Neonatal Tetanus: case report in Saudi Arabia

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Abstract

Aims: This paper aims to investigate a case of neonatal tetanus in Saudi Arabia, studying the different factors leading to infection, role and protocols used in hospital in diagnosis and management of the case.

Methods: A medical profile of neonatal case confirmed for neonatal tetanus was collected and studied, in addition to collecting literature reviews about epidemiology, diagnosis and management.

Results: A newborn 7-day old girl with poor socioeconomical status and poor aseptic delivery had been admitted to hospital with symptoms of jerky repetitive movement and history of decreased feeding and poor sucking for one day. Laboratory tests, cranial computed tomography (CT) and lumbar puncture were performed, all of them with normal results. She was hospitalized on 12 November, 2019 in an environment free of sensorial stimuli in the Pediatric Intensive Care Unit (PICU), with assisted ventilation. The patient was treated with metronidazole 30mg/kg/day, ampicillin 150 mg/kg/day, and cefotaxime 150mg/kg/day.

Sedation was maintained with midazolam 6mic/kg/min. Also, we started on muscle relaxation pancuronium 0.1 mg /kg/hr. and Magnesium sulfate. Besides that, we administered human immunoglobulin IM (500 IU), as well as one dose of tetanus toxoid. During hospital admission the condition of the patient was much improved. On 19 December 2019 the patient was extubated and started with baclofen and physiotherapy.

Conclusion: This case indicates that non-sterile delivery by non-practical attendants are the biggest cause of neonatal tetanus along with mothers unimmunized against tetanus. However, in the rarest of incidence of neonatal tetanus, physicians should be prepared to suspect, diagnose and treat neonatal tetanus and ensure clear and clean delivery of newborns. A combination of antibiotics and muscular relaxants are used to manage neonatal tetanus.

Key words: neonatal tetanus, case report, Saudi Arabia

Introduction

One of the concerns of current global public health policies is to eliminate neonatal tetanus and while in the last two decades, much progress has been made trying to reduce the global incidence of

neonatal tetanus, neonatal tetanus remains a leading cause of neonatal mortalities in some countries [1,2]. Neonatal tetanus is considered a medical emergency with high mortality which may reach 100 % without medical care and more than 50 % with hospital care [3,4] and it causes 7 % of total neonatal deaths [1].

According to many organizations such as the World Health Organization, United Nations Children's Fund (UNICEF) and The United Nations Population Fund (UNFPA), worldwide

incidence of neonatal tetanus has reduced significantly. In 2014, only 24 countries out of 59 originally targeted were still to eliminate the disease [5]. In the Eastern Mediterranean region 181 cases were confirmed with neonatal tetanus in 2018 compared with 557 in 2017 and 1130 cases in the Africa region in 2018 [6]. In Saudi Arabia, only 4 cases were officially reported for neonatal tetanus in 2018 compared with 37 cases in 2014 [7].

Clostridium tetani is the pathogen whose toxin causes the generalized tetanus of neonatal tetanus. The gram-positive spore- forming anaerobes whose spores can survive in soil and in the gastrointestinal tracts of animals (including human beings), and can contaminate many surfaces and substances and remains for decades, causes infection by contamination of wounds [8–11]. In neonatal cases, the main access of pathogen is contamination of umbilical stump at birth or during the first days of life with the clinical status appearing within 14 days after birth considering that the shorter the incubation period, the more serious the disease will be [12,13]. After contamination, tetanus toxin enters into central nervous system causing muscle spasm, interfering with the ability of sucking and feeding and later causing chest muscle spasm, lowering respiration and without emergency medical treatment, it may cause death of the baby [14,15].

According to WHO, only children with a history of the next three elements together are considered confirmed cases of neonatal tetanus. The first element is normal feeding and crying during the first 2 days of life. Onset of illness between age 3 to 28 days from birth and inability to suckle (trismus) followed by stiffness (generalized muscle rigidity) and/or convulsions (muscle spasms) [1]. It is a clinical diagnosis with no available laboratory investigation to confirm it [11,16].

