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ORIGINAL ARTICLES

Indian experience of tetanus – A study from south India

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Abstract: *Introduction: Tetanus is an old world disease where 2 centuries ago people had realized the link between wound leading to muscle spasm and fatality, Even today there are many cases of fatalities of tetanus being reported from different parts of the country even after viability of a tetanus toxoid and Immunoglobulin injections. This one of very few recent studies done in India on tetanus, as there is very little data available on tetanus so we are trying to share our experience on tetanus, so it will help the physicians to get a better understanding.*

Materials and Methods: This retrospective study has done collecting the patients' detail from 2017- 2019, detailed case sheet review was done and the patients' clinical presentation and the prognosis were noted in predesigned format. Inclusion criteria – all diagnosed cases of tetanus, exclusion criteria – patient already received treatment from the local hospital. The patient details were kept confidential during all times.

Results: The total of 58 cases – 35 males and 23 females, The average duration of hospital stay was 15 days. The most common occupation were farmers (barefoot workers). The site of injury was the foot in 65% cases followed by injuries to the fingers or the hand in 30% and 5% cases due to injury while tooth picking with a pin, splinter removal using pins. Clinical symptoms – trismus “lockjaw” (41), difficulty in walking (2), limb pain/stiffness (17), back muscle pain/stiffness (12), dysphagia (7), 72% autonomic dysfunction. Opisthotonus position and risus sardonicus developed after 7-8 days of infection. 20% of cases were vaccinated still developed diseases. 18% mortality was noted most cases were unvaccinated cases.

Conclusion: Tetanus is preventable diseases if TT vaccination and IMMUNOGLOBIN are administered on time. In all primary health care levels, the cold chain should be maintained for vaccines. The patients should be made sensitized about the consequence of the disease process.

Keywords: tetanus, bacterial infection

INTRODUCTION

Tetanus is an old world disease, where 2 centuries ago people had realized the link between wound leading to muscle spasm and fatality. It was a disease that the ancient physicians of Egypt and Greece dealt with often, however,

now its prevalence in developed countries has decreased significantly due to improvements in wound care and hygienic practices [1]. Arthur Nicolire isolated tetanus toxin from the soil in 1884 [2]. Even today it's a major health problem in developing countries and developed countries

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(Anuradha 2006; Ogunrin 2009) [2, 3].

In 1884 the etiology was further understood. The first transmissibility was demonstrated by Antonio Carle and Giorgio Rattone who were pathologists in Turin. They produced tetanus in rabbits by injecting pus from a person with fatal tetanus into their sciatic nerves [4].

Tetanus is a non-communicable, potentially fatal disease contracted by exposure to the spores of *Clostridium tetani*. It is a gram-positive, anaerobic spore-forming bacteria that produces an exotoxin called tetanospasmin which is responsible for the lethal effects of the disease. It is more commonly seen in developing countries as a result of low vaccination coverage, poorer medical care, and more risk of exposure [5].

Tetanus spores are present in the environment irrespective of specific geographical locations. Once the disease is contracted, it is difficult to manage despite even intensive advanced medical care if timely medical intervention is absent. The high infection and fatality rates in India could be a result of incomplete vaccination coverage, lack of awareness of the protocols to be followed after sustaining a wound, lack of resources in hard reach areas, lack of medical facilities in such areas [6].

Spores are present everywhere in the environment, more commonly in the soil of warm and humid areas. The dormant spores develop into active toxin-producing bacteria in the presence of a favorable environment, i.e. devitalized, dead or necrotic tissue. They enter the human system via open or infected wounds, or even through unclean delivery practices, burns, dental procedures, or surgeries. The toxin, tetanospasmin thus produced by the active bacteria results in widespread sustained contraction and spasm of the muscles in the body, i.e. dystonia. This is via the prevention of the release of the inhibitory neurotransmitter Gamma-aminobutyric acid (GABA) into the synaptic cleft. This results in manifestations such as pain, headache, trismus, stridor, laryngeal spasm, rigidity, opisthotonus, and stiffness [7].

Dystonia can manifest in various ways, such as with torticollis, tortipelvic, torticollis oculogyric, buccolingual, or opisthotonic [8].

The prognosis of a case can be assessed via the Phillips scoring system (Table 1).

