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Neonatal tetanus surveillance

Introduction

“Maternal tetanus is defined as tetanus during pregnancy or with 6 weeks after pregnancy (with birth, miscarriage or abortion) and has the same risk factors and means of prevention as neonatal tetanus. For this reason, neonatal tetanus elimination (<1 case per 1000 live births) is considered a proxy for maternal tetanus elimination. Surveillance for non-neonatal tetanus should detect cases of maternal tetanus but in most countries occurs through aggregated reporting which lacks the required information on age, sex and pregnancy status to distinguish maternal tetanus.”

All countries of the WHO South-East Asia Region achieved the status of elimination of maternal and neonatal tetanus (MNT) by May 2016. However, even after a country has been validated for MNT elimination, neonatal tetanus (NT) cases, though rare, can still be found. A sensitive and reliable NT surveillance system is required to detect every case and implement corrective measures to prevent further cases. Thus, NT surveillance should become an integral part of vaccine-preventable diseases (VPD) surveillance.

Objectives

The main objective of NT surveillance in this context is to detect cases to ensure the maintenance of MNT elimination, defined as less than one NT case per 1000 live births per year in every district. The other objectives are:

- to identify areas and subpopulations at high-risk
- to guide effective public health response in high-risk subpopulations;
- to monitor the impact of interventions at national and subnational levels; and
- to identify areas of the health system that need strengthening, as every NT case is an event that indicates the failure of multiple levels of the health system.

Type of surveillance

The minimal recommended standard is nationwide, case-based surveillance. In other words, each and every suspected case should be investigated and classified as confirmed or discarded. Surveillance, in this case, is population-based and includes all neonates of the age of 0–28 days. Laboratory confirmation is not an aspect of NT surveillance, as the basis of diagnosis is clinical.
Case detection

Definition of suspected case
A suspected case should meet either of the following criteria:

- could suckle and cry normally during the first two days of life but lost the ability and developed tetanus-like illness or died between 3 and 28 days after birth; or
- died of an unknown cause during the first month of life.

Description of case definition

- suckling well and crying normally for the first few days after birth and subsequently developing progressive difficulty and then inability to feed;
- excessive crying;
- spasms of facial muscles (trismus or lockjaw);
- stiffness of back muscles, leading to backward arching of the back;
- generalized convulsions.

Date of onset of illness

The date of onset of illness is the day the child shows inability to suckle.

Investigation of a suspected case

The VPD surveillance officer should investigate all suspected cases within 7 days of notification to arrive at a diagnosis. The sooner the mother and the persons who attended the birth are visited, the more likely that they will be available and remember relevant details.

At the end of the investigation, the surveillance officer should be able to determine why the infant contracted tetanus. Was it due to:

- the lack of maternal vaccination,
- birth unattended or attended by unskilled staff; or
- the use of unhygienic cutting tools or application of substances to the umbilical stump.

In addition, a simplified algorithm can be used to determine if the mother and infant were protected at birth (PAB) against tetanus, based on maternal vaccination history (Annex-3).
Case investigation form

A case Investigation form should be filled for every suspected case. (Please see Annex 2 for a sample case investigation form.)

The case investigation form must have details of the findings and actions taken or recommended and sent to the next level. A written feedback must be given to the reporting facility and community.

Unique ID

Each suspected case should be assigned a unique case identification number (UID). The case number should begin with one or more three-letter combinations designating the geographical location, the year, and the serial number of the case. All communications and forms related to the case should cite the UID.

For example:
- Code for NT disease : NNT
- Country code: NEP
- Province code: SUP
- District code: BJR
- Year of onset: 2022
- Serial number of case: 001
- The UID would then be NNT-NEP-SUP-BJR-22-001

How to ascertain protection at birth

Whether a child was protected against tetanus may be determined on the basis of maternal immunization records and questioning the mother about the number tetanus toxoid-containing vaccine (TTCV) doses she received during the last pregnancy, previous pregnancies, campaigns/outreach before the last pregnancy and during school going age. A birth is protected if the mother received:

- two TTCV doses while pregnant with the last child (with second dose at least two weeks before birth); OR
- one TTCV dose while pregnant with the last child (at least two weeks before birth) and one or more doses at any time before that pregnancy; or OR
no dose while pregnant with the last child and three or more adolescent/adult doses at any time before that pregnancy.

