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Research Article

STUDY TO DETERMINE THE DEMOGRAPHIC CHARACTERISTICS, OUTCOMES AND CLINICAL PICTURE OF NEONATAL TETANUS

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Abstract:

Purpose: To determine the demographic characteristics, clinical profile and outcomes of neonatal tetanus.

Study design: A case series.

Place and duration: In the Pediatric Unit-II of Holy Family Hospital, Rawalpindi for one-year duration from April 2019 to April 2020.

Material and methods: The study included records of patients with a clinical diagnosis of neonatal tetanus meeting the standard case definition. Data from the patient files were recorded on the proforma. Data were analyzed using an appropriate statistical test. A p value of <0.05 was considered significant.

Results: Data from 394 patients were analyzed. The mean age and body weight at the time of reporting were 8.99 ± 4.54 days and 2.77 ± 1.27 kg, respectively. There were 270 males (68.5%) and females 124 (31.5%). The majority (77.92%) were delivered at home and on an untrained podium. Three hundred and forty-six mothers (87.82%) were unvaccinated, while 12.8% were partially vaccinated against tetanus. The most common symptom was the jaw lock (84.26%) and spasm (88.57%). Total mortality was 29.19%, while 54.31% of patients improved and were discharged home. In mechanically ventilated patients, the mortality was 21.5%. Preterm babies with tetanus fared the worst, 98.4% died out.

Conclusion: Neonatal tetanus (NT) remains a major health concern and a major contributor to infant and infant mortality in Pakistan. Unimmunized mothers, home deliveries, and cutting the umbilical cord with unhygienic instruments were the main contributors to neonatal tetanus.

Keywords: tetanus, presentation, result.

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INTRODUCTION:

Neonatal tetanus is characterized by stiffness and spasm of skeletal muscles and is caused by the exotoxin of the bacterium *Clostridium tetani*, which are gram-positive anaerobic rods that form spores that are very heat resistant and are common antiseptics. Tetanus is found worldwide but is endemic in developing countries and continues to be a serious health problem in resource-poor countries. Most (90%) of neonatal tetanus develop symptoms within the first 3-14 days of life, with most occurring within 6-8 days. If untreated, the mortality rate is 100%. However, even with inpatient care, 10-60% of neonatal tetanus (NT) cases may die, depending on the availability of intensive care units. Of course, preventive measures for tetanus are more effective than case management, even if full intensive care is available, and certainly much more cost-effective. The tetanus vaccine is an inactivated toxin that was first produced in 1924. Tetanus antitoxin is actively transferred across the placenta from the immunized mother to her fetus, providing passive protection against tetanus in the neonatal period and in the next or second month of life. Maternal and neonate levels of anti-tetanus antibodies at the time of delivery are usually similar. Tetanus toxoid has almost completely eliminated tetanus in developed countries where vaccination is almost universal. According to the World Health Organization (WHO), tetanus is the second leading cause of death in children worldwide from vaccine-preventable diseases. NT accounts for 7% of all newborn deaths worldwide. A number of reasons, ranging from unhygienic deliveries to traditional labor assistants (TBA) and the lack of a tetanus vaccination program, are considered possible causes of the high prevalence of HT in developing countries. The interaction of these factors puts unvaccinated mothers and their babies at risk of contracting tetanus during delivery. Global elimination of NT is defined as reducing the number of tetanus cases to less than 1 / 1,000 live births in each district of each country. Although tetanus is completely preventable through vaccination, the burden of the disease is high. WHO estimated that neonatal tetanus killed about 59,000 newborns in 2008 alone. NT can be prevented by vaccinating women of childbearing age during or before pregnancy. It is estimated that in Pakistan in 1999, there were 28,825 cases with 21,619 deaths, resulting

in a neonatal mortality of 4.08 / 1,000 live births. By June 2010, MNTs had been eliminated in most countries, leaving 40 countries still not eradicated. Pakistan is among the countries where more than 50% of counties are at high risk of MNT due to limited health infrastructure, indicated by 50% or less of tetanus toxoid vaccination. The present study was conducted to review and evaluate the disease pattern and outcome of neonatal tetanus.

METHODOLOGY:

This retrospective study was conducted in Pediatric Unit-II of Holy Family Hospital, Rawalpindi for one-year duration from April 2019 to April 2020. Record data with clinical diagnosis of neonatal tetanus (NT), i.e., lock jaw, generalized spasm (provoked or unprovoked), irritability, fever and opisthotonos. Clinical information was recorded regarding age, sex, body weight, gestation period and clinical symptoms. Important information was also collected on the mothers' immune status, place of delivery, the technique of cutting the string, and the use of material painted on a string. The immediate result was also recorded on the proforma. Data from incomplete data and patients with sepsis, meningitis, kernicterus, asphyxia, and metabolic disorders were excluded from the study. Relevant tests such as CBC, CSF, electrolytes, sugar and ABG (if needed) were performed. All patients were treated according to the hospital's standard protocol. Patients who were critically ill and did not maintain oxygen saturation (O₂) were treated with mechanical ventilation. The data was entered into the SPSS 21.0 and the results were expressed as numbers and percentages.

