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44th Issue

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SEASONAL AWARENESS AND ALERT LETTER (SAAL)

For Epidemic-prone infectious diseases in Pakistan

Spring Season

OBJECTIVES OF SAAL

- To alert concerned health authorities and professionals at all levels about the epidemic-prone infectious diseases in the spring/summer season.
- To facilitate the preparations for timely and efficient response to the encountered alerts / outbreaks / epidemics and thus reduce the associated morbidity and mortality.

DATA SOURCES

The available national data collected during 2013 to 2018 by FE&DSD, NIH, Provincial Health Departments, Provincial Disease Surveillance & Response Units (PDSRUs), Expanded Program on Immunization (EPI), Directorate of Malaria Control and laboratory based data from NIH have been analyzed to assess the exhibited patterns of high priority communicable diseases.

The description of all priority diseases has been arranged in an alphabetical order. Additionally, under the section of National Potential Public Health Events, technical details on Extensively Drug Resistant (XDR) Typhoid fever and Naegleria Fowleri infection are included as fatal cases encountered in Karachi. Ebola Virus disease and Middle East Respiratory Syndrome Corona Virus (MERS CoV) infection have been shared as International Potential Public Health Events.

Outbreak - Prone Diseases	Alerts
Chikungunya	
Cholera (Acute watery Diarrhea)	
Crimean Congo Hemorrhagic Fever (CCHF)	
Dengue Fever	
Diphtheria	
Leishmaniasis	
Malaria	
Measles	
Meningococcal Meningitis	
Primary Amebic Meningoencephalitis	
Pertussis	
Poliomyelitis	
Seasonal Influenza - A (H1N1, H5N1)	
Typhoid Fever	

	High Alert- peak occurrence in the spring-summer season
	Medium Alert- cases will be encountered and may show up as an outbreak

CHIKUNGUNYA

Introduction: Chikungunya is a mosquito-borne viral disease. The first case was reported in southern Tanzania in 1953. In Pakistan, an outbreak occurred during November 2016 in Karachi and approximately 30,000 individuals were infected with CHIKV; it was later followed by cases from other areas of Gwadar and Turbat. Travel associated cases were reported from Islamabad and Rawalpindi (1).

Clinical Picture: Fever, arthralgia, myalgia, headache, nausea, fatigue and rash. Serious complications are not common with occasional cases of ocular, neurological and cardiovascular complications. There are rare reports of spontaneous abortions and mother-to-child transmission in perinatal period (2).

Infectious Agent: Chikungunya belongs to an *alpha virus* genus Togaviridae family (2).

Reservoir: Non-human and human primates are likely the main reservoirs (2).

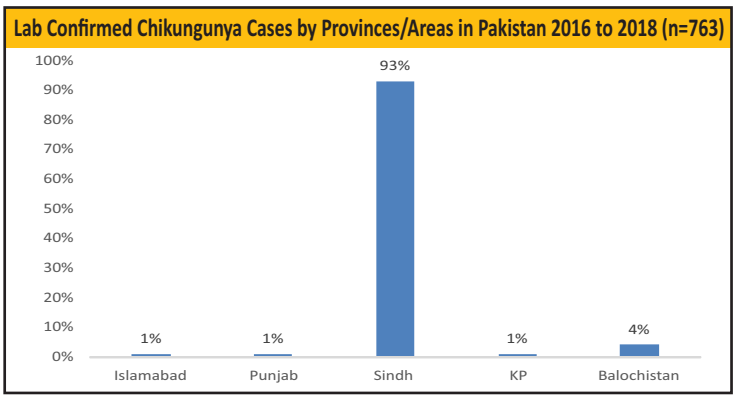
Mode of transmission: Transmit through bite of an infected female *Aedes aegypti* and *Aedes albopictus* mosquitoes (1).

Incubation period: Onset of illness occurs usually between 4 to 8 days but can range from 2 to 12 days (3).

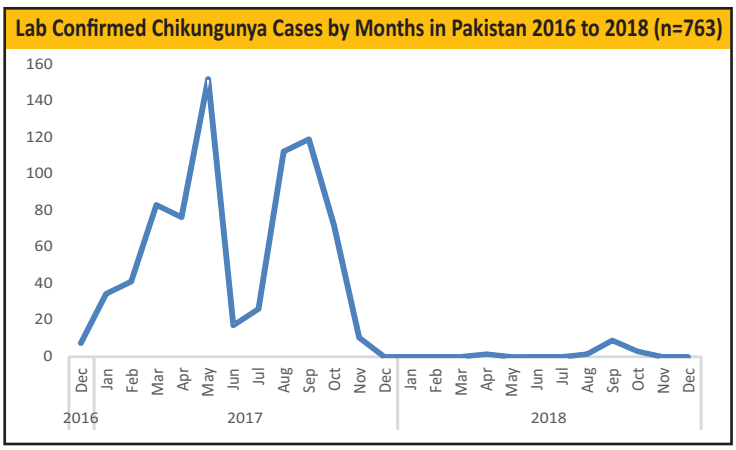
Communicability: CHIKV infections cause high levels of viraemia, which typically last 4-6 days, but can persist for up to 12 days after the onset of the illness(4).

Seasonality: Chikungunya can spread all year round. Warm humid weather and stagnant water favors breeding of mosquitoes that carry the virus, which is why an epidemic is most likely to occur during post-monsoon period (5).

Geographic Distribution in Pakistan: From Dec-2016 to December 2018, maximum laboratory confirmed cases (93%) were from Sindh, the most affected province in Pakistan.



Seasonal trend of the lab confirmed cases is as under:



Case Definitions:

Suspected case: Any person with an acute onset of fever >102°F and severe arthralgia/arthritis not explained by other medical conditions (7).

Probable Case: Any suspected case residing or having visited endemic areas within 15 days prior to the development of symptoms (7).

Confirmed case: Suspected/ probable case confirmed by any of the following laboratory tests:

- Molecular detection using Real-time polymerase chain reaction (RT -PCR) test within one week after onset of illness
- Confirmation of presence of IgM antibodies in serum by ELISA method after 4 days of the onset of illness (7).

Specimen Collection and Transportation: Collect 3-5 ml venous blood/serum of any suspected patient in sterile venoject tubes. Tighten and seal them with full biosafety precautions. Label and pack the tubes properly in triple packing with ice packs and transport to lab along-with patient's complete history form (8).

Transport the sample to the Virology Department of PHLD at National Institute of Health, Islamabad.

Case Management: There is no specific antiviral drug for Chikungunya. It is a self-limiting disease and the treatment is symptomatic i.e. using anti-pyretics, optimal analgesics/pain killers for the joint pain and plenty of fluids intake (9).

Preventive measures & vaccination:

- No vaccination available
- Minimizing vector population: Intensifying efforts to reduce larval habitats in and around residential areas
- Minimizing vector-patient contact
- Using bed-nets (preferably permethrin-impregnated nets)
- Wearing full-sleeved clothes to cover extremities
- Using Wire-mesh/ nets on doors and windows (10)

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CRIMEAN-CONGO HEMORRHAGIC FEVER (CCHF)

Introduction: A tick-borne zoonotic viral disease that is asymptomatic in infected animals, but is a serious threat to humans (1). Human infections begin with nonspecific febrile symptoms, but progress to a serious hemorrhagic syndrome with a high case fatality rate (10 – 40%) (2). It is one of the most widely distributed viral hemorrhagic fevers occurring in parts of Africa, Middle-East, Asia and Europe. CCHF is endemic in Pakistan with sporadic outbreaks. (3). Occurrence of virus is correlated with the distribution of *Hyalomma* tick species (Principle vector) (4).

Clinical Picture: Sudden onset with initial signs and symptoms including headache, high fever, backache, joint pain, stomachache, vomiting, redness of eyes, a flushed face, sore throat, and petechiae (red spots) on the palate are common. Symptoms may also include jaundice along with changes in mood and sensory perception. With progression of the illness, large areas of severe bruising, severe nosebleeds, and uncontrolled bleeding at injection sites can be seen, usually beginning on the fourth day of illness and lasting for about two weeks(5).

Infectious Agent: Crimean-Congo Haemorrhagic Fever (CCHF) Virus belongs to *Bunyaviridae* family (1)

Reservoir: *Hyalomma* tick and domestic animals, such as cattle, goats, sheep, wild animals/rodents, such as hedgehogs, rats, hares and birds are generally resistant with exception of Ostrich(6).