The prevention of neonatal tetanus is easily applicable through immunization of pregnant women against tetanus where the born child will also be immune against the disease for their first months of life. In addition to increase hygienic birth practice to ensure the prevention of infection of newborn during the birth process and proper cord care to ensure low risk of contamination [5].

Treatment of neonatal tetanus is based on proper cleaning of wounds and usage of antibiotics to eradicate the pathogens. Besides, tetanus antitoxin is given to the baby to inactivate any free tetanus toxin [17,18]. Treatment of the muscular rigidity and spasms in tetanus is of vital importance, since this feature of the disease often interferes with respiration and is a likely cause of death [19].

In this report, we show a neonatal case delivered to hospital showing the medical diagnosis and treatment.

Case Report

A 7 day old baby girl with a low socioeconomic status; home delivery, the umbilical cord had been cut with scissors under aseptic technique. She presented to the emergency department with jerky repetitive movement and history of decreased feeding and poor sucking for one day. On physical examination patients have generalized recurrent spasms which are clenched fists with flex and abduct their arms while extending their legs. Also, the neonate has muscular stiffness in the jaw. On the 2nd day of admission, patients started to have generalized abdominal muscle contraction.

Laboratory tests, cranial computed tomography (CT) and lumbar puncture were performed, all of them with normal results.

Hemoglobin 12.9 g/dl Leucocytes 13.01 *103/ul, Neutrophils 8.46 *103 /ul, Lymphocytes 3.01 *103/ul, Platelets 309.50*103/ul, Glucose 5 mmol/l,
Urea 1.5 mmol/l, Creatinine 47.60 umol/L, ALT 21 U/L AST 58U/L, Calcium 2.18 mmol/L, Sodium 150 mmol/L, Potassium 3.8 mmol/L.

She was hospitalized on 12 November 2019 in an environment free of sensorial stimuli in the Pediatric Intensive Care Unit (PICU), with assisted ventilation, parenteral hydration, and nutrition through nasogastric tube.

The patient was treated with metronidazole 30mg/kg/day, ampicillin 150 mg/kg/day, and cefotaxime 150mg/kg/day . Sedation was maintained with midazolam 6mic/kg/min. Also, we started her on muscle relaxation pancuronium 0.1 mg /kg/hr. and Magnesium sulfate. Besides that, we administered human immunoglobulin IM (500 IU), as well as one dose of tetanus toxoid.

During hospital admission the condition of the patient was much improved. On 19 December 2019, the patient was extubated and started with baclofen and physiotherapy.

Discussion

Approximately 515,000 neonatal deaths were attributed to tetanus worldwide in 1993 [20]. The World Health Organization [21] aimed to achieve worldwide neonatal tetanus elimination by 2005, which was defined as the reduction of neonatal tetanus cases to less than 1 case per 1,000 live births in every district of every country. In 2000, neonatal tetanus was still not eliminated in 57 countries, including Vietnam and China.

Poor socioeconomic status in some rural populations is associated with low immunization coverage, high incidence of delivery by untrained traditional birth attendants and inappropriate cord care as we saw in this case, which is considered higher risk for developing neonatal tetanus [11]. The failure of the mother in this case to have total care during delivery can be explained by poor socioeconomic status and low awareness of the importance of hospital delivery and immunization of her and her baby. Non-sterile delivery practice by unpractical or traditional attendant (daia) as shown in this case is the most contributing factor to neonatal tetanus in developing countries [22]. WHO supports the use of six clean measures to improve the hygiene of delivery including clean birth surface, clean hands, clean perineum, cord cutting, cord tying, and cord care [23]. Another study showed that clean birth practice at home could prevent 30 % of neonatal tetanus deaths, increased to 35 % in the presence of skilled attendants and 40 % if birth took place in a health-care facility with postnatal measures [24,25].

Clinical diagnosis is the principal diagnosis of neonatal tetanus including inability of the newborn to suckle, spasm, stiffness and convulsion beginning with trismus or 'locked jaw' due to spasms of the masseter. Then, rigidity spreads down the arms and trunks over the next 1 to 2 days of infection. However, these clinical manifestations may be confused with seizures and can only be differentiated from tetanus as consciousness is maintained with tetanus. In addition, similar symptoms are shown with meningitis, hypocalcemia and hypoglycemia. Therefore, CT and lumbar puncture besides blood analysis can be done and the results eliminate these reasons [20].

