

Research article

Newborn babies with tetanus in maternity children hospital Makkah: - Center experience from its application to prevent in the kingdom of Saudi Arabia

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Abstract

Neonatal tetanus (NNT), a disease preventable by immunization, is a major problem and a leading cause of neonatal mortality. To study the epidemiology, clinical appearances and outcomes of all patients diagnosed with neonatal tetanus. Moreover, to develop and supply a council to prevent NNT in the KSA. This cross-sectional study was conducted at Maternity and Children's Hospital, Makkah, KSA; a medical centre; from 2013 to 2017. All medical data for patients with suspected diagnosis of NNT were examined to get information about sociodemographic properties. Fifty-two (52) patients were diagnosed with neonatal tetanus over 5 years in our hospital. All the cases are house delivery for unvaccinated mothers with cut the umbilical cord using unsterilized household scissors. Most of the patients presented with muscle spasms, refusal to eat and abnormal posture. All of the patients were receiving mechanical ventilation and two of them died. It is essential to begin battle to achieve complete maternal tetanus toxoid immunization at primary health centers, during antenatal care. Immunization needs to be planed so pregnant women can be informed regarding the importance of authority clinics and the risks of unhygienic house birth, and immunization should be addressed with sufficient data. Pregnant women and those of childbearing age should be the first targets for these actions.

Introduction

Neonatal tetanus (NNT), immunization can control this disease, is a leading cause of neonatal mortality areas as a major health problem in many countries including KSA [1]. Tetanus as a cause of neonatal deaths ranged from 16.4 % to 72.5% in the rural areas and from 0 % to 68.7% in the urban areas as reported by The World Health Organization (WHO) [2]. One of the most underreported diseases [3]. Global elimination of neonatal tetanus is of major public health problems due to the Underreporting of NT cases. Also, the underreporting of NT in developing countries have limited the impact of surveillance on disease control strategies, yet little consideration has been given to ways of improving the reporting system [4]. Three steps are needed to complete the reporting. First; the public must have access to health services, and second, must use them. Third, the health services must report cases accurately and regularly to the suitable health organization [1, 5]. Community-based NT mortality surveys demonstrate that current surveillance systems as used in developing countries observe only 2–

8% of cases [1, 3–6]. In 2004, WHO received reports of only 9318 cases of NNT, compared to an estimated 128 000 NNT deaths [7-8].

Tetanus is a highly fatal infection in the fetal stage and caused by a neurotoxin produced by *C. tetani*, a gram-positive, obligate and anaerobic rod-shaped bacterium that forms spores. *C. tetani* spores are everywhere in the environment, including soil, dust, manure, and in the gastrointestinal tracts of animals (including human beings), and can contaminate many surfaces and substances [9]. The spores are extremely hardy but its destruction need prolonged exposure to iodine, hydrogen peroxide, formalin or gluteraldehyde or by autoclaving [10]. The spores grow into bacteria when they invade the body. *C. tetani* spores usually penetrate the body through a wound or fracture in the skin. Neonatal tetanus usually occurs because of umbilical infections. We should know this; the spores germinate in the presence of anaerobic states. The endotoxin being the cause for tetanus; tetanus toxin; is one of the most potent toxins ever identified, with a minimum human lethal dose of < 2.5 ng/kg [11-14]. Toxins are produced and spread via the blood stream

and lymphatic system. Toxins act at several sites within the central nervous system, including peripheral motor end plates, spinal cord, and brain, as well as in the sympathetic nervous system. The characteristic clinical demonstrations of tetanus are caused when tetanus toxin interferes with release of neurotransmitters and blocking inhibitor impulses. This cause muscle contraction and spasm. Seizures may occur, and the autonomic nervous system may also be affected. The incubation period is usually 3–21 days (median 7 days) [15-18], although exceptional cases have been reported with incubation periods as short as one day or longer than a month [19, 20]. The average incubation period for neonatal tetanus is shorter than that of non-neonatal tetanus. About 90% of neonates with tetanus develop symptoms in the first 3–14 days of life, mostly on days 6–8, distinguishing neonatal tetanus from other causes of neonatal mortality which typically occur in the first two days of life [6, 21, and 22]. Dysphagia, neck, shoulder, back, or abdominal muscle stiffness and pain are other common early symptoms. Also, in neonatal tetanus, trismus and lip muscle rigidity interfere with normal sucking and feeding, which is the hallmark of disease onset [23]. As disease severity increases, muscle rigidity extends throughout the body and muscle spasms begin, first in response to sensory stimuli but later progressing to spontaneous long-lasting excruciating spasms of many muscle groups [24].

