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Original Research Article

Study of clinico-epidemiological factors and outcome of tetanus in a tertiary care hospital

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ABSTRACT

Background: Tetanus is an acute neurological fatal disorder caused by anaerobic spore forming bacillus Clostridium tetani, which produced an exotoxin (Tetanospasmin) in a wound. Purpose of this study was to find out the clinico-epidemiological factors of tetanus and how we can modify or minimize the outcome of this disease.
Methods: This prospective, observational study was conducted in isolation ward in department of general surgery, SMS hospital Jaipur (Rajasthan) from 1 March 2016 to October 2017. Two hundred patients with clinical diagnosis of tetanus, who were admitted in single unit of SMS hospital, recruited in this study. Patients with age less than 1 yr were excluded. After admission, patient's detailed history and thorough clinical examination done. The day to day progress of the cases was followed till the time of their discharge from the hospital. Outcome variables were age, gender, geographical area, causes of tetanus and site of injury, precipitating factors, role of baclofen, morbidity, cured and mortality.
Results: In this study, mean age of patients were 17 years and male to female ratio was 2.44:1. Most of patients were from rural backgrounds with rural to urban ratio of 6.14:1. Overall mortality in present study was 16.5%. The severity of disease directly related with mortality. The mortality for mild, moderate and severe tetanus was 0%, 1.9% and 68.1% respectively.
Conclusions: Though tetanus is a vaccine preventable illness, its prevalence is high in our country. The incidence of tetanus can be reduced by: strengthening of primary immunization programme; proper wound management and giving prophylactic tetanus immune globulins along with tetanus vaccine.

Keywords: Mortality, Severity, Tetanus

INTRODUCTION

Tetanus is an acute neurological fatal disorder caused by anaerobic spore forming bacillus Clostridium tetani, which produced an exotoxin (Tetanospasmin) in a wound. This disease is characterized by progressive muscle rigidity and a spasm of the skeletal muscles.[1] Tetanus vaccination is included in routine immunization programmes to control the tetanus. But a goal for its eradication has not been established.[2]

Incidence of tetanus is rare in the developed countries. Reported tetanus cases had declined >95% and tetanus death had declined >99% in the United States since 1947.[3] The annual mortality rate per 100,000 people from tetanus in India has decreased by 86.3% since 1990, an average of 3.8% a year.[4] This decline has resulted from the widespread use of tetanus toxoid in wound management, improved childbirth practices and to increased levels of maternal immunity resulting from universal childhood vaccination. As of December 2014,

30 of the 36 states/UTs achieved Maternal and Neonatal tetanus elimination and in May 2015, India was officially certified as achieving maternal and neonatal elimination i.e. <1 cases per 1000 live birth.[5]

Purpose of this study was to find out the clinico-epidemiological factors of tetanus and how we can modify or minimize the outcome of this disease.

METHODS

This hospital based prospective, observational study was conducted in isolation ward in department of general surgery, SMS hospital Jaipur (Rajasthan) from 1 March 2016 to October 2017. Two hundred patients with clinical diagnosis of tetanus, who were admitted in single unit of SMS hospital, recruited in this study. Patients with age less than 1 year were excluded.

The patients were admitted in separate rooms reserved for tetanus cases. After admission, patient's detailed history and thorough clinical examination done, and the findings entered in proforma. The day to day progress of the cases was followed till the time of their discharge from the hospital.

Table 1: Traditionally used grading severity of tetanus.

Criteria	Points	Grade
Age >60 years	01	Total scores Mild: 0-2 Moderate: 3-4 Severe: ≥5
Incubation period <7 days	01	
Onset times <48 hours	01	
Dysphagia	01	
Generalized rigidity	01	
Reflex spasm	01	
Frequent spontaneous spasm	01	
Autonomic imbalance as evidenced by excessive sweating, fluctuating BP	02	
Post abortal tetanus	01	
Total	10	

All patients received standard treatment for tetanus and were actively immunized with tetanus toxoid 0.5 cc intramuscularly stat. Human tetanus immunoglobulin (HTIG) was given intrathecally in appropriate doses according to age of patients.

The repetition of HTIG was done on alternate day depending on patient's clinical response to treatment. Most of patients had urinary retention due to sphincter spasm so catheterization to all patients was done and input output chart was maintained. Outcome variables were age, gender, geographical area, causes of tetanus and site of injury, precipitating factors, role of baclofen, morbidity, cured and mortality.

