OBJECTIVES OF SAAL

1. To alert concerned health authorities and professionals at all levels about the epidemic-prone infectious diseases in the upcoming Winter Season.
2. 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 by the Disease Early Warning System (DEWS) and lab based data from NIH (2011-2014) has been analyzed to see the exhibited patterns of high priority communicable diseases. Alerts received during the same periods of time as well as the laboratory results of the received biological samples at the National Institute of Health, Islamabad have also been used for forecasting disease occurrence during 2015.

The description of all priority diseases has been arranged in alphabetical order. Additionally, under the section of public health events of national concern, technical details on *Naegleria fowleri* infection are included because of fatal cases encountered in Karachi during 2014-15. Reporting of Ebola Virus disease the largest outbreak affecting West African countries, Middle-east Respiratory Syndrome Corona Virus (MERS CoV) infection in Middle-east, has been shared as events of international concern.

CRIMEAN-CONGO HEMORRHAGIC FEVER (CCHF)
*Crimean-Congo Hemorrhagic Fever (CCHF)*, caused by infection with a tick-borne virus (*Nairovirus*) in the family *Bunyaviridae*, is a zoonotic viral disease that is asymptomatic in infected animals, but a serious threat to humans. Human infections begin with nonspecific febrile symptoms, but progress to a serious hemorrhagic syndrome with a high case fatality rate (10 – 40%). It is one of the most widely distributed viral hemorrhagic fevers occurring in parts of Africa, Middle-east, Asia and Europe. The occurrence of this virus is correlated with the distribution of *Hyalomma spp*., the principal tick vectors. CCHF is endemic in Pakistan with sporadic outbreaks. Since the diagnosis of first human case of CCHF in 1976, the sporadic cases have continued to occur across Pakistan. From 2011-2014 a total of 280 cases were confirmed from NIH. Balochistan remains the most affected province. Imported cases from Afghanistan are continuously being reported to the major hospitals of Peshawar, Quetta and Islamabad throughout the year.

**Identified Transmitting Sources**
Domestic animals cattle, goats, sheep etc are the usual hosts for the adult ticks. It is transmitted to humans by the bite of a *Hyaloma* tick; crushing an infected tick with bare skin, exposure to blood or tissue of the infected animal during slaughtering, drinking unpasteurized milk, direct contact with blood or secretions of an infected person and in hospitals due to poor infection control practices. Aerosol transmission was suspected in a few cases in Russia.

**Natural Process of CCHF**
The onset is sudden, with initial signs and symptoms including headache, high fever, back pain, joint pain, stomach pain, and vomiting. Red eyes, flushed face, red throat, and petechiae (red spots) on the palate are common. As the illness progresses, large areas of severe bruising, severe nosebleeds, and uncontrolled bleeding from injection site.

**Reported CCHF cases by Morth in Pakistan, 2011-2014 (n=280)**

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Number of cases

**Reported CCHF cases by Month in Pakistan, 2011-2014 (n=280)**

<table>
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**Epidemiology of CCHF**

**Seasonal Variation**

Monthly reported CCHF cases from January 2011 to 31st December 2014 showed varied trends.

**Incubation Period**

The length of the incubation period depends on the mode of acquisition of the virus. 

- After tick bite: 1 to 3 days, with a maximum of 9 days
- Following contact with infected blood or tissues: 5 to 6 days, with maximum of 13 days

**Alert threshold**: One probable case is an alert requiring immediate investigation

**Outbreak threshold**: One lab confirmed case is an outbreak.

**Case Definition**

**Suspected Case**

Patient with sudden onset of illness with high grade fever over 38.5°C for >72 hrs and <10 days, especially in CCHF endemic area and among those in contact with a confirmed patient, suspected sheep or other livestock (shepherds, butchers and animal handlers). Fever is usually associated with headache, muscle pains and bleeding manifestations, not responding to antibiotic or anti-malarial treatment.

**Probable case**

Probable case diagnosed positive in an especially equipped high biosafety level laboratories and through either of these techniques; Viral RNA sequence (RT-PCR) in blood or tissues and virus isolation during 1st week of illness. Confirmation of presence of IgM / IgG antibodies in serum by antigen-capture enzyme-linked immunosorbent assays (ELISA) from day 7 of illness.

