

## Expanded Programme on Immunization

# Prevention of Neonatal Tetanus through Immunization

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## 1. Introduction.

There are two strategies available to prevent neonatal tetanus:

- Training of traditional birth attendants in clean delivery techniques, and
- Immunization of women.

Training of birth attendants in hygienic practices during delivery is a gradual and long-term strategy of controlling neonatal tetanus. Not all sources of infection in home or hospital may be eliminated and not all cases of neonatal tetanus may be prevented. Advantages are, however, that other causes of neonatal and maternal death may also be prevented, having a greater cumulative impact than that of tetanus toxoid immunization. Immunization of women can make an immediate impact on the incidence of the disease. A combination of training

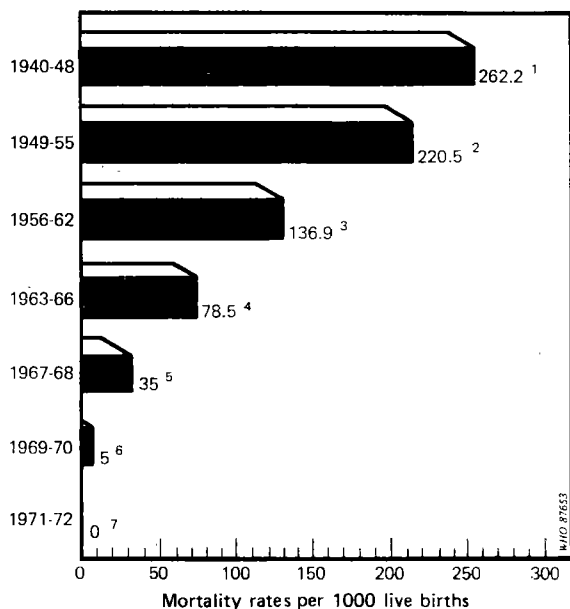
of birth attendants and immunization of women is therefore recommended as the best.

Figures 1 and 2 are examples of the relative impact of each of these strategies (1 & 2).

## 2. Prevention through immunization

The most obvious approach to the prevention of neonatal tetanus through immunization is by immunizing pregnant women. Although this approach has been promoted for several years, in 1986 only 16% of the pregnant women in the developing world were adequately protected. Alternative and supplementary approaches to the immunization of women therefore need consideration. Advantages and disadvantages of several of these approaches are summarized in Table 1 (3,4 & 5)

Figure 1.  
Neonatal mortality per 1 000 live births in rural Haiti, 1940-72, from a retrospective study of 2 574 mothers (1)



- 1) Before national programme for training TBAs
- 2) National programme for training TBAs
- 3) Hospital treatment for tetanus, training of TBAs by hospital nurse
- 4) Immunization of pregnant women in hospital clinics
- 5) Immunization of women in market-places by hospital team
- 6) Immunization after door-to-door invitation by community workers
- 7) Resident home visitor follow-up by hospital team

Figure 2.  
Effects of training traditional birth attendants and of immunizing pregnant women against tetanus on neonatal death rates, Bangladesh, late 1970's (2)

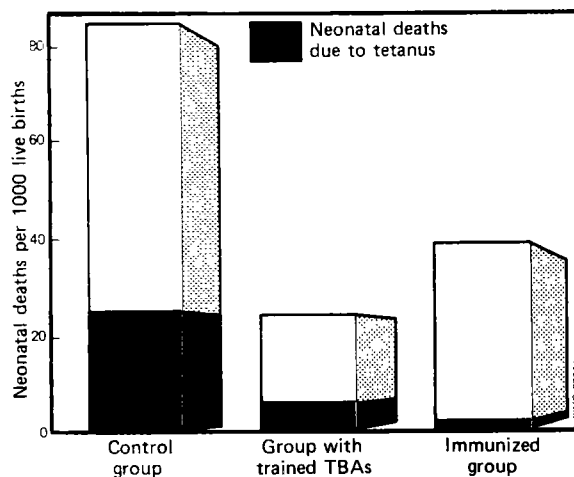


Table 1.  
Advantages and disadvantages of immunization approaches to the prevention of neonatal tetanus

