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Frequency of In-Hospital Mortality among Patients of Severe Adult Tetanus Presenting with Bad Prognostic Factors

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ABSTRACT

Background: This investigation seeks to evaluate the in-hospital mortality rate of adult patients with severe tetanus who present with poor prognostic factors. No studies have been performed on this specific demographic in our region which makes the results of this investigation vital to supporting future research and optimizing the care frameworks for patients suffering from severe tetanus inappropriately advanced. These findings will be disseminated to public healthcare practitioners along with other medical professionals to inform them of the prevailing mortality figures and the need to enhance management, control, and preventative strategies for patients enduring severe tetanus. This study seeks to evaluate the mortality rate of patients with severe adult tetanus and poor pre-determined indicators of prognosis. **Methodology:** A descriptive cross-sectional study was conducted at the Department of Emergency Medicine, Lady Reading Hospital, Peshawar from 12th November 2023 to 12th May 2024. A total of 176 patients between the ages of 18 and 60 years with severe tetanus and noted poor prognostic factors were selected for the study. Every patient was managed as per existing protocols and the mortality during hospitalization was noted. The analysis was carried out on SPSS version 25. **Results:** The research had 176 participants aged between 18 and 60 years. Average age of participants was 38.54 years (standard deviation of 10.82), with body mass index (BMI) averaging at 24.08 (standard deviation of 1.73) kg/m^2. Mortality within the hospital was noted for 64 patients (36.4%). **Conclusion:** Patients with severe tetanus who have poor prognostic signs, for example, advance age or higher risk of sepsis, are still at a greater risk of in-hospital mortality, emphasizing the fact that more clinical attention is required with these patients and requires more prompt and effective treatment plans tailored to them.

INTRODUCTION

Tetanus is a word that comes from the Greek word "teinein" meaning 'to stretch' is a disorder of the nervous system which involves muscle spasms as a result of the neurotoxin produced by the anaerobic soil-dwelling bacterium, Clostridium tetani (1). Tetanus remains a serious threat in developing areas, despite being rare in developed countries due to vaccination programs (2). The disease affects around a million people globally each year, and is particularly burdensome to people in underdeveloped regions where there is inadequate vaccination, poor wound care, and sanitation (3).

Tetanus mostly affects older adults because of partial vaccination histories, while infant tetanus is still a major cause of death in many developing countries (4). The treatment of advanced tetanus disease burden necessitates broad medical resources, in particular deep sedation with mechanical ventilation, which is seldom accessible in the regions most afflicted by the disease (5). Generalized tetanus continues to have a disturbingly high mortality rate, even with improvements in medical care, globally sitting between 20% to 50% (6-8). The mortality rate is heavily impacted by the age of the patient, incubation period, type of injury, clinical presentation, and the availability of medical care (9). For advanced cases of tetanus, the mortality rate can be as high as 60% in those with shorter incubation periods or presenting with fever and tachycardia.

Cognitive and economic factors like illiteracy and poverty support the high rates of tetanus in developing countries and the lack of preventative awareness doesn't help either (10). Research indicates that dividing tetanus cases according to clinical severity enhances mortality outcome predictions; with more profound cases resulting in higher

death rates. Improved public education along with proper immunization and better wound care protocols is crucial in order to alleviate this preventable illness on a global scale (11, 12).

This study seeks to determine the frequency of mortality among adult patients with severe tetanus and poor prognostic factors in our local population. The results will enhance understanding regarding the treatment of severe tetanus and morbidity, thereby stimulating further investigations and optimizing therapeutic guidelines. The findings will be shared with healthcare providers and decision-makers to improve education and encourage more effective management of severe tetanus.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted was carried out in the Department of Emergency Medicine, Lady Reading Hospital, Peshawar from 12th November 2023 to 12th May 2024. Non-probability consecutive sampling was employed. A total of 176 patients were included, based on a 34% mortality rate among severe tetanus patients with poor prognostic factors, a 95% confidence interval, and an 8% margin of error (calculated using WHO sample size determination guidelines).

