

# Introducing Protection at Birth (Pab) Method of Monitoring Tetanus-Diphtheria (Td) Vaccination Coverage of Mothers in Ghana

Stanley K Diamenu<sup>1\*</sup>, George Bosnu<sup>2</sup>, Francis Abotsi<sup>2</sup>, Peter Ofori Tweneboa<sup>3</sup>, Marion Okoh-Owusu<sup>4</sup>, Priscilla Amoh<sup>5</sup>, Ahmadu Yakubu<sup>6</sup> and Rownak Khan<sup>7</sup>

<sup>1</sup>WHO country office for Ghana, Accra, Ghana

<sup>2</sup>National EPI Office, Ghana Health Service, Korle Bu, Accra, Ghana

<sup>3</sup>Regional Disease Control Unit, Western Regional Health Administration, Takoradi, Ghana

<sup>4</sup>District Health Administration, Mponoh, Western Region, Ghana

<sup>5</sup>District Health Administration, Wassa East, Dabose, Western Region, Ghana

<sup>6</sup>World Health organization, HQ, Geneva, Switzerland

<sup>7</sup>UNICEF HQ, New York, USA

\*Corresponding author: Stanley K Diamenu, WHO Country Office for Ghana 29 Volta Street, Airport Residential Area, PO Box MB 142, Accra, Ghana, E-mail: [diamenus@who.int](mailto:diamenus@who.int)

Received date: 23 June 2015; Accepted date: 25 September 2015; Published date: 1 October 2015.

Citation: Diamenu SK, Bosnu G, Abotsi F, Tweneboa PO, Okoh-Owusu M, et al. (2015) Introducing Protection at Birth (Pab) Method of Monitoring Tetanus-Diphtheria (Td) Vaccination Coverage of Mothers in Ghana. *Int J Vaccine Immunizat* 1(1): doi <http://dx.doi.org/10.16966/2470-9948.102>

Copyright: © 2015 Diamenu SK, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

## Abstract

The use of the protection-at birth (PAB) method to assess tetanus-diphtheria (Td) vaccination status of mothers in the routine immunization program is not yet introduced in Ghana. PAB is rather estimated using the WHO-UNICEF model which is currently at 88%. As part of efforts to introduce the PAB method in the routine immunization reporting system in the country, WHO supported the Ghana Health Service (GHS) to pilot the PAB method in two districts (Wassa East and Mponoh) in the Western region between April and September 2014. The pilot was not to evaluate the WHO-UNICEF model of estimation but to explore the feasibility of introducing and implementing the natural PAB process of data collection and analysis into the country's routine monthly data collection process.

**Objective:** The main objective was to document the process, challenges and cost implications for introducing the PAB method as a primary data source at the health facility level in the country.

**Method:** Six month exploratory study conducted in the two districts to determine the feasibility and challenges such as training needs of staff and cost implications that may be associated with the introduction and implementation of the PAB method in the country. Td vaccination status of mothers attending post-natal clinic (PNC) and whether the newborn child was protected from neonatal tetanus before delivery was assessed using a checklist by trained health staff which was later compiled and analyzed.

**Results:** Of 2455 mothers interviewed in the two districts during the six month period, 2015 (representing 82.1%) received Td vaccination in their last pregnancy. History (81.7%) formed the main source of information. Children protected at birth from the assessment totalled 2027 (82.6%) which is close to WHO-UNICEF annual estimates (now at 88%).

**Conclusions:** PAB can be implemented as a routine monthly activity at the facility level when the reporting forms are revised and the field staff are adequately trained and supervised effectively. Once capacity has been built for PAB determination through the routine system at country level, the use of WHO-UNICEF estimation method may not be very much required as a regular activity. Other countries with similar challenges can draw on the lessons from this pilot programme and introduce the routine process.

**Keywords:** Protection-at-birth; Neonatal tetanus; Td vaccination; Ghana

## Introduction

Neonatal tetanus (NT) is a form of generalized tetanus that occurs in newborn infants born to mothers who do not have sufficient circulating antibodies to protect the infant passively by transplacental transfer. It usually occurs through infection of the unhealed umbilical stump, particularly when the stump is cut with an unsterile instrument. NT has been for several years a major cause of childhood mortality in developing countries killing over 200,000 newborns each year [1-3].

Newborn babies and young infants born to mothers with anti-tetanus antibodies are protected against tetanus by acquired maternal antibody. Vaccination with tetanus toxoid (TT) or tetanus-diphtheria (Td) during pregnancy is safe and effective in preventing NT. Two doses of TT/Td are needed to ensure protection in previously unimmunized pregnant women and their newborn babies. IgG antibodies produced by the immunized mother are transferred across the placenta to the foetus and provide transient, passive protection of the newborn against tetanus [4-5].