(A simplified algorithm to determine whether the mother and infant were protected at birth is given in Annex 3).

Diseases which produce similar clinical picture

Some other diseases which may produce similar clinical features include meningitis, sepsis (including umbilical sepsis) and birth defects. Some differentiating features are:

- trismus (lockjaw) is absent in these illnesses;
- there is no bulging of the fontanelle in NT;
- during tetanus spasms, the child is conscious, while in convulsions from causes such as high fever, the child is unconscious;
- tetanus spasms are often brought on by stimuli such as light and sound.

Laboratory testing

There is no diagnostic test. The diagnosis is based on clinical signs and symptoms. It may be possible to culture the bacteria from the umbilical stump in about a third of the cases.

Classification of cases

Confirmed case

A confirmed case is any suspected case found to have all three of the following:

- normal ability to suckle and cry during the first two days of life;
- progressively lost ability to suckle between 3 and 28 days after birth; and
- developed stiffness of muscles and/or spasms leading to jerking movement.

Discarded case

A discarded case is one that has been investigated and does not satisfy the clinical criteria for confirmation or has an alternate diagnosis.

Not investigated

Any suspected case that was not investigated or about which there was no information on age and symptoms confirming the case should be classified as “not investigated”.
Contact tracing

As NT is not contagious, contact tracing is not needed.

Clinical case management of NT

Neonatal tetanus is a medical emergency requiring hospitalization. Its management consists of the following components.

a). Immediate treatment with human tetanus immune globulin (TIG):
   - A single intramuscular dose of human TIG is recommended as soon as possible to prevent further progression of the disease.
   - If TIG is not available, equine-derived antitoxin tetanus serum (ATS) may be given in a single intravenous dose, after testing for hypersensitivity.
   - Alternatively, intravenous immunoglobulin (IVIG) may be used.

b). Control of muscle spasm: Benzodiazepines are usually prescribed to control muscle spasms.

c). Antibiotics: Metronidazole or penicillin G is used as the antibiotic of choice.

d). Other supportive treatment:
   - The patient must be kept in a dark and quiet environment to reduce the risk of reflex spasms.
   - Nasogastric feeding must be started.
   - A safe airway must be maintained during muscle spasms. If mechanical ventilation is not available, the patient must be carefully monitored, and efforts must be made to minimize spasm and autonomic dysfunction to avoid respiratory failure.

Outbreaks

Usually, outbreaks do not occur. However, clusters linked to a single source of substandard clinical care have been observed.

Public health response

It is good practice to do a rapid community assessment following a case investigation.

- The assessment should start from the house where the case occurred and proceed from house to house.
- A minimum of seven other mothers who delivered in the preceding two years should be interviewed to record the:
immunization status of the mother;
- place of last delivery;
- use of traditional substances on the umbilical cord; and
- immunization status of the last-born child.

If any mother was not immunized, she should be immunized immediately with one dose of Td vaccine and provided with a second dose one month later. She should also be informed about proper cord care.

If 90% of the mothers assessed are protected (clean delivery or/and TT2+), only the mother of the NT case need be immunized. Hygienic cord care practices must be promoted.

If less than 90% of the mothers are protected, and/or less than 90% of the children are completely immunized:
- the cause of non-protection must be determined and addressed;
- the community must be included in the microplanning (Reach Every Child) strategy and implementation;
- TT vaccination must be made an integral component of upcoming periodic intensification of routine immunization (PIRI) or Child Health Days; and
- the community and birth attendants must be informed about proper cord care.

If factors that placed the infant at risk of are identified, corrective actions must be taken. Some examples of such actions are including maternal immunization in the training of birth attendants and better coordination with maternal and child health services.