The spasms are most in the first 2 weeks, the autonomic disturbances following them by a few days and peaking in the second week. The muscle spasms and convulsions are often precipitated by even minor stimuli, such as light, touch, or noise. The severe spasms and muscle rigidity often necessitate paralysis in cases of tetanus. Autonomic

disturbances occur in the form of labile hypertension, sweating, tachycardia in severe cases.

Table 1: Prognostic Scoring Systems in Tetanus Phillips Score

Factor	Score
Incubation Time	
< 48 hours	5
2-5 days	4
5-10 days	3
10-14 days	2
> 14 days	1
Site of infection	
Internal and umbilical	5
Head, neck, and body wall	4
Peripheral proximal	3
Peripheral distal	2
Unknown	1
State of protection	
None	10
Possibly some or maternal immunization in neonatal patients	8
Protected > 10 years ago	4
Protected < 10 years ago	2
Complete protection	0
Complicating factors	
Injury or life-threatening illness	10
Severe injury or illness not immediately life-threatening	8
Injury or non-life-threatening illness	4
Minor injury or illness	2
ASA Grade 1	0
Total Score	

The diagnosis of tetanus is clinical for the most part. The WHO definition of adult tetanus requires at least one of the following signs: trismus or rismus sardonicus; or painful muscular contractions [6].

To manage this condition: isolation in a dark and quiet room, with heavy sedation and muscle relaxant administration to prevent spasms. Benzodiazepines are most commonly used; it's favored for its combination of antispasmodic, muscle relaxant, anxiolytic and sedative effects, which are particularly useful for tetanus patients. Diazepam modulates GABA-A transmission and increases presynaptic inhibition. Dantrolene is a muscle relaxant that is effectively used in the treatment of malignant hyperthermia and neuroleptic

malignant syndrome [9]. Studies have proven that magnesium sulfate has significant efficacy in the management of autonomic symptoms [10].

Antibiotics are also administered in tetanus, penicillin, and metronidazole being favored. It reduces the proliferation of the bacteria at the inoculation site.

For neutralization of circulating toxin, tetanus immunoglobulin is used. There is no certified fixed-dose; for prophylaxis in susceptible wounds, it is 250 IU of TIG administered intramuscularly. For active tetanus case a dose ranging from 3000 to 60000 IU may be administered, 500 IU at a time [11].

Recurrent tetanus is a possibility as infection does not provide immunity to subsequent infections [12].

Tetanus being a potentially fatal disease, the medical fraternity must emphasize its prevention rather than its treatment. Despite it being an “old world” disease, it is surprisingly prevalent in India, along with the other developing nations. This could be attributable to many factors, such as inadequate knowledge of wound hygiene, irregular immunization, lack of awareness on what the disease is, and how fatal it can be, unequipped health centers, unavailability of vaccine, etc. However, the annual mortality rate per 100,000 people from tetanus in India has decreased by 86.3% from 1990 to 2017 [13]. We are doing this study to understand the clinical profile of tetanus in our region.

MATERIALS AND METHOD

This is a retrospective hospital-based study done during the year 2017-2019 in Epidemic Diseases Hospital, Bangalore. All the cases presenting to the hospital and which were diagnosed with tetanus were included in the study. The patients who were started on treatment and then referred to the hospital were excluded from the study.

The patient's demographics and clinical data were collected and compiled in an excel sheet and analyzed. The patient data which was collected maintained patient confidentiality throughout.

RESULTS

The total number of patients who meet the inclusion criteria were 58 cases. The majority around 87% of the cases presented from the rural area and 13% were urban areas. The sex distributions were 35 males and 23 females. The majority of the patients were in the age group of 55-60 years; the minimum and maximum age being 5 years and 89 years respectively.

The average duration of hospital stay was 15 days, the minimum duration being 1 day and the maximum is 45 days. Out of these cases, Discharge against medical advice was done in 11 cases due to patients stating personal reasons.

The site of injury was an injury to the foot in 65% of the patients, followed by injuries to the fingers or the hand in 30% and 5% were cases of injury due to tooth picking with a pin, splinter removal using pins. Out of the injuries which occurred, the majority of them happened in agriculture fields summing up to 70%; and 10 % were from carpentry works; 10% due to fall/trauma/accidents.

In 25 cases the wound was noted and in the others, it was a healed wound.