**Specimen Collection and Transportation**

Collect 5 ml of blood observing strict bio-safety precautions and transport serum specimens to the lab in triple packing maintaining cold chain, along with a prominent Bio-Hazard label. A complete lab request form containing brief clinical, contact and travel history of the patient must invariably accompany the sample.

**Management**

Treatment is primarily supportive. Care should include attention to fluid balance and correction of electrolyte abnormalities, oxygenation, hemodynamic support and appropriate treatment of secondary infections. Oral Ribavirin has been used with reported success and maybe taken orally as 2 gm loading dose, 4gm/day in 4 divided doses for 6 days.

**Pregnancy should be absolutely prevented (whether female or male partner is the patient) within six months of completing a course of Ribavirin.**

**Prevention and Control Measures of CCHF**

- **At Healthcare Facility**- Patients with probable CCHF should be isolated under strict barrier nursing and health workers use PPEs. All contaminated articles should be handled and de-contaminated or disposed safely.
- **At community level** - Family of CCHF case should be provided with PPEs for caring the patient. In case of death, safe burial practices must be exercised.
- **Exposed HWs, family and contacts** - Those with high risk exposures needle stick, sharps, blood or body fluids contact should be monitored for fever (morning and evening) for 14 days. Once fever develops, patient should be immediately shifted and managed in isolation room.
- **Treatment of animals** - Reduce stick infestation on cows, sheep and goats. Acaricides may be useful on domestic animals if used 10 - 14 days prior to slaughter or to export.
- **Insect repellents**; Acaricides to be used on animals to control ticks, keeping the animals free of ticks for 14 days before slaughter or export. DEET are effective. Wearing protective clothing when working with livestock and correct removal of ticks are also recommended.

**DENGUE FEVER**

Dengue Fever, caused by any of the four distinct but closely related dengue virus (DENV) serotypes (called DENV-1, 2, 3, and -4), is a mosquito-borne viral disease that has rapidly spread in various regions of the world during recent years. Dengue virus is transmitted by female mosquitoes mainly of the species Aedes aegypti and, to a lesser extent, A. albopictus. It is a febrile illness and symptoms appearing 3-14 days after the infective bite. Clinical presentation can range from a mild nonspecific febrile syndrome, to classic dengue fever or “break-bone fever” or in the most severe forms like dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). More than 20% of cases may be asymptomatic.

**Sources of Transmission**

Dengue fever is transmitted by the bites of Aedes aegypti and sometimes A. albopictus. It can’t be spread directly from one person to another person. The vector mainly breeds on the surface of clean stagnant water, generally kept open in the buckets, water tanks or leftover in the plant saucers. It stays mainly in door, in cooler and darker places i.e. under the bed, behind curtains etc, and bites around dusk and dawn. Higher temperatures reduce the time required for the virus to replicate and disseminate in the mosquito as well.

**Dengue Fever Surveillance**

Dengue has emerged as a worldwide problem since 1950 and approximately 400 million people are infected yearly. Globally, the reported incidence of dengue has been increasing. More than one-third of the world’s population is living in dengue endemic areas and is the leading cause of illness and death in the tropics and sub-tropics. During 2011-2014, 48,188 laboratory confirmed cases were reported in Pakistan.

**Spatial distribution**

**Observed Pitfalls in Health Care Facilities of Pakistan**

- In Pakistan, a number of hospital acquired infections have been reported in the past indicative of poor infection control practices
- At times, monitoring of exposed contacts for 2 weeks, is not practiced in health facilities
- Asymptomatic contacts are started Ribavirin & also advised unnecessary lab. tests
- Some healthcare providers do not rule out common bleeding causes before suspecting CCHF

Reported Dengue Fever Cases by Province/Area in Pakistan, 2011-2014 (n = 48,188)
Natural Process of Dengue Fever

The majority (~75%) of DENV infections are asymptomatic. In symptomatic cases, the incubation period ranges from 3 to 14 days, symptoms typically develop between 4‐7 days after the bite of an infected mosquito. Dengue symptoms range from mild to incapacitating high fever, with severe headache, retro‐orbital pain, muscle and joint pain, and rashes. Severe dengue/dengue hemorrhagic fever is characterized by fever, abdominal pain, persistent vomiting, bleeding and breathing difficulty this is a potentially lethal complication, affecting mainly children. The infection causes vascular leakage as well as platelet destruction, which in severe cases, results in thrombocytopenia, bleeding and death.