Data management

Reporting requirements
- Designated reporting sites should report cases weekly, monthly or at some other specified frequency, even if there are zero cases (zero reporting).
- Copies of case investigation forms or electronic data from these forms should be forwarded to the national level.
- Cases should be reported annually to WHO/UNICEF through the Joint Reporting Form.
- Reporting of NT is not required under International Health Regulations (IHR).

Unique ID

A unique case identification number should be assigned to each suspected case, as explained earlier.
Recommended data elements

- Case notification
- Geographical information
- Demographics
- Clinical findings
- Neonatal outcome
- Maternal and perinatal risk factors
- Public health response effort

These data elements have been included in the case investigation form (Annex 2).

Data analysis

- Number and incidence of confirmed cases per 1000 live births, by month, year, sex, and district
- Percentage of confirmed cases that were PAB by maternal vaccination
- Percentage of confirmed cases whose mother received antenatal care (ANC)
- Percentage of mothers not vaccinated among those who received ANC (for analysis of missed opportunities)
- Percentage of confirmed cases by
  - place of birth (health facility/home delivery)
  - type of birth assistance
  - type of cord-cutting tools used
  - type of umbilical cord dressing used
  - mother’s age
  - mother’s parity (first birth/multiple births)
- Distribution of outcomes (death, left against medical advice, survived, unknown) among confirmed cases
- Case fatality ratio among confirmed cases
- Percentage of confirmed cases whose mother received a TTCV dose(s) after the case occurred, as a result of case detection/investigation or soon after
- Percentage of neonatal deaths attributable to NT (if part of neonatal death surveillance)
- Percentage of confirmed cases which triggered an active search in community
- Percentage of confirmed cases which triggered an immunization response among women of reproductive age
Surveillance data should be triangulated with data from the immunization programme, such as vaccination coverage and history of supplementary immunization activities (SIAs), as well as ANC coverage, and skilled birth attendance (SBA) coverage to understand the entire picture when drawing conclusions and formulating policies and strategies.

**Using data for decision-making**

Surveillance data may be used to draw conclusions, monitor implementation, and identify areas that require special attention.

- They may be used to monitor achievement and maintenance of MNTE (< 1 NT case per 1000 live births in every district) and document evidence towards validation of sustained elimination.
- They may be fed into annual risk assessments to identify high-risk geographical areas for targeting improvements in antenatal, obstetric, and vaccination services and conducting targeted SIAs for women of reproductive age.
- They may be used to identify NT risk factors, such as place/type of delivery, cord care, age and parity of mother, and migrant status and ethnicity, in order to design appropriate messaging and interventions.
- They may be used to monitor the impact of interventions, including SIAs.
- They may help identify missed opportunities for maternal immunization with TTCV.
- They may provide evidence needed to change immunization policy or strategy (for example, the introduction of WHO-recommended booster doses and school-based immunization if first-time mothers are not being reached at ANC visits).
- They may help in the rapid identification of cases for appropriate case management.

**Indicators for surveillance performance**

Countries should review the performance of each district annually. This should be a joint exercise conducted by the Expanded Programme on Immunization (EPI), maternal, neonatal and child health (MNCH) programme, and surveillance managers at different levels, together with partner representatives. The objectives of the review should be:

- to identify and classify districts that could potentially revert to at risk for MNT;
- to select and tailor relevant corrective strategies and interventions to sustain MNTE in the short, and longer term; and
to use the findings to improve the EPI and MNCH programmes, especially to optimize the ANC and immunization platforms.

Districts should be classified into “low risk” and “at risk” for MNT. Then “at risk” districts should be further classified into “high risk” and “medium risk” to enable a more adequate tailoring of corrective strategies.

An illustrative list of performance indicators is provided at Annex 4.

**Sustaining maternal and neonatal tetanus elimination**

Since countries in the Region have already achieved MNT elimination, regular risk assessments should be performed, triangulating district-level data on NT cases and rates, SBA, TT/PAB coverage from routine and SIAs, and other proxy indicators (details available at: [https://www.who.int/publications/i/item/protecting-all-against-tetanus](https://www.who.int/publications/i/item/protecting-all-against-tetanus)).