The mean incubation period was around 14.5 days from the time of injury to the development of symptoms in the patients who survived. Totally 14 deaths noted, the cause of death was a late presentation to the hospital, taking alternative medicine treatment; ignorance also contributed to delayed presentation to the hospital. The fatal cases also had multiple comorbidities like type 2 diabetes mellitus, hypertension, almost all the cases were in the age group of 65-75 years. The progression of illness was rapid and they passed away within 5 days. The patients with nil comorbidities have a better chance to recover. Overall 36 patients had NIL co-morbidities. 95% of death cases hadn't received tetanus immunoglobulin.

During the initial presentation of symptoms:

- lockjaw/inability to open mouth: 41
- neck stiffness/pain: 25
- difficulty in walking: 2
- limb pain/stiffness: 17
- back muscle pain/stiffness: 12
- dysphagia: 7

Towards the peak of the diseases, most of the symptoms were present for all the patients.

72% of the cases were noted to have autonomic dysfunction like fluctuation in pulse, blood pressures, sweating, and altered respiratory pattern on and off, postural fall of BP.

DISCUSSION

After compiling the epidemiological and clinical profiles of these patients we concluded that in a majority of the cases, the disease was introduced via injuries sustained in agricultural fields. This is in accordance with a paper published by Arijit Sinha, Bikash Chandra Seth et. In this study, they found that 81.34% of their patients hailed from rural areas [14]. The agricultural population constitutes a major part of the country's society, therefore we must focus

on preventative and awareness promoting methods to significantly reduce the risk as well as improving prognosis.

Another inference reached was the predisposition of tetanus to develop in males; according to our study 35 of the 58 cases were male which comes up to 60.34%. This is in line with a study conducted by Anuradha et. al [2].

Both of these inferences can be explained by the fact that the male population of the lower socio-economic strata who spend most of their day in the fields will inadvertently be at much higher risk of acquiring tetanus. Also, the female population whose attire covers more body surface, are additionally protected by the antenatal dose of tetanus vaccine that they receive as part of the routine immunization schedule prescribed by the government. These factors, along with the generally lower frequency of going into the fields, put them at lesser risk compared to men.

In the study conducted by us, it was also found that the majority of the patients were in the age group of 55-60 years. This is in accordance with the studies done by V G Marulappa [15] and Chalya et al. [16] which concluded that the majority of patients were above 40 years old.

Another finding of the study we conducted was that the average duration of hospital stay was 15 days, which is almost in accordance with to study done by S Chaudhary in which the mean duration of hospital stay was 12 days, ranging from 1-32 days [17].

In the collected data of patients presenting to our hospital, the site of injury the foot in 65% of the patients. This could be because field workers and people in rural areas do not use adequate foot protection when working in the fields or elsewhere and thus are more susceptible to sustaining tetanus prone wounds. This is in accordance with the findings of other studies [14, 17, 18], one being a paper by K.V.L. Sudha Rani [18] in which 79% of the cases included in their studied involved wounds on the lower extremities.

In 25 cases the wound was noted and in the others, it was a healed wound. In other studies however it was noted that commonly they presented with acute forms of injury rather than old ones [18,19]; in a study by V G Marulappa, they recorded that 47.9% of their patients presented with acute trauma, with 14.6% presenting with older wounds [15].

The mean incubation period was around 14.5 days from the time of injury to the development of symptoms in the patients who survived, which is in accordance with other studies conducted, the study conducted by AHM Feroz et al reported it to be 10.8±2.1 days with a range of 3-28 days [18].

According to the compiled data of the clinical presentations of the cases that came to the hospital, the most common presenting feature is lockjaw, i.e. inability to open the mouth, which was present in 70.68% of the patients. The others were neck stiffness and pain (43.1%), limb pain (29.3%), back pain (20.68%), dysphagia (12.06%), and difficulty in walking (3.4%) in decreasing order of frequency. This is in line with the findings of a study by Pornchai S in Thailand, in which 87.2% of the cases had presented with trismus [20]. Other studies also infer trismus to be the most common presenting feature [14, 21]. In a study conducted by Muhammad Saleh Khakheli et al., they reported patients to be clinically diagnosed with tetanus if they had the following symptoms- trismus, neck or abdomen rigidity, and reflex spasms; and were accordingly classified as generalized or cephalic tetanus [22]. According to a study carried out in Pakistan by Mahsud I U et.al, the most common symptoms tetanus patients presented with were lockjaw, dysphagia, and trismus [23].

