

## Maternal and Neonatal Tetanus: A Journey into Oblivion

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India was declared free of maternal and neonatal tetanus on 15th May, 2015. The journey towards its elimination from India has not been easy, and sustained efforts will be required to maintain this status. As the schedule of tetanus vaccination during pregnancy has been same across various health programs by the Government of India, we deliberated to find out other factors that contributed to a decline in maternal and neonatal tetanus in India. The emphasis on augmenting antenatal care services, increasing institutional deliveries and improving routine vaccination coverage are factors that might have led to a reduction in cases of neonatal tetanus.

**Keywords:** *Diphtheria-Pertussis-Tetanus vaccine, Clostridium tetani, Elimination, Tetanus toxoid.*

World Health Organization (WHO) added tetanus toxoid vaccine in its Expanded Program on Immunization (EPI) in the year 1974 [1]. Almost 15 year later, by 1989, only a quarter (27%) of pregnant females were receiving the standard doses of tetanus toxoid [2]. Year 1990 was initially set as target by WHO to achieve the goal of neonatal tetanus elimination, defined as less than one case per 1000 live births per year in all districts of a country; it was later extended to 1995. By the end of 1999, there were 57 countries that had yet not achieved this goal [3].

In the year 2000, WHO, United Nations Children's Fund (UNICEF) and United Nations Population Fund (UNFPA) partnered to re-launch their efforts to achieve the goal of neonatal tetanus elimination. As neonatal tetanus depends mainly on tetanus immunization of the mother during pregnancy, the goal of elimination of maternal tetanus was also added to this initiative which was rechristened "Maternal and Neonatal Tetanus Elimination Program" (MNTE), and year 2005 was set as the cut-off year to achieve this goal [3]. However, 19 countries are yet to achieve this goal [4]. India was one of the last few countries to be declared free of maternal and neonatal tetanus on 15th May, 2015 [5].

### HISTORICAL BACKGROUND

In 1960, Schlesinger described tetanus as a dangerous but rare disease [6]. But this 'rarity' of tetanus could be due to its gross under-reporting at that time. Attention to the massive burden of tetanus was drawn by Matveev and

Sergeeva [7]. They reported that during the years 1945-53 (in the countries in which the incidence of tetanus was recorded), there were more than 350 000 cases, of which nearly one-third died [7].

There were several reasons due to which tetanus, more so neonatal tetanus, had been neglected historically as a health problem. One of the main reasons could be that majority of cases occurred in poor and illiterate populations with limited access to information about health services and essential obstetric care [8]. As per Bytchenko [9], neonatal tetanus was neglected by the health services due to its high cost of treatment, poor outcome, and lack of reliable epidemiological data. Until 1984, neonatal tetanus was still reported per 100 000 population, clearly indicating failure to recognize tetanus as a more important cause of mortality in newborns as compared to other age groups [10]. The hospital data were also misleading about its real incidence because the infants were either dying at home or failing to reach the hospital. Traditional attitudes such as considering neonatal death as a wish of God and isolation of the mother and child in the post-partum period were other reasons that correct extent of neonatal tetanus was not known until late.

Tetanus has existed in Asia for centuries without any reliable statistics pertaining to its prevalence. The Indian Clinical Research Advisory Committee in 1946 suggested that there was a pressing need to study the magnitude of the problem of tetanus. The case fatality from tetanus as reported from a few states of India in the decade 1951-60 suggested that the case-fatality rate was

more than 90% in Goa, Daman and Diu. Between 1956-62, hospital admissions due to tetanus increased in India, probably due to improvement in the health consciousness of the population and in its attitude toward the public health services [9].

In the 1980s, community-based surveys from India documented that mortality rates due to neonatal tetanus ranged from less than 5 to more than 60 per 1000 live births. Tetanus alone was causing 23-72% of all neonatal deaths [11]. There were wide variations in the different states as well as rural and urban areas of India. Data for mortality due to neonatal tetanus during 1978-83 shows 5-67 and 0-15 neonatal tetanus deaths per 1000 live births in rural and urban India, respectively. Highest fatality (67/1000 live births) was in rural Uttar Pradesh.