Epidemiology of Dengue Fever

Seasonal Variation

Cases are increased during and after rainy seasons as compared to winter and summer seasons. Relative humidity and rainy days remained significant predictors of dengue incidence in Pakistan.

Case Definitions

Suspected case

Any person with acute febrile illness of 2 ‐ 7 days duration AND two or more of the symptoms like, headache, retro‐orbital pain, myalgia, arthralgia, rash, haemorrhagic manifestations and leucopoenia.

Confirmed Case

Any suspected case confirmed by laboratory isolation of virus by PCR or positive Non‐structural Protein‐1 (NS‐1) on days 1 ‐ 6 of illness. IgM sero‐conversion in specimens collected >5 days after the onset of symptoms.

Suspected Dengue Haemorrhagic Fever

A probable or confirmed case of dengue AND any two of these; thrombocytopenia <100,000/mm³, petechial or purpuric rash, epistaxis, haematemeses, haemoptysis, blood in stools, ecchymosis, gum bleeding, other haemorrhagic symptom - AND no known predisposing host factors for haemorrhagic manifestations.

Lab. Diagnosis

Laboratory diagnosis is best made during acute phase of the illness when virus circulates in blood through assays that detect viral RNA genome or soluble antigens i.e. NS‐1 antigen. Anti‐DENV IgM antibody becomes detectable by ELISA at days 3 ‐ 5 after the onset of fever. The RT‐PCR detects DENV serotypes 1, 2, 3 or 4.

Management

• There is no specific treatment of a dengue infection. As such supportive management must be undertaken as required.
• Fever and myalgias should be managed with acetaminophen. Aspirin or non‐steroidal anti‐inflammatory agents should generally be avoided because of the risk of bleeding complications and the potential risk of Reye’s syndrome in children.
• Maintain intake of oral fluid to avoid dehydration.
• Platelet transfusions may be warranted in severe thrombocytopenia <20,000/mm³ and active bleeding. Prophylactic platelet transfusions without active bleeding are generally not recommended.

Prevention and Control Measures

Indoor residual spray in urban and peri‐urban high‐risk areas at least one month before transmission period. Health education campaign for improved water storage practices, removal of mosquito breeding sites and protecting families and individuals from mosquito bites awareness sessions in schools focusing household control of breeding sites and avoidance of mosquito bites help in disease prevention and control. To reduce the mosquito population, get rid of breeding sites including old tyres, cans, or flower pots that collect rain. Regularly change the water in outdoor bird baths and pets’ water dishes

DIPHTHERIA

Diphtheria is caused by infection with Corynebacterium diphtheria, transmitted usually through direct contract with the respiratory droplets. In Pakistan, sporadic cases of Diphtheria continue to be reported.

From 1st January 2014 to 31st December 2014, DEWS has reported 96 Alerts/Outbreaks of Diphtheria from all over Pakistan, KPK 49%, Punjab 45%, Sindh 5% and AJK 1%. NIH Islamabad has received a total of 48 Human samples during this period. Of them 8 were positive. The number of Diphtheria cases remained highest during the colder months.

Incubation period: varies from 2-5 days.

Case Definition

Probable Case

An illness characterized by a thick adherent gray coating called “pseudomembrane” usually developed within 2 to 3 days over the nasal tissues, tonsils, voice box or throat.

Confirmed Case

A probable case which has been laboratory confirmed or linked epidemiologically to a confirmed case and meets the following criteria:
• The isolation of Corynebacterium diphtheria from a throat swab or nasopharyngeal swab; OR
• A fourfold or greater rise in serum antibody (but only if both serum samples were obtained before the administration of diphtheria toxoid or antitoxin)

Note: Asymptomatic person with positive C. diphtheria cultures i.e. asymptomatic carriers should not be reported as a probable or confirmed case.

Specimen collection and transportation:
• Collection nasopharyngeal samples by using alginate or throat cotton swab in Amies transport medium
• For serological diagnosis collect 5ml of clotted blood or serum in acute and convalescent phase.

