded settings must lead to an alert and requires an immediate investigation.

Case definition:

Suspected case of TB:

- Any person who presents with symptoms or signs suggestive of pulmonary TB, in particular cough for more than two weeks.
- May also have haemoptysis, chest pain, breathlessness, fever/night sweats, tiredness, and loss of appetite and significant weight loss.
- All TB suspects should have three sputum samples examined by light microscopy, early morning samples are more likely to contain the TB organism than a sample later in the day

Confirmed case of TB:

Pulmonary TB smear-positive (PTB+):

Diagnostic criteria should include:

- At least two sputum smear specimens positive for acid fast bacilli (AFB) or
- One sputum smear specimen positive for AFB and radiographic abnormalities consistent with active pulmonary TB or
- One sputum smear specimen positive for AFB and a culture positive for *M. Tuberculosis*

Pulmonary TB smear-negative (PTB-):

A case of pulmonary tuberculosis that does not meet the above definition for smear-positive TB. Diagnostic criteria should include:

- At least three sputum smear specimens negative for AFB and
- No response to a course of broad spectrum antibiotics and
- Decision by a clinician to treat with a full course of anti-tuberculosis chemotherapy.
- Radiographic abnormalities consistent with active pulmonary TB

Specimen Collection:**Sputum (Expectorated)**

- Collect 3 early morning specimens on different days having the volume of 5 to 10 ml containing recently discharged material from the bronchial tree with minimal saliva content.

Sputum (Induced)

- If the patient has difficulty in producing sputum, then induction should be considered by inhalation of a warm aerosol of sterile 5-10% sodium chloride in water produced by a nebulizer.
- The specimen should be clearly marked "INDUCED" on the request slip since nebulized sputum is watery in consistency and could be mistaken for saliva.

Gastric Lavage

- This procedure can be employed where sputum production is unsuccessful. This technique requires professional attention and should only be attempted in the hospital.
- Gastric lavage is performed early in the morning before eating and at least 8 hours after the patient has eaten or taken oral drugs.
- 5-10 ml specimen is required and neutralized with 100 mg of sodium carbonate.

Urine

- An early morning midstream specimen should be collected.
- Multiple specimens over several days may be required to obtain a positive specimen.
- Due to contamination and deterioration, 24-hour urine specimens are NOT acceptable. Keep specimen refrigerated until transport.

Blood

- Collect specimens in an Isolator tubes. Store tubes at room temperature and transport on the same day.

Fluids

- Collect body fluids like spinal, pleural, pericardial, synovial, ascitic, blood, pus, and bone marrow by aseptic technique.

Tissue

- Any tissue to be cultured must be collected aseptically in a sterile container without fixatives or preservatives.
- Add sterile saline to keep the specimen moist. Do not place tissue specimen for culture in formalin. Keep refrigerated until transport.
- Be sure specimen is sealed inside double bag, and form is inserted into outer pocket, separated from the specimen itself.
- Transport to lab at 4-8°C (using ice packs to prevent overgrowth of respiratory flora) along with requisition form in the biohazard bag.

Management:

The priority is the diagnosis and treatment of smear positive infectious cases of TB. To ensure appropriate treatment and cure of TB patients, strict implementation of the DOTS strategy is important. The DOTS strategy has the following components:

- Case detection through sputum smear microscopy
- Standardized short-course chemotherapy to, at least, all smear positive cases under direct observation of treatment, at least, during the initial phase of treatment.
- Regular supply of anti-TB drugs
- Monitoring system for programme supervision and evaluation

There are primarily three types of regimens: category 1 regimen for new smear positive (infectious) pulmonary cases, category 2 regimen for re-treatment cases, and category 3 regimens for smear negative pulmonary or extra-pulmonary cases.

The chemotherapeutic regimens are based on standardized combinations of 5 essential drugs: Rifampicin (R), Isoniazid (H), Pyrazinamide (P), Ethambutol (E) and Streptomycin (S).

Each of the standardized chemotherapeutic regimens consists of 2 phases:

Initial (intensive) phase: 2-3 months, with 3-5 drugs given daily under direct observation.

Continuation phase: 4-6 months, with 2-3 drugs given daily, or in some cases (e.g. during repatriation of refugees) 2 drugs for 6 months given daily unsupervised, but in fixed dose combination form.

All doses of rifampicin containing regimens should be observed by staff. Actual swallowing of medication should be checked.

Prevention:

Detection and treatment of smear positive TB cases is the most effective preventive measure. It helps in cutting the transmission line of infection.