Approach	Advantages	Disadvantages	When to use
Immunization of pregnant women attending ante-natal services	<ul style="list-style-type: none"> <li>• Few additional resources needed</li> <li>• Potentially rapid impact on disease incidence</li> </ul>	<ul style="list-style-type: none"> <li>• Hesitation over injections during pregnancy from health workers and women</li> <li>• Women at highest risk come rarely for antenatal care</li> <li>• Only very short periods available to immunize women and to maintain immune status</li> </ul>	<ul style="list-style-type: none"> <li>• When over 80% of pregnant women attend at least twice in ante-natal period</li> <li>• As part of overall effort to immunize women</li> </ul>
Immunization of women of child-bearing age through regular health services	<ul style="list-style-type: none"> <li>• Any contact of women with health worker can be used</li> <li>• Better chance of reaching high risk women (who may not come for preventive care, but would come for curative care for their child)</li> </ul>	<ul style="list-style-type: none"> <li>• Cooperation of health staff needed</li> <li>• More complex logistics</li> <li>• Accessibility of health services may be limited</li> </ul>	<ul style="list-style-type: none"> <li>• Preferred when coverage for antenatal care is less than complete and reasonable degree of access to general health services exists</li> <li>• May need to be supplemented by (limited) mass campaigns</li> </ul>
Immunization of women coming with a child to an immunization session	<ul style="list-style-type: none"> <li>• Few additional resources needed</li> <li>• Women with children are likely to become pregnant again</li> </ul>	<ul style="list-style-type: none"> <li>• Women not reached for first pregnancy</li> <li>• Coverage cannot exceed maximum coverage of children</li> </ul>	<ul style="list-style-type: none"> <li>• Should be part of any approach</li> <li>• If used as only approach, needs periodic supplementation with mass campaign</li> </ul>
Immunization of women coming with or without children to the immunization session	<ul style="list-style-type: none"> <li>• Few additional resources needed</li> <li>• Women reached for first pregnancy</li> </ul>	<ul style="list-style-type: none"> <li>• Accessibility may be limited</li> </ul>	<ul style="list-style-type: none"> <li>• Should be part of any approach and may eliminate need for campaign if coverage is high</li> </ul>
Special outreach clinics (markets, meetings)	<ul style="list-style-type: none"> <li>• Increases accessibility considerably</li> </ul>	<ul style="list-style-type: none"> <li>• Needs organization and some extra resources</li> </ul>	<ul style="list-style-type: none"> <li>• In situations with regular, well attended markets or other special events and limited access to regular health services</li> </ul>

Approach	Advantages	Disadvantages	When to use
Immunization of school children	<ul style="list-style-type: none"> <li>• Few additional resources needed</li> <li>• Can be incorporated into ongoing school health programmes</li> <li>• School immunization programme may provide good stimulus for improving health education on immunization</li> </ul>	<ul style="list-style-type: none"> <li>• Impact on disease incidence delayed (10-20 years)</li> <li>• High risk groups have low school attendance</li> <li>• No school health programmes in most of the rural areas</li> </ul>	<ul style="list-style-type: none"> <li>• Wherever a school health programme can be activated without distracting resources from MCH care</li> </ul>
Mass campaign	<ul style="list-style-type: none"> <li>• Rapid impact</li> <li>• High visibility has good promotional value</li> <li>• Men as well as women can be included</li> </ul>	<ul style="list-style-type: none"> <li>• Resource intensive</li> <li>• Might distract resources from development of regular MCH care</li> <li>• May need repetition</li> </ul>	<ul style="list-style-type: none"> <li>• Wherever incidence is 10/1000 live births or more</li> <li>• When special high risk areas/groups are not reached otherwise</li> <li>• As part of any accelerated immunization activity</li> </ul>

### 3. Immunization schedule

The first immunization with a conventional adsorbed tetanus toxoid induces a low and non-protective level of antibodies, but leaves a lifelong imprint on the individual's immune system, so that a second immunization anytime after four weeks will rapidly

produce an antitoxin level well over the minimum recommended (3). In Table 2 the relationship between doses of vaccine received and degree and duration of immunity are illustrated.

Table 2.

Relationship between tetanus toxoid doses and duration of protection (6,7 & 8)

Dose <sup>1</sup>	Minimum interval <sup>2</sup>	Percent protected <sup>4</sup>	Duration of protection <sup>5</sup>
TT 1	-	-	-
TT 2	4 weeks	80 (60-90)	3 years <sup>6</sup>
TT 3	6 months <sup>3</sup>	95	5 years
TT 4	1 year <sup>3</sup>	99	10 years
TT 5	1 year <sup>3</sup>	99	life long

1) For practical purposes:

- There are no contraindications to the administration of tetanus toxoid
- The risk of adverse reactions is negligible
- Only well documented immunizations should be counted. If in doubt, give an extra dose

2) There is no maximum interval between doses

3) If the previous dose of tetanus toxoid was given during a pregnancy, this dose could coincide with one of the immunizations of the child

4) Optimal protection of the infant can only be expected if the woman receives the vaccine at least two weeks before the delivery

5) For practical purposes it is assumed that the antibody levels in the mother and the umbilical cord are approximately the same.

