

# Study of Clinical Presentation and Associated Complications of Tetanus in Pediatric Patients- A Prospective Study.

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## ABSTRACT

**Background:**Tetanus is caused by a potent toxin produced by anaerobic bacilli clostridiumtetani. Though it's a completely vaccine preventable disease its incidence is still high in developing countries including in India. Tetanus is a disease of poor and developing countries of the world. Its incidence chiefly depends on economic, demographic and environmental factors. Since it carries a high morbidity and mortality despite advanced medical care the emphasis should be on complete immunization of children. We conducted this prospective study to analyze clinical features and complication in children with tetanus. **Aims and Objectives:** To study clinical presentation and complications of tetanus in children.**Methods:** After obtaining approval from institutional ethical committee we conducted a prospective study of 12 pediatric patients diagnosed with tetanus. The study was a prospective cohort study conducted in the department of pediatrics of a tertiary care hospital situated in a metropolitan area. Patients were included in this study on the basis of predefined inclusion criteria. Patients having any exclusion criteria were excluded from the study. The data was tabulated and analyzed using SPSS 16.0 version software.**Results:**The study comprised of 12 pediatric patients admitted with tetanus. Out of these 12 patients there were 6 males and 6 females with a M: F ratio of 1:1. 6 patients belonged to age group of 0-5 years and 6 patients were more than 5 years of age. Majority of the patients belonged to urban area (66.66%) while 4 patients (33.33%) belonged to rural area. The analysis of probable mechanism of infection showed that most of the patients acquired infection through injuries (41.66%) followed by ear infections (25%), wounds (16.66%) and burns (16.66%). Trismus (33.33%), hypertonicity in legs (25%), dysphagia (16.66%), stiffness (16.66%) and fever (8.33%) were the common presenting complaints in the studied cases. Clinical signs seen in the studied cases included tachycardia (66.66%), tachypnea (33.33%) and autonomic disturbances (8.33%). The study of immunity status showed that 6 children (50%) were partially immunized while 5 (41.66%) and 1 (8.33%) children were completely unimmunized and completely immunized. Complications were seen in 10 (83.33 %) children and were more common in the age group of 0-5 years in which all patients developed complications. Common complications seen in treated children included Pneumonia (33.33%), ARDS (16.66%), congestive cardiac failure (16.66%), Renal Failure (16.66%), DIC (8.33%), sepsis (8.33%) and bedsores (8.33%). Mortality was found to be 41.66%. **Conclusion:** Though being a vaccine preventable disease incidence of tetanus is still high in developing countries. Unimmunized children are susceptible to this dreadful disease after trauma, ear infections and burns. Since it carries a high morbidity and mortality the emphasis should be given in immunization of all children.

**Keywords:** Tetanus, Immunization, Clinical Features, Outcome.

## INTRODUCTION

Tetanus is an acute, spastic paralytic illness historically called lockjaw that is caused by the neurotoxin produced by Clostridium tetani which is a motile, gram positive, spore forming obligate anaerobe whose natural habitat is soil, dust, and alimentary tracts of various animals.<sup>[1]</sup> The Incubation period of tetanus may be up to several

months, but is usually about eight days. In general, the farther the injury site is from the central nervous system, the longer the incubation period, the more severe symptoms. The tetanus toxin initially binds to peripheral nerve terminals. It is transported within the axon and across synaptic junctions until it reaches the central nervous system. There it becomes rapidly fixed to gangliosides at the presynaptic inhibitory motor nerve endings, and is taken up into the axon by endocytosis. The effect of toxin is to block the release of inhibitory neurotransmitters glycine and gamma – aminobutyric acid (GABA) across synaptic cleft, which is required to check the nervous impulse. If nervous impulses cannot be checked by normal inhibitory mechanisms, the

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generalized muscular spasms characteristic of tetanus are produced. The toxin appears to act by selective cleavage of a protein component of synaptic vesicles, synaptobrevin II, and this prevents the release of neurotransmitters by cells.<sup>[2]</sup>

