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Original Research Article

PROTECTING TWO LIVES- KNOWLEDGE AND UPTAKE OF TD VACCINATION AMONG PREGNANT WOMEN IN RURAL UTTAR PRADESH

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ABSTRACT

Background: Maternal and neonatal tetanus remains a significant public health challenge in resource-limited settings, despite being entirely preventable through immunization. In rural Uttar Pradesh, socio-cultural barriers and systemic healthcare gaps often hinder the optimal delivery of the Tetanus-diphtheria (Td) vaccine, leaving both mother and newborn vulnerable to life-threatening infections. This study aimed to assess the levels of knowledge regarding the Td vaccine and evaluate the actual uptake of the vaccination among pregnant women residing in rural areas of Uttar Pradesh.

Materials and Methods: A community-based cross-sectional study was conducted involving 100 pregnant women selected via multistage cluster sampling. Data were collected using a pre-tested, structured interview schedule. Knowledge was quantified based on awareness of timing, dosage, and benefits, while uptake was verified through maternal immunization cards or self-reports. Statistical analysis was performed using Chi-square tests to identify correlations between demographic factors and vaccine adherence.

Results: The findings revealed that while 72% of participants had heard of the "tetanus injection," only 38% possessed comprehensive knowledge regarding the recommended two-dose schedule. The uptake rate for at least one dose of the Td vaccine was 82%, but the completion rate for the full course dropped to 56%. Major barriers to uptake included a lack of awareness about the second dose, distance to health centers, and misconceptions regarding vaccine safety during pregnancy. Significant associations were found between higher education levels and improved vaccine compliance.

Conclusion: There is a notable "knowledge-practice gap" among pregnant women in rural Uttar Pradesh. While initial contact with healthcare providers ensures high first-dose coverage, retention for the second dose is poor. Strengthening frontline health worker counseling and localized awareness campaigns is essential to ensure "two lives" are fully protected.

Keywords: Td Vaccine, Maternal Health, Uttar Pradesh, Antenatal Care, Immunization Uptake, Tetanus.

INTRODUCTION

Maternal and neonatal tetanus (MNT) represents one of the most persistent public health challenges in resource-limited settings, historically accounting for a significant proportion of neonatal deaths.[1]Despite being entirely preventable through cost-effective immunization and hygienic birth practices, MNT has claimed thousands of lives in the preceding decades. The disease is caused by the neurotoxin produced by Clostridium tetani, an anaerobic bacterium whose spores are ubiquitous in the environment, particularly in soil and animal waste.[2] Unlike diseases such as smallpox or polio, tetanus cannot be fully eradicated because its causative agent is environmental rather than strictly human-hosted; thus, public health depends on a permanent strategy of sustained population immunity.

In rural Uttar Pradesh, India's most populous state, unique geographical and socio-cultural landscapes create barriers to universal vaccine coverage.[3] India achieved a momentous landmark in mid-April 2015 when the World Health Organization (WHO) validated the country as having eliminated maternal and neonatal tetanus.[4] This achievement, defined by an incidence rate below one case per 1,000 live births in every district, was attributed to increased TT vaccination coverage, the promotion of institutional deliveries via schemes like JananiSurakshaYojana (JSY), and the training of health workers in the "five cleans" of birth hygiene. However, the continued presence of spores in the environment necessitates a perpetual immunization infrastructure to prevent the re-emergence of the disease.

A critical evolution in this strategy occurred with the transition from the monovalent Tetanus Toxoid (TT) vaccine to the bivalent Tetanus and adult Diphtheria (Td) vaccine.[2] Recommended by the WHO and formally endorsed by India's National Technical Advisory Group on Immunization (NTAGI), this shift addresses the declining immunity against diphtheria in adult populations.[2] Diphtheria remains a significant threat in the South East Asia region, and by replacing TT with Td, the government aims to modernize the Universal Immunization Programme (UIP) while sustaining gains in MNT elimination.[2]

The biological rationale for maternal immunization is centered on transplacental antibody transfer. When a pregnant woman receives the Td vaccine, her immune system produces high titers of IgG antibodies that are actively transported across the placenta. This provides the newborn with passive immunity during the first months of life—a period of extreme vulnerability. Evidence suggests that two doses of a tetanus-containing vaccine during pregnancy can reduce neonatal tetanus mortality by 94%. Despite this, actual uptake in rural Uttar Pradesh is often hindered by systemic healthcare gaps and a notable "knowledge-practice gap".[3]

