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ORIGINAL ARTICLE

Risk factors and clinical Outcome of Tetanus in Pediatric ICU of a developing country.

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ABSTRACT… Objective: To evaluate the Risk factors and clinical Outcome of Tetanus in Pediatric ICU of a developing country. **Study Design:** Prospective Cross-sectional study. **Setting:** PICU of National Institute of Child Health Karachi. **Period:** September 2019 to March 2020. **Material & Methods:** All cases of tetanus aged one month to 15 years were included with non-probability, convenient technique. Only children whose parents/guardians did not consent to the study participation, were excluded. **Results:** We enrolled 53 patients in study. Mean age was 8.2 years. Gender distribution was 33:20 male to female. History of trauma was present in 27% cases. Maximum ICU stay was 16 days (mean). Metallic material was used in 9/27 (33%) and wooden material was used in 4/27 (15%) patients, while in 14(51%) other materials were used. Otogenic infection was present in 9/53 (17%), post injury infection occurs in 1/53 (2%) while others are unknown. **Conclusion:** Tetanus is preventable disease with high morbidity, and mortality. It can be addressed at mass level with campaigns and prohibited with compliant EPI scheduled vaccination.

Key words: Children, Complications, Pediatric Intensive Care Unit, Tetanus.

INTRODUCTION

Tetanus is a vaccine-preventable disease acquired through environmental exposure to spores of Clostridium tetani.[1] It is an acute illness manifested by neuromuscular dysfunction due to a potent exotoxin, tetanospasmin produced by Clostridium tetani. Tonic spasms of the skeletal muscles with paroxysmal contractions are the typical presentations; lockjaw is the initial symptom.[2] Effective immunizations have reduced the incidence of tetanus significantly in the developed world. On the contrary, it remains a major public health problem associated with significant morbidity and mortality in developing countries.[3]

Most cases of tetanus follow an acute penetrating skin injury. The injury may be major but often is trivial, so that medical attention is often not sought.[4] Wherever the immunization programs are in place, the incidence of tetanus declines and the age distribution of case-patients shifts to reflect under immunization.[5]

Principles of management of tetanus cases include admission to dark and quiet room, muscle spasm and rigidity control, autonomic dysfunction control, ventilator support when needed, neutralization of tetanus toxin, wound management, benzodiazepines, antibiotics administration and prevention of recurrence with booster vaccination.[6] The case fatality rates (CFR) of tetanus varies from 10–70%, the highest occurring in developing countries. Availability of pediatric intensive care unit (PICU) reduces CFR to 10–20%.[7]

In a study conducted in children hospital Lahore, 132 children diagnosed as tetanus were enrolled in a duration of 04 years and there was 20 days mean time of stay in PICU with 18% mortality.[8]

National Institute of Child Health (NICH) receives a huge chunk of tetanus cases not only from

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Karachi but also from other parts of Sindh and Baluchistan. However, to the best of our knowledge, no report has been published from this center. Even at country level, there is lacking of complete study that could highlight the risk factors in vaccinated and unvaccinated children and their respective outcome. Hence, this study aims to evaluate the risk factors and clinical outcome of pediatrics tetanus cases admitted to NICH.

MATERIAL & METHODS

The study was prospective cross-sectional conducted prospectively in the pediatric intensive care unit of National Institute of Child Health for the duration of 06 months from September 2019 to march 2020 after ethical approval (IERB: 30/2019). All cases of tetanus age one month to 15 years admitted in the PICU were included with non-probability, convenient technique. Only children whose parents/guardians did not consent to the study participation, were excluded. Tetanus was diagnosed on clinical presentation having muscular spasm with history of risk factor or not. Vaccinated children have the all vaccinations according to EPI schedule, partial with incomplete vaccines and Unvaccinated with No vaccines at all.[9] Autonomic instability was defined as fluctuating hemodynamics. Outcome were the length of stay, alive, expire and referral. Continuous data were analyzed with mean and standard deviation while dependent variables corelated with chi-square test. Confounders were excluded at diagnosis.

RESULTS

We enrolled 53 patients in study. Mean age was 8.2 years. Gender distribution was 33:20 male to female. History of trauma was present in 27% cases. Maximum ICU stay was 16 days (mean). Metallic material was used in 9/27 (33%) and wooden material was used in 4/27 (15%) patients, while in 14 (51%) other materials were used. Otogenic infection was present in 9/53 (17%), post injury infection occurs in 1/53 (2%) while others are unknown.

Age Mean ± SD	 8.02 ± 3.104
Gender Male (n) (%) Female (n) (%)	 33 (62%) 20 (38%)
History of Trauma (n) (%)	27 (51%)
Length of ICU stay in days Mean ± SD	 16.30 ± 12.34
Mechanical ventilation needed (n) (%)	37 (70%)
Duration of Ventilation days Mean ± SD	 12.64 ± 9.91
Autonomic instability (n) (%)	27 (51%)
Tracheostomy (n) (%)	17 (32%)
Packed cell transfusion (n) (%)	25 (47%)
Inotropes (n) (%)	23 (43%)
Outcome Survived (n) (%) Expired (n) (%) Discharged against medical advice (n) (%) Referred cases (n) (%)	 31 (58%) 19 (36%) 01 (2%) 02 (4%)

Table-I. Demographic details of total cohort.