Management of tetanus depends on different factors including sedation and control of spasms of muscle, neutralization of tetanus toxin, getting rid of Clostridium tetani using antibiotic in order to prevent further production of toxin along with wound debridement, manage complications including autonomic dysfunction and supportive care [21]. To prevent local proliferation of C. tetani at the wound site, antibiotics are administered to patients with tetanus including penicillin G, metronidazole and doxycycline [26] e.g., with intravenous metronidazole, 500 mg three times daily, or penicillin, 100,000– 200,000 IU/kg/day. In this case, a combination of metronidazole/ ampicillin and cefotaxime was given to the patient.

The 'routine' practice in managing patients with tetanus includes heavy sedation and paralysis with neuromuscular blockade by muscle relaxants supported by artificial ventilation [27]. Benzodiazepines midazolam and diazepam and anesthetic agents such as propofol are used as sedatives [28,29].

Benzodiazepines [30], which enhance the effect of GABA on the GABA A receptors of lower motor neurons and causes combination of muscle relaxant, anticonvulsant, sedative and anxiolytic effects. Okoromah and Lesi proved that using diazepam was related with better survival rate in children when compared to a combination of phenobarbitone and chlorpromazine (relative risk for death 0.36, 95% confidence interval 0.15 to 0.86: risk difference −0.22, 95% confidence interval −0.38 to −0.06). Another GABA-A receptor modulator, may be used [31], as may non- depolarizing muscle relaxants (pancuronium, pipecuronium) [32]. These relaxants act by competing for the acetylcholine binding site directly on the muscle motor end plates. In addition, magnesium which is a calcium antagonist and has dual action by reducing acetylcholine release in addition to reduce the muscle response to acetylcholine [33–35], may be effective in relieving rigidity and spasms [36]. Magnesium also seems to reduce autonomic dysfunction [37]. In this case, management of convulsion had been managed by using a combination of midazolam/ pancuronium and Magnesium sulfate.

Tetanus patients should be in a calm environment to avoid the developing of spasms

by noise or other sensory stimulation. This objective must be balanced against the need to avoid sensory deprivation, which predisposes to delirium, a condition that tetanus patients are prone to, given their often-lengthy stays in intensive care units with mechanical ventilation and treatment with neuroactive drugs such as benzodiazepines and propofol [38].

Prophylaxis against tetanus consists of immunization with tetanus toxin (toxoid) and measures to achieve good hygiene of delivery. For example, contamination of the umbilical stump of the newborn is a primary cause of neonatal tetanus. These issues are preventable with a good immunization status in pregnant women leading to reduction in the prevalence of neonatal tetanus [39], because maternal anti- tetanus toxin antibodies are transferred across the placenta to the child [32].

Finally, in conclusion this case indicates that non-sterile delivery by non-practical attendants are the biggest cause of neonatal tetanus along with mothers un-immunized against tetanus.

However, in the rarest of incidence of neonatal tetanus, physicians should be prepared to suspect, diagnose and treat neonatal tetanus and ensure clear and clean delivery of newborns. A combination of antibiotics and muscular relaxants are used to manage neonatal tetanus.

