UNIT-10

Vaccine Preventable Diseases and VPD surveillance

Learning objectives

- *Define surveillance and list its uses*
- *Describe standard case definitions of various vaccine preventable diseases*
- *Explain steps in conducting surveillance and outbreak response.*

Key Contents

Surveillance for vaccine preventable diseases

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Surveillance is data collection for action. It is defined as the ongoing systematic collection, analysis, interpretation and dissemination of data about cases of a disease and factors influencing disease behaviour, which is used as a basis for planning, implementing and evaluating disease prevention and control activities, including immunization. Surveillance is the basic tool for understanding the epidemiology of a disease. Its key objectives are to trigger public health control measures, identify outbreaks and assess the effectiveness of prevention programmes.

Key elements of an effective surveillance system

These are:

- detection and notification of disease conditions
- investigation and confirmation (epidemiological, clinical and lab) of VPD cases
- collection, analysis and interpretation of data
- feedback and dissemination of results
- prevention and control responses.

Surveillance data on VPDs can monitor the impact of vaccination on disease incidence, identify HRAs and identify outbreaks.

Uses of VPD surveillance

Disease surveillance enables the following:

- predicting or detecting disease outbreaks for containment (**what** disease is occurring)
- identifying high-risk populations (**who** gets the disease)
- identification of HRAs requiring special attention, and where system performance is poor (**where** the disease is occurring)

- determining the frequency of occurrence of a disease in the community and magnitude of the problem (**when** the disease is occurring and **how many** get the disease)
- identifying underlying causes (or risk factors) of the disease (**why** the disease is occurring)
- guiding response activities, including immunization (**how** the disease can be prevented, controlled or eliminated).

Prerequisites for effective surveillance

- Standard case definitions (to ensure uniformity in reporting)
- Recording and reporting system (to ensure regularity in reporting)
- List of all the reporting units (to ensure completeness in reporting)

The quality of surveillance data depends upon correct diagnostic criteria, timeliness and completeness of reports.

Case definitions of VPDs

The case definitions of VPDs are as follows:

- ***Polio:*** Acute flaccid paralysis (AFP) is defined as sudden onset of weakness and floppiness in any part of the body in a child < 15 years of age, or paralysis in a person of any age in whom polio is suspected. **(WHO)**
- ***Measles:*** Any person in whom a clinician suspects measles infection,

  or

  Any person with fever **and** maculopapular rash, i.e. non-vesicular

  and

  cough, coryza (runny nose), or conjunctivitis (red eyes). **(WHO)**
- ***Diphtheria:*** A suspected case of diphtheria is defined as an illness of the upper respiratory tract characterized by the following:
  - laryngitis or pharyngitis or tonsillitis,

    and

  - adherent membranes of tonsils, pharynx and/or nose. **(WHO)**
- ***Pertussis:*** A suspected case of pertussis is defined as a person with a cough lasting for at least 2 weeks, with at least one of the following:
  - paroxysms (fits of coughing)
  - inspiratory whooping
  - post-tussive vomiting (vomiting immediately after coughing)
  - without other apparent causes. **(WHO)**

- ***Neonatal tetanus:*** Any neonate with a normal ability to suck and cry during the first 2 days of life, and who thereafter cannot suck normally between 3 and 28 days of age and becomes stiff or has convulsions/spasms (jerking of the muscles), or both. **(WHO)**
- ***Tuberculosis:*** A child with fever and/or cough for more than 2 weeks, with loss of weight/no weight gain and history of contact with a suspected or diagnosed case of active TB disease within the last 2 years. **(WHO)**
- ***Bacterial meningitis:*** Any person with sudden onset of fever (> 38.5 °C rectal or 38.0 °C axillary)

  and

  one of the following signs: neck stiffness, altered consciousness or other meningeal sign **(IDSP).**
- ***Hepatitis B:*** An acute illness typically including acute jaundice, dark urine, anorexia, malaise, extreme fatigue and right upper quadrant tenderness.
  - Biological signs include increased urine urobilinogen and >2.5 times the upper limit of serum alanine aminotransferase.

  Note: Most infections occur during early childhood. A variable proportion of adult infections are asymptomatic. **(IDSP)**
- ***Japanese Encephalitis:*** A person of any age, at any time of the year with acute onset of fever and change in mental status (including symptoms such as confusion, disorientation, coma or inability to talk)

  and/or

  new onset of seizures (excluding simple febrile seizures).