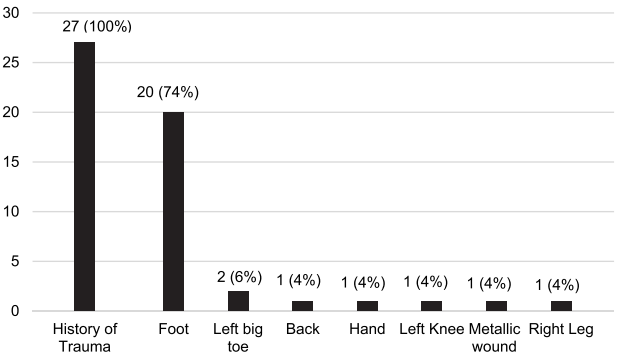

Figure-1. Different sites in trauma patients.

DISCUSSION

Tetanus is a highly ranked global health problem. Yet, in many developing countries including Pakistan it has not been eradicated or even diminished due to low EPI coverage.[10] In this study the average age of children was 8 years. Further classification shows male dominance (62%) over female (38%). This is likely caused by the fact that boys are much more engaged in outdoor rough activities which results for trauma and injuries. Studies done in India also gives an evidence of the fact that boys are much more prone to this infection than to girls.[11]

	Unvaccinated	Partially vaccinated	Appropriately vaccinated	P-Value
Age Mean ± SD	8.43 ± 3.02	7.60 ± 2.9	7.50 ± 3.6	0.603[a]
Gender Male (n) Female (n)	 19 09	 08 07	 06 04	0.636[b]
History of Trauma (n)	12	10	05	0.330 [b]
Length of ICU stay in days Mean ± SD	16.63 ± 10.68	18.0 ± 16.59	12.75 ± 7.96	0.642[a]
Mechanical ventilation needed (n)	21	10	06	0.642 [b]
Duration of Ventilation days Mean ± SD	13.58 ± 8.63	13.10 ± 13.20	12.75 ± 7.96	0.771 [a]
Autonomic instability (n)	12	08	07	0.330 [b]
Tracheostomy (n)	11	03	03	0.429 [b]
Inotropes (n)	11	10	02	0.057 [b]
Outcome Survived (n) Expired (n) Discharged against medical advice (n) Referred cases (n)	 20 08 00 00	 06 07 01 01	 05 04 00 01	0.261 [b]

Table-II. Comparative analysis of different variables with the vaccination status.
a= Annova, b= Chi-square test

In this study the most likely cause emerged to be a history of trauma (51%) followed by Otogenic infection (17%) and post injury infection occurs in (2%) respectively. Otitis media is common in children, which causes irritability in ears and ultimately triggers children to put in their unhygienic fingers into the ears.[12,13] With respect to the fact that C tetani, the tetanus organism gets an ideal environment in the middle ear and mastoid to thrive and reproduce thus recurrent otorrhea contributes to be the second portal of entry for the infection.[14]

It was documented that the most common site for injury was the foot (74%) similar to other studies and material was metallic (33%) because it causes deep wound. Another study also highlights this fact because due to poverty and low socioeconomic status many children in rural areas don't wear shoes, while playing outdoor. On the contrary neglecting of injuries by the parents combined with other factors becomes a great cause of infection.[15]

Autonomic instability causes excessive secretion of acetylcholine which causes bradycardia and hypotension. Together 51% of our patients has these symptoms for which ionotropic support has to be given.

Our study shows that 70% of the cases needed mechanical ventilation either vaccinated or unvaccinated. 45.94% among them have got tracheostomy. Similarly, a study in Ethiopian tertiary care hospital showed that the major cause of death was respiratory distress secondary to muscular spasm.[3] As a result the countries suffering from economic crises and lack of pediatric ICU care will experience a higher rate of mortality. Tracheostomy is preferred because endotracheal tubes itself is a stimulus for muscle spasms.[16] Also, because tracheostomy is indicated for prolong intubation when more than 10 days are required.[17]

On evaluation it emerged that the proportion of vaccinated children was much lesser than to the unvaccinated. In our study (58%) of children survived whereas (36)% expired. Unlike other studies, septic shock was the main cause of

death in our study.[18]

Thus, campaigning and awareness programs should be conducted to eradicate this preventable disease. Furthermore, government should make strict policies for vaccination according to EPI schedule.

CONCLUSION

Tetanus is avoidable disease, if acquired may lead to high morbidity, and mortality. It can be addressed at mass level with campaigns and prevented with compliant EPI scheduled vaccination.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

No.	Author(s) Full Name	Contribution to the paper	Author(s) Signature
1	Murtaza Ali Gowa	Concept of idea, Manuscript Writing.	
2	Farjam Ahmed Zakai	Data collection.	
3	Muhammad Shahzad	Analysis of Data.	
4	Habib Ahmed	Data collection & Interpretation.	
5	Muhammad Ashfaq	Discussion writing.	
6	Zubair Ahmed Khoso	Critical review.