Epidemiology of Polio

BY

DR. M. SIVA DURGAPRASAD NAYAK, MD, PHD

ASSISTANT PROFESSOR, DEPARTMENT OF COMMUNITY MEDICINE

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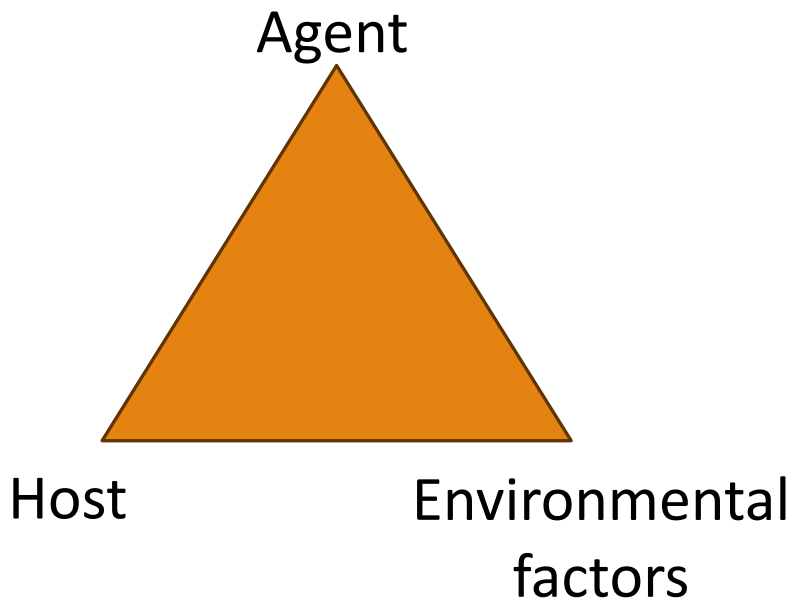
Introduction

- Poliomyelitis is an acute viral infection caused by an RNA virus
- It is primarily an infection of the human alimentary tract
- However very small percentage of cases (<1%) infect central nervous system resulting in paralysis

Problem statement

- India was certified as polio free since 27th March 2014
- PAN countries, Pakistan, Afghanistan and Nigeria currently reporting polio cases in the world
- The attenuated viruses in Oral Polio vaccine can undergo genetic changes and cause vaccine derived polioviruses that can cause paralytic polio

Epidemiological triad



Agent factors

- There are three serotypes 1,2, and 3
- Type-1 serotype causes most of the outbreaks
- It can survive 4 to 6 months in water in cold environment
- Man is the only reservoir of infection
- The virus is found in faeces and oropharyngeal secretions of infected person
- The cases are most infectious 7 to 10 days before and after onset of symptoms

Agent factors

- Most infections are subclinical
- Mild and subclinical cases play a dominant role in the spread of infection
- It is estimated that for every clinical case, there may be 1000 subclinical cases in children and 75 in adults

Host factors

- The disease occurs in all ages, but children are more susceptible.
- In India 50% of cases are reported in infancy. The most vulnerable age is 6 months to 3 years.
- Maternal antibodies will give protection up to 6 months of age.
- Males are more vulnerable in the ratio of 3 males to one female case.
- Immunity following infection is long lasting.
- However infection with one type will not give protection against other two types
- Other risk factors are trauma, intramuscular injections, tonsillectomy etc..

Environmental factors

- Polio is more likely to occur in rainy season during June to September
- The environmental sources of infection are contaminated water, food and flies
- Overcrowding and poor sanitation are other risk factors
- Mode of transmission: Faecal – oral route and droplet infection
- Incubation period: usually 7 to 14 days

Clinical spectrum – Four stages

Stage	Proportion	Symptoms
1.Inapparent (Subclinical) infection	91- 96%	No presenting symptoms
2. Abortive polio or Minor illness	4 to 8%	Mild or self limiting illness due to viraemia
3. Non-paralytic polio	1%	Stiffness and pain in the neck and back. The disease lasts 2 to 10 days. Recovery is rapid
4. Paralytic polio	<1%	Virus invades CNS causing asymmetrical flaccid paralysis Tripod sign can be observed Paralysis is descending starting from hip to distal parts There is no sensory loss

Clinical spectrum – Tripod sign

- Child finds difficulty in sitting and sits by supporting hands at the back and by partially flexing the hips and knees.