Management

Patients:
• Upon diagnosis of probable diphtheria, the treatment should be started immediately without waiting for the lab results which may turn out negative if sampling is not done carefully and before antibiotic is administered.
Surveillance systems have been weakened by other diseases. Children, especially those with insufficient vitamin A, or whose immune death. Severe measles is more likely among poorly nourished young (ADEM) and Sub acute Sclerosing Panencephalitis (SSPE), deafness and post measles infection(s) like pneumonia, lifelong brain damage/complication. Measles can cause variety of clinical syndrome such as fever beyond the 3rd – 4th day of rash suggests a measles‐associated white spots inside the mouth (Koplik's spots) etc. The occurrence of photophobia, muscle pain, conjunctivitis, runny nose, sore throat, tiny reinfection. Symptoms may include: bloodshot eyes, cough, fever, rash in mouth or throat of the infected persons. Immunity after measles under‐ vaccinated children. Its virus spreads via droplets from the nose, community vaccination coverage, measles outbreaks can occur among caused by community vaccination coverage. If children in outbreak area are unimmunized, the most affected and highest risk age group should be immunized. MEASLES (RUBEOLA)

Introduction

Measles is a highly contagious viral disease mostly affecting children caused by Paramyxoviridae, genus Morbillivirus. Despite high vaccination coverage, measles outbreaks can occur among under‐vaccinated children. Its virus spreads via droplets from the nose, mouth or throat of the infected persons. Immunity after measles infection is life long, although there are rare reports of measles reinfection. Symptoms may include: bloodshot eyes, cough, fever, rash photophobia, muscle pain, conjunctivitis, runny nose, sore throat, tiny white spots inside the mouth (Koplik’s spots) etc. 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/nerologic syndromes i.e. acute disseminated encephalomyelitis (ADEM) and Sub acute Sclerosing Panencephalitis (SSPE), deafness and death. 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.

Contacts

All close contacts, regardless of vaccination status, should have nose and throat cultures and must receive a single dose of benzathine penicillin i/M 600,000 units for children <6 years; 1.2 million units for 6 years or older or a 7-10 days course of erythromycin orally and remain under surveillance for 7 days.

Prevention and Control Measures

Routine immunization consists of 3 doses of 0.5 ml DPT‐HepB‐Hib administered IM to children under one year of age with the schedule of 1st dose at the age of 6 weeks; 2nd at 10 and 3rd at 14. Booster dose is recommended at 4-6 years of age.

Epidemic Control

If children in outbreak area are unimmunized, the most affected and highest risk age group should be immunized.

Laboratory diagnosis

WHO recommends serum IgM as the standard confirmatory test. Antimeasles IgM is detectable in 3 - 30 days after the appearance of the exanthema. Anti- measles IgG is undetectable up to 7 days after rash onset and subsequently peaks about 14 days after the exanthema appears.

Management

Uncomplicated cases

The treatment is mainly supportive includes antipyretics, fluids and antibiotics for bacterial super infection(s). The WHO and UNICEF recommend Vit. A. 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 Vit. A deficiency, doses should be repeated on day 2 and 28.

Complicated cases

Refer the complicated cases to the health facility after Vit. A supplementation.

Prevention and Control Measures

Immunize population at risk as soon as possible. Priority is to immunize children of 6 months to 5 years old, regardless of vaccination status or history of disease. Children who are vaccinated against measles before 9 months of age must receive a 2nd measles vaccination. All children aged 6 months – 5 years should also be administered prophylactic Vit. A supplementation.

Seasonal Influenza – A (H1N1, H5N1)

Influenza is a contagious respiratory illness caused by influenza A and B viruses and may cause mild to severe illness; at times leading to death. Older people, young children and people with certain health conditions are at high risk for serious complications. A novel influenza A H1N1 virus emerging in 2009 caused global influenza pandemic with low mortality rate (0.45%). The virus caused serious disease in children and certain risk groups such as diabetes, obesity and pregnant women. During 2010, WHO announced the end of the pandemic period, but recommended clinicians to remain vigilant and treat all suspected cases of H1N1 appropriately.

In Pakistan, the influenza activity typically starts increasing from September and reaches peak during the winter months. In Pakistan, the influenza activity typically starts increasing from September and reaches peak during the winter months.
**Case Definitions**

A case of seasonal influenza may present with **Influenza Like illness (ILI)**

A patient with acute respiratory infection with fever $\geq 38^\circ C$ with cough and onset of symptoms within 7 days

**Severe Acute Respiratory Illness (SARI)**

A patient with acute respiratory infection with fever $\geq 38^\circ C$ with cough, onset within 7 days and requiring hospitalization

**Sample Collection & Transportation**

- Respiratory specimens including throat or nasal/nasopharyngeal swabs and nasopharyngeal aspirates may be collected from patients in Viral Transport Medium (VTM).
- The samples may be transported to lab at 4°C within 4 days, or frozen at -70°C in case of prolonged storage.
- Specimens for influenza virus isolation should not be stored or transported in dry ice unless they are sealed, taped and double plastic bagged as CO (dry ice) can rapidly inactivate the virus.

