

## ORIGINAL ARTICLE

## RISK CHARACTERIZATION OF MATERNAL AND NEONATAL TETANUS IN VIEW OF TETANUS VACCINATION CAMPAIGNS IN PAKISTAN

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**Background:** Pakistan is one of the remaining 24 countries which have not yet achieved Maternal and Neonatal Tetanus Elimination (MNTE). The country adopted high-risk approach for 56 out of 119 districts with country-wide Tetanus Toxoid (TT) provision in Routine Immunization (RI) during early 2000–2003. The TT's mass campaigns could only cover 13% of high risk districts for 2009–2011, and mostly for the Punjab province. To achieve MNT elimination, the country needs risk mapping for cost-effective intervention. **Methods:** We used both the quantitative and qualitative methods to conduct risk characterization. All the three available data sets (Reported EPI coverage data, PDHS 2012–13, and PSLM 2010–11) were assessed. A mix of core and surrogate indicators for risk categorization was used through ranking and scoring the aggregated data and considering the past tetanus campaigns' coverage. Tetanus Toxoid (TT2+) coverage of pregnant women and delivery in health facility, both received more weightage in scoring. We based the higher and lower cuts off points for each indicator on data ranges. The districts with higher scores, i.e., 10.5 and above were ranked good followed by medium (5.5–10.4) and low performing (less than 5.5). Consultations with the national and provincial field officers were utilized to understand the local context. **Results:** In Pakistan, there are 139 districts out of which, 60 are the high risk districts for tetanus. Highest percentage is for Baluchistan (83%) followed by Sindh (52%), and Khyber Pakhtunkhwa (40%). Most of the Punjab is at medium risk (55%), followed by KP (52%), and Sindh (39%). **Conclusion:** Pakistan is at medium to high risk of MNT with a great variation at the sub-national level. Campaigns aiming to these districts may bring the country closer to MNT elimination target.

**Keywords:** Tetanus Toxoid, mothers, neonates, risk categorization, developing country

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### INTRODUCTION

Lives of mothers and children could always be saved to an extent of 180,000 to 309,000 per year if tetanus was eliminated from the face of the earth.<sup>1,2</sup> An Estimated 787,000 new-borns died due to tetanus in 1980s<sup>1</sup> which, has been reduced to 49,000 in 2013, a more than 90% reduction of neonatal tetanus in last three decades. Despite substantial progress by June 2014, according to the WHO, 24 countries are still struggling to confine this deadly disease.<sup>1</sup> Most of the countries which were able to eliminate tetanus did through high-risk approach. This approach is designed with targeting all women of reproductive age (WRA) in high-risk areas with Supplemental Immunization Activities (SIAs) in addition to the Routine Immunization (RI).<sup>1,3</sup> Since 1999, more than 128 million women of reproductive age were reached through high-risk approach in 52 countries. Nearly all the neonatal deaths due to tetanus occur in low income countries including the countries of Asia and Africa. As compared to diarrhoea and pneumonia, neonatal tetanus accounts for lesser deaths, yet it is easily preventable.

Pakistan is one of those developing countries where neonatal tetanus is yet to be eliminated. Vaccination coupled with clean delivery techniques and their full access to the population, is the key to success.<sup>1,2</sup> The percentage of deliveries in Rural Sindh and Balochistan are worst hit by the lowest percentages of the coverage (33%, 17%).<sup>4-7</sup> District specific small studies from high risk areas of Pakistan show that with more than 80% coverage through Supplementary Immunization Activities (SIAs), not only a substantial number of deaths due to tetanus could be averted but the cost-effectiveness could be around US\$ 2.6 per DALY averted.<sup>8,9</sup> Other studies from the country have identified unhygienic practices for cord care, home delivery and educational status of the mother as major risk factors for the disease.<sup>10,11</sup> Maternal and Neonatal Tetanus (MNT) can be thus eliminated if the two major factors of low coverage and mother's attendance by trained health professional is achieved.<sup>12,13</sup> About 99% of neonatal deaths occur in low and middle income countries due to various causes among which the neonatal tetanus contribute to less (1%)<sup>14</sup> though easily preventable though effective surveillance, risk categorization and timely interventions.

In this article, we describe an innovative approach to conduct risk categorization for the MNT to decide on the supplementary immunization activities as a strategy to help achieve elimination. The same approach can be used to identify poor performing areas for maternal and child health programme to help develop focused interventions in marginalized areas.

Given the fact that MNT can be eliminated from Pakistan with a few but strong efforts, rationalization of resources on the evidence base is required. SIAs have a major role to address the coverage gap issues, and risk categorization gives a targeted approach to achieve goal of elimination of the disease.

**MATERIAL AND METHODS**

We used both the quantitative and qualitative methods to conduct risk characterization. Assessed all the three available data sets (Reported Data, Pakistan Demographic and Health Survey 2012–13, and Pakistan Social and Living Standards Measurement Survey 2010–11) were assessed to reach a consensus to agree upon core and surrogate indicators for risk categorization. We weighted the selected indicators and scored the aggregated data. Tetanus Toxoid (TT2+) coverage of pregnant women and delivery in health facility, due to direct correlation with maternal and neonatal incidence, received more weight compared to other indicators. The higher and lower cuts off points for each indicator were agreed upon by reviewing the data range.