RESULTS:

Three hundred and ninety-four (394) cases of neonatal tetanus were included in the study. Their mean age at presentation was 8.9 days. The average weight was 2.77 kg. Men dominated (68.5%) and the male to female ratio was 2.1: 1. Most of the patients gave birth at home (77.92%) and 22.08% in the hospital / clinic. They were attended by untrained podiums (95.95%) and doctors (3.05%). The umbilical cords were cut with a knife (35.5%), a blade (21.5%), scissors (25.5%), a razor (10.5%), and unknown (7.0%) objects. Only 12.08% of the mothers were partially vaccinated (Table 1).

TABLE-1: Characteristics of study cases.

Characteristics	(n=394)	Percentage	P-Value
Gender			
Male	270	68.5	0.001
Female	124	31.5	
Age			
(1 - 7 days)	164	41.6	0.001
(8 -14 days)	193	49.0	
(15- 21 days)	27	6.9	
(22 - 28 days)	10	2.5	
Birth Weight			
Low Birth Weight < 2.5 kg	91	23.10	0.001
Normal Birth Weight > 2.5 kg	303	76.90	
Gestation			
Preterm < 37 weeks	63	15.99	0.001
Full term > 37 weeks	331	84.01	
Place of Delivery			
Home	307	77.92	0.001
Hospital/Clinic	87	22.08	
Delivery Attended by			
Doctor (trained person)	12	3.05	0.001
Dai (untrained)	382	96.95	
Vaccination status of the mother			
Vaccinated/Partially vaccinated	48	12.18	0.001
Unvaccinated	346	87.82	
Material applied on the cord stump			
Surma	158	40.5	0.001
Ash	96	25.2	
Ghee	65	16.49	
Dung	6	1.53	
Talcum powder	13	3.30	0.001
Unknown	56	15.21	

As for the clinical picture, the lock jaw was found in 84.26%, irritability 35.02%, spasm 88.57%, fever 34.26% and opisthotonos 34.87% (Table 2).

TABLE-2: Clinical presentation (n = 394)

Presentation	Number	Percentage
Lock Jaw	332	84.26
Irritability	138	35.02
Spasm	349	88.57
Fever	135	34.26
Opisthotonos	98	24.87

Pneumothorax, aspiration pneumonia and sepsis accounted for 80% of complications, followed by renal failure and bronchopneumonia (Table 3).

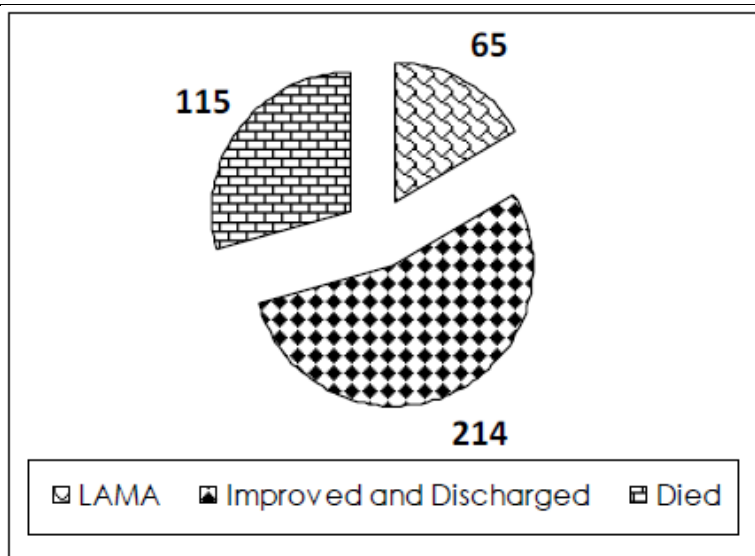
TABLE-3: Complications and outcome (n = 394)

Complications	Number of Patients	Expired	Survived	Percentage of mortality
Aspiration Pneumonia	118	30	88	25.4
Bronchopneumonia	236	16	220	6.77
Pneumothorax	24	8	16	33.3
Sepsis	256	57	201	21.48
Renal failure	50	6	44	12.00

Total mortality was 29.19%. Patients who discontinued medical advice (LAMA) accounted for 16.50%, while 54.31% of patients improved and were discharged from the facility (Fig. 1). In the group of premature babies, the mortality was 98.4%. The mechanically ventilated patients were seventy-nine years old and had a mortality of 25.5%. In people with an incubation period of less than 7 days, the mortality rate was 56.70% (Table 4).