Out of the 58 cases, 14 deaths were noted, which sums up a case fatality rate of 24.1%. Other studies yielded similar values, for example in a study conducted in Ethiopia by Amare A. they had a case fatality rate of 27% [24]. In a study conducted in Solapur by A B Pawar et al., they found that in 26.3% of the cases complications such as respiratory failure, cardiac arrest, septicemia, etc arose, and in those with complications, there was a 75% fatality [25]. Autonomous complications have been reported in various other studies which significantly worsened the prognosis [1, 26]. Case fatality can be attributed to several factors, such as the presence of comorbidities, advanced age, the degree and mechanism of the wound, the time of presentation, lack of awareness of preventative measures, and immunization. 95% of the fatalities had never received immunoglobulin. Also, mortality would seem to be inversely proportional to the duration of the incubation period according to various studies [27, 28, 29].

72% of the cases were noted to have autonomic dysfunction like fluctuation in pulse, blood pressures, sweating, and altered respiratory pattern on and off, postural fall of BP. In other studies also autonomic dysfunction was found to be a frequent complication [18, 30]. In a paper in which the study was carried out in Mysore, it is reported that most of their cases too died as a result of cardiorespiratory arrest [15].

Out of the total number of patients, 11 of them went DAMA, i.e. had to be discharged against medical advice. This could be due to several reasons. A simple lack of awareness as to the seriousness of the condition, financial constraints, customs and beliefs, faith in alternate methods of non-medical treatment, etc, etc. The only way to minimize such

cases is to make admission financially more feasible, increase the availability of immunoglobulin, ensure the adequate counseling of patient and attenders, and to spread awareness in the community as to how this disease must be treated at a fully equipped hospital, as well as the potential fatality of the disease.

CONCLUSION

Tetanus is a treatable disease if there are timely precautions and interventions, such as taking tetanus toxoid injection, followed by Tetanus immunoglobulin and wound care. Through our study, we want to promote awareness among the doctors about the current situation of tetanus and emphasize that it's a still ongoing and ever-prevalent problem and we have to address it by working together. We need to create awareness among the general public regarding basic wound treatment, the prescribed immunization schedule. We must also emphasize the

symptoms and signs of the disease to them so that they may identify it early and allow for timely intervention, which significantly improves the prognosis. Most of all, it needs to be made known to the public that this is an ailment, that if left untreated, has a very high chance of fatality and must not be underestimated.

Disclosure statement

This is a retrospective study, where there was no involvement of any human subject or any intervention, it was just an observational study, and only data collected from the case sheet was done and patient details were kept confidential at all times.

The institutional ethics committees approved was this research complied with acceptable international standards (such as the Declaration of Helsinki)

Acknowledgments

Author contribution: VSS was responsible for the idea, and conduct of the study; SN was responsible for the organization and fieldwork; AA was responsible for data collection; VRM was responsible for paper writing and coordination.

References:

