

# THE BURDEN AND CHALLENGES OF NEONATAL TETANUS IN KILIFI DISTRICT, KENYA- 2004-7

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## ABSTRACT

**Objectives:** To estimate the burden of neonatal tetanus (NNT) and to describe the trends between 2004 and 2007; to show the geographical distribution of NNT in Kilifi district and to describe routine immunization coverage, catch-up campaigns and mop-ups.

**Methods:** Kilifi District disease surveillance and immunisation records and the 1999 Kenya National census were reviewed for the period 2004-7. The incidence of NNT was calculated using the standard WHO equations. The Kilifi Demographic Surveillance System (DSS) mapping data (coordinate system) were used to show the distribution of reported cases and thematically high-risk areas. Mapping data were collected using GPS machines (E-Trex Garmin) and the distribution and the thematic maps were made using ESRI's Arc-GIS 9.2 software. The reference system used was Geographic Coordinates System, WGS 84.

**SETTING:** Kilifi district, Coastal Kenya

**RESULTS:** The incidence of NNT in Kilifi increased from 0.6 in 2004 to 1.0 per 1000 live births in 2007. Over 50% of Kilifi district was a high risk area for NNT. It was a public health problem (>1 per 1000 live births) in 19/36 locations. Immunisation (TT2+) increased from 4% in 2004 to 17% in 2007 for women of childbearing age and from 22% to 98% for

pregnant women in the same period. All cases of NNT were delivered at home, 83% were applied potentially infectious substances to their cords.

**CONCLUSIONS:** Neonatal tetanus was an increasing problem in Kilifi district and immunisation coverage was low for women of childbearing age. TT immunisation data capture was mix-up (pregnant women and women of childbearing age) at various health facilities and was a challenge to accurate estimates of TT2+ immunisation coverage.

**RECOMMENDATIONS:** The study recommends strengthening of immunisations including mop-up immunisation activities, clean delivery and hygienic care of the umbilical cord; a single card with both Antenatal care (ANC) profile of the mother and Child welfare card (CWC) of the child and the insertion of a column in the permanent registers to record TT status of mothers when they bring their children for Pentavalent 1; a study to confirm and explain why many women deliver at home and fail to attend the four antenatal care services and to describe the domiciliary birthing surfaces, cord cutting instruments and cord care. Also a refresher training to be done to all midwives on good public relationship with women who come to deliver at Health Facilities.

## **INTRODUCTION**

Neonatal tetanus (NNT) is caused by the effects on the nervous system of an exotoxin produced by clostridium tetani, a bacterium found in the intestines of animals including humans, decaying dung and faeces through out the world. It kills more than 128,000 newborns every year (WHO, 2004). Typically the baby affected by tetanus normally cries and suckles well in the first two days of life; but stops suckling, develops stiffness of the

body and spasms resulting into locked jaw, arching of the back and opisthotonus between the 3rd and 28th day of life. Neonatal tetanus has a very high case fatality rate estimated at 82% (2004-2007) at Kilifi district hospital. Although mortality from NNT was very high, it can be prevented through immunisation of the mother with tetanus toxoid vaccine. A pregnant woman immunised with well-spaced 2TT is protected against tetanus for 3 years and her baby for the first 6 weeks of life. Clean delivery and hygienic care of the cord are other ways of preventing NNT.

Most cases of NNT go unreported especially in places where vital registration systems are inadequate. WHO estimates that only 5% of NNT cases are actually reported (WHO, 1999). NNT is therefore considered a public health problem if 1 case per 1000 live births is reported. Globally, NNT was a major health problem in 46 countries. Not only do most NNT cases die but also the few who survive are likely to suffer brain damage, such as, neurological abnormalities and behaviour problems (Barlow J.L et al 2002).

Vital registration in Kilifi district was incomplete and captures less than 40% of the events (Kilifi DSS, 2004). Majority of the women deliver at home (72%). In many home deliveries, potentially infectious substances were applied to the umbilical stump. Immunization levels were low and the community was extremely poor, 65% food poor and 43% hardcore poor meaning unable to satisfy food requirements after spending all income on food (GOK, 2002-2008). Kilifi District Hospital (KDH) was the only one in the entire district with facilities to manage neonatal tetanus. Therefore all reported cases were captured by the Kilifi district disease surveillance system. Due to the many NNT cases reported in Kilifi district and Coast province in general the district is practising the 5-TT schedule as opposed to focused

antenatal care (FANC). The 5-TT schedule involves all women of childbearing age (15-49 years) to create immunity as opposed to Focused Ante-Natal Care (FANC) that focuses on immunising only pregnant women. This study estimates the burden of neonatal tetanus (NNT) and describes the trends and geographic distribution of the reported cases and immunisation coverage.