Reducing deaths from neonatal tetanus is one of the simplest and most cost-effective means to reduce the neonatal mortality rate. Tetanus transmission is prevented during childbirth by improving immunization services, especially for pregnant women, promoting clean delivery and cord-care practices, and strengthening disease surveillance and case investigation. Vaccination with TT/Td will also protect the mothers from maternal tetanus during pregnancy and delivery [6].

## Maternal and Neonatal Tetanus Elimination in Ghana

Ghana, a tropical country situated on the west coast of Africa implements Immunization program that is integrated with other child survival interventions during child welfare clinics at static and outreach points. These services are delivered effectively through the reaching every district (RED) approach which has been adopted and implemented in all districts since 2003 at the over 3000 immunization centres in the country.

TT vaccination was introduced in Ghana in 1978 when the Expanded Program on Immunization (EPI) was established. Tetanus-diphtheria

(Td) vaccine was introduced in 2013 to replace the TT. The Child Health Policy of the country states that pregnant women should be provided with at least two doses of tetanus diphtheria if they have not already completed the Td schedule. Immunization services including DPT-HepB-Hib (which has tetanus and Pertussis vaccines in it) are also provided to children as per the National Immunization Policy.

In 1988, the Ministry of Health in Ghana adopted the five-dose schedule for TT/Td vaccination to women in child-bearing age (WCBA). Table 1 below shows the Td vaccination scheduled in the country.

TT/Td coverage is routinely monitored in Ghana by the Td2+ method, in which the reported number of protective doses of (Td1 Td2, Td3, Td4 and Td5) given to pregnant women during a calendar year is divided by the estimated number of live births during the year as in some other countries [7-8]. Each dose is considered to represent a protected pregnant woman and hence a protected newborn. Figure 1 below illustrates the 11 years trend of TT2+ vaccination coverage and neonatal tetanus cases and deaths in Ghana from 2004-2014

**Figure 1**

Ghana attained maternal and neonatal tetanus (MNT) elimination status in September 2011 through the World Health Organization (WHO) assessment criteria (i.e. neonatal tetanus cases occurred at a rate of less than 1 per 1000 live births in every district in the country). A community-based NT mortality survey was conducted in two rural districts (Nanumba North and Nanumba South) in the Northern region using a protocol combining lot quality assurance and cluster sampling methodology (LQA-CS). In total 3,313 households were visited during the survey (an average of 25 households per cluster) comprising 27,779 household members. One thousand three hundred and forty nine (1,349) live births were surveyed, yielding a crude birth rate (CBR) of 49 per 1000. Among the 1,349 eligible live births, there were 34 neonatal deaths detected (estimated NMR of 25 per 1000 live births), none of them was caused by tetanus [9].

**The PAB pilot in Ghana**

PAB is a measure to determine the proportion of newborn children who are protected from neonatal tetanus before delivery. It is one of the methods of assessing the TT/Td vaccination status of women in some countries. The importance of PAB is that it allows the national immunization program to determine the TT/Td vaccination coverage of mothers through the routine coverage monitoring process and to take corrective measures regularly to address gaps. Percent (%) protected at birth is a supplemental method of determining the coverage protection (particularly where TT/Td2+ is unreliable and where DPT1 coverage is high. To monitor PAB during DPT1 visits, health workers record whether infants were protected at birth by mother's TT/Td status. Percent (%) PAB is then estimated as: number of infants protected divided by the total

Dose of Td (according to card or history)	When to give	Expected duration of protection
Td1	At first contact or as early as possible in pregnancy	None
Td2	At least 4 weeks after Td1	1 - 3 years
Td3	At least 6 months after Td2 or during subsequent pregnancy	At least 5 years
Td4	At least one year after Td3 or during subsequent pregnancy	At least 10 years
Td5	At least one year after Td4 or during subsequent pregnancy	For all childbearing years and possibly longer