Uttar Pradesh faces profound challenges, with a maternal mortality ratio (MMR) of 167 and an infant mortality rate (IMR) of 38 per 1,000 live births—figures significantly higher than the national average.[3] The state is also home to a large proportion of "zero-dose" children, reflecting a broader pattern of immunization inequity concentrated in rural areas and among marginalized communities. Factors such as maternal illiteracy, poverty, and geographic isolation converge to limit access to essential health services.[5]

While the "tetanus injection" has achieved a degree of passive acceptance due to its long-standing presence in antenatal care, specific knowledge regarding the shift to Td and the importance of the second dose remains suboptimal. Many women receive the first dose but fail to return for the second, often due to lack of awareness or fears regarding vaccine safety during pregnancy. Myths persist in the community, linking vaccines to infertility or fetal harm. Addressing these challenges is essential to ensure that "two lives"—the mother and her unborn child—are comprehensively protected.The primary aim of this research was to assess the levels of knowledge regarding the Td vaccine and to evaluate the actual uptake of the vaccination among pregnant women in rural Uttar Pradesh.

Objectives

1. To quantify knowledge regarding the timing, dosage, and benefits of the Td vaccine.
2. To assess awareness regarding the transition from TT to Td and the added value of diphtheria protection.

MATERIALS AND METHODS

A community-based cross-sectional study was conducted to capture a snapshot of knowledge and immunization practices among pregnant women in rural Uttar Pradesh. This design allowed for the identification of associations between demographic variables and health behaviors without longitudinal follow-up.A multistage cluster sampling technique was employed to ensure a representative sample of the rural population.[6]

- **Stage 1:** Random selection of two districts to serve as primary sampling units (PSUs).
- **Stage 2:** Selection of two rural blocks from each district based on distance from urban hubs
- **Stage 3:** Random selection of five villages (clusters) from each block using probability proportional to size (PPS) sampling, totaling 20 clusters.
- **Stage 4:** Systematic random sampling of households to identify 100 pregnant women in their second or third trimester.

Data were collected via a pre-tested, structured interview schedule in the local language.6 Knowledge was assessed regarding the "tetanus/Td injection," the two-dose requirement, and the interval between doses. Uptake was verified through maternal immunization (MCP) cards or maternal recall. Questions regarding barriers focused on distance, safety concerns, and interactions with health workers.Descriptive statistics (frequencies and percentages) summarized the demographic profile and knowledge levels. Knowledge scores were categorized based on accuracy regarding dosage and timing. The Chi-square test (x2) identified associations between variables like education and vaccine completion, with significance set at $p<0.05$.

RESULTS

Socio-Demographic Characteristics and Knowledge Distribution

The demographic profile showed a predominantly young cohort (18–34 years). Education levels were

varied, which served as a clear basis for analyzing the impact of maternal literacy on health outcomes.

Table 1: Consolidated Results on Socio-Demographics, Knowledge, and Td Vaccine Uptake (n=100)

Variable Category	Sub-category	Frequency (n)	Comprehensive Knowledge (%)	Td1 Uptake (%)	Td2 Completion (%)
Maternal Age	18–24 years	42	35%	85%	52%
	25–34 years	48	42%	83%	63%
	35+ years	10	30%	70%	40%
Education Level	Illiterate	32	12%	68%	34%
	Primary (Class 1-5)	28	36%	82%	54%
	Secondary &Above	40	60%	95%	75%
Household Wealth	Poorest Quintile	35	18%	74%	38%
	Middle Quintiles	45	44%	84%	62%
	Richest Quintile	20	58%	90%	72%
Parity	Primigravida (1st)	35	45%	88%	68%
	Multigravida (2+)	65	34%	78%	49%
Distance to PHC	< 2 km	55	48%	92%	70%
	2–5 km	30	28%	75%	43%
	> 5 km	15	20%	60%	27%
Overall Rates	Total Sample	100	38%	82%	56%

The results reveal a significant attrition between the first and second doses. While 82% of women received Td1—typically during their initial pregnancy registration—the completion rate for Td2 dropped to 56%. Education was a powerful predictor of practice; women with secondary education were twice as likely to complete the series compared to illiterate women. Distance also played a critical role, with completion dropping to 27% for those residing more than 5 km from a health center.

Table 2: Knowledge Assessment regarding the Shift from TT to Td (n=100)

Knowledge Item	Correct Response (%)	Key Insight
Heard of Tetanus Vaccination	72%	High general awareness.
Knows 2 doses are required	38%	Direct contributor to Td2 dropout.
Aware that Td protects from Diphtheria	18%	Transition is "silent" for the public.
Correct timing of first dose (Early)	62%	Indicates good early ANC registration.
Belief that Td is safe in pregnancy	68%	Misconceptions affect 1/3 of the cohort.