## **Objectives**

The objectives of the study were: To estimate the burden of NNT and to describe the trends between 2004 and 2007; to show the geographical distribution of NNT in Kilifi district and to describe routine immunization coverage, catch-up campaigns and mop-ups.

## **Methods and data**

There were 150 health facilities in Kilifi district, 3 hospitals, 6 health centres, 36 dispensaries, 97 medical clinics, 4 nursing homes and 6 Bamako initiative clinics (KDSS, 2006). Health facilities refer NNT cases to Kilifi district hospital, the only facility equipped to manage NNT in the district. All reported NNT cases were therefore captured by the district disease surveillance system at Kilifi. Completeness of reporting was estimated by dividing reported cases by expected cases from 32 health facilities in the district and multiplying by 100. Average completeness of reporting of 88% was achieved implying that the overall capture of NNT cases was fairly good. Reported cases provide the numerator in the

estimation of NNT incidence. The denominators were live births, the population at risk of NNT. These were obtained by multiplying the projected total population for the years 2004-2007 (GOK, 2001; GOK, 2002) by 4.1%, the proportion of pregnant women in Kilifi district (WHO, 1999). The equation to estimate NNT incidence was:

$$\frac{\text{Total number of reported cases}}{\text{Estimated number of live births}} \times 1000 = \text{the incidence rate per 1000 live births (WHO, 1999)}$$

Tetanus toxoid (TT) immunization provides immunity to the mother only after the second dose and the child born to such a mother is protected for the first 6 weeks of life. TT immunization coverage was therefore estimated by TT2+ and calculated for both women at risk of childbearing (women in the reproductive age of 15-49 years) and pregnant women. TT immunization data for each year between 2004 and 2007 were extracted from the health management information system (HMIS). Total number of doses of TT2+TT3+TT4+TT5 for each year of the study was calculated to give the numerator. The denominator was the number of childbearing age women in the population estimated as 24% of the total population (GOK, 2002).

The equation to calculate TT2+ coverage in women of childbearing age was:

$$\frac{\text{Total TT2+TT3+TT4+TT5 given to women of childbearing age in the year}}{\text{Estimated number of child bearing women in the population}} \times 100 = \% \text{TT2+ coverage (WHO, 1999)}$$

The equation to calculate TT2+ coverage in pregnant women was:

Total TT2+TT3+TT4+TT5 given to pregnant women in the year/Estimated number of pregnant women in the population X 100 = %TT2+ coverage in pregnant women (WHO, 1999).

The Kilifi DSS mapping data were used to show the distribution of reported cases and the high-risk areas. Mapping data were collected using GPS machines (E-Trex Garmin) and the distribution and the thematic maps were made using ESRI's Arc-GIS 9.2 software. The reference system used was Geographic Coordinates System, WGS 84. Tetanus toxoid sub-national immunization campaigns were described as well as insights from relevant community dialogue discussions.

## **Results**

### **Surveillance of Neonatal Tetanus**

Table 1 shows reported NNT cases and incidence for Kenya, Coast province and its districts for the years 2005-7. At national level there was a marked decline from 167 cases in 2005 to 52 cases in 2007. An increasing trend in the same period is observed for Kilifi district from 14 to 27 cases becoming the leading district in Coast province. Coast province contributed 36% of the NNT burden (2005-7 periods) with Kilifi and Malindi taking 15% and 10% of the burden respectively. Trends were not clear in the other coastal districts except for Kwale that depicts a low level and a declining trend. Patterns of NNT incidence levels and trends follow closely to those of reported cases with Kilifi and Malindi districts showing high levels of 1 reported case per 1000 live births and Kilifi district portraying a worrying rising trend from 0.5 in 2005 to 1 reported case per 1000 live births in 2007.