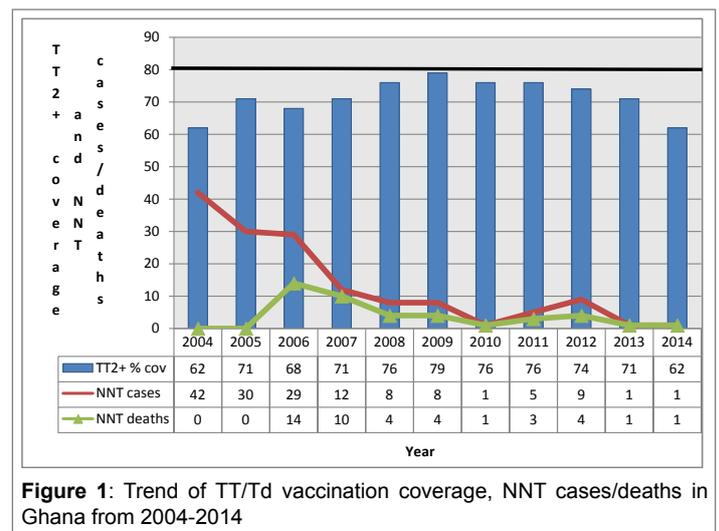
**Table 1:** Tetanus diphtheria immunization schedule

number of births [10]. In Ghana PAB method has not yet been introduced and field staff has very little knowledge and experience about how it is implemented. PAB in Ghana is estimated through the use WHO-UNICEF model as in most developing countries[10]. Table 2 below is the summary of WHO estimated PAB coverage in Ghana from 2004-2013. Estimate for 2014 is not yet available.

The WHO office for Ghana supported the Ghana Health Service (GHS) to pilot the PAB method in two districts (Wassa East and Mpohor) to draw lessons for its introduction in the country. The pilot study covered 24 health facilities in the two districts. The Mpohor district had 8 health facilities and Wassa East had 16 facilities. All the facilities and their catchment areas were covered with the study either as static vaccination clinics or outreach immunization sessions. The PAB method (which is routine assessment of mothers' vaccinations status) is part of the MNT elimination sustainability plan to ensure all eligible mothers receive their doses of the Td vaccine on schedule.

**Objectives**

The main objective was simply to document the process, challenges and cost implications for introducing the PBA method as a monthly routine activity in the country. Specifically the pilot project was to (i) determine whether the PAB method can be implemented at the health facility as a routine process considering the technical feasibility and financial implications for a nationwide activity.



**Figure 1:** Trend of TT/Td vaccination coverage, NNT cases/deaths in Ghana from 2004-2014

Year	TT2+ % cov	NNT cases	NNT deaths	WHO estimated PAB %
2004	62	42	0	77
2005	71	30	0	83
2006	68	29	14	85
2007	71	12	10	85
2008	76	8	4	86
2009	79	8	4	86
2010	76	1	1	86
2011	76	5	3	88
2012	74	9	4	88
2013	71	1	1	88
2014	62	1	1	NA

**Table 2:** WHO estimated PAB in Ghana from 2004-2013

## Method

This was an exploratory activity trying to determine the feasibility of introducing and implementing the PAB method of monitoring Td vaccination status of mothers in the country. It was a six month programme implemented from April - September 2014. The key activities implemented were (i) Training of health staff and supervisors on how to conduct the interviews with the mothers to determine the protection level of the newborn using a checklist and how to analyse the data and report to the district office. The training session involved classroom activity and practical exercise at the health facility. (ii) Six months interview by the trained health staff with mothers using the checklist and submission of monthly report to the region through the district office. For eligibility, the interview was conducted among mothers who were visiting the clinic after six weeks of delivery and their children were due for DPT1/Penta1 vaccination [11]. Other caregivers who brought children not born by them were not included in the study because their TT/Td vaccination status has no link with protection of the child. (iii) The Regional and district health administrations supervised the exercise through regular visits to the facilities to assist with the data compilation and reporting with additional support from the national level. (iv) WHO country office facilitated the training and provided further support including funding.

The pilot did not examine any factors like mother's illiteracy, occupation, income, residence that may influence the protection status of the child. Such considerations would be issues for formal research after the PAB method has been introduced as a normal regular reporting system in the country. It was also not to evaluate the current WHO-UNICEF model of estimation PAB in the country but just to explore the feasibility of introducing PAB as a routine process to be implemented by local health staff on monthly basis.

## Results

Of the total number of 2455 mothers interviewed in the two districts (807 in Mphor and 1648 in Wassa East) during the six month period, 2015 (representing 82.1%) received TT/Td vaccination in their last pregnancy. Using the PAB assessment criterion, children protected at birth totalled 2027 (82.6%). TT/Td vaccination received ranged from 1-15 doses suggesting that some mothers received as many as 6-15 doses above the recommended 5 doses in one's lifetime. Reasons for multiple doses above the recommended 5 doses may be the result of low card retention by the mothers. In addition, History (81.7%) formed main source of information source indicating that very few mothers (18.3%) had TT/Td vaccination cards. Summary of results is presented table 3 below.