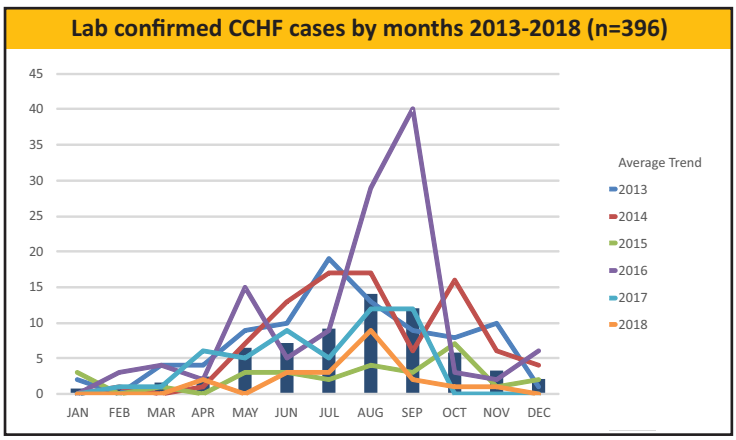
Mode of transmission: Bite of the infected *Hyalomma* tick, handling of tick infested animals, direct contact with blood / tissue of infected domestic animals (slaughtering), or direct contact with blood / tissue of infected patients. Nosocomial infections are common sources of transmission (7).

Incubation Period:

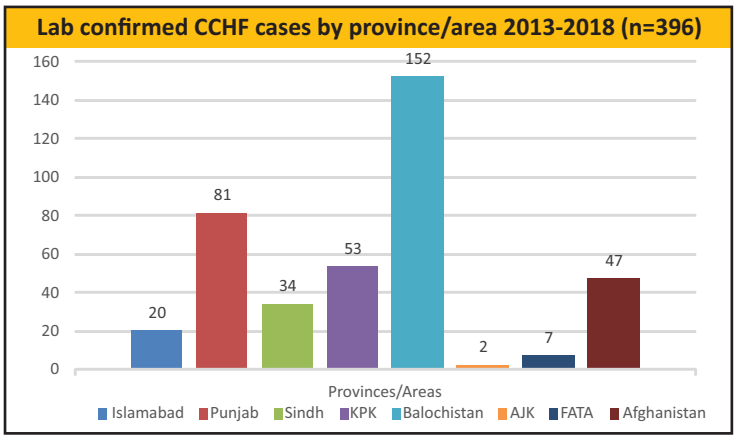
1-3 days after tick bite

5–6 days after exposure to infected blood or tissues with a documented maximum of 13 days (8).

Seasonality: Peak of cases occur during Fall and Spring seasons, associated with life-cycle of ticks, exposure of new born animals, exposure of migrating animals(9).



Geographical Distribution in Pakistan: Since the diagnosis of first human case of CCHF in 1976, the sporadic cases have continued to occur, mostly from different areas of Pakistan and predominantly from Balochistan (10).



Alert Threshold: One probable case is an alert and requires immediate investigation (11).

Outbreak Threshold: One lab confirmed case of CCHF is an outbreak (11).

Case definitions:

Suspected Case: Any person with sudden onset of fever over 38.5°C for more than 72 hours and less than 10 days, especially in a CCHF endemic area and those in contact with livestock such as shepherds, butchers, animal handlers and health care personals (11).

Probable Case: Suspected case with history of febrile illness of 10 days or less with epidemiological link AND any two of the following: thrombocytopenia less than 50,000/mm3, petechial or purpuric rash, epistaxis, haematemesis, haemoptysis, blood in urine and/or stools, ecchymosis and gum bleeding (11).

Confirmed Case: Suspected/Probable case confirmed through PCR and/or serology (11).

Laboratory Confirmation: Detection of viral nucleic acid by PCR in blood specimen. Confirmation of presence of IgM antibodies in serum by ELISA (Enzyme-Linked Immunoassay) (11).

Specimen Collection and Transportation: Collect 3-5ml of blood in vacutainer observing strict biosafety precautions. Keep in upright position to prevent hemolysis. Transport to the laboratory in triple package 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 (11).

Case Management:

- Patients with probable or confirmed CCHF should be isolated and cared for using strict barrier-nursing techniques with recommended Infection Prevention & Control (IPC) measures i.e. standard plus contact precautions. Use additional precautions, (droplet/aerosol) in case of any extensive contact/ procedure.
- Only designated medical / para-medical staff and attendants should attend the patient.
- All medical, para-medical staff and attendants should wear recommended Personal Protective Equipments (PPEs) before entering the isolation room and dispose it properly after use.
- All secretions of the patient and hospital clothing in use of the patient and attendants should be treated as infectious and where possible, should be autoclaved before incinerating.
- Every effort should be made to avoid spills, pricks, injury and accidents during the management of patients. Needles should not be re-capped but discarded in proper safety disposal box.
- All used material e.g. syringes, gloves, cannula, tubing etc. should be collected in autoclave-able bags and autoclaved before incinerating.
- After the patient is discharged, room surfaces should be wiped down with disinfectant like sodium hypochlorite (Naocl) 10% solution and the room should be fumigated in case of risk for tick infestation (12).

Treatment: 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 needs to be initiated immediately in consultation with the attending physician. Studies suggest that Ribavirin is most effective if given in the first 6 days of illness. Oral Ribavirin: 30 mg/kg as loading dose, followed by 16 mg/kg every 6 hours for 4 days and then 8 mg/kg every 8 hours for 3 days.

Prophylaxis Protocol: The efficacy for post exposure Ribavirin in the management of hospital-associated CCHF, remains anecdotal.

It may be given in a high loading dose (35 mg/kg orally followed by 15 mg/kg three times daily for 10 days) and only for high-risk settings e.g. needle stick injury, mucous membrane contamination, emergency resuscitative contact, or prolonged intimate exposure during transport after baseline blood tests.

Household or other contacts of the case who may have been exposed 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 temperature of 38.5°C or greater, headache and muscle pains, he/she would be considered as a probable case and should be admitted to hospital and started on Ribavirin treatment as mentioned above (12).

Preventive measures & vaccination:

- Educate public about the mode of transmission and about the means for personal protection.
  - Persons living in endemic areas must be educated on:
  - Avoidance of areas where tick vectors are abundant, especially when they are active (spring to fall).
  - Regular examination of clothing and skin for ticks, and their removal (without crushing them).
  - Wearing light colored clothing, covering legs and arms, and using repellents on the skin.
  - Other measures, such as wearing gloves or other protective clothing to prevent skin contact with infected tissues or blood, may be taken by persons who work with livestock or other animals.
- For tick control, animal dipping/spraying in an insecticide solution is used. Injectable insecticide like Ivermectin is also recommended.
- Butchers should wear gloves and other protective clothing to prevent skin contact with freshly slaughtered meat, blood and other tissues. Meat should drain for at least 30 minutes, before distribution to public.
- Hospitals in endemic areas should ensure universal precautions in OPD, Emergency Rooms, ensure injection safety measures and maintain stock of Ribavirin with PPEs.
- Bio-safety is the key element to avoid nosocomial infection. Patients with suspected or confirmed CCHF must be isolated and cared for by using barrier-nursing techniques to prevent transmission of infection to health workers and others.
- In case of death of patient due to CCHF, family members should be advised to follow safe burial practices.
- Exposed contacts: - those with high risk exposure (needle stick, sharps, blood or body fluids contacts should be observed for fever for 14 days. If fever develops, Ribavirin should be started immediately (12).
- There is no approved vaccine available (13).

Guideline Link: https://www.nih.org.pk/wp-content/uploads/2018/03/Guidelines-for-Prevention-of-Crimean-Congo-Haemorrhagic-CCHF-Fever-Human-and-Animals-in-Pakistan..pdf

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Acute Watery Diarrhea (Cholera)

Introduction: Cholera is an acute, diarrheal illness caused by infection of the intestine due to bacterium *Vibrio cholerae*. An estimated 3-5 million cases and over 100,000 deaths occur each year around the world (1).