**Management**

- The symptoms in mild illness are relieved with warm fluids and rest along with analgesics and antipyretics.
- Analgesics such as Paracetamol 500mg – 1G every 4-6 hours usually relieves headache and generalized pains and cough suppressants such as pholcodine 5-10 mg, 3-4 times daily are generally sufficient.
- Antibiotics are not effective against viruses, specific treatment with antibiotics for complications such as bronchitis and pneumonia may be necessary.
- High risk patients, including pregnant women and children under age 5 years, may be treated with anti-virals, oseltamivir or zanamivir as indicated but preferably not later than 48 hours after onset of the symptoms to ensure a positive clinical outcome.

**Prevention and Control Measures**

Annual winter vaccination (seasonal anti-influenza vaccine) is recommended for health care workers, pregnant women, young children and immuno-compromised patients with pulmonary, cardiac or renal disease. General precautions include improved ventilation in living places; avoiding close contact with ill people and crowded settings, avoiding touching mouth and nose and regular hand washing with soap. Patients should be encouraged to cover their faces with a mask or handkerchief when coughing and sneezing.

**AVIAN/HUMAN INFLUENZA –A (H5N1)**

Avian (bird) flu is caused by influenza-A viruses that occur naturally amongst birds. Human infections carry high mortality rates. Since 2003 to September 2015, a total of 844 confirmed cases of human infection from subtype influenza-A H5N1 infection have been confirmed globally, including 449 deaths (CFR 53.1%). In atleast five countries Cambodia, China, Egypt, Indonesia and Vietnam, the influenza-A H5N1 virus continues to circulate in poultry with sporadic cases in human with the risk of mutation and triggering yet another influenza pandemic in the world.

Since reporting of 3 cases and one death in 2007, there has been no reported human H5N1 infection in Pakistan. Since 2008, the country’s poultry sector also enjoys H5N1 free status declared by the WHO. However, in view of the disease dynamics, the Public Health Authorities are advised to maintain a close liaison with veterinary sector to pre-empt and tackle human infections, if any.

**Case Definition**

**Possible Case**

Any person presenting with severe pneumonia, characterized by fever $\geq 38^\circ C$ and one or more of these cough, sore throat, shortness of breath AND who can answer “Yes” to any of the following questions:

In the 7 days before first symptoms started
1. Have you been in contact with a person who was suspected or confirmed case of influenza-A H5N1 during the infectious period?
2. Have you been in contact with live or dead birds, pigeons including chickens, ducks, fancy/backyard birds or crows?
3. Have you lived or have you visited a place where poultry deaths have occurred in the last 2 weeks?
4. Have you worked in a laboratory where there is processing of samples from persons or animals that are suspected of having Highly Pathogenic Avian Influenza (HPAI) infection?

**Probable Case**

Any possible case AND limited laboratory evidence for influenza-A H5N1 such as IFA + using HF5 monoclonal antibodies OR no other disease

**Confirmed Case**

Confirmed case of influenza-A H5N1 infection is any probable case with detection of viral nucleic acid by PCR.

**Prevention and Control Measures**

- The primary risk factor for human infection appears to be direct or indirect exposure to infected live or dead poultry or contaminated environments.
- Humans become infected with avian influenza through close contact with live, sick or dead infected birds, e.g. breathing in particles from their droppings, plucking or handling poultry, playing in an area where carcasses were buried.
- The public may accordingly be educated on the following preventive measures:
  a) Report sick or dying poultry to local authorities
  b) Wash hands after contact with poultry or other birds
  c) Cook poultry and eggs thoroughly before eating. If you must go to a bazaar where live poultry is sold, protect your eyes, nose and mouth from dust.

**Treatment**

Suspected H5N1 case should be hospitalized and treated in intensive care strictly observing the universal precautions. Treatment with antiviral medication such as oseltamivir or zanamivir should be started as soon as possible, ideally within 48 hours following symptoms onset, to maximize its therapeutic benefits. However, given the significant mortality associated with H5N1 infection and evidence of prolonged viral replication in this disease, administration of the drug should also be considered in patients presenting later in the course of illness.