**Special considerations**

The following considerations must be kept in mind while conducting surveillance.

**Ethical and equity issues:** Neonatal deaths may be a sensitive topic, especially among some cultures and ethnic groups. Such deaths occur most frequently among marginalized groups, such as migrants, the homeless and residents of urban slums, missed by the immunization programme. Members of these groups may be sensitive to questioning by government officials. Guidance must be taken from the local health staff on how best to address these challenges.

**Neonatal death surveys:** The relative contribution of NT to neonatal mortality can be assessed through audits of neonatal deaths at health facilities or in community settings (for details see: [https://www.healthynewbornnetwork.org/hnn-content/uploads/WHO_Audit-Review-of-Stillbirths-and-Neonatal-Deaths-Highlights_2016-1.pdf](https://www.healthynewbornnetwork.org/hnn-content/uploads/WHO_Audit-Review-of-Stillbirths-and-Neonatal-Deaths-Highlights_2016-1.pdf)).

**Serological surveys:** Where feasible, serosurveys of tetanus IgG among adult women should be considered as a complementary tool for monitoring MNT risk and guiding vaccination strategies. Since immunity does not result from natural infection, tetanus seroprotection reflects population immunity from vaccination. Close attention should be paid to the objective of the survey, sampling strategies and laboratory methods to ensure that the results are valid and interpretable. Serosurveillance should not replace NT surveillance.
Annexes

Annex 1: Disease epidemiology

Introduction

Tetanus is a bacterial disease caused by Clostridium tetani. Spores of C. tetani are present in soil contaminated with animal and human faeces. The spores gain entry through breaks in the skin and germinate under anaerobic conditions. The organisms produce a toxin, tetanospasmin, which when it reaches the nervous system, causes painful muscular contractions. Usually, the muscle stiffness begins in the jaw and neck, and later becomes generalized.

In 1989, the 42nd World Health Assembly called for the elimination of neonatal tetanus by 1995. The following year, the 1990 World Summit for Children listed neonatal tetanus elimination as one of its goals, and the goal was again endorsed by the 44th World Health Assembly in 199. The Maternal and Neonatal Tetanus Elimination (MNTE) initiative aims to reduce MNT cases to such low levels that the disease is no longer a major public health problem.

The eradication of NT is not possible as the bacteria and its spores are found in the environment everywhere in the world. However, it can be eliminated (defined as less than one case of neonatal tetanus per 1000 live births in every district) through the immunization of mothers and other women of reproductive age (WRA), and the promotion of more hygienic deliveries and cord care practices.

The South-East Asia Region of WHO was declared to have eliminated MNT in 2016. Indonesia, Nepal, Bangladesh, Myanmar, Timor-Leste, and India reached the elimination goal and were validated in 2005, 2008, 2010, 2012 and 2015, respectively. On the basis of the quality of their longstanding performance in routine immunization and surveillance systems, it was assumed that Bhutan, the Democratic People’s Republic of Korea, Maldives, Sri Lanka, and Thailand had already achieved MNT elimination before 2000.

Notwithstanding the fact that MNT has been eliminated in the Region, a small number of cases are likely to occur. Thus, there is a need for an effective and sensitive surveillance system to detect these cases, so that appropriate remedial measures can be taken. Surveillance can be quite challenging, as most neonatal deaths occur at home, and experience has shown that only 1 in 10 NT cases and deaths get reported. However, efforts must be made to ensure that every case gets reported and investigated to understand the reasons why the case occurred.
**Essential epidemiology**

*Infectious agent: Clostridium tetani*

*Reservoir of infection:* Spores are present in the environment, especially in the soil and fomites contaminated with animal and human faeces. The organism is a harmless normal inhabitant of the intestines of horses and other animals, including human beings.

*Mode of transmission:* Tetanus spores are introduced into the body of a newborn infant via the umbilical cord following unhygienic deliveries and poor postnatal hygiene and cord care practices. Some examples of unhygienic practices are the use of non-sterile instruments to cut the umbilical cord and the use of contaminated material to cover the umbilical stump. Deliveries carried out by persons with uncleansed hands or on a contaminated surface are also risk factors.