## CURRENT SCENARIO

### World

Around 49 000 newborns died of neonatal tetanus in 2013 (1% of all neonatal deaths) as compared to around 200 000 deaths (7% of newborn deaths) in the year 2000. Number of countries that have not eliminated maternal and neonatal tetanus has come down from 59 in 2000 to 19 in 2016 (**Table I**). Augmentation of supplementary immunization activities under MNTE initiative has led to vaccination of more than 170 million women of reproductive age [4,12]. Deliveries conducted by skilled health personnel have also increased from 59% in 1990 to 71% in 2014.

### India

In 1988, 11 849 cases of neonatal tetanus were reported from India while only 492 were reported in 2014 (95.8% reduction) [13]. India was declared free of maternal and neonatal tetanus on 15th May, 2015. Andhra Pradesh was the first, and Nagaland the last Indian state to achieve the elimination goal [3]. Various factors contributed to its early elimination from Andhra Pradesh, much before the rest of India [14]. Tetanus toxoid immunization to all pregnant women was started in 1979 in the State, as compared to 1983 in rest of the country. Cash incentives were given to cover the costs associated with institutional deliveries, and there was a high political commitment for the cause, leading to increased recruitment of auxiliary nurse midwife (ANMs). Also, there was an increase in village-level promotional material on vaccination, and 24-hour service provided in most peripheral health centers (PHCs).

## STRATEGIES WHICH HELPED INDIA ACHIEVE NEONATAL TETANUS ELIMINATION

There has been an overall 44% reduction in neonatal

deaths in India between 1990 (13,54,000) to 2012 (7,58,000). But this reduction has not been uniform across India. While some states have a single-digit neonatal mortality rate (NMR), others have an NMR more than 30 [15]. India, in particular, faced unique challenges because of its economic, cultural, and demographic diversities.

A Cochrane systematic review suggests that a two or three dose course of tetanus toxoid to pregnant mothers provides protection against neonatal deaths [16]. Tetanus vaccination of pregnant women was included in India's National Immunization Policy in the year 1983. According to NFHS-3 data (2005-06), around 82% of pregnant women registered for antenatal care were receiving second dose of tetanus toxoid or booster [17].

Neonatal tetanus had decreased significantly in developed countries even before tetanus toxoid vaccine was being given during pregnancy [10]. The main factors

**TABLE I** COUNTRIES WHICH HAVE NOT ELIMINATED MATERNAL NEONATAL TETANUS BY 2016.

Country	Maternal Mortality Ratio*
1 Afghanistan	396
2 Angola	477
3 Central African republic	882
4 Chad	856
5 Congo (DRC)	442
6 Equatorial Guinea	342
7 Ethiopia	356
8 Guinea	679
9 Haiti	359
10 Kenya	510
11 Mali	587
12 Nigeria	814
13 Pakistan	178
14 Papua New Guinea	215
15 Philippines	114
16 Somalia	732
17 Sudan	311
18 South Sudan	789
19 Yemen	385

\*UNICEF. *Trends in Maternal Mortality 1990 to 2015. Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division.* ([http://data.unicef.org/corecode/uploads/document6/uploaded\\_pdfs/corecode/MMR\\_executive\\_summary\\_final\\_mid-res\\_243.pdf](http://data.unicef.org/corecode/uploads/document6/uploaded_pdfs/corecode/MMR_executive_summary_final_mid-res_243.pdf).)

Data Source: Sample Registration System, Government of India and WHO 2015 global summary of vaccine preventable diseases.

responsible were safe delivery practices and cord care. Moreover the TT2 coverage had remained steady in India, and had rather decreased in 2013 [14]. It indicates that other factors have also played an important part in elimination of maternal and neonatal tetanus from India. Many program have been introduced in India in the last 25 years to address maternal and newborn health (**Table II**) [15].