**Table 1: Reported NNT cases (2005-7) and Incidence of NNT by district**

National and Coast province NNT surveillance (reported cases 2005-7)						Incidence of NNT by district			
	2005	2006	2007	2005-7	%	2005	2006	2007	Average
Kilifi district	14	16	27	57	15	0.5	0.6	1.0	0.7
Kwale district	6	5	1	12	3	0.3	0.2	0.0	0.2
Lamu district	1	2	0	3	1	0.3	0.6	0.0	0.3
Malindi district	15	16	6	37	10	1.1	1.1	0.4	0.9
Mombasa district	10	5	11	26	7	0.3	0.1	0.3	0.3
T/Taveta district	0	0	2	2	1	0.0	0.0	0.2	0.1
T/River district	0	2	0	2	1	0.0	0.2	0.0	0.1
Coast province	46	46	47	139	36	0.4	0.7	0.3	0.5
Kenya	167	157	52	376	100	0.1	0.1	0.0	0.1

**Source: Integrated Disease Surveillance and Response (Mombasa and Nairobi) & Projected population from 1999 Kenya population and housing census. Note: Coast province consists of the seven districts listed in table 1. Coast province is one of the 8 provinces that make Kenya.**

Table 2 shows reported NNT cases and incidence by division in Kilifi district for the years 2004-7. Four divisions, Bamba, Kaloleni, Kikambala and Bahari show a rising trend consistent with the general trend for the district and between them contributed 78% of the burden. On average 6 out of 7 divisions were prone to NNT with average burdens of 0.6 or more reported NNT cases per 1000 live births.

**Table 2: Reported NNT cases (2004-7) and Incidence of NNT by division**

		Incidence of NNT by division	

	2004	2005	2006	2007	2004-7	%	2004	2005	2006	2007	Average
<b>Bamba</b>	2	2	3	4	11	15	0.5	1.4	0.0	0.9	0.7
<b>Vitengeni</b>	4	1	3	0	8	11	0.4	0.9	0.4	0.9	0.7
<b>Kaloleni</b>	4	0	6	13	23	32	0.6	0.4	0.4	0.8	0.6
<b>Kikambala</b>	3	2	2	4	11	15	0.0	0.6	0.6	0.0	0.3
<b>Chonyi</b>	1	2	1	2	6	8	1.2	1.2	1.7	2.2	1.6
<b>Ganze</b>	0	1	1	0	2	3	2.0	0.5	1.4	0.0	1.0
<b>Bahari</b>	2	6	0	4	12	16	0.4	0.0	0.6	1.3	0.6
<b>Kilifi</b>	16	14	16	27	73	100	0.6	0.5	0.6	1.0	0.7

**Source: Integrated Disease Surveillance and Response Kilifi district & Projected population from 1999**

**Kenya population and housing census. Note: Kaloleni division of Kilifi district is now a district**

Fig. 1 below illustrates the burden of NNT in Kilifi by location. It varies between locations, ranging from as low as 0.2 in Mariakani to a high of 4.1 in Chumani. The top three locations were Chumani of Bahari division; Mitangani of Bamba division and Tsangatsini of Kaloleni division with NNT incidence rates of 4.1, 2.7 and 2.5 reported cases per 1000 live births respectively. The map shows that neonatal tetanus was a public health problem (>1 per 1000 live births) in 19 out of 36 locations of Kilifi district.