*Incubation period:* The symptoms usually present 3 to 14 days, averaging 7 days, after birth in 90% of cases. Shorter incubation periods are associated with more severe disease and worse prognosis.

*Period of communicability:* The disease is not directly transmitted from person to person.

*Case fatality ratio:* The case fatality ratio is very high, exceeding 80% among cases with a short incubation period and low birth weight.

**Vaccines**

The tetanus vaccine is a toxoid vaccine, prepared by the inactivation of the tetanus toxin. It is available as either a single-antigen vaccine or in combinations containing vaccines against diphtheria, pertussis, poliomyelitis, hepatitis B and the Haemophilus influenzae type b (Hib) disease. The pentavalent vaccine, which provides protection against diphtheria, tetanus, pertussis, Hib, and hepatitis B (DTP-Hib-HepB), is the most commonly used childhood vaccine worldwide to complete primary series of vaccination to prevent NT, but other pentavalent (DTaP-IPV/Hib) and hexavalent (DTaP-IPV/Hib-HepB) combinations are also available.

A tetanus-diphtheria combination with a lower concentration of the diphtheria antigen is available for booster dosing. The use of combinations containing tetanus toxoid (TT) and diphtheria toxoid vaccines is recommended and single-antigen vaccines should be discontinued whenever feasible to help maintain high immunity to both diphtheria and tetanus throughout the life course.

*Effectiveness:* The effectiveness of ≥2 properly timed doses of TT given to pregnant women or women of reproductive age against NT mortality was 94% [95% CI: 80–98%]
**Disease burden**

Despite the availability of highly effective TT–containing vaccines, tetanus continues to have a substantial health impact in the world. WHO estimates that in 2018 (the latest year for which estimates are available), 25 000 new-borns died due to NT. Though this was a reduction of 88% from the figure of 200 000 for the year 2000, the MNT elimination initiative still faces numerous challenges. Approximately 47 million women and their infants are not protected against tetanus. In addition to maternal immunization, promotion of clean deliveries and adequate umbilical cord care practices are included in the recommended WHO strategies to eliminate MNT.

**Annex 2: Case investigation form**

<table>
<thead>
<tr>
<th>Case notification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of child (can be omitted if confidentiality is a concern, provided unique identifier exists)</td>
</tr>
<tr>
<td>Unique identification number</td>
</tr>
<tr>
<td>Country code/ Province code/District code/ Year/Serial number</td>
</tr>
<tr>
<td>Date of notification</td>
</tr>
<tr>
<td>Date of investigation</td>
</tr>
<tr>
<td>Source of notification</td>
</tr>
<tr>
<td>Name of person:</td>
</tr>
</tbody>
</table>

**Geographic information**

<table>
<thead>
<tr>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>State:</td>
</tr>
<tr>
<td>District/ province:</td>
</tr>
<tr>
<td>City/town:</td>
</tr>
<tr>
<td>Reporting health facility</td>
</tr>
</tbody>
</table>

**Demographic information**

| Date of birth | dd/mm/yyyy |
|---------------|
| Sex | Male ☐ Female ☐ Not known ☐ |

**Clinical information**

<table>
<thead>
<tr>
<th>Age of baby in days at onset of symptoms</th>
<th>Date of onset (date of inability to suckle or of lockjaw)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of hospitalization</td>
<td></td>
</tr>
</tbody>
</table>
### Signs and symptoms

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to suckle and cry during the first 2 days of life</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cannot suckle normally between 3 and 28 days of age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle stiffness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Muscle spasms (jerking)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Neonatal outcome

<table>
<thead>
<tr>
<th>Final outcome of child's illness</th>
<th>Alive</th>
<th>Dead</th>
<th>Unknown</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final classification</td>
<td>Confirmed</td>
<td>Discarded</td>
<td>Not investigated</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Maternal and perinatal risk factors