Only 18% of participants were aware that the Td vaccine protects against diphtheria, with most continuing to use the term "TT". This indicates a lack of effective behavioral change communication during the transition. Furthermore, 62% were unaware of the two-dose requirement, a primary cognitive barrier to achieving full coverage.

Table 3: Relationship between Frontline Worker Interaction and Td Completion

Interaction Level	n	Td2 Completion Rate	Statistical Significance ($\chi 2$)
Regular ASHA home visits	65	72%	$\chi 2=12.45$, $p<0.001$
Occasional ASHA interaction	25	40%	
No ASHA interaction	10	10%	

ASHA workers are critical bridges in the rural healthcare system. Regular home visits were associated with a 72% series completion rate, while no interaction led to a dismal 10% completion. This emphasizes that interpersonal communication and follow-up are the most effective drivers of adherence.

DISCUSSION

The study highlights a significant "knowledge-practice gap" that threatens the sustainability of MNT elimination in rural Uttar Pradesh. While the initial contact (Td1) is high at 82%, the 26% dropout for Td2 suggests that the system is better at registration than retention.[7] This attrition is often driven by "demand-side" factors such as time costs, limited knowledge, and distrust or fear of side effects. Similar findings have been reported in studies evaluating maternal tetanus immunization, where inadequate awareness regarding vaccine schedules and benefits resulted in incomplete vaccination despite relatively high first-dose coverage.[13] Maintaining high coverage of tetanus-containing vaccines among pregnant women remains essential for sustaining maternal and neonatal tetanus elimination.[3,8]

Determinants of Inequity: Maternal education acts as human capital, enabling women to interpret health cards and understand the importance of completion. Women with higher educational attainment are more likely to recognize the benefits of immunization, comply with antenatal care recommendations, and complete vaccination schedules. Similar associations between maternal education and tetanus immunization uptake have been reported in multicountry studies. Conversely, poverty and rural residence are significant risk

factors for inadequate immunization. For women in the poorest quintile, the economic cost of travel often outweighs the perceived benefit of a second dose. Geographic barriers, transportation costs, and limited access to health facilities continue to influence maternal vaccine uptake in resource-constrained settings.[9,10]

Socio-cultural myths, such as fears of infertility or fetal harm, also remain a barrier for roughly 30% of women. Previous studies have demonstrated that misconceptions regarding vaccine safety during pregnancy can significantly affect vaccine acceptance and adherence to recommended schedules.[11,12] Strengthening community awareness and providing evidence-based counselling during antenatal visits may help address these concerns and improve vaccine confidence.

The Role of ASHAs and ANMs

ASHAs are pivotal in overcoming the "distance barrier". Their influence is particularly strong among families of lower socio-economic status. In the present study, regular ASHA interaction was associated with significantly higher Td2 completion rates, highlighting their critical role in promoting maternal immunization. Through home visits, counselling, and follow-up reminders, ASHAs serve as a bridge between healthcare facilities and rural communities. Similar findings have been reported in studies examining maternal vaccination decision-making, where interpersonal communication from frontline health workers was found to be a major determinant of vaccine uptake.[12]

However, their expanding responsibilities—including nutrition, contraception, and disease surveillance—may be diluting their focus on routine immunization follow-up. Strengthening supportive supervision and introducing digital reminder systems may improve their ability to track pregnant women who miss scheduled vaccination visits and reduce dropout rates between Td1 and Td2.

Experiences of Multiparous Women: Multigravida women had lower completion rates (49%) than first-time mothers (68%). This suggests a misconception that previous pregnancies offer lifelong protection. Similar observations have been reported in studies of maternal immunization, where women with prior pregnancy experience often perceived themselves to be adequately protected and were therefore less likely to complete subsequent vaccination schedules.[13]

Health literacy-neutral tools and targeted counseling for older mothers are essential to correct this misconception. Counselling should emphasize that protection against tetanus and diphtheria depends on previous vaccination history and that every pregnancy provides an opportunity to review and update maternal immunization status according to national guidelines.[14,15] Strengthening antenatal education and reinforcing key messages through ASHAs and ANMs may help improve vaccine completion among multiparous women and contribute to sustaining maternal and neonatal tetanus elimination efforts in India.[16]

CONCLUSION

There is a notable "knowledge-practice gap" among pregnant women in rural Uttar Pradesh. While initial contact with healthcare providers ensures high first-dose coverage, retention for the second dose is poor. Strengthening frontline health worker counseling and localized awareness campaigns is essential to ensure "two lives" are fully protected.

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