6) A high percentage of women (more than 80%) are protected up to one year after the second dose; this percentage diminishes slowly over the next 2 years.

Administration of tetanus toxoid may be guided by the following advice (see also Table 3):

- To unimmunized persons (including pregnant women), give two doses spaced at least four weeks apart
- Give third, fourth and fifth doses at approximately annual intervals when the person is in contact with the health services or during their subsequent pregnancies at intervals of more than one year
- Five doses spread over a period of at least 10 years are expected to provide lifelong protection. An additional dose should be given when there is specific risk (pregnancy or deep penetrating wound) if:
  - less than three years has separated the third dose from the fourth, and the fourth from the fifth dose,

OR

- more than 10 years has elapsed since the last dose.
- Accept written documentation of doses of DPT, DT or Td given anytime during life as counting toward the five doses providing lifelong immunity. The antigenic response is still protective, even if there is an interval of many years between doses. There is no need to restart an immunization series.

Table 3.  
**Immunization schedule for women of childbearing age, including pregnant women**

Dose	Schedule
TT 1	At first contact, or as early as possible during pregnancy
TT 2	Four weeks after TT1
TT 3	Six to 12 months after TT2, or during subsequent pregnancy
TT 4	One to three years after TT3, or during subsequent pregnancy
TT 5*	One to five years after TT4, or during subsequent pregnancy

\*A sixth dose may be given in special circumstances such as penetrating wounds

## 4. Adverse reactions

Currently available adsorbed vaccines are extremely effective and safe, causing only negligible reactions (9,10 & 11).

There is convincing evidence that tetanus toxoid can be given at any stage of pregnancy without increased risk of congenital abnormalities or abortion (12).

Local reactions in the form of erythema, pain, and swelling usually last less than one day and only rarely more than three days. White reports that the incidence of these reactions increases with the number of doses received. He found rates of local reactions of 0.9%, 2.7%, 7.4% and 16% respectively after the first, second, third and fourth and subsequent doses (13).

Severe systemic reactions such as acute anaphylactic reactions, urticarial rash with or without angioneurotic oedema are rare. In Denmark over 2.5 million tetanus injections were given with only 10 systemic reactions (14). Among soldiers, repeatedly injected with adsorbed toxoid, important reactions occur in less than two per 100 000 (13).

## 5. Recording and reporting of tetanus immunizations

The basic record for the registration of tetanus toxoid administrations is the "Tetanus Protection Card" (Figure 3) or a similar home-based record. This card is to be kept by those constituting the target group for tetanus immunization. In addition, depending on the strategy used for the administration of tetanus toxoid, recording may occur on school health cards/registers, health centre attendance records, maternity records and child health records. The latter is particularly useful, since it provides a reminder to health staff not only to check the child's immunization status, but to check the mother's as well.

**Reporting** of tetanus immunizations is preferably integrated in overall reporting of immunizations. For this a form can be used as shown in Figure 4.

**Monitoring** of coverage presents particular difficulties. This is because the denominator used to estimate coverage should change depending on the immunization policy which is used, as different

policies focus on target groups of different sizes. From an administrative point of view, the simplest strategy would be immunizing pregnant women. But even in this group estimation of coverage becomes very complex if one considers the need for repeat doses in subsequent pregnancies. It is therefore proposed to simply use the rate:

$$\frac{\text{pregnant women receiving a second dose (or more) of tetanus toxoid}}{\text{total number of pregnancies}}$$

as an indicator of coverage, realizing that a successful implementation of this strategy is compatible with an initial increase in this rate, followed by a decline and a levelling off to the rate of first pregnancies.

Estimates of coverage are more complex when strategies aiming at women of childbearing age (irrespective of pregnancy) are used. Using only the number of pregnancies as the denominator would over-estimate coverage several fold, particularly during mass tetanus toxoid campaigns. One might have the situation of reporting coverage of 100% or more. Worse, if pregnant women were systematically missed, one might see no impact on the diseases, despite reported high levels of coverage. When all women of child bearing age are the target group for immunization, the simplest way to monitor coverage will be to use the rate:

$$\frac{\text{women of childbearing age receiving a second dose (or more) of tetanus toxoid}}{\text{total number of women of childbearing age}}$$