<table>
<thead>
<tr>
<th>Age of mother</th>
<th>Ethnic group</th>
<th>Migrant status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of live births delivered (including the last one) by the mother</td>
<td>Number of previous births with similar symptoms and whether children survived</td>
<td></td>
</tr>
<tr>
<td>Number of ANC contacts the mother had with a trained healthcare worker during this pregnancy</td>
<td>Location of ANC (for follow-up regarding missed vaccination opportunity)</td>
<td></td>
</tr>
<tr>
<td>PAB status of last birth</td>
<td>Place of birth: Hospital</td>
<td>Others Specify: Unknown</td>
</tr>
<tr>
<td>Assistance during childbirth/ birth attended by</td>
<td>Health staff</td>
<td>Traditional birth attendant</td>
</tr>
<tr>
<td>Alone</td>
<td>Others</td>
<td>Unknown</td>
</tr>
<tr>
<td>If not health staff, whether clean surface and hands were used for delivery</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Describe :</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tool(s) used to cut umbilical cord</td>
<td>Cleaned</td>
<td>Boiled*</td>
</tr>
<tr>
<td>Substance put on umbilical cord*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal outcome</td>
<td>Alive</td>
<td>Dead</td>
</tr>
<tr>
<td>If dead, cause of death</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**NEONATAL TETANUS**

<table>
<thead>
<tr>
<th>Public health response</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother given TTCV dose(s) at the time of case detection/investigation; or as soon as possible afterwards</td>
<td>Yes □</td>
</tr>
<tr>
<td></td>
<td>No □</td>
</tr>
<tr>
<td></td>
<td>Not needed/already protected □</td>
</tr>
<tr>
<td></td>
<td>Unavailable □</td>
</tr>
<tr>
<td></td>
<td>Unknown □</td>
</tr>
<tr>
<td>If protective dose given, date when it was given</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS**

* Designated core variable that must be recorded

**Annex 3: Reporting form for assessing protection at birth**

<table>
<thead>
<tr>
<th>Health facility information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>Province</td>
<td>District</td>
</tr>
<tr>
<td>Type</td>
<td>Health facility □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mother’s information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Age in years</td>
</tr>
<tr>
<td>Gravida (total pregnancies so far)</td>
<td>Parity (total number of children so far)</td>
</tr>
<tr>
<td>Received TTCV vaccination before or during the last pregnancy</td>
<td>Yes □ No □</td>
</tr>
<tr>
<td>If yes, total number of vaccinations</td>
<td></td>
</tr>
<tr>
<td>Source of information</td>
<td>Maternal health record □</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Decision point</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Was the child protected from tetanus at birth?</td>
<td></td>
</tr>
<tr>
<td>If mother received 2 or more valid doses of TTCV</td>
<td>Yes □</td>
</tr>
<tr>
<td>If mother received less than 2 doses of TTCV</td>
<td>No □</td>
</tr>
</tbody>
</table>
### Annex 4: Indicators of surveillance performance