Tetanus is rarely seen in developed countries but still remain a major health concern in developing countries where many children remains partially or completely unimmunized despite widespread immunization programs. Tetanus can be acquired after minor injuries like wood or metal splinters or thorns. In some cases it may follow middle ear infections or minor burns. It may also be seen in patients with chronic conditions such as nonhealing wounds, abscesses and gangrene. Since in many instances no obvious injury can be identified it is important that the children are completely immunized and this immunity should be adequately maintained with periodic booster doses whenever indicated.<sup>[3]</sup>

Tetanus in children usually present with trismus, local or generalized hypertonia, dysphagia, stiffness, neck rigidity, restlessness and reflex spasms. These muscle spasms become progressively stronger as the disease progresses. The features s/o autonomic imbalance may include raised hyperthermia, hypertension, increased sweating and arrhythmias. The complications seen In these patients may include fractures and dislocations (most commonly Glenohumeral and temporomandibular) due to intense powerful spasms (Reflex spasm are usually triggered by minimal external stimuli like sound, light or touch), Hypoxic brain damage, aspiration pneumonia and acute respiratory distress syndrome, disseminated intravascular coagulopathy (DIC), cardiac arrhythmias, paralytic ileus, urinary retention (in uncatheterised patients), nerve palsies, neuropathies and eventually coma may develop. One of the most dreadful complications of tetanus includes intense laryngeal spasm and massive aspiration which in many instances may prove fatal. Usually presentation of tetanus is unique but in some instances strychnine poisoning, malignant hyperthermia and encephalopathies must be considered in differential diagnoses.<sup>[4]</sup>

The principle of cure in this disease mainly include means to neutralize free toxin using tetanus immunoglobulin, keeping patient alive till the effect of toxin weans off and avoid life threatening complications. Muscle relaxants may be used to control spasms. Mechanical ventilation may be required in cases of impending respiratory failure.<sup>[5]</sup>

## MATERIALS AND METHODS

This was a prospective observational study conducted in the pediatric department of a tertiary care hospital. The tetanus patients attending the Emergency, in-patient and outpatient Departments of Pediatrics Division of our institute were enrolled for

the study as per the criteria given. It was a prospective, stratified randomized cohort study conducted on children in the age group of 0 to 12 years having diagnosed with tetanus. The children above 12 years were excluded from this study. A detailed clinical and developmental history was taken and physical and neurological examination was carried out. History of tetanus immunization, mode of infection, incubation period, period of onset, clinical features was noted in all the patients. A complete neurological examination was done in all the patients. The modified Patel and Jog criteria for gradation of tetanus were used for determining severity of tetanus. Blood samples of all subjects were drawn on admission and routine laboratory studies were performed. Complete blood counts, blood sugar, serum Na<sup>+</sup>, K<sup>+</sup>, calcium were analyzed.

Prompt treatment was started once the diagnosis was made. The patients were treated as per standard protocol of the department. The management included antibiotics (i.e. Penicillin or Metronidazole), proper wound care, human tetanus immune globulins in appropriate doses and active immunization with injection Tetanus Toxoid at the time of admission. Tetanus Toxoid dose was repeated at the time of discharge. Diazepam, clobazam and Magnesium sulphate was given for the control of spasm. Mechanical ventilation was instituted in cases of impending respiratory failure.

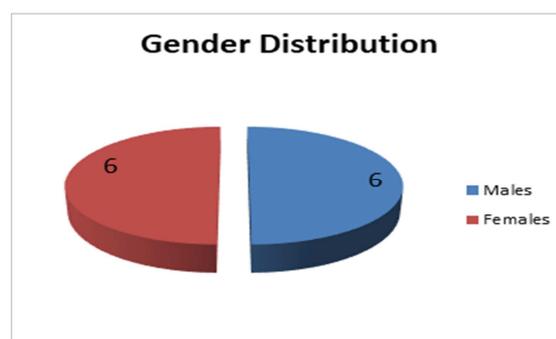
### Inclusion Criteria

- 1) Children below 12 years admitted and diagnosed to be having tetanus.
- 2) Parents given informed consent to be part of study.