The inclusion criteria were patients diagnosed with severe tetanus, patients presenting with poor prognostic factors according to operational definitions and patients aged 18 years and older, of either gender. The exclusion criteria were patients with renal impairment (defined as blood urea >108 mg/dL or urine output <50 mL/hour) or those with other neuromuscular junction disorders (e.g., myasthenia gravis or Eaton-Lambert syndrome) were excluded to minimize confounding factors that could bias the study results.

After receiving approval from the hospital's ethical committee, eligible patients presenting to the Emergency Department with severe tetanus and poor prognostic factors were enrolled. Patients were managed according to ICU protocols, including antibiotic therapy, ventilator support, and intravenous diazepam. All relevant patient information, including demographic data and clinical outcomes, was recorded on a pre-designed proforma.

Data were entered and analyzed using SPSS version 25. Descriptive statistics, such as mean and standard deviation, were used for continuous variables (e.g., age). Frequencies and percentages were calculated for categorical variables (e.g., gender and mortality). Subgroup analyses were performed to assess the effect of age and gender on mortality outcomes, and results were presented in tables and charts.

RESULTS

Table 1shows the average and standard deviation for the age, BMI, height, and weight of the patients:

The mean age is 38.54 years, with a standard deviation of 10.82, indicating a wide age range among participants. The average BMI is 24.08 kg/m^2, within the normal range, showing limited variability.

Height and Weight: The mean height is 170.35 cm and the average weight is 68.26 kg, with moderate variability.

Table 2 shows the frequency distribution by age, gender, and in-hospital mortality 2% of the patients are 40 years or younger, while 39.8% are older than 40 There is a slight male predominance (55.7% male and 44.3% female). The in-hospital mortality rate is 36.4%, indicating the severe nature of the condition.

Table 1

Means ± SD of Patients According to Age, Weight, Height, and BMI

Parameter	Mean	Std. Deviation
Age (years)	38.54	10.824
BMI (kg/m^2)	24.085	2.7358
Height (cm)	170.35	12.457
Weight (kg)	68.262	7.401

Table 2

Frequencies and Percentages of Patients According to Age, Gender, and In-Hospital Mortality

Category	Variable	Frequency	Percentage
Age (years)	40 or below	106	60.2%
	More than 40	70	39.8%
Gender	Male	98	55.7%
	Female	78	44.3%
In-Hospital Mortality	Yes	64	36.4%
	No	112	63.6%

Table 3: presents the mortality data stratified by age and gender. Mortality was slightly higher in patients aged 40 or below (38.7%) compared to those older than 40 (32.9%). Males show a higher mortality rate (40.8%) than females (30.8%). The p-values suggest no statistically significant differences in mortality based on age or gender.

Table 3

Stratification of In-Hospital Mortality by Age and Gender Stratification by Age and Gender

Age (years)	In-Hospital Mortality (Yes)	In-Hospital Mortality (No)	Total	P-value
40 or below	41 (38.7%)	65 (61.3%)	106	0.432
More than 40	23 (32.9%)	47 (67.1%)	70	
Gender				
Male	40 (40.8%)	58 (59.2%)	98	0.169
Female	24 (30.8%)	54 (69.2%)	78	