References

1. Roper MH, Vandelaer JH, Gasse FL. Maternal and neonatal tetanus. Lancet. 2007;370(9603):1947-1959. doi:10.1016/S0140-6736(07)61261-6
2. Black RE, Cousens S, Johnson HL, et al. Global, regional, and national causes of child mortality in 2008: a systematic analysis. Lancet. 2010;375(9730):1969-1987. doi:10.1016/S0140-6736(10)60549-1
3. Rai R, Singh DK. Neonatal Tetanus: A Continuing Challenge. Indian J Pediatr. 2012;79(12):1648-1650. doi:10.1007/s12098-011-0666-8
4. Chavada VK. To study the clinico-epidemiological factors of tetanus cases admitted in a tertiary care hospital for the last 10 years. J Clin Diagnostic Res. 2010;4:2649-2651.
5. Azhar Abid Raza. Eliminating a silent killer — maternal and neonatal tetanus. UNICEF [Internet]]. Published 2022. Accessed February 4, 2023. https://www.unicef.org/blog/eliminating-silent-killer-maternal-neonatal-tetanus
6. To A, Gvap THE, Report LL. Global Vaccine 2019 Regional Reports on Progress Towards Gvap Rvap Goals. Published online 2019:1-88. https://cdn.who.int/media/docs/default-source/immunization/strategy/gvap2020/gvap-review-annex-sc.pdf
7. WHO. WHO vaccine-preventable diseases: monitoring system 2010 global summary WHO vaccine-preventable diseases: monitoring system 2010 global summary. Published online 2010.
8. SM. F. Tetanus. In: Collier L, Balows A, Sussman M E, ed. Topley & Wilson's Microbiology and Microbial Infections. Oxford University Press; 1998:694-722.
9. SGF W, MH R, TV M, WA. O. Tetanus Toxoid. In: Plotkin SA, Orenstein WA E, ed. Vaccines. Saunders; 2004:745-781.
10. T.P. B. Clostridium tetani. In: Mandell G.L., Bennett J.E., Dolin R. E, ed. Principles and Practice of Infectious Diseases. 6th ed. Elsevier; 2005:2817–2822.
11. Pan America Health Association. Neonatal Tetanus Elimination. 2005;4(2):8-11.
12. Brett EM E. Paediatric Neurology. 3rd ed. Churchill Livingstone; 1997.
13. Bennett J, Macia J, Traverso H, Banoagha S, Malooly C, Boring J. Protective effects of topical antimicrobials against neonatal tetanus. Int J Epidemiol. 1997;26(4):897-903. doi:10.1093/ije/26.4.897
14. Patel JC, Mehta BC. Tetanus: study of 8,697 cases. Indian J Med Sci. 1999;53(9):393-401. http://www.ncbi.nlm.nih.gov/pubmed/10710833
15. Cook TM, Protheroe RT, Handel JM. Tetanus: a review of the literature. Br J Anaesth. 2001;87(3):477-487. doi:10.1093/bja/87.3.477
16. CDC Centers for disease control and prevention https://www. cdc. gov/arthritis/basics/gout. htm. Diagnosis and Treatment. CDC. Published 2022. Accessed February 4, 2023. https://www.cdc.gov/tetanus/about/diagnosis-treatment.html
17. Ganesh Kumar A V., Kothari VM, Krishnan A, Karnad DR. Benzathine penicillin, metronidazole and benzyl penicillin in the treatment of tetanus: a randomized, controlled trial. Ann Trop Med Parasitol. 2004;98(1):59-63. doi:10.1179/000349804225003037
18. Blake PA, Feldman RA, Buchanan TM, Brooks GF, Bennett J V. Serologic therapy of tetanus in the United States, 1965-1971. JAMA. 1976;235(1):42-44. http://www.ncbi.nlm.nih.gov/pubmed/946000
19. Amare A, Melkamu Y, Mekonnen D. Tetanus in adults: Clinical presentation, treatment and predictors of mortality in a tertiary hospital in Ethiopia. J Neurol Sci. 2012;317(1-2):62-65. doi:10.1016/j.jns.2012.02.028
20. CDC Centers for disease control and prevention https://www. cdc. gov/arthritis/basics/gout. htm. International Notes Progress Toward the Global Elimination of Neonatal Tetanus, 1989- 1993. MMWR Morb Mortal Wkly Rep. 1994;43(48):885-887. https://www.cdc.gov/mmwr/preview/mmwrhtml/00033858.htm
21. WHO. U, UNFPA. Maternal and neonatal tetanus elimination by 2005: Strategies for achieving and maintaining elimination. Accessed. 2000;(November 2000).
22. Ibinda F, Bauni E, Kariuki SM, et al. Incidence and Risk Factors for Neonatal Tetanus in Admissions to Kilifi County Hospital, Kenya. Trotter CL, ed. PLoS One. 2015;10(4):e0122606. doi:10.1371/journal.pone.0122606
23. Organization WH, of Midwives IC, internationale de Gynécologie et d'Obstétrique F. Making pregnancy safer: the critical role of the skilled attendant: a joint statement by WHO, ICM and FIGO. Published online 2004:18 p.
24. Blencowe H, Cousens S, Mullany LC, et al. Clean birth and postnatal care practices to reduce neonatal deaths from sepsis and tetanus: a systematic review and Delphi estimation of mortality effect. BMC Public Health. 2011;11(Suppl 3):S11. doi:10.1186/1471-2458-11-S3-S11
25. Raza SA, Avan BI. Eliminating Maternal and Neonatal Tetanus and Promoting Clean Delivery Practices Through Disposable Clean Birth Kits. Front Public Heal. 2019;7. doi:10.3389/fpubh.2019.00339
26. LEE CH, LIN KS. [CLINICAL STUDIES OF 91 CASES OF NEONATAL TETANUS]. Zhonghua Min Guo Xiao Er Ke Yi Xue Hui Za Zhi. 1965;6:21-31. http://www.ncbi.nlm.nih.gov/pubmed/14287751
27. Thwaites CL YL. Tetanus. In: Longo DL, Fauci AS, Kasper DL, Hauser SL, Jameson JL, Loscalzo J E, ed. Harrison's Principles of Internal Medicine. McGraw Hill Inc; 2011:1197–1200.
28. Campbell JI, Lam TMY, Huynh TL, et al. Microbiologic characterization and antimicrobial susceptibility of Clostridium tetani isolated from wounds of patients with clinically diagnosed tetanus. Am J Trop Med Hyg. 2009;80(5):827-831. http://www.ncbi.nlm.nih.gov/pubmed/19407132
29. Gilligan JEF, Lawrence JR, Clayton D, Rowland R. Tetanus and the evolution of intensive care in Australia. Crit Care Resusc. 2012;14(4):316-323. http://www.ncbi.nlm.nih.gov/pubmed/23230882
30. Chun P, Ying-Zi H, Yi Y, Hai-Bo Q. Titration of high dose sedation is effective in severe tetanus: a case report. Cases J. 2009;2(1):6865. doi:10.4076/1757-1626-2-6865