### Exclusion Criteria

- 1) Patients more than 12 years of age.
- 2) Children whose parents refused informed consent to be part of the study.
- 3) All the cases in which there was diagnostic dilemma such as brain abscess, parapharyngeal abscess, retropharyngeal abscess, dental abscess, strychnine poisoning, acute encephalitis, epileptic seizures

## RESULTS



**Figure 1: Gender Distribution of the studied cases.**

As per data collection, in age group 0-5 years, there were 50% of cases. In age group of 6-12 years, 50%

of cases had been found. Rural population infected with tetanus was found to be 33.33% and that of urban population had been found 76.66% of cases.

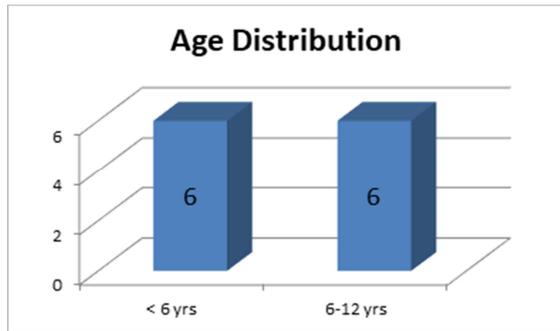


Figure 2: Age Distribution of The Studied Cases.

Out of 12 patients, 5 patients (41.66%) attributed tetanus due to Injury due to various reasons. About 3 patients (25%) acquired tetanus following ear infections. Wounds and burns were found to be responsible source of infection in 2 patients (16.66%) each.

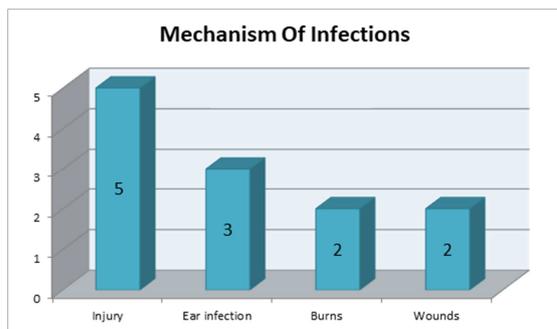


Figure 3: Mechanism of infection in the studied cases.

The most common presenting complaints was found to be trismus (33.33%) followed by hypertonicity in legs (25%), dysphagia (16.66%), stiffness (16.66%) and fever (8.33%).

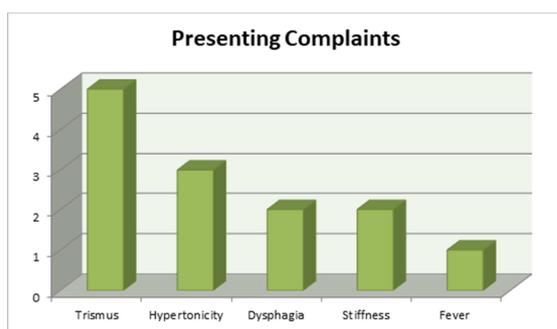


Figure 4: Presenting complaints in studied cases.

Clinical signs such as tachycardia was present in 66.66 % of cases, tachypnea had been found in 33.33 % of cases and autonomic imbalance was seen in 8.33 % of cases.

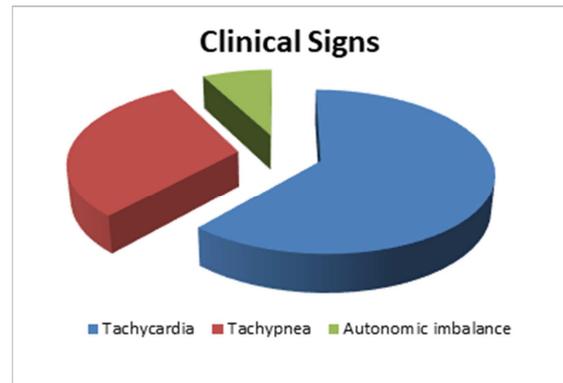


Figure 5: Clinical Signs in the studied cases.

The assessment of severity of tetanus using the modified Patel and Jog criteria for gradation of tetanus showed that 6 patients (50%) had mild grade while 3 patients (25%) had moderate grade tetanus and 3 patients (25%) were having severe of tetanus.