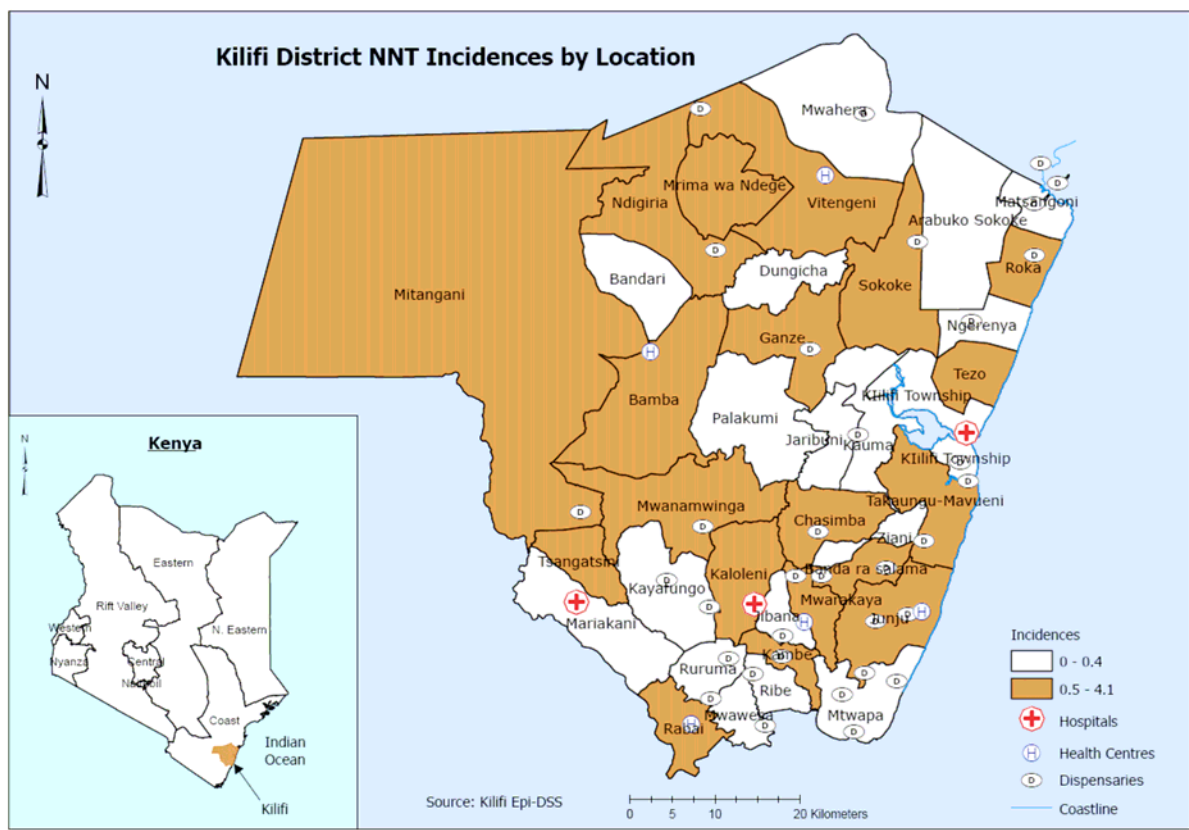


Figure 1

The map shows that neonatal tetanus is a public health problem (>1 per 1000 live births) in 19 out of 36 locations of Kilifi district (53% of the district)

### Immunisation coverage for Neonatal Tetanus

Tetanus toxoid provides protection to the mother and child after the second dosing (TT2+). This is shown in Table 3 for the seven divisions of Kilifi district. Routine immunisation coverage (TT2+) for all childbearing women increased minimally from 4% in 2004 to 17% in 2007. TT immunization levels were much higher for pregnant women and increased from 22% in 2004 to 98% in 2007. The top two divisions were Bamba and Bahari with average TT2+ of 19% and 13% for childbearing women and 111% and 75% for pregnant women respectively. The worst two cases were Ganze and Chonyi with average TT2+ of 9% and 10%

for childbearing women and 50% and 55% for pregnant women respectively. Children protected against tetanus at birth (PAB) is a very useful indicator but could not be estimated due to lack of data. For example, the TT immunisation registers were not adequately updated and the ANC registers were not linked to the permanent immunisation registers.

Immunisation levels above 100% suggest reporting errors inflating the numerator or erroneous assumptions for population projections. Data validation compared information in the tally sheet against that in the summary sheet for Bamba, 2007. There were 314 TT shown in the tally sheets and 450 reported in the summary sheets suggesting over-reporting of TT immunisation coverage by 43%.

**Table 3:** Tetanus Toxoid coverage (TT2+) for Childbearing women and pregnant women by divisions in Kilifi

Tetanus Toxoid coverage (TT2+) for childbearing women						Tetanus Toxoid coverage (TT2+) for pregnant women					
Division	2004	2005	2006	2007	Average	2004	2005	2006	2007	Average	
Bahari	5	16	14	16	13	30	94	83	91	75	
Chonyi	3	10	11	14	10	19	61	62	79	55	
Kikambala	3	11	10	19	11	19	64	61	111	64	
Ganze	3	8	13	11	9	15	45	76	63	50	
Bamba	5	20	21	30	19	31	115	121	175	111	
Vitengeni	4	12	13	16	11	23	69	78	94	66	
Kaloleni	3	17	12	15	12	20	102	69	90	70	
<b>Total</b>	<b>4</b>	<b>15</b>	<b>13</b>	<b>17</b>	<b>12</b>	<b>22</b>	<b>85</b>	<b>74</b>	<b>98</b>	<b>70</b>	