TABLE-4: Outcome measures (n = 394)

Variable	No. of subjects (%)	Expired	Survived	P value
Birth Weight				
Low Birth Weight (Up to 2.5 Kg)	91(23.10)	64	27	0.001
Normal birth Weight (> 2.5 Kg)	303(76.90)	51	252	
Gestation				
Preterm up to 37 weeks	63(15.99)	62(98.4%)	01	0.001
Full Term (37 – 42 weeks)	331(84.01)	53(16.0%)	278	
Incubation period				
Up to 7 days	164(41.6)	93	71	0.001
> 7 days	230(58.4)	22	208	
Mechanical ventilation				
Ventilated	79(20.05)	17(21.5%)	62	0.09
Not ventilated	315(79.95)	98(31.1%)	217	

**Fig-1: Overall outcome (Total cases 394)****DISCUSSION:**

Neonatal tetanus is a vaccine-preventable disease and is more common in developing countries. The disease

can be effectively prevented by using tetanus toxoid. In addition to vaccination, promoting clean supplies and improving surveillance are major strategies to eliminate them. Neonatal tetanus (NT) is most common in the lowest income countries and those with the least developed health infrastructure. Most of the patients in our study came from the Karachi slums where the underlying health structure is poor. In this study, 68.6% were male and 31.5% female, with a male to female ratio of 2.1: 1. Various local and international studies have reported male dominance. Locally, the Rehman study included 87.5% of men, while Khattak and Shah had 78% of men in each of their studies. Dikici et al. From Turkey described 48 men and 19 women. Interestingly, Emodi reported equal sex ratio. The predominance of men may be due to gender bias in seeking medical help and a cultural practice that favors the survival of male children. Regarding maternal vaccination status, in our study only 12.18% were partially vaccinated, while 87.82% were unvaccinated. It is comparable to other studies. Even before the tetanus vaccine was available, neonatal tetanus was becoming less frequent in most European and North American countries thanks to hygienic birth practices and umbilical cord care. Shah and Rehman reported that unvaccinated and partially vaccinated mothers are 88% compared with 21% and 97.56%, respectively, compared with 2.44%. Dikici et al. Reported that 100% of mothers were unvaccinated. In our study, home births accounted for 77.92%, and 22.08% of births took place in outpatient clinics or small hospitals. In Rehman's study, 97.5% were home births with the participation of untrained platforms. Home deliveries in Khattak accounted for 88% and TBA for 78%. A similar pattern was demonstrated by the study of Dikici et al. As for clinical symptoms, the most common clinical symptoms in our study were generalized convulsions and jaw spasm, followed by irritability, fever and opisthotonos. This is consistent with the studies by Dey, Dikici et al., and Rehman. In our study, the overall mortality was 29.15%. Our NT mortality is comparable to the reported values of 31.7% and 36.5% for Emodi and Rehman, respectively. Reducing the number of HT deaths has been found to be one of the simplest and most cost-effective ways of reducing infant mortality. Shah recorded a mortality rate of 50%. Dikici et al. Showed a mortality of 41.8%. In the Basu study, the mortality rate was 63.3%, this high mortality was attributed to risus sardonicus, a concomitant infection, generalized stiffness and respiratory arrest. Onalo reported mortality due to NT (75%), and it was attributed to occurrence before 7 days of age and hypoglycemia. Fetuga reported 63.6% of newborn deaths. This high

mortality rate was due to low birth weight, symptoms within one day of symptom onset, young mothers under the age of 18, and low socioeconomic conditions. Seventy-nine (79) patients were mechanically ventilated, and the mortality was 21.5%. A study by Shah¹⁶ found that the mortality rate of ventilated patients was 46.66%. Premature tetanus cases were the worst, as virtually all of them died out by 98.4%. This is in line with the research by Shah who showed 100% mortality in premature babies. Pneumothorax, aspiration pneumonia and sepsis account for 80% of complications followed by renal failure and bronchopneumonia. This is comparable to the results of other studies.

CONCLUSION:

High mortality is seen in neonatal tetanus, especially premature babies with low birth weight, and babies with an incubation period of less than 7 days. Home deliveries accounted for over 3/4 of deliveries, and 97% were made by untrained people. The harmful practice of painting the umbilical cord with various types of substances is unacceptably high. The number of unvaccinated mothers of 88% is disappointingly high. It well reflects the constant lack of awareness and knowledge of the nature of the disease in the community.

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