Clinical Picture: Cholera infection is often mild or without symptoms, but can sometimes be severe and life threatening. Approximately 5-10% infected persons in the early stages will have severe disease characterized by profuse watery diarrhea, vomiting, and leg cramps. In these people, rapid loss of body fluids leads to dehydration and shock (1).

Reservoir of Infection: Humans and aquatic environment are reservoirs for *V. cholerae* O1 and O139. Humans are considered the primary reservoir and can be asymptomatic carriers (2).

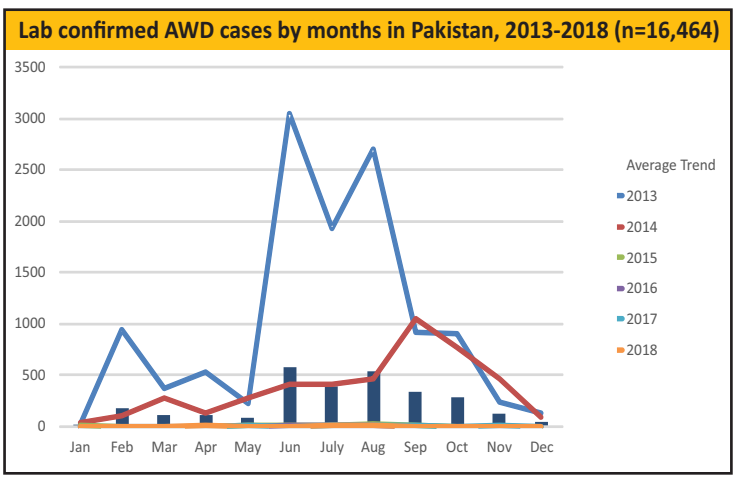
Infectious Agent: *Vibrio cholerae* (1)

Mode of transmission: Infection results from ingestion of organisms present in contaminated food and water or directly from person to person by the fecal–oral route (3)

Incubation period: Few hours to 5 days (4)

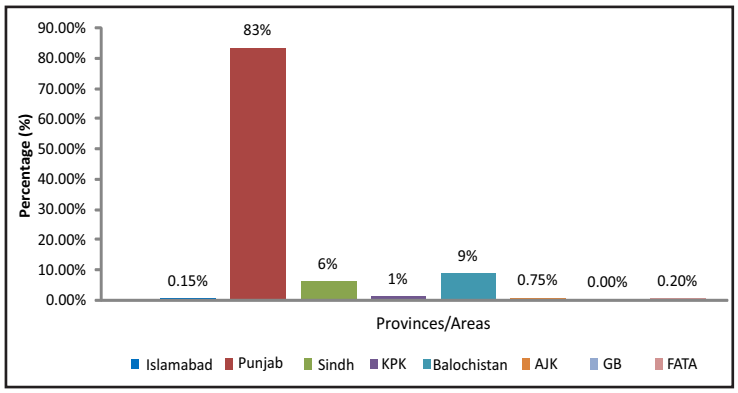
Infectivity period: The contagious period for cholera begins as soon as the organism is excreted in the feces. This can occur as early as about 6 to 12 hours after exposure to the bacteria and can last for about 7 to 14 days (5).

Seasonality: Throughout the year; higher incidence from May to November, in hot, humid and rainy season (6).



Geographical Distribution in Pakistan:

During 2013 to 2018 in Pakistan 83% (n=13,734) cases were reported form Punjab followed by Balochistan 9% (n=1,431) and Sindh 6% (n=977)



Alert Threshold: One suspected case of AWD is an alert (7).

Outbreak Threshold: One lab confirmed case, or cluster of 6 or more cases of AWD in one location, is an outbreak (7).

Case Definitions:

Acute watery diarrhea: Three or more abnormally loose or fluids stools in the past 24 hours with or without dehydration of any age group (7).

Suspected Case:

- Person aged over 2 years with acute watery diarrhoea in an area, where there is a cholera outbreak.
- Person aged over 5 years with severe dehydration or death from acute watery diarrhoea with or without vomiting (7).

Confirmed Case:

Any suspected case confirmed through isolation of Vibrio cholerae 01 or 0139 from the stool (7).

Specimen Collection and Transportation:

- Place specimen in clean container and transport to laboratory within two hours of collection at room temperature
- If there is a 72 hours delay, place stools soaked swab in a Cary-blair transport medium (7).

Case Management: Low osmolar ORS should be given orally every hour. Even with severe dehydration, intravenous electrolyte solutions should be used only for initial rehydration, including those who are in shock. Severely dehydrated patients require administration of intravenous fluids. Ringer's Lactate Solution (Hartman's Solution) is the preferred fluid for intravenous rehydration. Antibiotics (Doxycycline, Ciprofloxacin, Cefixime, Co-trimaxozole, Erythromycin) reduce the duration of disease and period of excretion of V. cholerae in the stool of infected patient (7).

Preventive measures & vaccination: Ensuring adequate safe drinking water supply and proper sanitation. To make water safe for drinking, either boil the water or chlorinate it (7). People (visitors or residents) in areas where cholera is occurring or has occurred should observe the following recommendations:

- Drink only bottled, boiled, or chemically treated water and bottled or canned carbonated beverages. When using bottled drinks, make sure that the seal has not been broken.
- Use bottled, boiled or chemically treated water to wash dishes, brush your teeth, wash and prepare food or make ice.
- To disinfect your own water: boil for 1 minute or filter the water and add 2 drops of household bleach or ½ an iodine tablet per liter of water.
- Avoid tap water and fountain drinks.
- Wash your hands often with soap and clean water.
- If no water and soap are available, use an alcohol-based hand cleaner (with at least 60% ethyl alcohol).
- Clean your hands especially before you eat or prepare food and after using the bathroom.
- Eat freshly cooked food ,served hot.
- Do not eat raw and undercooked meats and seafood or unpeeled fruits and vegetables.
- Dispose off feces in a sanitary manner to prevent contamination of water and food sources (4).

Vaccination: A single-dose live oral cholera vaccine called Vaxchora

(lyophilized CVD 103-HgR) for adults 18 – 64 years old is recommended who are traveling to an area of active cholera transmission. Two other oral inactivated or non-live cholera vaccines, Dukoral® and ShanChol®, are World Health Organization (WHO) prequalified. No cholera vaccine is 100% protective and vaccination against cholera is not a substitute for standard prevention and control measures (4).

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DENGUE FEVER

Introduction: Dengue is a mosquito-borne viral disease (also known as break bone fever), causes flu-like illness, and occasionally develops into a potentially lethal complication called severe Dengue. The global incidence of Dengue has grown dramatically in recent decades and about half of the World's population is now at risk(1). The first confirmed outbreak of Dengue fever in Pakistan was in 1994, but a sudden rise in cases and the annual epidemic trend first occurred in Karachi in November 2005(2).

Clinical Picture:

Dengue Fever: Dengue fever is defined by fever (for>3 days and <10days) as reported by the patient or healthcare provider and the presence of one or more of the following signs and symptoms i.e. nausea/vomiting, rash, aches and pains (e.g., headache, retro-orbital pain, joint pain, myalgia, arthralgia), tourniquet test positive, Leukopenia (Platelets count <150,000).

Dengue Hemorrhagic Fever: Defined as Dengue fever with any one or more of the warning signs i.e. severe abdominal pain or persistent vomiting, red spots or patches on the skin, bleeding from the nose or gums, blood in vomiting, black tarry stools (feces, excrement), drowsiness or irritability, pale, cold or clammy skin, difficulty in breathing, a total white blood cells count of <50,000/mm3 and Platelets count <100,000.

OR

Dengue Shok Syndrome: Defined as Dengue fever with any one or more of the following scenarios:

Severe plasma leakage evidenced by hypovolemic shock and/or extravascular fluid accumulation (e.g., pleural or pericardial effusion, ascites) with respiratory distress, severe bleeding from the gastrointestinal tract and vital organs involvement (3).

In 1-3% of cases, the disease develops into the life-threatening Dengue hemorrhagic fever (DHF), sometimes progressing into Dengue shock syndrome (DSS) (4).