Clinical spectrum - treatment

- There is no specific treatment for polio.
- Good nursing care from the beginning of illness can minimize or even prevent crippling
- Physiotherapy is of vital importance
- It helps the weakened muscles to regain strength.

Prevention

- Immunization is the sole effective means of preventing poliomyelitis
- It is essential to immunize all infants by 6 months of age to protect them against polio
- Both Killed and Live attenuated vaccines available

1. Inactivated (Salk) Polio vaccine
2. Oral (Sabin) Polio Vaccine

IPV and OPV

IPV (Salk Type)	OPV (Sabin Type)
Induces Circulating antibody, but no local(intestinal) immunity	Immunity is both humoral and intestinal. Induces antibody quickly
Prevents paralysis, but does not prevent reinfection by wild polio virus	Prevents not only paralysis, but also intestinal reinfection
Not Useful in controlling epidemics	Can be effectively used in controlling epidemics. Even a single dose gives substantial immunity
Safer to persons with immune deficiency diseases, or persons with corticosteroid radiation therapy. No serious adverse effects	Induces herd immunity. There is a chance for vaccine associated paralytic polio because of mutations in type 3 virus.

IPV and OPV

<table>
<tr><th colspan="2">IPV (Salk Type)</th><th>OPV (Sabin Type)</th></tr>
<tr><td colspan="2">Killed virus</td><td>Live Virus</td></tr>
<tr><td colspan="2">It is a trivalent vaccine containing 40 units of type-1, 8 units of type 2 and 32 units of type 3 vaccine</td><td>It is bivalent vaccine contains type 1 and type 3 virus types</td></tr>
<tr><td colspan="2">Dose: 4 inoculations First 3 doses at 1-2 months interval and 4th dose at 6-12 months interval after 3rd dose</td><td>Dose: Zero dose at birth, 3 doses at one month interval from 6 weeks onwards, 1 booster dose at 12 to 18 months</td></tr>
<tr><td>IPV IM</td><td>IPV Intra Dermal</td><td rowspan="2">The dose is drops with help of dropper supplied with vaccine. Repeat the process if the child spits out the vaccine. Dose given to children on diarrhoea will not be counted. Repeat the vaccination on next available date.</td></tr>
<tr><td>0.5 ml at 14 weeks to thigh</td><td>0.1 ml at 6& 14 weeks to upper arm</td></tr>
</table>

Human Normal Ig

- Normal Human Ig in a dose of 0.25 – 0.3 ml per kg body weight
- It gives protection for weeks against paralytic polio but not subclinical infections

Strategies for polio eradication in India

1. Conduct pulse polio immunization days every year
2. Sustain high levels of routine immunization coverage
3. Monitor OPV coverage at district level and below
4. Improve surveillance of detecting all cases of AFP due to polio & non polio aetiology
5. Ensure rapid case investigation, including the collection of stool samples for virus isolation
6. Arrange follow up of all cases of AFP at 60 days to check for residual paralysis
7. Conduct out break control for cases confirmed or suspected to be poliomyelitis to stop transmission

Strategies for polio eradication in India

- The occurrence of a single case of polio is now considered as an epidemic.
- All cases of AFP must be reported immediately to district immunization officer
- Regardless to routine immunization, Pulse polio immunization will be conducted in two rounds at 4 to 6 weeks apart, generally between November to February, during low transmission season of polio in India.
- In India on 30th november 2015 IPV was introduced
- The switch from tOPV to bOPV was carried out in April 2016

Thank You