## Discussion

Field Staff administered the checklist at all the 24 health facilities during both static and outreach sessions and submitted monthly reports to the regional office through the district health administration. They were able to determine the protection status of the new born using lessons from the training sessions suggesting that with adequate training and supervision, the PAB can be introduced and implemented in the country as a routine monitoring activity.

The 6 month pilot project in the two districts has, however, revealed some programmatic challenges in the immunization programme that require attention and action at all levels with regards to the Td vaccination. (i) The findings that some mothers received more than the maximum 5 doses (as many as 6-15) of Td suggests that the field staff are not following the schedule properly and calls for regular orientation of staff on the Td vaccination schedule. (ii) The revelation that almost 18% of the children were not protected at birth calls for intensive community education to raise awareness on the importance of Td vaccination especially during pregnancy. (iii) Health workers can vaccinate mothers who are due for the Td vaccination but fail to receive it during the last pregnancy at the time of verification to reduce the defaulter rate. (iv) Finally very few mothers (13%) had vaccination cards and this should be a source of worry to the program managers at the district level to find out the cause. It also calls for regular supply of stock and community education on card retention as future reference documents.

## Conclusion

The six month pilot programme has shown that (i) the protection-at birth method of monitoring Td vaccination status of women is technically feasible and can be implemented as a routine national reporting activity and once introduced and implemented by health staff, the use of the WHO-UNICEF estimation method as a regular activity would be minimized. (ii) the financial implication of introducing PAB nationwide would only be the cost of revising the monthly reporting forms and initial training of staff at the facilities. (iii) Effective supervision is also required to ensure high data quality from the lower level.

**Competing interest:** None

## Acknowledgement

Authors are grateful to all the health staff of the two districts for immense work and dedication to the exercise. They are equally grateful to the Western Regional Health Administration for the support provided.

Indicators	District		Summary	
	Mphor	Wassa East		
Characteristics of Mother	Total interviewed	807	1648	2455
	Age Range (years)	24-41	21-40	21-41
	Range of gravida	1-8	1-6	1-8
	Range of Parity	1-8	1-5	1-6
	Range of TT doses received	1-12	1-15	1-15
Received TT in last pregnancy	Yes	728 (90.2%)	1287(78.1%)	2015(82.1%)
	No	79 (9.8%)	361 (21.9%)	440 (17.9%)
Source of Information	History	619 (76.7%)	1386 (84.1%)	2005 (81.7%)
	Records	188 (23.3%)	262 (15.9%)	450 (18.3%)
PAB status of child	Protected	712 (88.2%)	1315 (80%)	2027 (82.6%)
	Not Protected	95 (11.8%)	331 (20%)	426(17.4%)

**Table 3:** summary of the results

### Authors' contributions

SKD – WHO Country office for Ghana technical advice, funding and drafting of manuscript, GB and FA – national level support, POT – Regional coordination and supervision, MOO and PA – district implementation and supervision, AY – WHO external support, RK-UNICEF external support

### References

1. Demicheli V, Barale A, Rivetti A (2013) Vaccine for women to prevent neonatal tetanus. *Cochrane Database Syst Rev* 31: 5.
2. World Health Organization (2000) *Weekly Epidemiological Record* .75: 2003-2006.
3. Roper MH, Vandelaer JH, Gasse FL (2007) Maternal and neonatal tetanus. *Lancet* 2070: 1947-1959.
4. Owusu-Darko S, Diouf K, Nour NM (2012) Elimination of maternal and neonatal Tetanus: A 21st-Century Challenge. *Rev Obstet Gynecol* 5: 151-157.
5. CDC (1998) Neonatal Tetanus. *Montana MMWR Weekly*, November 06, 1998/47 43 928-930.
6. Galazka AM (2013) *Tetanus: the immunological basis for immunization*. Geneva, Switzerland: WHO/EPI/GEN/91.13
7. Expanded programme on Immunization (Ghana), Sustaining maternal and neonatal tetanus (MNT) elimination Maternal and Neonatal tetanus Eliminationa Sustainability Plan for Ghana; July 2015.
8. Kidane T (2004) Factors influencing TT immunization coverage and protection at birth coverage in Tselemti District Ethiopia. *Ethiop J Health Dev* 18: 153-158.
9. Hilde Sleurs (for the core MNTE survey team) Report on Maternal and Neonatal Tetanus Elimination Validation using the Lot Quality Assurance – Cluster Sampling Survey; Nanumba North and Nanumba South Districts, Ghana; October 2011.
10. WHO/UNICEF estimates of protection at birth (PAB) against tetanus WHO and UNICEF estimates of national immunization coverage – draft Data as of May 15, 2014, 19.
11. World Health Organization. WHO-recommended surveillance standard of neonatal tetanus. Immunization vaccines and Biologicals.