Infectious Agent (5): Belonging to *Flavivirus* group; four different Dengue viruses (serotypes) are known: *DEN1, DEN2, DEN3, and DEN4.*

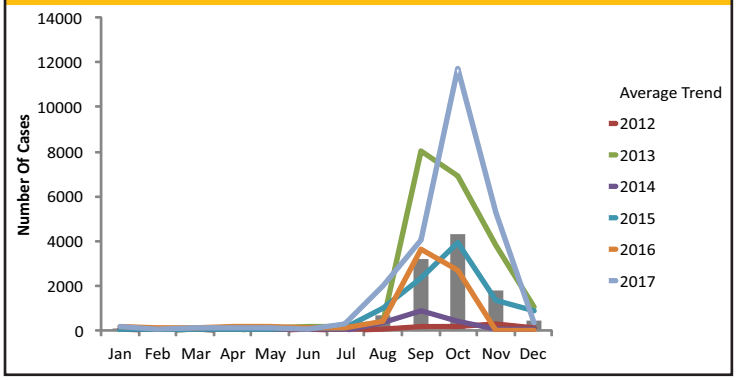
Mode of transmission: Bite of infected mosquitoes, Aedes Aegypti and Aedes Albopictus(6).

Incubation period: 3-14 days (average 4–7 days) after the infective bite (7).

Period of communicability: 2–7 days (7).

Seasonality: Cases are increased during and after rainy seasons as compared to winter and summer seasons. Relatively humidity, temperature and rain remained significant predictors of dengue incidence in Pakistan. Surge of cases occurred during September to October (8).

Lab. Confirmed DF cases by month in Pakistan, 2012-2017(n=65,721)



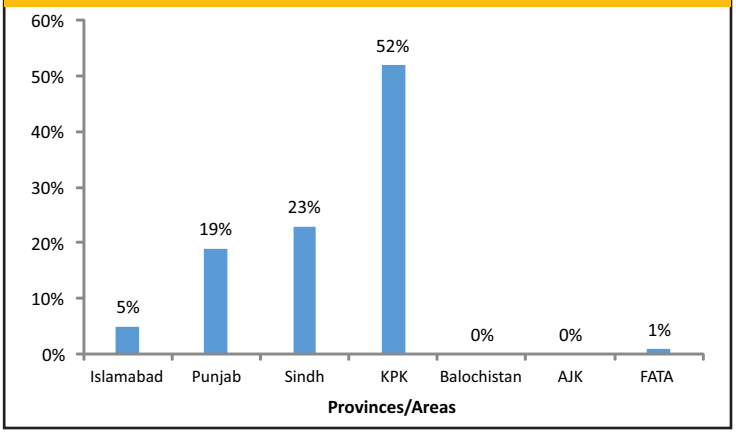
Geographical distribution: During 2012-2016, KP remained most affected area with Dengue Fever in Pakistan.

Alert Threshold: Dengue Fever: Cluster of 3 suspected cases with at least one confirmed (10).

Alert Threshold; Dengue Haemorrhagic Fever:

One probable case is an alert and requires an immediate investigation to assess differential diagnosis with CCHF.

Area wise Distribution of Dangue Cases From 2013-2018 (n=66459)



Outbreak threshold: Cluster of 6 suspected cases and one lab confirmed case is an outbreak (10).

Case Definitions:

Suspected Case: A clinically compatible case of Dengue fever, or Dengue hemorrhagic fever with an epidemiologic linkage (11)

Probable Case: A clinically compatible case of Dengue fever, or Dengue hemorrhagic fever with laboratory results indicative of probable infection (11)

Confirmed Case: A clinically compatible case of dengue fever, or Dengue hemorrhagic fever with confirmatory laboratory results (11).

Lab Confirmation: Probable; Detection of IgM anti-DENV by validated immunoassay in a serum specimen

Confirmatory Test: Detection of DENV nucleic acid in serum/plasma by PCR, detection in serum or plasma of DENV Non Structural Protein[1] (NS1) antigen by a validated immunoassay

Timings: PCR: Initial 4–5 days of onset of illness.

NS1: One day post onset of symptoms (DPO) up to 18 DPO

Serology: IgM antibodies are detectable after 4th day of onset of illness IgG is used for the detection of past dengue infection and usually can be detected during 2nd week of illness (11).

Specimen Collection and Transportation: Collect 5 ml of blood, centrifuge, and separate serum for analysis, observing strict safety precautions. Transport serum specimens to the lab in triple container packing with ice packs or frozen with dry ice (for long distance) along with a prominent bio hazard label and complete lab request form with brief history of the patient (10).

Case Management:

Febrile Phase: In the early febrile phase, it is not possible to distinguish DF from DHF. The treatment during febrile phase is symptomatic and largely supportive, as follows:

Paracetamol 10 mg/kg/dose in children and 500-1,000 mg/dose in adult. Maximum adult dose is 4 grams/day. Do not give Aspirin or other NSAID like Ibuprofen.

Extra amounts of fluids Oral rehydration therapy (ORT/ ORS) is recommended for patients with moderate dehydration .Complete blood count (CBC/CP) with follow up is an important tool in management of suspected dengue patients .Provide brochure for families about the "warning signs" together with other recommendation. All Dengue patients must be carefully observed for signs of shock for at least 24 hours after recovery from fever.

The patient who does not have any evidence of circulatory disturbance and who has been afebrile for > 24 hours does not need further observation and may be discharged (10) .

Protocol for management according to Phases of DHF

(1) Dengue hemorrhagic fever (DHF) Grades I and II:

As in DF, during the afebrile phase of DHF Grades I and II, the patient has the same symptoms as during the febrile phase. The clinical signs plus thrombocytopenia and rise in hematocrit are sufficient to establish a clinical diagnosis of DHF. During this situation hospitalize the patient and treat accordingly.

(2) DHF Grades III and IV (DSS):

Common manifestations observed during the afebrile phase of DHF Grade III are circulatory failure manifested by rapid and weak pulse, narrowing of the pulse pressure characterized by high diastolic pressure relative to systolic pressure, e.g. 90/80 mm of Hg (this is usually due to plasma leakage) or hypotension (possibly due to bleeding), the presence of cold clammy skin and restlessness or lethargy. Immediately shift the patient to Intensive care unit (ICU) and treat accordingly. The mortality is up to 30% without treatment but less than 1% with adequate treatment by experienced physician in dedicated facility (10).

Preventive Measures: Community survey to determine density of vector mosquitoes Identify and destroy mosquito larval habitats and indoor breeding sites. Community mobilization should be conducted through schools, religious leaders, to promote health education campaigns.

Proper solid waste disposal and improved water storage practices, including covering containers to prevent access by egg-laying female mosquitoes. Protection against day biting mosquitoes including use of screening, protective clothing and repellents (10).

Vaccination: In late 2015 and early 2016, the first Dengue vaccine,Dengvaxia(CYD-TDV) was registered in several countries for use in Individuals aged 9-45 years living in endemic areas (12). WHO recommends that countries should consider introduction of the Dengue vaccine CYD-TDV only in geographic settings (national or subnational) where epidemiological data indicate a high burden of disease (13).

References: References are available in online version at www.nih.org.pk

Leishmaniasis

Introduction: Leishmaniasis is a parasitic disease and is classified as a Neglected Tropical Disease (NTD). It can present as cutaneous, mucosal and visceral forms but the most common form is cutaneous Leishmaniasis (1).

Leishmaniasis is found in areas of more than 90 countries in the tropics, subtropics, and southern Europe. The annual incidence of new cases is estimated between 1.5 and 2 million. Geographical distribution of the disease depends on sand fly species acting as vectors [2].

Infectious agent: Leishmaniasis is caused by a protozoa parasite from over 20 Leishmania species [1].

Mode of transmission: Spread by the bite of the sand fly on the skin. If animals are the primary host reservoirs, it is called Zoonotic Leishmaniasis, if humans are the primary host reservoirs is called Anthroponotic Leishmaniasis. (Human-sand fly-human)[1].

Reported Cases of Leishmaniasis in KPTD

District Wise Leishmaniasis Cases, 2018

Tribal District	Cases
Bajaur	2802
Mohmand	5373
Khyber	9378
Kurram	225
Orakzai	163
North Waziristan	443
South Waziristan	354
FR Peshawar	270
FR- Lakki	28
FR Kohat	20
FR-DI khan	12
FR-Tank	4
FR Bannu	0
Total	**19072**

Incubation period: Considered to be at least a week but may extend up to several months [3].

Clinical Features:

(A) Visceral Leishmaniasis (VL)

Also known as kala-azar is fatal if left untreated in over 95% of cases. It is characterized by irregular bouts of fever, weight loss, enlargement of the spleen and liver, and anemia [4].