Figure 3. Prototype tetanus immunization record

Front

Back

**TETANUS PROTECTION CARD**

Family name \_\_\_\_\_

First name \_\_\_\_\_

Year of birth \_\_\_\_\_

Address \_\_\_\_\_

District \_\_\_\_\_

State \_\_\_\_\_

**Childhood DPT/DT immunization**

Number of doses \_\_\_\_\_

No information \_\_\_\_\_

**Adult tetanus toxoid**

	Day	Month	Year
1st dose	_____	_____	_____
2nd dose	_____	_____	_____
3rd dose	_____	_____	_____
4th dose	_____	_____	_____
5th dose	_____	_____	_____

**RECOMMENDED IMMUNIZATION SCHEDULE FOR CHILDREN**

at birth	BCG and polio
at 6 weeks	DPT and polio
at 10 weeks	DPT and polio
at 14 weeks	DPT and polio
at 9 months	measles

Women who did not receive immunization before need two doses of tetanus toxoid (with four weeks interval between) and one dose in each future pregnancy. A total of five doses gives life-long protection.

If a single coverage figure is needed for areas within which some sub-areas are immunizing only pregnant women and some all women of childbearing age, assume that the coverage being achieved in all women is also representative of pregnant women, and calculate an overall estimate for pregnant women.

Eventually it may be possible to target only 14 - 15 year old girls as they enter the childbearing population, and evaluation may then become only a matter of measuring coverage in this age group. Similarly, if school populations or the total adult population are the target for immunization the size of these groups should be used for estimating the coverage.

Because of the inherent problems in obtaining good tetanus immunization coverage figures through routine reports, sample surveys should be used to assess protection in women just completing pregnancy. Using the same methodology as for the estimation of coverage in children, select 210 women (7 in each of 30 clusters) giving birth in the past 0-11 months. Using the criteria in Table 2, decide for each delivery whether it can be regarded as protected by immunization. Estimate the proportion of protected deliveries for the group as a whole. Variations on this methodology are possible. The survey could be part of the standard childhood survey. From mothers with children 12-23 months of age the immunization status at the time of birth of those children could be assessed in addition to mothers of children 0-11 months old. This would allow for assessment of programme changes in recent years. Such surveys can only be carried out with a reasonable degree of reliability where tetanus protection cards are used.

## 6. Actions for countries where neonatal tetanus has not yet been eliminated

### Define the problem

- Conduct special surveys to determine the incidence of neonatal tetanus, unless it has already been proven that the disease is not a public health problem. Focus preventive efforts on higher risk geographic areas and population groups since the disease is unlikely to be uniform everywhere.
- Make neonatal tetanus a notifiable disease (separate from other forms of tetanus) in reports from all health facilities. Emphasize reporting from hospitals and clinics likely to treat cases.

### Train

- Accelerate and improve the training and supervision of traditional birth attendants.

- Educate all health staff including private practitioners in the benefits of TT immunization.

- Increase women's awareness of the importance of tetanus immunization, using all available methods of social mobilization, including mass media, to reach the women at risk.

### Investigate

- Investigate cases of neonatal tetanus to determine why the case occurred and what action could have prevented it.

### Immunize

- Ensure that TT is included in all EPI schedules; programmes should ensure that TT receives the same priority as other vaccines when contacting eligible populations.

- Give two doses of tetanus toxoid spaced at least four weeks apart to all unimmunized women of reproductive age whether or not they are pregnant. Give a third dose to previously immunized women to protect them and their newborns for the next five years.

- Give a single dose to women who have already received three or more doses of DPT in childhood or tetanus toxoid during earlier pregnancies to protect both the mother and her newborns for another 10 years.

- Take advantage of any visit by women to a health facility as an opportunity for immunization.

- Encourage acceleration of routine activities and carry out mass immunization programmes to cover all women of childbearing age in areas where the disease is found to be prevalent.

- Include tetanus toxoid immunization of women of child bearing age in national immunization days or other accelerated immunization activities.

- Record tetanus immunization status on the child's immunization record, on maternity records, or on a separate card kept by the mother. Consider making tetanus toxoid immunization a prerequisite for marriage registration.

**Figure 5. Number of persons immunized in relation to target population, by age and vaccine**

<b>Immunization Report</b>			
Country/Area: _____			
Total Population: _____		Period: _____	
Age Group	0-11 months	12-23 months	24+ months
Target population			
<b>BCG</b>			
Polio 0 <sup>1</sup>			
Polio I			
Polio II			
Polio III			
Polio others			
Polio total			
<b>DPT I</b>			
DPT II			
DPT III			
DPT others			
DPT total			
<b>Measles</b>			
Others <sup>2</sup> .....			
Target group	Pregnant women	Women of child bearing age	Others <sup>2</sup>
Target population			
Tetanus I			
Tetanus II			
Tetanus others			
Tetanus total			

1) To note doses of polio vaccine, given in the first 6 weeks of life  
2) Specify

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