All the scores were summed up for total district score. Considering the poor quality of NT surveillance, reported NT cases was not included in the scoring as it could have misrepresented the risk status. Scoring of indicators: Diptheria, Pertusis, Tetnus Vaccination (DPT3) (>80%=2, Between 50–79%=1, <50%=0), TT2+ of pregnant women (>80%=4, Between 50–79%=2, <50%=0), NT rate (>1/1000 LB=0.5, <0.5/1000 LB=1.5, Between .5–.9=1); >1 Ante Natal care (>80%=2, Between 50–79%=1, <50%=0), Health Facility(HF) delivery (>80%=4, Between 50–79=2, <50%=0) was used for the scoring. The Districts with higher scores (10.5 and above) were good performing followed by medium (5.5–10.4) and low performing (less than 5.5). Finally, we had consultations with national and provincial field officers to understand local context and finalize the process.

**RESULTS**

The final risk categorization was conducted through combination of scoring and consultation with national and sub national health officials. In some cases field situations and local knowledge were given weight over the score while categorizing the districts. The analysis showed that the Punjab and AJ&K did not have any high risk districts. Most of the districts in Balochistan,

GB and FATA were high risk for MNT. More than 50% districts in Sindh were also found high risk (Table 1).

In Pakistan, there are 139 districts out which 60 are the high risk districts for tetanus. There are estimated 6.7 Million pregnant women who lived in the high-risk districts. Percentage distribution of districts within the provinces is: Balochistan (83%) followed by Sindh (52%), and Khyber Pakhtunkhwa (40%). For intermediate risk, Punjab had the most of its districts (55%), followed by KP (52%), and Sindh (39%). Punjab was the only province having lowest tetanus-risk-districts (44%).

**Table-1: Risk scoring for MNT by district and by women (CBA) at risk among all provinces of Pakistan**

	Total Districts	Ranking		
		Low Risk	Medium Risk	High Risk
Punjab	36	16	20	0
Sindh	23	2	9	12
KP	25	2	13	10
Balochistan	30	0	5	25
FATA	7	0	0	7
GB	7	0	1	6
AJK	10	10	0	0
Islamabad	1	1	0	0
<b>Total districts</b>	<b>139</b>	<b>31</b>	<b>48</b>	<b>60</b>
<b>Total number Women of reproductive age</b>	<b>38,635,749</b>	<b>13,924,209</b>	<b>17,936,973</b>	<b>6,774,567</b>

**DISCUSSION**

According to the assessment and risk-categorization, there are 108 districts (high-risk 60, medium-risk 48), which need Supplementary Immunization Activities (SIAs). A total of 24.6 million women of reproductive age in both the high and medium risk districts need to be vaccinated against tetanus through supplementary efforts. The low routine immunization coverage, low institutional delivery coverage coupled with the low literacy rate, and lack of knowledge and accessibility itself justifies conducting SIAs in order to achieve MNT elimination from the country.15 Immunizing the WRA is one of the most effective intervention in achieving this goal, along with other useful practices such as increasing delivery by skilled birth attendants and improving clean cord card, especially in the developing countries.16,17

Implementing three rounds of Tetanus SIAs in the high-risk, and two rounds in medium risk areas, are effective in moving forward in eliminating the disease.16,18 This must be coupled with the strengthening of the routine immunization with tetanus toxoid vaccine targeting pregnant mothers and improving institutional delivery, especially in under privileged areas and districts. There is strong evidence from the low and middle income countries in this context, as it helped in eliminating tetanus and taking a step forwards in attaining MDGs.19,20

## CONCLUSIONS

The study concluded that Pakistan has areas/districts that are medium to high risk of maternal and neonatal tetanus where close to 24 million women and their newborns are not protected against tetanus. For high risk districts: three rounds of TT campaigns, for medium risk districts: At least one or two rounds of campaign following a local assessment, and for low risk districts: TT vaccination through routine EPI or ANC along with focus on improving clean delivery and Neonatal Tetanus surveillance should be the part of national strategy to eliminate tetanus in Pakistan. In order to speed-up the efforts towards elimination of the neonatal tetanus, we recommend that for the high-risk districts, three rounds of TT campaigns, targeting women of reproductive age, should be conducted As soon as possible. For the medium-risk districts, at least one round of campaign following a local assessment, and for the low-risk districts, we recommend continuing the TT vaccination through routine EPI or through Anti Natal Care, with a focus on improving clean delivery techniques.

**Competing Interests:** The authors declare that they have no competing interests whatsoever in conducting and publishing this study.

## AUTHORS' CONTRIBUTIONS

EAK: Conceptualized the study idea, contributed to scoring methods, analysis, write-up and initial and final proof reading. RK: Contributed to conceptualizing of the study idea, scoring methods, write-up, initial and final proof reading. MTI: Contributed to conceptualizing of the study idea, data collection, scoring methods, initial and final proof reading. QH: Contributed to scoring exercise, analysis and proof reading. SF: Contributed to initial proof reading and scoring exercise. MSR: Contributed to final proof reading

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