  Other early clinical findings may include an increase in irritability, somnolence or abnormal behaviour greater than that seen with usual febrile illness. **(IDSP)**

Reporting network: the backbone of a surveillance system

Efficient and reliable reporting network and notification systems are vital for any disease surveillance. In many developing countries, the number of cases that are reported into the system is an underestimation of the actual disease burden, for the following main reasons:

- ***Community level:*** Not all cases seek healthcare at the designated reporting sites (this is called under ascertainment).
- ***Health facility level:*** Failure of the reporting site to adequately report suspected cases that have sought medical advice (under-reporting). The common reasons for under-reporting include lack of knowledge of case definitions , lack of appreciation of the importance of reporting , lack of motivation, competing priorities and complexity of the reporting procedure.

- All ***health-care delivery sectors not included in the reporting network*** (e.g. private sector not involved, ISM practitioners not involved, etc.)

It is difficult to address under-ascertainment. However, under-reporting can be addressed by diligently selecting the reporting sites, creating awareness of the importance of case reporting and regular monitoring to verify the quality and completeness of reporting. The health facility selected for VPD surveillance should:

- be adequately motivated to participate in the surveillance with the understanding of its importance
- serve the population of interest
- have medical staff sufficiently specialised to diagnose, treat and report cases of the diseases under surveillance.

Various types of surveillance systems functioning in India

Surveillance system for polio and other VPDs

The country has established an efficient surveillance system for polio with technical, operational and monitoring support from WHO-NPSP. This support for countrywide AFP surveillance is made through its strong field presence and a well-distributed network of reporting sites.

The reporting network for AFP involves both public and private sector health facilities and has established mechanisms for case investigation, reporting and data management. AFP surveillance has proved to be one of the best surveillance systems globally and functions beyond the globally accepted quality standards. Details of operational protocols are available in the AFP surveillance field guide, also popularly known as Red Book.

Utilizing the AFP surveillance system for surveillance of other VPDs

To capitalize on the existing infrastructure and investments already made in the Polio Eradication Initiative, the platform of the AFP surveillance system is being modified to generate valuable epidemiological information for other VPDs. A laboratory-supported surveillance system for VPDs has been designed to capture epidemiological data on measles, rubella, diphtheria, pertussis and neonatal tetanus.

A measles-rubella surveillance system has been established across the country with 14 laboratories in the network. National Institute of Virology, Pune and King Institute of Preventive Medicine (KIPM), Chennai are designated as reference laboratories. The operational protocols for measles-rubella surveillance are available in the “Measles Surveillance and Outbreak Investigation– Field Guide”.

A laboratory network for surveillance of other VPDs is being established. The Christian Medical College at Vellore has been designated to serve as the reference laboratory for the VPD surveillance laboratory network and state-specific laboratories functioning under the supervision of the reference laboratory are expected to test the samples collected from suspect cases. Technical and operational details of the laboratory-supported case-based VPD surveillance system are available in "Surveillance for Vaccine Preventable Diseases – Field Guide" developed by WHO in coordination with the GoI.

Integrated Disease Surveillance Project

IDSP is a surveillance system wherein data generation, compilation, analysis and feedback to actions take place at district level and flow upwards to the state surveillance unit (SSU) and central surveillance unit (CSU). IDSP has an administrative mechanism in the form of surveillance committees and surveillance units at district and state levels headed by a surveillance officer and supported by an epidemiologist, microbiologist, data entry operator and data managers. Implementation is intended to uncover the burden of infectious diseases and detect early warning signals for outbreaks based on syndromic reporting right from the population level. Gaps exist in capturing of data from the private sector.

Laboratory confirmation of cases and outbreaks is another important component of IDSP that feeds into Form L at the district level. In addition, a reference laboratory network has been established in nine states by utilizing the existing functional laboratories in the medical colleges and other facilities which provide diagnostic services.

Central Bureau of Health Intelligence (CBHI)

CBHI, under the Directorate General of Health Services (DGHS), is an agency involved in collection, compilation, analysis and dissemination of information on a broad range of indicators related to health status and health services in the country. It is the national nodal institution for health intelligence. CBHI has a web-based data entry portal for collation of data at the national level. It regularly brings outs an annual publication in the form of National Health Profile based on the health data collected from all health directorates of states and union territories.