In severe tetanus, sudden generalized tonic contractions of all muscle groups, or tetanospasms, result in opisthotonos, adduction of the shoulders, flexion of the elbows and wrists, and extension of the legs, usually accompanied by temperature rises of several degrees [25]. Overall case fatality rates for patients admitted to hospital with neonatal tetanus in developing countries are 8–50%, while the fatality rate can be as high as 100% without hospital care [26]. The true extent of the tetanus death toll is not known, since many newborns and mothers die at home and neither the birth nor the death is reported. MNT cases are clustered in poor, remote, and disenfranchised communities where unhygienic obstetric and postnatal practices prevail, and access to maternal tetanus toxoid immunization is poor. Differences in neonatal tetanus incidence and mortality of at least an order of magnitude have been identified between regions and countries, and between urban and rural areas within countries [27]. In industrialized countries, neonatal tetanus ceased to be a significant problem by the mid-20th century: once TT vaccination became common, neonatal tetanus disappeared [28-30]. By contrast, mortality rates as high as 110 per 1,000 live births were identified in rural populations in developing countries in the 1960s and 1970s with neonatal tetanus accounting for 50% or more of all neonatal deaths and 25% of infant mortality in some countries [31-32]. However, this situation has improved in the past 20 years. According to the Child Health Epidemiology Reference Group estimates from 2008, an

estimated 59,000 newborns die of the disease each year; this translates into ~164 deaths in children under one month of age every day or one death every 9 min. Several thousand mothers are also estimated to die of maternal tetanus [33]. Many countries still striving to achieve elimination have improved vaccine coverage in most districts and are close to meeting elimination criteria.

There are no published data on NNT from the KSA, except for one report in adult patients. However, a range of 4-14 patients; over the last five years; 2009-2013, was reported to the WHO [34, 35]. This report from King Faisal Specialist Hospital at our capital city; Riyadh; reviews the clinical aspects and outcomes of NNT cases treated over the last 22 years. The objective of this study is to high-lighting the occurrence of this preventable disease with the desire of gathering more epidemiologic facts and developing a national strategy for eliminating NNT.

Patients and methods

The study protocol was approved by our institutional review board instructions. This cross-sectional study was conducted at Maternity and Children's Hospital, Makkah, KSA; a medical centre; from 2013 to 2017. We examined and surveyed 52 newborns. All medical data for patients with suspected diagnosis of NNT were examined to get information about sociodemographic properties containing gestational age, birth weight, nationality, gender, area of stay, antenatal care of the mother and immunization against tetanus. In addition, place of delivery, attendance of the birth by medical or paramedical personnel and the instruments employed to cut the umbilical cord. The clinical characteristics of the patients were obtained after admission, including the signs; symptoms on introduction and the management to get healthy and improved life. The managements supplied were mechanical ventilation and the medications used for paralysis and controlling convulsions. The end results for death or discharge and the neurological examination results were also noted.

Statistical analysis

Frequency distribution, chi-square and t-test analysis will be used to compare percentages of studied parameters among patients group participated in the study. The statistical analyses were performed using IBM SPSS Statistics v. 18 for Windows. P-value < 0.05 was used as the level of significance.

Results and the treatment

All the cases are house delivery for unvaccinated mothers with cut the umbilical cord with unsterilized scissors and most of them came to our emergency department (ER) at the age of 6-7 days with poor feeding and spastic, weight