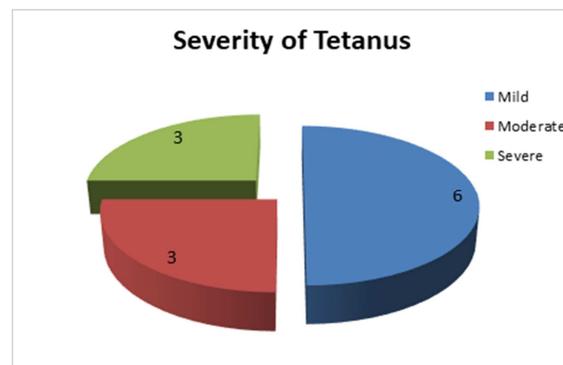


Figure 6: Severity of tetanus by Patel and Jog criteria.

The study of immune status of the patients showed that 50% cases of tetanus were partially immunized while tetanus was seen in 5 (41.66%) and 1 (8.33 %) completely immunized and immunized children respectively.

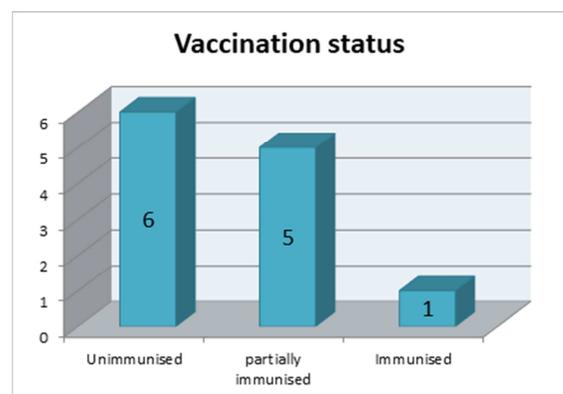


Figure 7: Vaccination status of the studied cases.

Pneumonia was the most common complication seen in treated cases and was seen in 4 (33.33%) patients. Other common complications seen in studied cases included Pneumonia (33.33%), ARDS (16.66%), congestive cardiac failure (16.66%), Renal Failure

(16.66%), DIC (8.33%) and sepsis (8.33%). Out of 12 studied cases 7 patients had progressive form of tetanus and out of these 7 patients 5 patients succumbed to various complications. Out of 5 patients in whom there was non-progressive form of tetanus all patients survived. The overall mortality was found to be 41.66%.

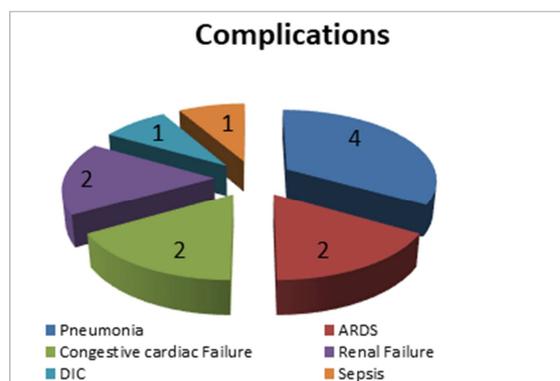


Figure 8: Complication in the studied cases

Comparison of complications in males and females showed that out of 6 male patients 5 patients (41.66%) developed complication and 1 patient (8.33 %) was uncomplicated and out of 6 female patients, 5 patients (41.66%) developed complication and 1 patient (8.33 %) was uncomplicated. By using chi square test, P value was found to be 1 (statistically insignificant difference)

Table 1: Complications of tetanus gender wise

Patients character	complications	No complications	P value
Male	05	01	P = 1*
Female	05	01	

Out of 6 patients in less than 5 years of age complications were seen in all patients (100%) While in patients in between age groups of 5-12 years 4 patients (66.66%) developed complications. By using chi square test, P value was found to be 0.44; these show complications in different age groups wise are insignificant.

Table 2: Table 6-Complications in different age groups

Patients character	complications	No complications	P value
Age group 0-5	06	00	P = 0.44*
Age group 5-12	04	02	

Table 7: Complications in Demography wise.

Patients character	Complications	No complications	P value
Urban	06	02	P = 0.78*
Rural	04	00	

Out of 8 patients belonging to urban area 6 patients (75%) developed complications while out of 4 patients belonging to rural areas all 4 patients

(100%) developed complications. P Value was found to be 0.78 which was statistically 'not-significant'.