Though the dose and schedule for tetanus vaccination has remained same in each of these programs, it is probably the focus on integrating the reproductive health services and a goal-directed approach that has helped India to eliminate MNT. Under the 'Child Survival and Safe Motherhood Program', emphasis was laid on training of traditional birth attendants and strengthening of first referral units so that they deal better with high-risk obstetric emergencies [18]. The 'Reproductive and Child Health' programs stressed on 24 hour delivery services at PHCs and referral facilities, and training of MBBS doctors in emergency obstetric management, to improve skilled birth attendance. Policy decisions were made to permit health workers to use drugs in emergency situations to reduce maternal mortality [19]. Government of India launched Janani Suraksha Yojna (JSY) in 1995 offering conditional cash transfers. This led to a quantum increase in institutional deliveries from 26% (NFHS-1, 1992-93) to 72.9% (Coverage Evaluation Survey, 2009). National Rural Health Mission (NRHM) introduced several other interventions for maternal and neonatal health in 2005 [3]:

- Village health and nutrition days were started to increase coverage of TT-containing vaccines in children and pregnant females;
- All skilled birth attendants were trained for 3-weeks;
- Peripheral health centers were enabled to provide round the clock maternal and neonatal care services;
- Facility-based neonatal care (FBNC) was

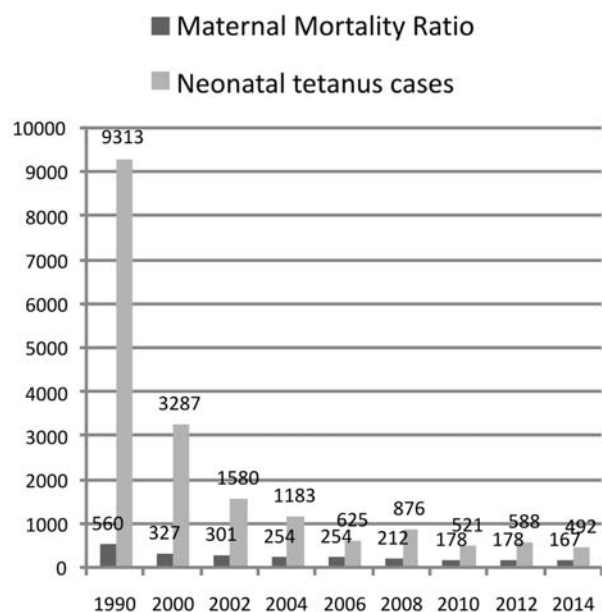
strengthened. Newborn care corners were set up in maternity facilities; Special neonatal care units were started in district hospitals; and Newborn stabilization units were established at first referral units;

- More than 8.9 million accredited social health activists (ASHAs) were employed to augment the use of health facilities;
- Skilled birth attendants were given free disposable delivery kits for distribution to pregnant women; and
- Institutional deliveries were promoted, more so in pregnant females of lower socio-economic status.

This program was supplemented by Janani Shishu Suraksha Karyakram (JSSK) in 2011. Under this program, free maternity services and newborn care were provided by all government health care institutions. Both the mother and her newborn are entitled to get free diagnostic services, free drugs including blood transfusion, free diet, and free referral transport with drop back facility [20]. An observational study published in 2012 [21] showed that institutional deliveries increased by 42.6% after implementation of the JSY scheme, including those among lower socioeconomic strata. With increase in safe delivery practices, maternal mortality as well as incidence of neonatal tetanus cases have declined (**Fig. 1**). Intensive communication program promoting 5 cleans (clean hands, delivery surfaces, instruments for cutting the umbilical cord, cord tie and caring of the umbilical cord) have also contributed to the increase in

**TABLE II** MATERNAL AND CHILD HEALTH PROGRAMS IN INDIA

Year of launch	Health program
1992	Child Survival and Safe Motherhood (CSSM)
1997	Reproductive Child Health-I (RCH-I)
2005	Reproductive Child Health-II (RCH-II)
2005	National Rural Health Mission (NRHM)
2013	Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A)
2013	National Health Mission (NHM)
2014	India Newborn Action Plan (INAP)



**Fig. 1** Neonatal tetanus cases and maternal mortality ratio, India (1990-2014).

safe deliveries [3]. Incentives for ASHAs were also increased in 2012.