(B) Cutaneous Leishmaniasis (CL)-Oriental sore

It is the most common form of Leishmaniasis and causes skin lesions without involvement of the mucosa, mainly ulcers, on exposed parts of the body, leaving life-long scars and serious disability [4].

(C) Mucocutaneous Leishmaniasis (MCL)

MCL is due to *L. braziliensis and L. Panamensis*. It has two stages. During the first stage, there is development of a primary cutaneous lesion, which eventually is followed by nasal mucosal involvement, later on destroying the nasal septum. During the second stage, disease can progress to lips, palate and larynx [4].

(D) Post Kala-Azar Dermal Leishmaniasis (PKDL)

After a latent period of one year following kala-azar cure, skin lesions can appear in around 20% of cases [4].

Case Definition:

1. Visceral Leishmaniasis (VL)

Suspected case: A Person with prolonged irregular fever >2 weeks, weight loss, splenomegaly, hepatomegaly, ascites, diarrhea, cough, anemia and bleeding etc.

Confirmed case: A suspected/ probable case of Visceral Leishmaniasis with serological/parasitological confirmation [5].

2. Cutaneous Leishmaniasis (CL)

Suspected Case: A person presenting with one or more lesions (skin or mucosal), skin lesions typically present on uncovered parts of the body; the face, neck, arms and legs which are the most common sites. The site of inoculation may present with a nodular appearance followed by indolent ulcer [5].

Probable case: A suspected case of VL with serological evidence of

infection [5].

Confirmed case: A suspected/probable case confirmed by a positive smear or culture [5].

Diagnostic criteria:

(1) History of residence and travel to Leishmaniasis endemic areas

(2) Clinically compatible findings

(3) Laboratory confirmation

Note: *In endemic malarious areas, visceral Leishmaniasis must be suspected when fever is not responding to anti-malarial drugs and persists for more than two weeks (assuming drug-resistant malaria has also been considered).*

Specimen Collection:

Cutaneous Leishmaniasis: Skin biopsy is the standard dermatologic technique for obtaining specimen. No preservatives are required for examining LD bodies or for Leishmania culture [5].

Visceral Leishmaniasis: Collect 5ml of clotted blood or serum for serologic studies. Splenic or bone marrow aspirate collected in a tube with anticoagulant is required for the demonstration of amastigote. Specimen may be transported at room temperature without delay [5].

Lab diagnosis: Examination of slides (e.g. of biopsy specimens, impression smears, and dermal scrapings).

Serologic testing for detection of antibodies against organisms useful primarily for visceral Leishmaniasis.

Culture: Aspirates of pertinent tissue/fluid (e.g., skin lesion, bone marrow, lymph node, blood/Buffy coat) [6].

Case Management: The treatment of Leishmaniasis depends on several factors including type of disease, concomitant pathologies, parasite species and geographic location. Leishmaniasis is a treatable and curable disease which requires an immunocompetent system because medicines will not help rid parasites from the body, thus risk of relapse may occurs with immunosuppression of the patient. All patients diagnosed with visceral Leishmaniasis require prompt and complete treatment .Detailed information on treatment of the various forms of the disease by geographic location is available in the WHO technical report series 949,''Control of Leishmaniasis'' [7].

Prevention:

- The majority of the recommended precautionary measures are aimed at reducing the contact with phlebotomes (sand fly).
- Prevention of ACL is very similar to Malaria, as sand flies bite at night and indoors.
- Permethrin treated bed nets, should be used in endemic areas. Sand flies are generally more sensitive than mosquitoes to insecticide, i.e. residual spraying of indoor rooms for 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 [6].

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MEASLES (RUBEOLA)

Introduction: Measles is a highly contagious viral disease mostly affecting children. Caused by measles virus of genus Morbillivirus. Despite community vaccination coverage, Measles outbreaks can occur among under- vaccinated children and remains an important cause of death among young children globally. The virus spreads via droplets from nose, mouth or throat of the infected person [1]. Pregnant women while infected are also at greater risk of severe complications and the pregnancy may end in miscarriage or preterm delivery. Immunity after measles infection is life long, although there are few reports of measles re infection. The case-fatality rate may be as high as 25% [2].

Clinical Picture: Cough, coryza, conjunctivitis, fever, rash, photophobia, muscle pain, sore throat, tiny white spots inside the mouth (Koplik's spots) etc. [3]. The occurrence of fever beyond the 3rd - 4th day of rash suggests a measles-associated complication. Measles can cause variety of clinical syndrome such as post measles infection(s) like pneumonia, lifelong brain damage/ neurologic syndromes i.e. acute disseminated encephalomyelitis (ADEM) and Sub-acute Sclerosing Pan Encephalitis (SSPE), deafness and death [4]. Severe measles is more likely among poorly nourished young children, especially those with insufficient vitamin A or whose immune systems have been weakened by other diseases [5].

Incubation period: Averages 14 days with a maximum range of 7-21 days [6].

Infectivity period: It can be transmitted by an infected person from 4 days prior to the onset of the rash to 4 days after the rash erupts [6].

Alert threshold: One suspected case is an alert [7].

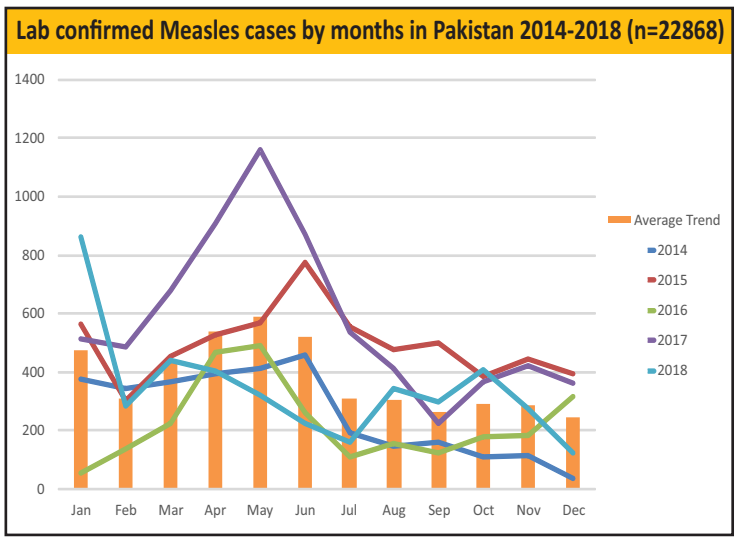
Outbreak threshold: Five or more clinical cases in a single location over a 30 day time with at least one lab confirmed case is an outbreak .It requires an investigation and immediate response [7].

Case Definitions:

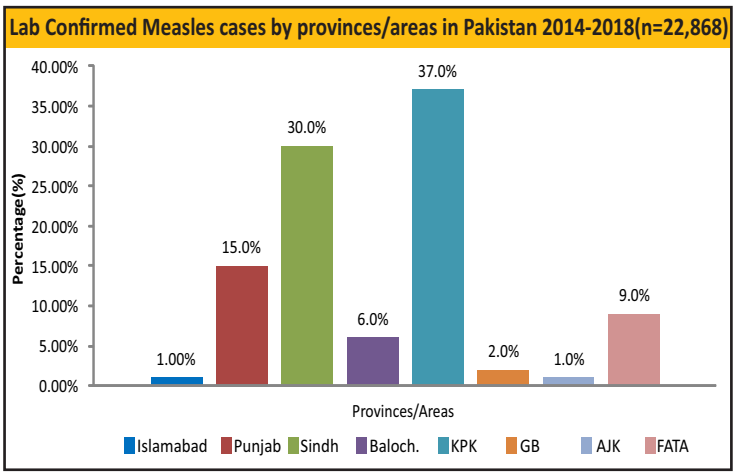
Suspected Case: A patient presenting with fever, generalized maculopapular rash with one of these: cough, coryza and conjunctivitis (3Cs) [8].

Confirmed Case: A suspected case, which is laboratory-confirmed or linked epidemiologically to a laboratory- confirmed case (positive IgM antibodies) [8].

Seasonality: Peak incidence in Pakistan is usually during April and May.



Geographical Distribution in Pakistan: During 2014-18, Sindh and KPK remained the most effected provinces in Pakistan [9].