**POLIOMYELITIS**

**Introduction**

Poliomyelitis is a crippling viral disease that can affect nerves and can lead to partial or full paralysis. It is an infection with an enterovirus subgroup, family Picornaviridae, having three serotypes P1, P2 and P3, each capable of causing paralysis and infection with one does not confer protection against the other two strains. Humans are the only known reservoir and the disease is transmitted person-to-person mostly through the faecal-oral route. Cases are most infectious from 7-10 days before and after paralysis onset.

There are three basic patterns of polio infection: subclinical infections, nonparalytic, and paralytic. Clinical poliomyelitis affects the CNS and is divided into nonparalytic and paralytic forms.

Worldwide in 2015, 41 wild poliovirus type 1 (WPV1) cases have been...
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. Polio was declared a Public Health Emergency of International Concern (PHEIC) on 5th May 2014 due to concerns regarding the increased circulation and the international spread of wild poliovirus during 2014. Government of Pakistan has also declared Polio as an Emergency Program. On the acquisition of poliovirus exportation, International Health Regulatory Committee had imposed temporary recommendations for travel regulations on 6th May 2015, in relation to PHEIC. On 17th August 2015, the temporary recommendations in relation to PHEIC were extended for another three months. The transmission zones in Pakistan included Peshawar and surrounding districts, FATA, southern KPK, Quetta and adjoining districts, northern Sindh province, Karachi and southern districts of Punjab.

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

**Seasonality:** Hot and rainy season.

**Alert Threshold:** One case is an alert requires an immediate notification and sample for confirmation.

**Outbreak threshold:** One lab confirmed case is an outbreak.

**Case Definition**

**Suspected**
Acute flaccid paralysis (AFP) in a child aged <15 years, including Guillain-Barré Syndrome; OR Any paralytic illness in a person of any age when polio is suspected.

**Confirmed**
AFP with laboratory-confirmed wild poliovirus in stool sample.

**Polio-compatible**
AFP clinically compatible with poliomyelitis, but without adequate virological investigation.

**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 gms 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 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.

**Prevention and Control**

**Four pillars of polio eradication**
1. Achieving a high level of routine EPI coverage with at least 3 doses of the oral poliovirus vaccine (OPV)
2. Providing supplementary doses of OPV to all children<5years old during NIDs.
3. 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 surveillance studies.

**Polio Eradication and Endgame Strategic Plan 2013-2018**
The WHO Global Polio Eradication Initiative (GPEI)’s new Polio Eradication and Endgame Strategic Plan target the end of all kinds of polioviruses by 2018, including the wild and rare vaccine-related strains. The plan is focused on deploying inactive polio vaccine (IPV) to replace the Oral Polio Vaccine, which is known to occasionally cause the same disease that is supposed to prevent.

**IPV introduction and OPV withdrawal**
The Government of Pakistan has approved the introduction of inactivated polio vaccines (IPVs) to be used in routine immunization drives to strengthen children’s immunity. From July 2015 onward both the oral polio vaccine and injectable polio vaccine (OPV-IPV) will be part of the routine immunization. IPV is administered by intramuscular (IM) injection, preferably or subcutaneously (S/C), in a dose of 0.5 ml into the outer part of the thigh.

**PERTUSSIS (WHOOPING COUGH)**
It is caused by the bacterium *Bordetella Pertussis*, primarily transmitted by direct contact with discharges from respiratory mucous membrane of infected person or via airborne rout. Human is the only host. It has three phases i.e. Catarrhal, Paroxysmal and Convalescent Phase. A typical presentation may occur in vaccinated children. Patients develop catarrhal symptoms including cough. In the course of 1-2 weeks, coughing paroxysms ending in the characteristic whoop may occur. Fatality is up to 1% in infants <6 months of age who have not yet completed the primary series of Pertussis vaccines.

**Infection Spreading Mechanism**
- House-to-house OPV campaigns, targeting areas in which transmission of wild poliovirus persists, based on surveillance studies.
- Surveillance for all cases of acute flaccid paralysis.
- Achieving a high level of routine EPI coverage with at least 3 doses of the OPV.
- Providing supplementary doses of OPV to all children<5 years old during NIDs.