Another strategy used for neonatal tetanus elimination was the use of a high-risk approach in certain high-incidence states of India, like Rajasthan. Under this approach, supplementary immunization activities were conducted in these states to vaccinate >80% of all women of childbearing age with three properly spaced doses of TT vaccine and the promotion of antenatal care with clean delivery practices [3].

In addition to this, the Ministry of Health and Family Welfare (MoHFW) has been intensifying the routine immunization by conducting campaigns like special immunization weeks and Mission Indradhanush.

#### SUSTAINING MATERNAL AND NEONATAL TETANUS ELIMINATION

Unlike measles and polio which are amenable to eradication, it is impossible to eradicate tetanus as the tetanus spores cannot be completely removed from the environment [12]. Therefore, we need to make sustained efforts to maintain the tetanus elimination status.

Strategies which need strengthening are discussed below [22]:

*Routine immunization (RI) coverage:* The routine immunization in India is a part of the NRHM and is administered by the MoHFW. The vaccination coverage statistics of India are far from satisfactory. According to the WHO, the coverage of DTP3 and TT2 of India in 2013 was 83% and 61%, respectively [13]. According to Coverage Evaluation Survey 2009 conducted by UNICEF, the most common reasons for partial or no immunization were that the people did not realize the need for vaccination and also did not know about the vaccines [23]. In order to sustain maternal and neonatal tetanus elimination status in India, routine immunization coverage will have to be strengthened. This can be done by augmenting IEC activities, ensuring adequate cold chain facilities, deployment of adequate number of medical and paramedical personnel for immunization, ensuring vaccine safety, monitoring for adverse events following immunization (AEFIs), and surveillance of vaccine preventable diseases (VPDs). There is also a need for adequate training of health personnel for immunization program.

Poor performing districts should be identified and corrective strategies should be determined. Mission Indradhanush was launched in 2014 with a goal to vaccinate all children up to two years of age and pregnant women with all the available vaccines under universal

immunization program [24]. The MoHFW identified high focus districts in the country which have the highest number of partially immunized and unimmunized children. Of these, around 40 per cent districts are in just four states – Uttar Pradesh, Bihar, Madhya Pradesh, and Odisha. Special immunization drives will be conducted in these districts to improve routine immunization coverage. More than 20 lakh children were fully vaccinated during phase 1.

Innovation and achieving self-sufficiency in vaccine production will also go a long way in strengthening RI in India.

*Supplementary immunization activities:* Supplementary immunization must complement and not replace routine immunization. It helps to increase coverage of routine immunization as well as for catch-up vaccination of unimmunized children. It is one of the pillars of disease elimination; the other two pillars being routine immunization and surveillance.

*Surveillance:* Regular audits of all neonatal deaths should be done. Continued surveillance of neonatal tetanus cases is paramount to keep the disease burden in check.

*Institutional delivery:* More number of ANMs and ASHAs will have to be trained and regularly incentivized to mobilize pregnant women to register for antenatal care and safe delivery practices. Public awareness about government health schemes like JSY and JSSK and their implementation should be reviewed regularly.

WHO has advised certain strategies to sustain the MNTE status in India (**Box 1**) [12]. Unless and until sustained efforts are made to increase vaccination coverage and safe deliveries, MNTE status could be difficult to maintain in India.

#### **Box 1** WHO GUIDELINES FOR SUSTAINING MATERNAL AND NEONATAL TETANUS ELIMINATION STATUS [12]

1. To discuss and review annually the elimination status with main stake-holders including State immunization officers, data managers, partners, and others as identified by MoHFW.
2. Maintain the high TT coverage and further augment it in areas with poor coverage.
3. Increase the rates of booster dose coverage of children as per national immunization schedule to ensure life-long protection.
4. Deliveries by skilled birth attendants should be increased further and neonatal illnesses should be managed in an integrated program under National Rural Health Mission.
5. Surveillance.

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