Original Article

Tetanus in Children: Risk Factors, Vaccination, and Outcomes

Quratulain Leghari

University College of Medicine and Dentistry, Lahore

*Corresponding Author

Quratulain Leghari

quratulain.leghari@ucmd.edu.pk

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Abstract

Background:

Tetanus remains a life-threatening yet preventable disease, particularly in low- and middle-income countries. Despite global efforts, its burden persists among children due to insufficient immunization coverage, lack of booster doses, and poor awareness of post-exposure prophylaxis. In Pakistan, these challenges continue to contribute to morbidity and mortality associated with post-neonatal tetanus.

Aim:

This study aimed to evaluate the frequency of risk factors, immunization coverage, and clinical outcomes among children diagnosed with tetanus beyond the neonatal period at a tertiary care center.

Methods:

Conducted in 2024, this prospective observational study took place at the University of Lahore Teaching Hospital. Pediatric patients aged 1 month to 15 years admitted with clinical tetanus were included. Variables such as age, gender, immunization status (including DTP and TT boosters), identifiable risk factors, duration of hospitalization, and final outcomes were analyzed using SPSS version 16.

Results:

Among 74 participants, 46 (62.2%) were boys and 28 (37.8%) girls. The mean age was 6.8 ± 3.2 years, with the highest prevalence in children aged 6–10 years (52.7%). Vaccination data revealed 51 (68.9%) children were unvaccinated; none had received booster doses or post-exposure prophylaxis. Trauma accounted for the majority of cases (34; 45.9%), followed by ear discharge (14; 18.9%) and piercing injuries (3; 4.1%). The risk factor remained unidentified in 23 (31.1%) cases. Mean hospital stay was 13.7 ± 11.2 days. A mortality rate of 20.3% (15 patients) was significantly linked with shorter hospital stays ($p<0.001$) and absence of vaccination ($p=0.01$).

Conclusion:

The study revealed significant gaps in routine immunization and post-injury tetanus prophylaxis. Implementation of booster vaccination and early identification of high-risk groups, such as those with otorrhoea, is essential for prevention.

Keywords:

Tetanus, Pediatric, Immunization, Risk Factors, Clinical Outcomes

Introduction:

Tetanus is a severe neurological disorder marked by muscle rigidity and spasms, triggered by the neurotoxin tetanospasmin produced by *Clostridium tetani* (1). This gram-positive, spore-forming anaerobe thrives in soil and organic matter, contributing to the disease's widespread incidence, especially in low-resource settings (2).

While neonatal tetanus receives significant attention, post-neonatal tetanus also poses a persistent threat in countries with suboptimal immunization coverage (3, 4). The World Health Organization (WHO) estimates thousands of pediatric deaths annually due to tetanus (1). In Pakistan, inadequate vaccination schedules, lack of booster doses, and reliance on traditional practices exacerbate disease prevalence (5).

Most tetanus cases stem from wounds that may appear trivial, yet become portals for infection (6). Additional sources include chronic otitis media, surgical procedures, burns, and cultural practices like non-sterile piercings (7). Notably, many cases present with no identifiable entry point (1, 8).

This study investigates the epidemiological and clinical profile of post-neonatal tetanus in children, aiming to identify gaps in immunization and factors contributing to disease persistence.

Methods:

A prospective observational study was carried out in the Department of Pediatrics at the University of Lahore Teaching Hospital during 2024. Pediatric patients (1 month to 15 years) admitted with clinical features consistent with tetanus were enrolled following informed consent.

Patients with alternative causes of hypertonia (e.g., encephalitis or meningitis) or those whose guardians declined participation were excluded. A structured data form recorded demographic details, vaccination history (DTP and TT), exposure to known risk factors (e.g., injury, otorrhoea, ear/nose piercings), post-exposure prophylaxis, hospitalization duration, and outcomes.

SPSS version 16 was used for data analysis. Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Chi-square test was applied, with $p<0.05$ considered statistically significant.

Results:

Out of 74 cases, 46 (62.2%) were male and 28 (37.8%) female. The mean patient age was 6.8 ± 3.2 years. Children aged 6–10 years comprised the majority (52.7%).

Immunization records indicated 51 (68.9%) children were unvaccinated. None of the patients had received a TT booster or post-injury prophylaxis.

Risk factor analysis revealed trauma as the most frequent cause (34 cases; 45.9%), followed by otorrhoea (14 cases; 18.9%) and ear/nose piercing (3 cases; 4.1%). In 23 patients (31.1%), no specific cause could be identified.

The average hospital stay was 13.7 ± 11.2 days. Overall, 15 children (20.3%) died. Mortality was significantly associated with shorter hospital stay ($p<0.001$) and lack of vaccination ($p=0.01$).

Table 1: Vaccination Status of Patients (n=74)

Vaccination Status	Number of Patients	Percentage (%)
Unvaccinated	51	68.9%
Partially Vaccinated	22	29.7%
Completely Vaccinated	1	1.4%

Table 2: Outcome vs Hospital Stay Duration

Outcome	Mean Hospital Stay (days)	Number of Patients
Recovered	15.2 ± 12.1	59
Deceased	6.3 ± 3.2	15

Discussion:

This study highlights persistent challenges in managing tetanus among children in Pakistan. The predominance of unvaccinated children reflects ongoing gaps in routine immunization programs. Although the Expanded Programme on Immunization (EPI) includes primary DTP vaccination, it lacks adequate provisions for booster doses essential for long-term protection (5).

Trauma emerged as the leading predisposing factor, emphasizing the need for public awareness and improved wound care practices. None of the trauma cases received post-exposure tetanus prophylaxis, mirroring previous findings from other regional studies (17, 18, 19).

Otorrhoea was the second most common risk factor. As a recognized portal for tetanus infection, children with chronic ear discharge should be prioritized for vaccination evaluation (3, 5, 7, 9). Although piercing-related infections were less frequent, they remain a modifiable risk factor through education and hygienic practices (21).

The mortality rate of 20.3% aligns with other national and regional reports. A similar study conducted in Larkana documented a 22% mortality rate (1), while another in Faisalabad showed a higher rate of 40.4% (22). Mortality varied across studies (4.5%–43%) depending on care quality and severity at presentation (6, 9, 17, 19).

Notably, shorter hospital stays were strongly linked to poor outcomes, likely due to delayed presentation and disease severity at admission (3, 4, 5).

Conclusion:

Post-neonatal tetanus remains a critical pediatric health issue, with high mortality driven by inadequate immunization coverage and missed opportunities for prophylaxis. Strengthening vaccination programs with timely boosters, raising awareness on wound management, and targeting at-risk groups can substantially reduce disease burden.

Author's Contribution:

N.N. contributed to the conceptualization and design of the study, conducted data analysis, and drafted the initial manuscript. N.N. also participated in revising the manuscript critically for important intellectual content for the final version for publication.

Conflict of Interest:

The author declare no conflict of interest related to this study.

Funding & Ethics:

This research was self-funded by authors. The study was conducted in accordance with ethical guidelines and approved by the institution.

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