**Seasonality:** Pertussis has no distinct seasonal pattern, but may increase in summer and fall.

**Incubation Period:** 7-10 days (range 6-20 days)

**Alert threshold:** One suspected case is an alert and requires prompt action.

**Outbreak Threshold:** Five (5) cases in one locality

**Risk Factors:**
- Low DPT Coverage (<80%)
- Crowded conditions facilitate transmission
- And older sibling or a parent usually brings the disease home

**Period of Communicability:**
Pertussis is highly communicable with early catarrhal stage. Communicability gradually decreases after the onset of paroxysmal cough. Untreated patient may be contagious for up to 3 weeks after the onset of cough.

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**Reported Polio cases by Province/Area in Pakistan, (1st Jan 13-21st September 2015)**

<table>
<thead>
<tr>
<th>Province/Area</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khyber Pakhtunkhwa</td>
<td>11</td>
<td>69</td>
<td>13</td>
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<tr>
<td>FATA/FR Areas</td>
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<td>178</td>
<td>10</td>
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<tr>
<td>Sindh</td>
<td>10</td>
<td>30</td>
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<tr>
<td>Balochistan</td>
<td>----</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Punjab</td>
<td>7</td>
<td>4</td>
<td>----</td>
</tr>
<tr>
<td>Gilgit Baltistan</td>
<td>----</td>
<td>----</td>
<td>----</td>
</tr>
<tr>
<td><strong>Pakistan</strong></td>
<td><strong>93</strong></td>
<td><strong>306</strong></td>
<td><strong>32</strong></td>
</tr>
</tbody>
</table>

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**Reported Pertussis cases by Month in Pakistan, 2011-14 (n=4,043)**

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**Reported Pertussis cases by Province/ Area in Pakistan, 2011-14 (n=4,043)**
onset of paroxysmal cough in the absence of treatment or up to 5 days after onset of treatment.

**Case Definition:**

**Suspected Case:**
Any person with cough lasting at least 2 weeks with one of these paroxysms of cough OR inspiratory "whooping cough"; OR post-tussive vomiting (immediately after coughing) AND without other apparent cause.

**Confirmed Case:**
A clinical case that is laboratory confirmed

**Specimen Collection:**

**Culture:** culture is the standard for diagnosis and growth typically takes 7 to 10 days. Collect duplicate nasopharyngeal specimens using calcium alginate swabs on fine flexible wire. Wherever possible, bronchial or nasopharyngeal secretions/aspirates provide superior specimens for analysis. Direct plating at bedside of the patients on a freshly prepared Bordet Gangue (BG) medium is the most reliable method for culturing. In the absence of direct plating, appropriate bacterial transport medium may be used for sample transportation.

**Serology:** IgA and IgG are most specific for the diagnosis of *B. pertussis* infection.

**Blood Picture:** Marked leukocytosis (>60,000/µL) with absolute lymphocyte count >10,000/µL.

**Management:**
Antibiotic treatment should be initiated in all suspected cases. Treatment options include:
- Erythromycin 500 mg, 6 hourly for 7 days
- Azithromycin 500 mg orally for 3 days OR Clarithromycin 500 mg orally twice daily for 7 days
- Trimethoprim Sulfamethoxazole, 160-800 mg orally twice a day for 7 days.

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**Public Health Events of International Concern**

**Ebola virus disease (EVD), or Ebola hemorrhagic Fever (EHF)**

Clinical manifestations are similar to bacterial meningitis (severe frontal headache, fever, vomiting, meningeal signs, stiff neck, seizures and focal neurologic deficits) that increases chances of misdiagnosing. 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 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 people on requisite preventive measures.

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**Timeline for diagnosis of Pertusis**

**Symptomatic Treatment and Supportive Case Management:**
- Young infants particularly those <6 months of age should be hospitalized and mild cases require only supportive treatment
- 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.

**Immunization:**
Active primary immunization against *B. Pertussis* infection with the whole cell vaccine (WP) is recommended in association with the administration of diphtheria and tetanus toxoids (DTP). Children who have received at least 3 doses are estimated to be protected especially against sever disease. However, protection begins to wane after about 3 years.
Countries with previously widespread and intense transmission: Liberia: declared Ebola-free on 3 September 2015.
Countries that have reported an initial case or localized transmission: Nigeria, Senegal, the USA, Spain, Mali, the UK and Italy.