Specimen Collection & Transportation: Collect throat swab for virus isolation, very early in the rash phase and preserve in Viral Transport Medium (VTM). Five samples should be taken from fresh cases, less than five days from rash onset, in documented outbreaks. Collect 5ml blood for serology. Store serum at 4-8°C and not for more than 48 hours. Do not freeze the whole blood. Transport the specimens in triple packaged with complete request form by maintaining cold chain at 4-8°C [8].

Laboratory diagnosis: WHO recommends ELISA as the gold standard for Measles diagnosis. Anti-measles IgM is detectable in 3 - 30 days after the appearance of the rashes. Anti-measles IgG is undetectable up to 7 days after rash onset and subsequently peaks about 14 days after the appearance of skin rashes [8].

Prevention and Control Measures: Immunize population at risk as soon as possible. Priority is to immunize children of age 6 months to 5 years, regardless of vaccination status or history of disease. Children who are vaccinated against measles before 9 months of age must receive a 2nd dose of measles vaccination at 15 months of age [6].

Treatment:

Uncomplicated cases: The treatment is mainly supportive which includes antipyretics, fluids and antibiotics for only bacterial super infection(s). The WHO recommend Vitamin- A supplementation for 2 days with the dose of 50,000IU in <6 months, 100,000 IU in 6-11 months, 200,000IU in >12 months and for children with ophthalmologic evidence of Vitamin- A deficiency, doses should be repeated on day 2 and 28.

Antibiotics should be prescribed to treat eye and ear infections, and pneumonia [10].

Complicated cases: Pneumonia complicated cases should be referred to the health care facility immediately after Vitamin- A supplementation [10].

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Pertussis (whooping cough)

Introduction: A toxin-mediated disease that can affect people of all ages, but can be very serious even deadly among infants. Despite generally high coverage with childhood Pertussis vaccines, Pertussis is one of the leading causes of vaccine-preventable deaths worldwide (1).

Clinical Picture: The clinical course of the illness is divided into three stages: Catarrhal, Paroxysmal and Convalescent. Characterized by uncontrollable, severe coughing which often makes it hard to breathe. The disease usually starts with cold-like symptoms and maybe a mild cough or fever. Infants may have a symptom known as "apnea." Pneumonia is the most common complication in all age groups; seizures and encephalopathy generally occurs only among young infants (2).

Infectious agent: *Bordetella pertussis* (3).

Reservoir: Humans are the only known reservoir (3).

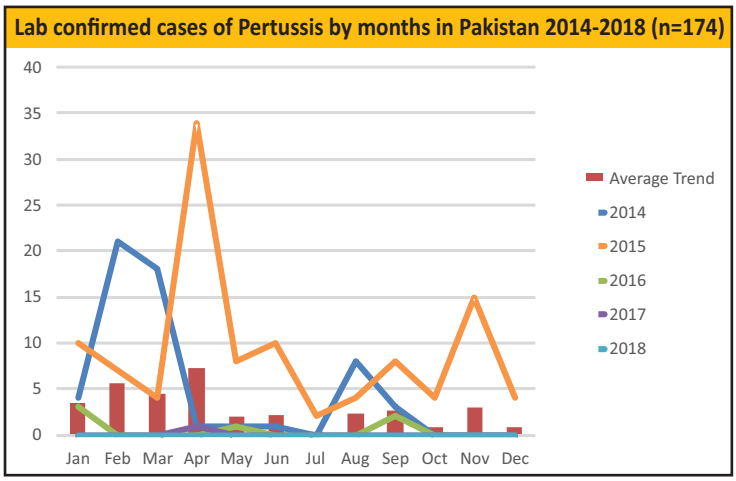
Mode of transmission: Mode of transmission is airborne i.e. by direct contact with discharge from respiratory mucous membranes of infected persons (3).

Incubation period: 9 -10 days (range 6-20 days) (3).

Communicability: Highly communicable in the early catarrhal stage and gradually decreases after paroxysmal cough.

Untreated patients may be contagious for up to 3 weeks after the onset of paroxysmal cough or up to 5 days after initiation of treatment (3).

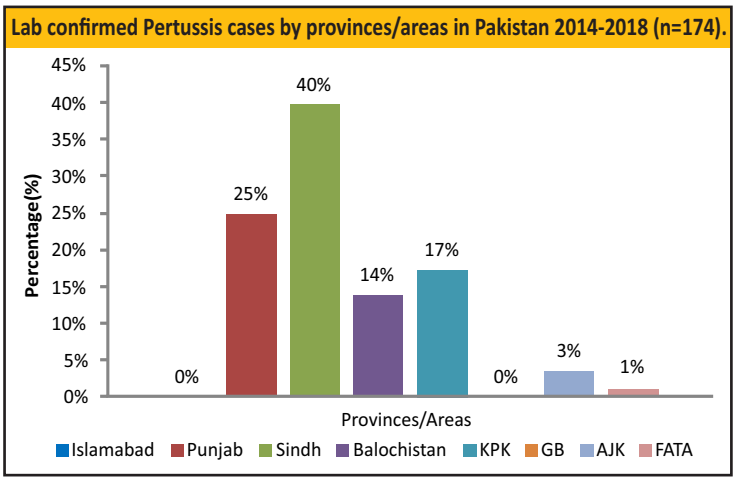
Seasonality: Pertussis has no distinct seasonal pattern (3).



Geographical Distribution in Pakistan: During 2014 to 2018 in Pakistan, 40% (69) cases were reported from Sindh followed by 25 %(43) from Punjab, 17% (30) from KPK and 14% (24) from Balochistan (4).

Alert Threshold: One suspected case (5).

Outbreak threshold: Five suspected cases with one lab confirmed case (5).



Case Definition

Suspected: A person with a cough lasting at least 2 weeks with at least one of the symptoms i.e. Paroxysms/ fits of coughing, Inspiratory "whooping", Post-tussive vomiting and apnea in infants with or without cyanosis (5).

Probable case: A clinical suspected case with an epidemiological linkage (6).

Confirmed case: Suspected/Probable case with laboratory confirmation (6).

Lab confirmation:

- Culture is gold standard
- Detection of genomic sequences by polymerase chain reaction (PCR)
- Positive paired serology (6).

Specimen Collection:

- Collect two 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 organisms in culture (5).

Storage: Sample can be stored at room temperature for 48 hours, refrigerated for 7 days and can be frozen up to 30 days (5).

Packaging: Triple packaging seal in biohazard bag (5).

Transportation: Via universal transport medium (UTM) (5).

Case Management: Antimicrobial treatment is more effective in the catarrhal phase, prior to paroxysmal coughing.

Antibiotic treatment should be initiated in all suspected cases (7).

Treatment options include:

- Erythromycin 500mg, 6 hourly for 7 days
- Azithromycin 500mg orally for 3 days OR Clarithromycin 500mg orally twice daily for 7 days
- Trimethoprim-Sulfamethoxazole, 160-800 mg orally twice a day for 7 days
- Young infants particularly those younger than 6 months of age should be hospitalized
- Supportive case management including cough suppressant and good nursing care
- Maintenance of proper water and electrolyte balance, adequate nutrition and sufficient oxygenation (8).

Preventive measures & vaccination: Timely treatment of the cases decreases the risk of transmission

Chemoprophylaxis: Erythromycin 40-50 mg/kg per day in four divided doses for 14 days

Immunization: Active primary immunization against B. pertussis infection with the whole-cell vaccine (WP) is recommended.

Children who have received at least 3 doses are estimated to be protected especially against severe disease. However, protection begins to wane after about 3 years (9).

Vaccination during pregnancies: It is important for women to get the whooping cough vaccine during 27th week through 36th week of their pregnancy (9).

Return to school: Infected child should avoid school / day care until they have completed 5 days course of therapy or if not treated 21 days after the onset of symptoms (9).

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POLIOMYELITIS

Introduction: A potentially fatal viral infectious disease that can affect nerves and can lead to partial or full paralysis .It mainly affects children under 5 years of age (1).

There is no cure, but there are safe and effective vaccines. The strategy to eradicate polio is therefore based on preventing infection by immunizing every child until transmission stops and the world is polio-free. Global public health efforts are ongoing to eradicate polio by immunizing every child and focusing on pockets of missed children until transmission stops and the world is polio free (2). Polio was declared as a Public Health Emergency of International Concern (PHEIC) by WHO on 5th May 2014 (3).