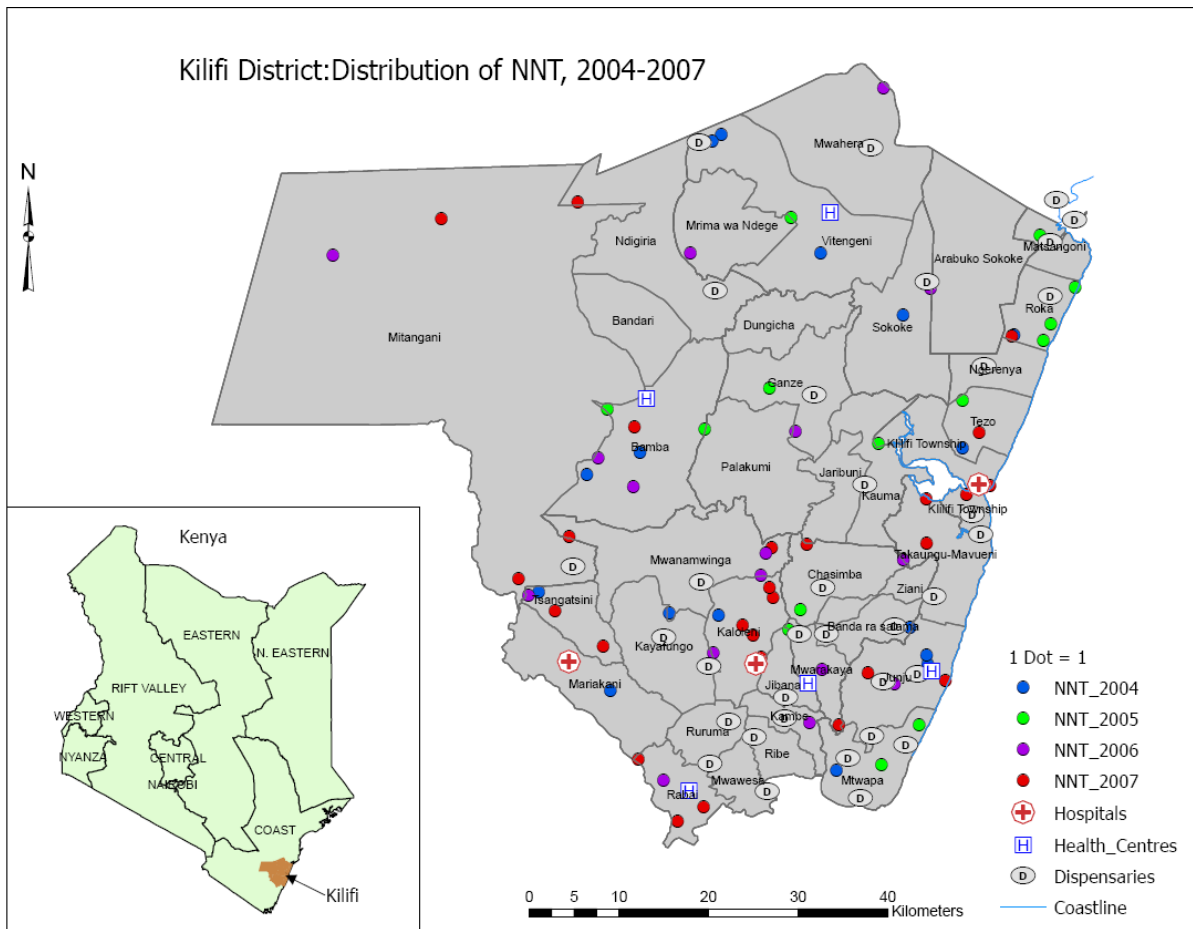
## Delivery and Post-delivery care

In general most women deliver at home (72%) where hygienic and clean conditions were difficult to observe. Deliveries at KDH increased from 917(4%) in 2004 to 6335 (23%) in 2007. Despite increased use of KDH for delivery, all reported NNT cases (100%) were delivered at home, 73% used unsterile instruments to cut the cord and 83% applied potentially infectious substances to the umbilical stump and 74% of the NNT mothers were not immunised.

## **Neonatal Tetanus Interventions**

Routine TT vaccination for women of childbearing age was in place through out Kilifi district. In addition the activities described below pertain to reported NNT cases. Neonatal tetanus cases were referred to Kilifi district Hospital and the district disease surveillance office informed. Referred NNT mothers were given tetanus toxoid vaccine and their homes visited. The community around these homes were sensitised on the value of immunising against tetanus, clean delivery and cord care. Women in the reproductive age 15-49 were given TT vaccine after screening. These are referred to as mop-up activities. Despite the mop-up activities there were recurring of cases in the villages suggesting weak mop-up procedures. For example mop-ups were not followed up after a month to give TT2. In addition, from time to time, there were national campaigns carried through out the district. For example, in 2002 there was a sub-national TT immunisation campaign targeting women aged 15-49 and achieved coverage of 45%; in 2006 another campaign targeting school children aged 7-14 years was carried out and reached coverage of 94%. More recently in October-November 2008 there was a national TT vaccination campaign targeting women 15-49 years in the district and reached coverage of 37%(TT2).