Figure 1

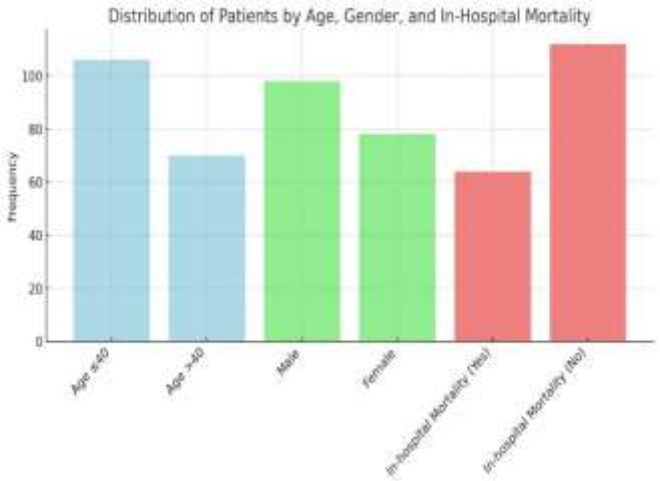

Figure 1 The majority of patients (60.2%) are aged 40 or below, while 39.8% are older than 40, indicating that a larger portion of the patient population is younger. In-hospital mortality affected 36.4% of patients, with 63.6% surviving, highlighting the significant risk of mortality associated with severe tetanus.

DISCUSSION

Tetanus remains a vaccine-preventable disease, yet it continues to affect populations in low- and middle-income countries, particularly due to widespread Clostridium tetani spores in the environment. Achieving lifelong immunity requires multiple booster doses during adolescence. Unfortunately, current immunization programs mainly target women of childbearing age, significantly reducing maternal and neonatal tetanus, but leaving adult men, especially in South Asia and Sub-Saharan Africa, vulnerable. According to the Global Burden of Disease (GBD) study, these two regions accounted for approximately 82% of all global tetanus cases and 77% of the 38,000 tetanus-related deaths in 2017 (13). This study adds to the limited research on the factors influencing in-hospital mortality among adult tetanus patients in this region.

In our study, the in-hospital mortality rate was 36.4%, which is higher than previously reported rates in Bangladesh, ranging from 22.5% to 28.6% (14). Variations in mortality rates across regions highlight differences in healthcare resources, such as access to ventilatory support. While countries like China and Nepal reported lower death rates of 5.9% and 7.5%, respectively, Tanzania's mortality rate remained high at 43.1% despite mechanical ventilation, emphasizing the need for comprehensive management facilities (15).

Older age was identified as a significant risk factor for in-hospital mortality, with patients aged 40 years or older showing a higher likelihood of death. This finding aligns with research from Bangladesh, Tanzania, and India, where older age groups were associated with worse outcomes (7, 16, 17). Males constituted the majority of patients, likely reflecting gaps in immunization programs, as many countries still face challenges in implementing booster doses for adults beyond childhood vaccination schedules.

Another key finding was that over half of the patients were farmers from rural areas. Previous studies have similarly identified farming as a high-risk occupation for tetanus, as workers often face exposure to soil-borne bacteria through puncture wounds and lack adequate protective measures (18). These findings suggest that rural agricultural workers should be prioritized for booster vaccination to reduce their risk of tetanus.

A significant observation was the low awareness of tetanus vaccination among patients, with only 6.6% recalling prior immunization and just a quarter having received post-exposure prophylaxis. This reflects the need for improved public health education to raise awareness of the importance of tetanus vaccination, especially following injuries. Health authorities must address this gap to prevent tetanus infections from minor wounds, particularly in areas where tetanus is still prevalent.

Finally, the development of complications, hypoxemia and aspiration pneumonia, significantly increased the risk of mortality. While comorbidities like diabetes and hypertension did not correlate with higher mortality, complications arising from the disease itself played a crucial role in patient outcomes. These findings underscore the need for better monitoring and management of complications in tetanus patients to improve survival rates.

CONCLUSION

Although immunization programs have led to significant reductions in tetanus cases, especially in maternal and neonatal populations, adult men, particularly those in rural areas engaged in farming, remain vulnerable. Targeting these high-risk groups for booster vaccination programs is essential to further reduce tetanus incidence. Additionally, tetanus patients who are older and present with shorter onset times should receive close monitoring and critical care, as they have a higher risk of mortality. Improving public awareness about post-exposure prophylaxis and expanding access to comprehensive medical care for managing complications are also vital steps in lowering death rates among tetanus patients.

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