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Indicator</th>
<th>Target</th>
<th>Formula</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completeness of reporting</td>
<td>Percentage of designated sites reporting NT data, even in the absence of cases (zero reporting)</td>
<td>≥ 90%</td>
<td>(Number of designated reporting sites sending data/number of designated reporting sites for surveillance) x 100</td>
<td></td>
</tr>
<tr>
<td>Timeliness of reporting</td>
<td>Percentage of designated sites reporting on time, even in the absence of cases (zero reporting)</td>
<td>≥ 80%</td>
<td>(Number of designated reporting sites reporting by deadline /number of designated sites for surveillance) x 100</td>
<td>At each level, reports should be received on or before the requested date.</td>
</tr>
<tr>
<td>Completeness of investigation</td>
<td>Proportion of suspected cases investigated (only from health facilities)</td>
<td>≥ 90%</td>
<td>(Number of case investigations /number of suspected cases reported) x 100</td>
<td>If database only has data on case investigations performed, this indicator can be calculated as: (Number of suspected cases in the case-based dataset/number of suspected cases in the aggregate report) x 100. This indicator will reflect the representativeness of case-based surveillance and efficiency of case investigations.</td>
</tr>
<tr>
<td>Timeliness of investigation</td>
<td>Percentage of all suspected cases investigated within 7 days of notification</td>
<td>≥ 80%</td>
<td>(Number of suspected cases investigated within 7 days of notification/ number of suspected cases investigated) x 100</td>
<td></td>
</tr>
<tr>
<td>Adequacy of investigation</td>
<td>Percentage of cases investigated with complete information on all core variables</td>
<td>≥ 80%</td>
<td>(Number of suspected cases for which adequate investigation was conducted for all 12 core variables / number of suspected cases investigated) x 100</td>
<td>The core variables are case identification, date of birth, sex, place of residence, date of illness onset, date of notification, date of investigation, symptoms in case definition, outcome, maternal vaccination history, place/type of delivery, tool for cutting cord, and material applied to cord. If information on any of the core variables is missing, the investigation is considered inadequate.</td>
</tr>
<tr>
<td>Attribute</td>
<td>Indicator</td>
<td>Target</td>
<td>Formula</td>
<td>Notes</td>
</tr>
<tr>
<td>--------------------</td>
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<td>-----------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Maintenance of MNTE</td>
<td>Percentage of districts with &lt; 1 NT case per 1000 live births</td>
<td>100%</td>
<td>(Number of districts with &lt; 1 NT case per 1000 live births / total number of districts) x 100</td>
<td>Ideally, this indicator should be calculated using confirmed cases. If the completeness of investigating suspected cases is &lt; 90%, it can be calculated using suspected cases to highlight districts needing targeted interventions and programme strengthening.</td>
</tr>
<tr>
<td>Adequate case response</td>
<td>Percentage of confirmed cases for which the mother received a TTCV dose in conjunction with case detection or investigation</td>
<td>100%</td>
<td>(Number of mothers of NT cases who received a TTCV dose in conjunction with case detection or investigation / total number of NT case investigations) x 100</td>
<td></td>
</tr>
</tbody>
</table>
Further reading


CONTRIBUTION

The document was produced under the strategic guidance of the Regional Director, Dr. Poonam Khetrapal Singh; Director, Programme Management Dr. Pem Namgyal, and Director CDS Dr. Suman Rijal WHO SEARO.

The entire process was overseen by Dr. Sunil Bahl, Coordinator, COVAX, Immunization and Vaccines Development.

Dr. Sudhir Khanal, IVD/CDS WHO SEARO, lead the coordination and development of the technical document together with Dr. Sudhir Joshi, IVD/CDS WHO SEARO. WHO Consultant Dr. Lalit Kant played a crucial role in updating the technical content of the document.

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**WHO HQ staff:** Dr. Anindya Bose and Dr. Heidi Soeters reviewed the draft surveillance standard document and provided technical inputs.

**WHO-SEARO:** Dr. Jayantha Liyanage, Dr. Sigrun Roesel, Dr. Emmanuel Njambe, Dr. Lucky Sangal, Dr. Pankaj Bhatnagar, Ms. Uttara Aggarwal, Mr. Sharifuzzaman, Dr. Rajendra Bohara, Dr. Ariful Islam, Dr. Tanbir Islam, Dr. Subramanya Balakuntlam Pattabhiramaiah, Dr. Ratnesh Murugan, Dr. Stephen Chacko, Dr. Paba Palihawadana, Dr. Aishath Thimna Latheef, Dr. Balwinder Chawla, Dr. Khaing Khaing Gyi, Dr. Vinod Bura, Dr. Rahul Pradhan, Dr. Pasang Rai, Dr. Preshila Samaraweera, Ms Aree Moungsookjareoun, Dr. Sudath Peiries

**UNICEF:** Christopher Gregory provided inputs as well as coordinated inputs from UNICEF team to the various sections of the document.

**US CDC:** Dr. Ahmed Kassem, Dr. Michelle Morales provided inputs to the various sections of the document and coordinated inputs from various teams within US CDC.