Health education to improve awareness and reduce stigma

Maintaining good ventilation and reducing overcrowding in health clinics, and ensuring hospitalized patients are kept in a separate ward for the first two weeks of treatment.

Isoniazid prophylaxis is not recommended in refugee situations, except for children being breast-fed by smear positive mothers. If the child is well, BCG vaccination should be postponed and Isoniazid should be given to the child for 6 months. In the event of a sudden disruption to the programme, Isoniazid may be stopped, and BCG should be given before the child leaves the refugee camp (preferably after a one week interval)

Immunization:

BCG has been shown to be effective in preventing severe forms of TB such as meningitis in children.

BCG is strongly recommended for all newborn children and any children up to the age of 5 years who have not already received it.

The vaccination of newborns should be incorporated into the immunization programme for all children. Vaccination is not recommended.

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Typhoid Fever

Infectious agent:

Bacterium - Salmonella typhi

Mode of transmission:

Fecal-oral route, particularly contaminated water and food

Incubation period: Usually between 8-14 days but may be from 3 days up to one month

Alert Threshold:

Two or more linked cases are an alert and require an immediate investigation.

Case Definition:*Suspected case:*

Any person with acute illness and demonstrates:

Insidious onset of sustained fever, headache, malaise, anorexia, relative bradycardia, constipation or diarrhoea and abdominal tenderness progressing to prostration. Pulse is often slower than expected due to the elevation of the temperature.

Confirmed case:

A suspected case that is laboratory confirmed by:

Isolation of Salmonella typhi from blood, stool or urine specimens or a suspected case that has positive Widal Test, i.e. a fourfold increase in agglutination titer against S. typhi O and H antigens, in the 3rd week of illness.

In the 1st week of fever, blood culture is the most important diagnostic method in suspected cases. During the 2nd and 3rd weeks, the faeces will contain the organism more frequently.

Specimen Collection:

- Blood culture is one of the most important factors in the isolation of *S. typhi* from typhoid patients.
- Collect 10-15 ml of blood from school children and adults in order to achieve optimal isolation rates; 2-4 ml is required from toddlers and preschool children.
- For blood culture inoculate media at the time of drawing blood.
- Once specimens are inoculated, blood culture bottles should not be kept cold. They should be incubated at 37°C or in tropical countries, left at room temperature, before being processed in the laboratory.

Serum

- Collect 1-3 ml of blood inoculated in a tube without anticoagulant for serological purposes.
- 2nd sample should be collected at the convalescent stage, at least 5 days later.
- Separate serum after clotting and store in aliquots of 200 ml at +4°C.
- Testing can take place immediately or storage can continue for a week without affecting the antibody titre.
- For longer storage the serum may be frozen at -20°C.

Stool

- Collect stool sample in a sterile wide-mouthed plastic container from acute patients, which is useful for the diagnosis of typhoid carriers.
- Specimens should preferably be processed within two hours after collection. If there is any delay, then stored at 4°C or in a cool box with freezer packs and should be transported to the lab in a cool box.
- If stool sample cannot be obtained, rectal swabs inoculated into Carry Blair transport medium can be used but it is less successful.

Management:

Patient is treated in bed and preferably in isolation. Special attention must be paid towards the maintenance of nutrition and fluid intake, care of the mouth and prevention of pressure sores. Several effective antibiotics include: Co-trimoxazole (2 tab. or I.V./12 hourly), Trimethoprim (300 mg 12 hourly), Amoxicillin (750 mg 6 hourly), Ciprofloxacin (500 mg 12 hourly), Chloramphenicol (500 mg 6 hourly) for 14 days. ORS plays an important role in correction of dehydration.

Prevention:

Two basic actions can protect from typhoid fever; avoid risky foods and drinks and get vaccinated against typhoid fever. Eat only thoroughly cooked and still hot foods. Avoid raw vegetables and fruits that cannot be peeled. Avoid salads, food and beverages from street vendors. Flies must not be allowed to access food.

Immunization:

Mass immunization may be an adjunct for the control of typhoid fever during a sustained, high incidence epidemic. This is especially true when access to well functioning medical services is not possible or in case of a multi-drug resistant strain.

- Parenteral vaccine containing polysaccharide Vi antigen is the vaccine of choice amongst displaced populations. An oral, live vaccine using *S. typhi* strain Ty21a is also available.
- Neither the polysaccharide vaccine nor the Ty21a vaccine is licensed for children under 2 years old. The Ty21a vaccine should not be used in patients receiving antibiotics.

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