Fig. 2



## Community Dialogue

Community dialogue was a recent initiative by the Ministry of Public Health and Sanitation to reach people to discuss matters relating to individual and community health (KDH report 2008). The dialogue found out that mothers were more comfortable to deliver at home.

Many deliver squatting or in any preferred posture as opposed to mandatory lying on the

back on a narrow dangerously high maternity bed in the hospital. Friendly neighbours and relatives, especially the mother in-law, made a home delivery environment attractive and reassuring as opposed to unfamiliar maternity ward often staffed with unsympathetic midwives. Burying the placenta under the ground was the culturally accepted way of disposal compared to disposing it into a placenta pit in the hospital. Women apply a variety of substances to the umbilical stump claiming to stop bleeding and enhance fast healing.

## **Discussion**

The results above suggest that the burden of reported neonatal tetanus is <1 per 1000 births in Kenya and equal to or >1 per 1000 births in Kilifi. While the problem of NNT was small nationally, it was not only a major public health problem in Kilifi, but also, persistently increasing. From public health perspective, this was a very worrying trend. It was not clear whether the high rates and a rising trend in this particular district reflect a true difference or was attributable to improved surveillance. Clearly the large number of women delivering at home, the use of unsterile instruments to cut the cord and application of potentially infectious substances to the umbilical stump favour high rates of NNT. In other studies, these have been shown to be risk factors for NNT (Cumberland P, et al, 2007). All reported neonatal cases were delivered at home supporting the view that home deliveries were at a higher risk of infection with tetanus. Immunisation coverage TT2+ increased from 4% in 2004 to 17% in 2007 and varied considerably by region. TT immunization levels were much higher for pregnant women and increased from 22% in 2004 to 98% in 2007. The relatively high TT2+ for pregnant women was interpreted with caution due to data mix-up at the health facilities. Women of childbearing age (5-TT schedule) and pregnant women (FANC)

were captured in the same tally sheet because there was only one (1) tally sheet and some health facilities lacked TT registers to capture women of childbearing age. This tends to inflate the figures for pregnant women. Despite a positive immunisation trend, coverage remained relatively low for women of childbearing age. Catch-up campaigns had been conducted over the years but their coverage has remained surprisingly low. For example, the most recent catch-up campaign in October 2008 achieved only 62%. In this regard catch-up campaigns have failed to adequately boost routine immunisation to raise tetanus toxoid coverage to avert infection. It appears that ways of preventing neonatal tetanus were in place but having little impact as the number of reported cases escalated by 69% in just three years from 16 cases in 2004 to 27 in 2007. In Kaloleni the increase was more dramatic at 225% from 4 cases in 2004 to 13 in 2007. In these circumstances, it was not surprising that the burden of NNT remains a public health problem (1 per 1000 births) in 19 out of 36 locations of Kilifi district representing more than 50% of the district. This calls for better planning, targeting and focused interventions, especially in the problem locations.

## **Conclusions**

Neonatal tetanus was a public health problem in over 50% of Kilifi district. The problem was increasing and immunisation coverage was low for TT2+. TT immunisation data capture mix-up (pregnant women and women of childbearing age) at various health facilities was a challenge to accurate estimates of TT2+ immunisation coverage.

## **Recommendations**

The study recommends strengthening of immunizations including mop-up immunisation activities, clean delivery and hygienic care of the umbilical cord especially in the high-risk locations to eliminate neonatal tetanus. In addition, a single card with both Antenatal care (ANC) profile of the mother and Child welfare card (CWC) of the child and the insertion of a column in the permanent registers to record TT status of mothers when they bring their children for Pentavalent 1. This will require mothers to produce the ANC/CWC card from which to extract TT immunisation status to record in the permanent immunisation register. This information will allow accurate calculation of protection at birth (PAB). The study also propose a study to confirm and explain why many women deliver at home and fail to attend the four antenatal care services and to describe comprehensively the domiciliary birthing surfaces, cord cutting instruments and cord care. Another recommendation is strengthening of data capturing by introducing two (2) tally sheets-one for women of child bearing age and the other for trauma. Also a refresher training to be done to all midwives on good public relationship with women who come to deliver at Health Facilities.

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