Scoring was done as recommended by the modified scoring system (Table 1) derived from Singh and Patel, which is traditionally used for tetanus grading.[6]

Statistical analysis

Statistical analysis was performed with the SPSS, version 21 for Windows statistical software package (SPSS inc., Chicago, IL, USA). Qualitative data were expressed in proportion and percentage and inferred by Chi-square test and quantitative data were expressed in mean±SD and inferred by Student 't' test. For significance P Value <0.05 was considered significant. Sample size was calculated 189 subjects at 95% confidence limit and 20% relative allowable error. So, for study purpose 200 tetanus cases were taken. Informed consent was taken from each patient.

RESULT

In this study, mean age of patients were 17 years and male to female ratio was 2.44:1. Most of patients were from rural backgrounds with rural to urban ratio of 6.14:1.

Overall mortality in present study was 16.5% (33/200). We found that as age of patient's advances, mortality increases. Mortality rate was 13.3%, 18.8%, 21.4% and 25% in age groups of 1-20 years, 21-40 years, 41-60 years and >60 years respectively (p value = 0.069). Male and female mortality was 16.19% and 17.24% respectively (p value = 0.856). The mortality in rural and urban population was 16.27% and 17.85% respectively (p value = 0.834).

Trauma was the commonest cause of tetanus in 56% and next commonest cause was otic 21.5%. The mortality was highest in case of post burn tetanus i.e. 80% followed by post abortal tetanus 50%, traumatic tetanus 18.75% (Table 2).

Table 2: Causes of tetanus.

Cause	Mortality
Burn (n=5)	4/5 (80%)
Idiopathic (n=26)	3/26 (11.5%)
Otic (n=43)	3/43 (6.9%)
Post abortal (n=4)	2/4 (50%)
Post infection (n=10)	0/10 (0%)
Traumatic (n=112)	21/112 (18.8%)

The most common anatomical site of traumatic injury was foot and toes (33%), followed by face (21.4%), head (15.17%), finger and hand (12.5%), forearm and arm (7.1%), buttock and thigh (5.4%) and leg (5.4%). The mortality associated with in case of injury to forearm & arm, face, head, thigh and buttock. Finger and hand, foot and toe and leg were 50%, 37.5%, 29.41%, 16.6%, 7.14%, 2.7% and 0% respectively.

The severity of disease directly related with mortality. The mortality for mild, moderate and severe tetanus was 0%, 1.9% and 68.1% respectively.

In present study, the highest mortality was found in those patients who had incubation period of <7 days as compared to patients with incubation period of >7 days. We also found that mortality was more in patients with duration of onset of spasm < 48 hours as compared to duration of >48 hours. Patients, who were not having any spasm, were survived (Table 3).

Mean duration of spasms, locked jaw and rigidity in cured patients were 3.6±6.3 days, 9.9±5.2 days and 14.4±7.1 days respectively. Mortality in ICU patients and Tracheostomy patients were high in severe grade as compared to moderate grade (p value 0.068 and 0.053 respectively).

Mean duration of oral baclofen therapy and hospital stays in cured patients were also high in severe grade, which were statistically significant (Table 4).

Table 3: Mortality according to incubation period and period of onset of spasm.

	Incubation period		
	<7 days (n=51)	≥7 days (n=125)	Unknown (n=24)
Mortality	21/51 (41.17%)	8/125 (6.4%)	4/24 (16.7%)
Duration of onset of spasm			
	<48 hrs (n=38)	> 48 hrs (n=60)	Absent spasm (n=102)
Mortality	25/ 38 (65.8%)	8/ 60 (13.3%)	0/102 (0%)

Table 4: Mortality in ICU patients and tracheostomy patients, duration of oral baclofen therapy and hospital stays in cured patients according to grade of tetanus.

	Mild	Moderate	Severe	p-value
Mortality in ICU patients (n=40)	0	1/4 (25%)	29/36 (80.5%)	0.068
Mortality in Tracheostomy patients (n=47)	0	1/5 (20%)	31/42 (73.8%)	0.053
Mean duration of oral baclofen therapy in days (Cured patients)	10.3±2.3	12.6±3.0	14.5±6.5	0.0003
Mean hospital stays (days)	7.1±3.2	11.9±4.5	23±13.7	0.00001

In this study authors found that wound status of patients also affect mortality. Patients with clean contaminated and grossly contaminated wound had mortality of 4.39% and 55.88% respectively (p value 0.0001). In present study it was founded that number of intramuscular and intrathecally doses are directly proportional to severity of tetanus.