EVD outbreak is still a Public Health Emergency of International Concern although the epidemic of Ebola in West Africa is slowing down. 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. In 2014 Ebola outbreak, nearly all of the cases of EVD are a result of human-to-human transmission. Healthcare providers and the family and friends in close contact with Ebola patients are at the highest risk. A person infected with Ebola virus is not contagious until symptoms appear. Ebola is not spread through the air or by food or water. The virus can spread through direct contact with the bodily fluids of an infected person, or with contaminated objects. No specific drug available however early supportive clinical treatment and management are essential and can improve the chances of recovery.

Person Under Investigation (PUI): A person who has both consistent symptoms and risk factors as follows:
- Clinical criteria includes fever, severe headache, muscle pain, vomiting, diarrhea, abdominal pain, or unexplained hemorrhage
- Epidemiologic link/risk factors within the past 21 days before the onset of symptoms, such as contact with a confirmed or suspected patient; residence in or travel to an endemic area; or direct handling of bats, rodents, or primates from disease-endemic areas.

Probable Case
Any suspected case evaluated by a clinician OR any deceased suspected case (where it has not been possible to collect specimens for laboratory confirmation) having an epidemiological link with a confirmed case.

Contact Tracing
The identification and follow-up of persons who may have come into contact with an Ebola patient should be monitored for 21 days and be isolated if they become ill.

Laboratory Confirmed Case
Any suspected or probable cases with a positive laboratory result. Laboratory confirmed cases must test positive for the virus antigen, either by detection of virus RNA by RT-PCR, or by detection of IgM antibodies.

Public Health Measures
Ensure preparedness, contact tracing, raising awareness and sensitizing healthcare workers, supporting them with resources, information and communication to travelers and surveillance.

Preventive Measures in Healthcare Settings
Ensure implementation of infection control measures, Isolation rooms with dedicated bathroom, availability of personal protective equipment and trained Personnel.

First reported in Saudi Arabia in April 2012 and as of 17 September 2015, 1,597 cases of MERS have been reported including 610 deaths in over 20 countries. MERS is viral respiratory illness caused by corona virus from the same family as 2003 outbreak of Severe Acute Respiratory Syndrome (SARS). The source of the virus remains unknown but virological studies point towards dromedary camels. Human-to-human transmission is amplified among household contacts and in healthcare settings. 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 is the most common mode of transmission. The majority of cases so far have been reported from hospital outbreaks in Saudi Arabia, the United Arab Emirates and South Korea. WHO does not recommend travel restrictions.

A large nosocomial outbreak of MERS in Riyadh, Saudi Arabia, Over 110 new cases and 30 deaths have been reported. The recent outbreaks in South Korea and in Riyadh also highlight the continued risk of healthcare-associated transmission and the need for timely diagnosis and implementation of infection prevention and control measures. Travelers returning from affected countries to seek medical attention if they develop a respiratory illness with fever and cough or diarrhea during the two weeks after their return.

Mass gathering events such as the Hajj provide a basis for communicable diseases to spread easily. Despite intensive surveillance in Saudi Arabia in 2013, no cases of MERS were detected among the pilgrims. In 2014, several cases detected outside of Saudi Arabia were in pilgrims returning from the minor Umrah pilgrimage, but not from the Hajj. Large number of Pakistani travelers visiting the identified high risk countries making Pakistan at great risk and sporadic, imported cases can be expected in Pakistan. This highlights the need for awareness among healthcare workers, early detection, preparedness planning and stringent infection control precautions. Citizens travelling to Middle East, in particular Saudi Arabia and the UAE, need to be made aware of the importance of good hand and food hygiene, and advised to avoid contact with sick people. This is particularly important for travelers with pre-existing medical conditions. Travelers to the Middle East should avoid close contact with camels, visiting camel farms and consuming unpasteurized camel milk products or raw/under-cooked meat.

WHO recommends that probable and confirmed cases should be admitted to adequately ventilate single rooms or rooms with airborne transmission precautions. In addition to eye protection (goggles or face shield), gown and gloves, healthcare workers caring for probable or confirmed cases of MERS should use personal protective equipments (PPEs) appropriate for the exposure risk defined by a pre-assessment of the workplace and the planned interventions.

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.
- Wear personal protective equipment and adhere to infection control precautions.
- Notify to district health departments 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.