

Polio

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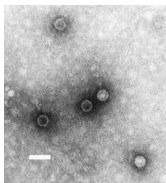
Introduction

- Polio commonly refers to paralytic poliomyelitis, a potentially devastating illness causing permanent paralysis.



Polio virus

- Polio virus is an **Enterovirus** belonging to the family Picornaviridae.
- It is related to Rhinoviruses.
- Three serotypes - Type 1, 2 and 3.
- Icosahedral capsid composed of 60 subunits (capsomeres).
- RNA virus with single 7.4 Kb (+)sense RNA genome.



Symptoms

- Only 1% of infections result in clinical disease.
- Mild disease: Fever, malaise, drowsiness, headache, nausea, vomiting, constipation, sore throat *etc.* in various combinations.
- Non paralytic poliomyelitis (Aseptic meningitis): Additional stiffness and pain in back of neck.
- Paralytic poliomyelitis: **Flaccid paralysis** due to lower motor neuron damage. Brain stem invasion leads to incoordination and spasms.
 - Recovery is usually complete within 6 months.
 - Residual paralysis may be lifelong.
- Progressive post poliomyelitis muscle atrophy: Some paralytic patients undergo muscular atrophy of affected limbs.
 - Caused by physiological and aging changes, rather than directly by polio infection.

Pathogenesis

- 1 Infection is through oral route.
- 2 Virus infects cells of pharynx and intestinal mucosa where it rapidly multiplies.
 - Isolated from throat during early stages of infection.
- 3 Infection spreads to tonsils and lymph nodes.
- 4 Infection moves to Peyer's patches in the ileum and then to the rest of the small intestine.
- 5 Virus enters blood (viremia) through lymph nodes and infects the nervous system.
- 6 In paralytic polio, virus replicates within motor neurons, thereby destroying them.

Diagnosis

Polio virus can be detected in

- Throat swabs in early infection.
- Rectal swabs or stool samples.
- Cerebrospinal fluid (uncommon).

Assay of poliovirus

1 Culture and serotyping

- Cultured on human or monkey cell lines.
- Cytopathogenic effects become apparent in 3-6 days for positive samples.
- Isolated virus is typed using specific antisera.

2 PCR based diagnosis.

Transmission

- Primary mode of transmission is **fecal-oral route**. Also spreads through **oral-oral route**.
- Occurs mainly in areas with warm climates and poor sanitation.
- Transmission is increased due to crowding and poor hygiene.

Prophylaxis and Control

Sabin vaccine / Oral Polio Vaccine (OPV).

- Introduced in 1963.
- A mixture of three attenuated strains of polio virus.
- These strains can infect and replicate normally in the gut, but cannot invade the nervous system.
- Cheap and easy to administer.
- Rarely (1 in 7,500,000 doses), the type 3 strain can revert to pathogenicity and cause paralysis (Vaccine-derived polio).



Prophylaxis and Control

Salk vaccine / Inactivated polio vaccine (IPV)

- 1 Introduced in 1954.
- 2 Contains three strains of polio virus inactivated by formalin treatment.
- 3 Generally given in 4 doses, which ensures >90% protection.
- 4 More expensive than OPV, but no chance of reversion.
- 5 Only option for immunocompromised individuals.



WHO polio eradication programme started 1988

- In 1988, 3,50,000 children from 125 countries suffered paralytic polio.
- Since then, incidence of polio has been reduced by over 99%.
- WHO declared India free from endemic polio in 2014, 3 years after the last confirmed polio case was reported from West Bengal.
- Polio remains endemic in only two countries, Pakistan and Afghanistan.



Pulse polio campaign

- Children in the age group 0-5 years are administered polio drops (OPV) during National Immunization Day (NID) every year.
- The immunized children excrete the attenuated virus in large numbers, further immunizing the population coming in contact with them.