Government of Pakistan has also declared polio as Public Health Emergency Program. Pakistan is one of the only three countries in the world with ongoing wild polio virus transmission, alongside Afghanistan and Nigeria. The year 2017 showed the lowest ever annual number of polio cases in the country but polio virus continues to be isolated through environmental surveillance over a significant geographical range (4).

Clinical Picture: There are three basic patterns of Polio infection: subclinical, non-paralytic, and paralytic. Wild Poliovirus may cause Acute Flaccid Paralysis (AFP), although most infections (at least 95%) remain asymptomatic. Weakness is ascending and may vary from one muscle or group of muscles, to quadriplegia, and respiratory failure. Tone is reduced, nearly always in an asymmetric manner. Proximal muscles usually are affected more than distal muscles and legs more than arms. Reflexes are decreased or absent. The sensory examination is normal.

1 in 200 infections results in irreversible paralysis. Among those paralyzed, 5% to 10% die when muscles used for breathing become

Case Breakdown by Country

Countries	Year-to-date 2019		Total in 2018		Onset of Paralysis of most recent cases	
	WPV	cVDPV	WPV	cVDPV	WPV	cVDPV
Afghanistan	2	0	21	0	12 Jan, 2019	NA
Democratic Republic of the Congo	0	0	0	20	NA	7 Oct 2018
Niger	0	0	0	10	NA	5 Dec 2018
Nigeria	0	1	0	34	NA	22 Jan 2019
Pakistan	4	0	12	0	20 Jan 2019	NA
Papua New Guniea	0	0	0	26	NA	18 Oct 2018
Somalia	0	0	0	13	NA	7 Sep 2018

Confirmed Polio cases in Pakistan since 2012 till date (5)

Province/Area	2012	2013	2014	2015	2016	2017	2018	2019
Islamabad	0	0	0	0	0	0	0	0
Punjab	2	7	5	2	0	1	0	1
Sindh	4	10	30	12	8	2	1	0
KPk	27	11	68	17	8	1	2	2
Balochistan	4	0	25	7	2	3	3	0
GB	1	0	0	0	0	1	0	0
AJK	0	0	0	0	0	0	0	0
FATA (KPTD)	20	65	179	16	2	0	6	1
Total	**58**	**93**	**307**	**54**	**20**	**8**	**12**	**4**

immobilized (6).

Infectious agent: Poliovirus belong to genus Enterovirus subgroup, family Picornaviridae, having three serotypes of Poliovirus, labelled P1, P2, and P3 (7).

Reservoir: Humans are the only known reservoir (7).

Mode of transmission: Primarily person to person spread, principally through the fecal oral route, virus is detectable more easily and for a longer period in feces than in throat secretions (7).

Note: After initial infection with poliovirus, the virus is shed intermittently in faeces for several weeks

Incubation Period: 7 -14 days for paralytic cases (range 3 - 35 days) (7)

Alert Threshold: One suspected case of polio is an alert and requires an immediate notification and sample collection for confirmation (8).

Outbreak threshold: One lab confirmed case is an outbreak (8)

Case Definition: This sensitive case definition will capture acute Poliomyelitis but also other diseases, including Guillain-Barre syndrome (GBS), Transverse Myelitis and Traumatic Neuritis, therefore each case must be investigated carefully (9).

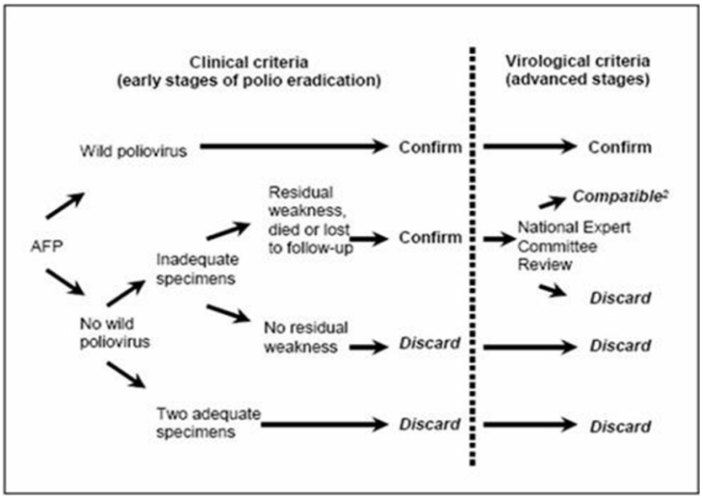
Suspected Case: Sudden onset of weakness and floppiness in a child aged <15 years, including GBS; OR any person of any age with paralytic illness if polio is suspected (9).

Polio-compatible AFP: A case in which one adequate stool specimen was not collected from a probable case within 2 weeks of the onset of paralysis, and there is either an acute paralytic illness with polio-compatible residual paralysis at 60 days, or death takes place within 60 days, or the case is lost to follow-up (9).

Vaccine-associated Paralytic Poliomyelitis case: A case with acute paralytic illness in which vaccine-like poliovirus is isolated from stool samples, and the vaccine derived virus is believed to be the cause of the disease(9).

Confirmed Polio case: A case with acute paralytic illness, with or without residual paralysis, and isolation of wild poliovirus from the stools of either the case or its contacts (9).

Discarded case: A case with acute paralytic illness for which one adequate stool specimen was obtained within 2 weeks after onset of paralysis and was negative for poliovirus (9).



Specimen Collection & Transportation: Collect 2 stool samples about 8 grams each (about the size of the tip of both thumbs) 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 and 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 (10).

Public Health Measures:

Four pillars of polio eradication as public health measures include:

1. Achieving a high level of coverage with at least 4 doses of the oral poliovirus vaccine (OPV) and one dose of IPV
2. Providing supplementary doses of OPV to all children <5years old during NIDs and SNIDs
3. Active and Passive Surveillance for all cases of acute flaccid paralysis
4. House-to-house OPV campaigns, targeting areas in which transmission of wild Poliovirus persists, based on National Emergency Action Plan (NEAP 2018-19) (11).

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National Public Health Events

Extensively Drug Resistant (XDR) Typhoid Fever:

Salmonella enterica serovar typhi causes typhoid fever, a life-threatening illness that affects more than 21 million people in the developing world. The bacterium is transmitted by contaminated water and food and tends to spread in areas with poor sanitation. Antibiotic resistance to Salmonella typhi is a major public health threat. Multidrug-resistant (MDR) isolates are prevalent in parts of Asia and Africa and are associated with the dominant H58 haplotype. Reduced susceptibility to Fluoroquinolones is also widespread, and sporadic cases of resistance to third-generation Cephalosporin or Azithromycin have also been reported.

In Pakistan the first large-scale emergence and spread of a novel S. typhi clone harbouring resistance to three first-line drugs (Chloramphenicol, Ampicillin, and Trimethoprim-Sulfamethoxazole) as well as Fluoroquinolones and third-generation Cephalosporin has been identified in Sindh, which was classified as extensively drug resistant (XDR). From November 2016 to March 2019, there are more than 5000 confirmed XDR Typhoid cases have been reported from the Sindh region, primarily in the cities of Karachi and Hyderabad. Now cases are being reported from other parts of the country as well. Additionally, travel associated XDR typhoid cases have been identified abroad as well.

Clinical manifestations: Patient presents with high grade fever (103 F to 104 F), weakness, stomach ache, headache and loss of appetite. In some cases, patients have a rash of rose-colored spots. Blood complete picture and blood/ stool/ urine cultures are performed to confirm the diagnosis of typhoid fever.

Preventive measures and control: Along with the appropriate treatment, preventive measures are urgently needed, including improved sanitation, food safety and vaccination. The antibiotic resistance strains have been treated with Azithromycin and Meropenem. Typbar-TCV vaccine, a trivalent conjugate vaccine that was recently prequalified by the World Health Organization, is recommended. The vaccine has long-lasting immunity, requires only one dose, and can be given to children as young as 6 months.

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Primary Amebic Meningoencephalitis (Naegleria fowleri)

Since detection of first case in Australia during 1965; about 300 cases have so far been reported from 16 countries. In Pakistan, according to International Journal of Infectious Disease (IJID) as many as 31 cases of Naegleria were reported in Karachi from 2015 to 2018.