1. Bleck TP. Clostridium tetani (tetanus). In: Mandell GL, Bennett JE, Dolin R, eds. Principles and Practices of Infectious Disease. 6th edition. Vol 2. Philadelphia: Churchill Livingstone, 2005: 2817–2822.
2. Anuradha S (2006) Tetanus in adults—a continuing problem: an analysis of 217 patients over 3 years from Delhi, India, with special emphasis on predictors of mortality. Med J Malaysia 61(1):7–14
3. Ogunrin AO (2009) Tetanus—a review of current concepts in management. J. Postgrad. Med. 11(1):46–61
4. Atkinson, William (May 2012). Tetanus Epidemiology and Prevention of Vaccine-Preventable Diseases(12 ed.). Public Health Foundation. pp. 291–300. ISBN 9780983263135
5. Tetanus and Clostridium tetani—a brief review; Med Monatsschr Pharm. 2015 Feb;38(2):57-60.
6. Tetanus vaccines: WHO position paper – February 2017
7. J J Farrar, L M Yen, T Cook, N Fairweather, N Binh, J Parry, C M Parry; Tetanus; J Neurol Neurosurg Psychiatry 2000;69:292–301292
8. Dingli, Kyra, Rhoda Morgan, and Clifford Leen. "Tetanus versus acute dystonic reaction caused by metoclopramide." BRITISH MEDICAL JOURNAL 7599 (2007): 899.
9. Chaturaka Rodrigo, Deepika Fernando, and Senaka Rajapakse; Pharmacological management of tetanus: an evidence-based review; Crit Care. 2014; 18(2): 217. Published online 2014 Mar 26. doi: 10.1186/cc13797
10. Thwaites CL, Yen LM, Loan HT, et al. Magnesium sulphate for treatment of severe tetanus: A randomised controlled trial. Lancet 2006; 36:1436-1443
11. <https://www.cdc.gov/tetanus/clinicians.html>
12. Boutros El-Haddad, M. D., Jill Hanrahan, and Maha Assi. "Tetanus: The Forgotten Disease."
13. Global disease burden. healthgrove.com/l/8386/tetanus in India
14. Bhattacharyya, Ranjan. (2014). STUDY OF CLINICAL PROFILE OF TETANUS PATIENTS AT ID & BG HOSPITAL, KOLKATA. National Journal of Medical and Allied Sciences. 3. 4-8.
15. Marulappa,V.G.,Manjunath,R.Mahesh Babu,N.Malige Gowda,L.(2012).A Ten Year Retrospective Study on Adult Tetanus at the Epidemic Disease (ED) Hospital, Mysore in Southern India: A Review of 512 Cases, 6(8), 1377-1380.
16. Chalya PL, Joseph BM, Ramesh MD, Nkinda M, Stephen EM, Japhet MG, A 10-year experience with Tetanus at a tertiary hospital in north western Tanzania: A retrospective review of 102 cases World Journal of Emergency Surgery 2011 6:20
17. Shachindra Chaudhary Kaushal Kumar, Study on clinical profile of adult tetanus patients at infectious disease hospital, N.M.C.H, Agamkuan, Patna International Journal of Medical and Health Research ISSN: 2454-9142
18. Feroz AHM, Rahman MH, A ten-year retrospective study of tetanus at a teaching hospital in Bangladesh J Bangladesh Coll Phys Surg 2007 25:62-69.
19. Lau LG, Kong KO, Chew PH, A 10-year retrospective study on Tetanus at a general hospital in Malaysia Singapore Med J 2001 42(8):346-50.
20. Pornchai S, Chutarat S, Kitti L, Suwanna S, Kanitpong P, Tetanus - A retrospective study of the clinical presentations and the outcomes in a medical teaching hospital J Med Assoc Thai 2009 92(3):315-19.
21. Baumgardner, Dennis J. "Soil-related bacterial and fungal infections." The Journal of the American Board of Family Medicine 25.5 (2012): 734-744.
22. Khakheli, M.S. & Khuhro, B.A. & Jamali, A.H.. (2013). Tetanus: Still a killer in adults. Anaesthesia, Pain and Intensive Care. 17. 149-153.
23. Mahsud, I. U. (2005). Mortality rate in adult tetanus patients in district DI Khan, NWFP Pakistan. Biomedica, 21(2), 86-89.
24. Amare A, Yami A, The case fatality of adult Tetanus at the Jimma University Teaching Hospital, southwest Ethiopia African Health Sciences 2011 11(1):36-40.
25. Pawar AB, Kumawat AP, Bansal RK, An epidemiological study on the Tetanus cases which were admitted to a referral hospital in

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- Solapur Indian Journal of Community Medicine 2004 29(3):115-116. Available from: <http://www.ispub.com:80/journal/a-retrospective-clinical-study-of-factors-affecting-tetanus.html/>
26. Younas NJ, Abro AH, Das K, Abdou AMS, Ustadi AM, Afzal S. Tetanus: Presentation and outcome in adults. *Pak J Med Sci* 2009;25(5):760-765
27. Khrisnan, Lohghinee, Anam Ong, and Ramdan Panigoro. "Factors Affecting Mortality in Adult Tetanus Patients." *Althea Medical Journal* 2.2 (2015).
28. Owolabi, L. F., A. G. Habib, and M. Nagoda. "Predictors of mortality among adult tetanus patients in Northwestern Nigeria." *Neurology Asia* 16.3 (2011).
29. Chukwubike, Onwuchekwa Arthur, and Asekomeh Eshiofe God'Spover. "A 10-Year Review of Outcome of Management of Tetanus in Adults at a Nigerian Tertiary Hospital." *Annals of African Medicine* 1 Sept. 2009: 168–172. *Annals of African Medicine*. Web.
30. Derby, A., Amdu, A., Alamneh, A. et al. Clinical profile of tetanus patients attended at Felege Hiwot Referral Hospital, Northwest Ethiopia: a retrospective cross sectional study. *SpringerPlus* 5, 892 (2016). <https://doi.org/10.1186/s40064-016-2592-8>