Table 5: Comparison of grading of tetanus to number of Intrathecally (I.T.) dose of TTIG.

Number of I.M. dose TTIG	Number of cases	Number of cases		
		Mild	Moderate	Severe
1	95	66	24	5
2	21	2	10	9
3	10	-	1	9
4	5	-	3	2

Authors analyzed that in 95 patients of tetanus patients total one dose of TTIG intramuscularly was given; Out of these 95 patients 66, 24 and 5 were mild, moderate and severe cases respectively. In 21 cases total two dose of IM, TTIG were given; 2 cases- mild, 10 cases-moderate and 9 cases-severe. In 10 cases total three dose of IM, TTIG were given; 1 case- moderate and 9 cases-severe. In 5 cases total four dose of IM, TTIG were given; 3 cases- moderate and 2 cases-severe (Table 5).Total one intrathecally dose of TTIG was given in 119 patients; mild, moderate and severe cases were 91, 12 and 16 respectively.

Total two I.T. dose of TTIG were given in 60 patients; mild, moderate and severe cases were 10, 35 and 15 respectively. Total three I.T. dose of TTIG were given in 19 patients; mild, moderate and severe cases were 0, 4 and 15 respectively. Total four I.T. doses were given in only 1 patient that was severe case (Table 6).

DISCUSSION

A total two hundred cases were enrolled for study from March 2016 to October 2017 by excluding absconded cases and those left hospital against medical advice. This type of hospital-based studies can help in developing the new strategies to reduce the number of tetanus and to plan for its elimination. Hence, we made an attempt, this kind of study in present hospital mainly to estimate the burden of Tetanus and its endemicity.

In developed countries tetanus occurs mainly in elderly due to declining in antibodies and in developing countries tetanus is common in young due to lack of effective

immunization program and appropriate treatment of injuries. In this study majority of patients were below 40 year of age, male and belonging to rural area.

Trauma (56%) was the most common cause of tetanus, followed by Otogenic cause (21.5%). Lower limb was the most common site of injury. Mostly patients acquired tetanus following trauma which was mainly due to working bare footed in the fields and road traffic accidents.[7,8]

In present study overall mortality rate is 16.5% which is quite consistent with the observation reported by Younas at el (18%) and Kole et al (21.6%), whereas Anuradha and Marulappa et al had reported higher mortality rate, 37.78%, and 42.2% respectively.[7-10] The present study observed that overall mortality due to tetanus was much lower compared with other Indian studies due to timely and proper management.

Authors found that patients of post burn and post abortal were severe form of tetanus having the mortality 80% and 50%. Post traumatic, idiopathic and Otogenic tetanus were of less severe type having mortality 18.7%, 11.5% and 6.9% respectively. Kole et al and Yadav et al reported 100% and 70% mortality in case of post abortal tetanus.[10,11]

Incubation period and onset of spasm were inversely proportional to the mortality rate. In present study the Incubation period could be determined in 88% patients in whom the source of entry could be identified. The patients with incubation period of less than 7 days had higher mortality rate of 41.17%, compared to 6.4% mortality in patients with incubation period of more than 7 days. Similar findings were also observed by Marulappa et al, Rani et al and Patel et al.[8,12,13]

The mortality of tetanus was also associated with severity of tetanus, duration of rigidity and spasm. Mortality in ICU patients and tracheostomy patients, duration of oral baclofen therapy and hospital stays in cured patients were more in severe tetanus as compared to mild to moderate tetanus. Mukherjee et al concluded that patients in stage III (severe) of the disease referred for tracheostomy hardly ever recovered while patients in stage II (moderate) on whom tracheostomy was performed early stood the best chance of survival and recovery.[14]

Decrease mortality in present study is quite remarkable and not reported by Indian authors in the literature. The reasons are larger dose of HTIG (Human tetanus hyper immunoglobulin), better sedation and muscle relaxants, proper nursing care and ICU admission and tracheostomy when indicated.

Limitation of present study is relatively small number of patients. So, this was balanced by the combination of the prospective and retrospective study. This was a tertiary level hospital-based study; large scale surveys like at the level of primary health centre, community health centre are needed to provide the valuable data for prevention and control of tetanus in future.

CONCLUSION

Though tetanus is a vaccine preventable illness, its prevalence is high in present country. The incidence of tetanus can be reduced by: strengthening of primary immunization programme; proper wound management and giving prophylactic tetanus immune globulins along with tetanus vaccine.

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