## DISCUSSION

The present study was a hospital based prospective study conducted in the department of pediatrics of a tertiary care hospital. The total numbers of cases of tetanus in present study are 12 over the study period of two years .Out of the 12 cases of tetanus there were 6 male and 6 female children with male: female ratio of 1:1. In their study Sinha et al reported that males were predominantly affected (M: F=1.43:1).<sup>[6]</sup> Similarly Komolet et al in a study of 79 adult patients reported male preponderance (M: F =2.4:1.45). Higher incidence in males may be associated with increased outdoor activity and the fact that females are more likely to remain indoors. As a result males are more likely to suffer from contaminated injuries leading to higher incidence of tetanus.<sup>[7]</sup>

In our study majority of the patients came from urban areas. The factors responsible for high incidence in urban areas may include poor immunization coverage in urban slum areas. Dietz et al, in their study concluded that tetanus is an important endemic infection in India and behaviors such as lack of hand washing, delivery practices, traditional birth customs and lack of immunization are all contributory factors. There were 75% of cases referred to this hospital while only 25% of cases were directly admitted to this hospital. This may be due to the fact that this hospital is a tertiary care hospital and has a separate isolation ward for infectious diseases like tetanus.<sup>[8]</sup>

The study of immunity status showed that 6 children (50%) were partially immunized while 41.66 % and 8.33 % children were completely unimmunized and completely immunized. Ignorance and illiteracy augmented by poor socio-economic status were the foremost factor responsible for the poor immunization status. This reflects the inadequacy of our immunization program.

The analysis of probable mechanism of infection showed that most of the patients acquired infection through injuries (41.66%) followed by ear infections (25%), wounds (16.66%) and burns (16.66%). The incidence of tetanus following ear infections was found to be a significant finding of our study. Some of these were severe tetanus. Wagle et al and Phadke et al have reported similar rates of otorrhoea in tetanus in pediatric practice. From these result it is clear that ear discharge in pediatric practice should not be passed over with complacency. A course of Inj. Tetanus toxoid to these children should prove immensely useful in preventing tetanus.<sup>[9,10]</sup>

Trismus was found to be a leading symptom observed in tetanus patients and was found in 33.33 % cases. Rigidity in legs had been found in 25 % of

cases, Dysphagia in 16.66 %, stiffness was present in 16.66 % of cases and fever in 8.33 % of cases. King et al reported similar clinical features in their study of tetanus patients.<sup>[11]</sup>

In the present study, majority of cases were of generalized type i.e 83.33%, while only 2 cases (16.66%) belonged to local tetanus and no cephalic tetanus was observed. Chopra et al have reported 82.23% of generalized type of tetanus, 2% of cephalic tetanus and 0.9 % of local tetanus.<sup>[12]</sup> Patel et al have reported generalized type of tetanus in 75 % of cases and an incidence of 0.9 to 2% for cephalic tetanus.<sup>[13]</sup>

Of these patients, 7 patients (58%) progressed to higher grades whereas only 5 patients did not show progression. Of these patients who progressed, there were mortality seen in 57.15% of cases. However, in patients, in whom there was no progression i.e. 5 (42%) all patients were survived and discharged. Thus, the tetanus cases in which there was no progression in the grade of tetanus, the survival is better.<sup>[14]</sup> In this study, after progression, 4 (57.15%) patients were in severe grade of which all died. 3 (47.85%) patients were in moderate grade of which all survived. Thus in whom the final grade attained was higher, the mortality increased as per the grade attained. According to Tullu et al,<sup>[15]</sup> fourteen patients out of 40 (35%) died after progression from mild to severe grade. Measures like early tracheostomy, elective paralysis and Mechanical Ventilation, and following an established treatment protocol are said to decrease the mortality.

## CONCLUSION

Tetanus is a vaccine preventable disease. Its prevalence has drastically reduced in developed countries but still remain a major health care problem in developing countries. It carries a high morbidity and mortality despite advance medical care. Complete immunization and proper booster doses are important in its prevention.

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