31. Petitjeans F, Turc J, Coulet O, Puidupin M, Eve O, Benois A. The use of boluses of propofol for the management of severe tetanus in a child. Trop Doct. 2009;39(1):52-53. doi:10.1258/td.2008.080236
32. Okoromah CA, Lesi AF. Diazepam for treating tetanus. Cochrane Database Syst Rev. 2004;2010(1). doi:10.1002/14651858.CD003954.pub2
33. Orko R, Rosenberg PH, Himberg J-J. Intravenous infusion of midazolam, propofol and vecuronium in a patient with severe tetanus. Acta Anaesthesiol Scand. 1988;32(7):590-592. doi:10.1111/j.1399-6576.1988.tb02791.x
34. Dutta TK, Das AK, Sethuraman KR, Swaminathan RP. Neuroparalysis and ventilatory support in severe tetanus. J Indian Med Assoc. 2006;104(2):63-66. http://www.ncbi.nlm.nih.gov/pubmed/16856583
35. del Castillo J, Engbaek L. The nature of the neuromuscular block produced by magnesium. J Physiol. 1954;124(2):370-384. doi:10.1113/jphysiol.1954.sp005114
36. Lee C, Zhang X, Kwan WF. Electromyographic and mechanomyographic characteristics of neuromuscular block by magnesium sulphate in the pig. Br J Anaesth. 1996;76(2):278-283. doi:10.1093/bja/76.2.278
37. Grassi F, Degasperi V. Modulation of fetal and adult acetylcholine receptors by Ca2+ and Mg2+ at developing mouse end-plates. Pflügers Arch - Eur J Physiol. 2000;440(5):704-709. doi:10.1007/s004240000354
38. Thwaites C, Yen L, Loan H, et al. Magnesium sulphate for treatment of severe tetanus: a randomised controlled trial. Lancet. 2006;368(9545):1436-1443. doi:10.1016/S0140-6736(06)69444-0
39. Thwaites CL, Yen LM, Cordon SM, et al. Effect of magnesium sulphate on urinary catecholamine excretion in severe tetanus. Anaesthesia. 2008;63(7):719-725. doi:10.1111/j.1365-2044.2008.05476.x