Primary Amebic Meningoencephalitis (PAM) is caused by parasite *Naegleriafowleri;* a rare, with about 99% CFR. *Naegleriafowleri* "brain-eating amoeba" is a unicellular, free-living microscopic organisam & grows best at higher temp. Up to 46°C & is naturally found in warm freshwater environments feeding on bacteria and other microbes. Transmission occurs primarily through inhalation of infested water during swimming or putting contaminated water in to the nose during ablution. Symptoms start 1-9 days (median 5 days) after nasal exposure to Naegleria-containing water. People may die 1-18 days (median 5 days) after symptoms begin.

Initial symptoms of PAM usually start from 1-7 days after infection which may include headache, fever, nausea or vomiting.

Clinical manifestations are similar to bacterial meningitis (severe frontal headache, fever, vomiting, meningeal signs, stiff neck, seizures and focal neurologic deficits) with increase chances of misdiagnosis. After the start of symptoms, the disease progresses rapidly and while death may occur in 1-12 days of illness,Because of rapid progression, the diagnosis is usually made after death.

Prevention & Control: Both trophozoites and cysts forms are sensitive to adequate levels of chlorination. The municipality public health authorities, therefore must ensure that adequate levels of disinfectants like chlorine are maintained in the supplied tap water along with strict monitoring arrangements. Any of the suspected cases should immediately be reported to health authorities. Awareness and education in the affected areas must also be undertaken to educate and sensitize communities on preventive measures.

International Public Health Events

Ebola Virus Disease (EVD)

Ebola Virus Disease (EVD) or Ebola hemorrhagic fever (EHF) is the most virulent human viral hemorrhagic disease caused by the *Ebola virus*; with the average case fatality rate is around 50%. Symptoms may appear from 2 to 21 days after exposure which typically include fever, headache, joint and muscle aches, weakness, diarrhea, vomiting, stomach pain and lack of appetite and may be followed by rash, red eyes, difficulty breathing, difficulty swallowing, bleeding from different sites of the body. A person infected with Ebola virus is not contagious until symptoms appear. Ebola cannot spread through the air, food and water. The virus can spread through direct contact with the body fluids/secretions of an infected person. No specific drug available, however early supportive clinical treatment and management are essential and can improve the chances of recovery.

The outbreak of Ebola virus disease began in West Africa mainly affecting Guinea, Liberia and Sierra Leone in December 2013 and declared as Public Health Emergency of International Concern (PHEIC) by WHO.

On 8 May 2018, the Ministry of Health (MOH) of the Democratic Republic of the Congo (DRC) officially declared an outbreak of Ebola virus disease in Bikoro Health Zone, Equateur Province. This is the ninth outbreak of Ebola virus disease over the last four decades in the Democratic Republic of Congo, with the most recent occurring in May 2017. In May 2018, cases erupted from the same area and as of 11 June, there were a total of 59 confirmed, probable and suspected Ebola cases, of which 28 people had died.

Risk assessment: The risk is low at global level due to the remoteness and inaccessibility of the area as well as the rapid response launched by the MoH of DRC, WHO, and all the other coordinating partners.

Public Health Measures: WHO recommends the implementation of proven strategies for the prevention and control of Ebola outbreaks. These strategies include (1) coordination of the response, (2) enhanced surveillance, (3) laboratory confirmation, (4) contact identification and follow-up, (5) case management, (6) infection prevention and control, (7) safe and dignified burials, (8) social mobilization and community engagement, (9) logistics, (10) risk communication, (11) vaccination, (12) partner engagement, (13) research and (14) resource mobilization.

Guidelines link: https://www.nih.org.pk/guidelines/

Middle East Respiratory Syndrome Coronavirus (MERS - CoV)

Introduction: First reported case of MERS-CoV was from Saudi Arabia in September 2012. So far, all cases of MERS have been linked through travel to or residence in countries in and near the Arabian Peninsula. MERS is a viral respiratory illness caused by corona virus from the same family which caused outbreak of Severe Acute Respiratory Syndrome (SARS) in 2003. The source of the virus remains unknown but virological studies point towards dromedary camels. MERS-CoV has spread from ill people to others through close contact, such as caring for or living with an infected person. Its Incubation period is 1-2 weeks. The clinical presentation of MERS ranges from asymptomatic to very severe pneumonia with acute respiratory distress syndrome, septic shock and multi-organ failure resulting in death. The clinical course is more severe in immune-compromised patients and persons with underlying chronic co-morbidities. Human-to-human transmission has occurred mainly in health care settings.

Since April 2012, a total of 2,220 cases of MERS, including 790 deaths have been reported from 27 countries worldwide (Algeria, Austria, Bahrain, China, Egypt, France, Germany, Greece, Islamic Republic of Iran, Italy, Jordan, Kuwait, Lebanon, Malaysia, the Netherlands, Oman, Philippines, Qatar, Republic of Korea, Kingdom of Saudi Arabia, Thailand, Tunisia, Turkey, United Arab Emirates, United Kingdom, United States, and Yemen).

Sample Collection and Transportation: Collection of lower respiratory specimens (sputum or broncho-alveolar lavage) is strongly recommended however, nasopharyngeal swab, oropharyngeal swab, sputum, serum, and stool/rectal swab may be collected. Repeat sequential sampling for PCR testing is strongly encouraged in the respiratory tract (upper and lower) and multiple other body compartments. Wear personal protective equipments and adhere to infection control precautions and notify to district health departments immediately if suspect MERS-CoV infection in a person.

Treatment and Prevention: No specific treatment/ drugs and vaccines are currently available. Treatment is mainly supportive and based on the clinical condition of the patient. Preventive measures include standard plus aerosol, droplet precautions and practicing good hand hygiene.

Guidelines link: https://www.nih.org.pk/wp-content/uploads/2018/03/Guidelines-for-the-Prevention-Control-and-Management-of-Middle-East-Respiratory-Syndrome-Coronavirus-MERS-CoV-updated-MAY-2014.pdf

Mosquito Alert Pakistan ماسکیٹو الرٹ پاکستان

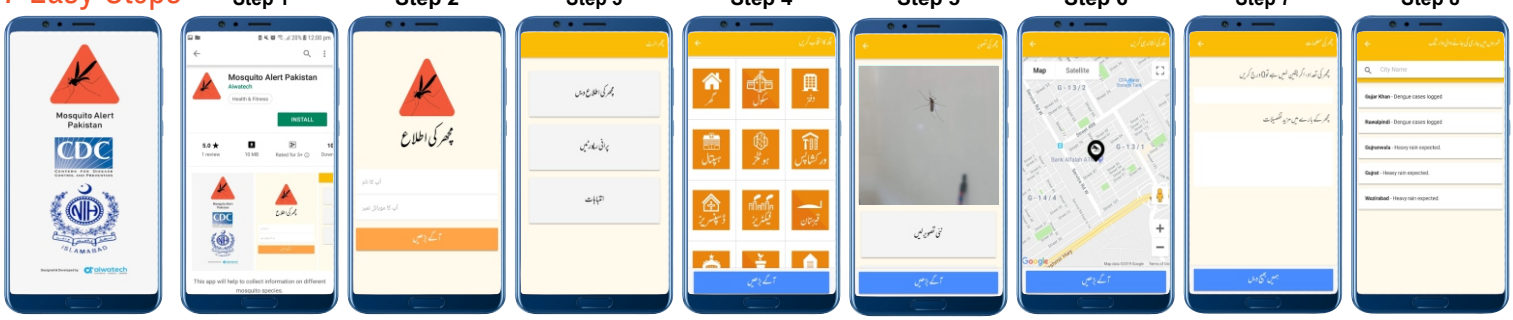
GET IT ON Google Play

The National Institute of Health (NIH) has launched its first-ever android-based application named “Mosquitoes Alert Pakistan”. The app will help to collect information on different mosquito species present in different areas which will ultimately help in mapping out the magnitude of burden related to different mosquito species.

Through this Mosquito Alert app, anyone can send photo of mosquitoes or breeding places. These photos will be part of a common database and will be used for investigation, monitoring and control of mosquitoes.

This information is key for generating a participatory alert system to improve the management of mosquito’s species, minimize the risk of disease transmission and raise awareness among general public. Link of app: https://maa.nih.org.pk/

7 Easy Steps



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