A sensitive and reliable VPD surveillance system can become an important tool for generating valuable epidemiological data which provides guidance to national policy-makers to identify specific national challenges and formulate evidence-based recommendations on immunization.

Awareness and skills of health staff are major factors for high sensitivity and quality of a surveillance system. All these systems are dependent on the district and sub-district level health staff. The states have to ensure capacity building of the health-care providers/ surveillance staff, monitoring and evaluation of the key components of surveillance, data analysis and providing feedback.

Outbreak investigation, response and control

An **outbreak** is defined as the occurrence of an illness in a community, clearly in excess of the expected numbers. Usually, an outbreak is limited to a small focal area. When an outbreak covers a larger geographic area and has more than one focal point, it is termed as an epidemic.

Outbreaks are defined differently for different VPDs. For diphtheria, polio, neonatal tetanus or JE, even a single case is defined as an outbreak, whereas for measles and pertussis, a sudden increase in the number of cases is considered to be an outbreak.

Steps in outbreak investigation

Prompt and timely action during an outbreak is critical for minimizing the damage and maintaining public trust in health and immunization services. The emphasis should be on saving lives. Do not wait for confirmation of a suspected outbreak, immediately provide logistic support to the field teams. Once the cause of the outbreak is confirmed, do not further waste laboratory support for diagnosing every case, since standard case management for epidemiologically-linked cases does not require laboratory confirmation.

Step 1: Confirm the outbreak

Confirmation of an outbreak is done through two related steps. Firstly, you have to visit the area concerned and confirm the diagnosis of as many reported cases as possible. Next, you should ascertain its geographical spread through a preliminary search.

- **Confirm the diagnosis** by:
  - ***Clinical criteria:*** According to the standard case definition using information obtained by history and examination.

- ***Epidemiological association:*** If an outbreak has been confirmed, and similar cases in the same area in the same period of time are reported by HWs but not investigated individually, they may be confirmed by epidemiologically-linked association with confirmed cases.
- ***Laboratory tests:*** For VPDs subject to eradication or elimination, collect laboratory specimens from every suspect case (e.g. stool sample from each AFP case). For VPDs subject to control, collect specimens from a sufficient number of cases (e.g. five blood samples in case of a measles outbreak) to confirm the outbreak. However, no laboratory specimens are required for neonatal tetanus.

- **Ascertain the geographical extent** of the outbreak to the surrounding villages/ blocks. The search for additional cases must include visits to:

  Health facilities: Talk to the doctors and nurses to see if they are seeing suspected cases of the VPD. Visit hospital wards and outpatient departments and search all patient registers for cases that fit the standard case definition.

  The community: Visit the area from where cases have been identified. Talk to volunteers and other influential persons in the community. If feasible, organize a rapid house-to-house search of the affected area(s) to search for similar cases. Identify key informants in each village/ward for prompt information about any cases.

Step 2: Conduct house-to-house searches to find additional cases and provide case management

Train and assign HWs to conduct house-to-house searches to find the cases in the designated area. Ensure all are aware of the case definitions and ensure monitoring of this activity.

Step 3: Line list and notify the cases

Enlisting all cases is important as it collates all relevant information.

Step 4: Describe the outbreak

Describe the outbreak in terms of time, place and person.

Step 5: Analyze the data to:

- Confirm the outbreak:
  - Are the number of cases reported greater than the number expected for this period (e.g. threshold)?
  - What proportion of cases fulfill the case definition?

- Define the extent of the outbreak (time, place and person).
- Measure the severity of the outbreak (what proportion of confirmed cases were hospitalized, suffered complications or died).

Step 6: Use the data for action

Use data on the various components of the immunization system such as coverage, status of the cold chain, training and availability of personnel to determine the probable causes of the outbreak.

Step 7: Write the report

After conducting the outbreak investigation, prepare a short comprehensive report.

Step 8: Give feedback

Provide feedback to all levels (community/SC/PHC/CHC/district) on the outcomes of the VPD outbreak investigation, in order to ensure that all stake holders are aware of the reasons for the outbreak, the actions initiated and the plan to prevent future outbreaks.

Step 9: Initiate action

In all VPD outbreaks, effective case management and followup of cases is a priority. Thereafter, conduct activities for strengthening and raising awareness of RI.

For further details refer to operational manuals / guidelines of VPD surveillance, measles and AFP.