range between 3-3.5 kg. All of them had managed initially in the ER by ventilation and anti-tetanus (Toxoid) vaccine was given. Also, started antibiotic immediately and then shift the babies to a neonatal intensive care unit (NICU). In NICU; the babies admitted in dark room, then started valium and pavilion infusion, under cardiac monitoring and respiratory care support. All cultures were sent on the 3rd day the babies started feeding through orogastric tube and stilled on valium; and pavlon infusion and ventilated support. The sociodemographic properties of these patients and their mothers are shown in Table 1. CT scans for the brains, were done for all babies. No evidence of birth asphyxia. Physiotherapy came every day for babies. Since the protection received from the mother will last only for a few months, infants are given TT as a combined vaccine with diphtheria toxoid and pertussis vaccine (DPT). The immunization program is a part of primary health care and the services are provided through the existing health delivery systems. The vaccination services are available at the hospitals, maternal and child health clinics, and dispensaries in the urban areas and in the primary health centers and the sub centers in the rural areas. CT scans for the brains for all babies, were normal. Most of our cases cured and discharge, two out of 52 babies died due to sepsis. Fifty (50) babies were discharged and followed in an Out Patient Department of the hospital. A patent airway should be maintained and, depending on the severity of disease, endotracheal intubation or tracheostomy and mechanically assisted respiration may be lifesaving. Sedation and muscle relaxant drugs were used to control muscle spasms. Agents to control autonomic nervous system instability may be required. Active immunization may be initiated concurrently with treatment.

Table 1. Sociodemographic properties for mothers of newborn babies with neonatal tetanus for this study.

Variable	%
Full-term pregnancy	96
preterm	4
Antenatal care	10
No antenatal care	90
No Tetanus toxoid or Tetanus antitoxin	100
TT, one dose	0
TT+2	0
House delivery	100
Healthcare hospital center	0
Attended*	9
Not attended	41
Not recorded	50
Instrument employed to cut the umbilical cord	61
Not reported	39

* Childbirth is attended by trained healthcare employee

Discussion

This study postulated the fact that all our patients suspected with NNT, were delivered at house of residence a way from health care organization. This demonstrates that these pregnant women like the birth process to occur at house or obligate for this due to our customs. However, they not having knowledge of the complications that accidentally may occur as NNT. The majority of these women did not get antenatal care after or before the baby birth. No information about whether a health care worker was present was recorded in the patient's medical chart as well.

Educating pregnant women and women of child-bearing age in high-risk areas during antenatal care is very important to raising their awareness of birth at health care centers or at least having a trained assistant if house delivery is obligatory. It appears that counseling on important vaccines for pregnant women is not adequately provided by health care personnel. The primary health care centers may not provide sufficient information to pregnant women, particularly regarding the importance of immunization, including the tetanus vaccine. The mean age of patients at the onset of disease was 6.5 days. The most common clinical features were muscle spasms, refusal to eat, abnormal posture and fever. The clinical presentation of our patients was not different from that indicated in other previous reports [10-11]. It is the current protocol of the NICU at our hospital to intubate and ventilate most patients with a diagnosis of NNT based on reports of improved outcomes with this intervention [12-13]. The most frequent clinical complications were pneumonia, followed by difficulty feeding and septicemia. Hypothermia, decreased need for sedation and diminished signs of tetanus usually indicate the onset of bronchopneumonia. Some data were missing from the patients' medical records; for example, information regarding maternal immunization, attendance of the delivery and causes of death was not recorded. Thus, we will need to consider this NNT is a medical emergency requiring hospitalization, immediate treatment with human tetanus immune globulin, to control muscle spasm, aggressive wound care and a tetanus toxoid booster. If tetanus immune globulin is unavailable, Immune Globulin Intravenous can be used.

Thus, we can say that newborns with tetanus were endemic in the KSA and were the cause of many deaths in the past. Our university hospitals are the only referral centers for the intensive care management of tetanus patients in the area. Adequate routine vaccination for prevention of this disease is important as none of our patients had been immunized ever against tetanus. The need for routine immunization, especially for pregnant women, was obvious. The expanded program on immunization for the entire country was initiated in 1990s. At that time, we expect that only very small

percentage of women of childbearing age had received adequate vaccination against tetanus. Successful elimination of neonatal tetanus requires protection of more than 80% of the infants at birth, through complete vaccination of their mothers and by clean deliveries and cord-care application [36]. The increase in the number of rural and urban health centers, training of a larger number of midwives and general practitioners, improve the educational programs through the mass media and motivation of people for active contribution in the vaccination programs by health authorities' and local religious leaders resulted in greatly better results.

These actions can save many lives each year and, therefore, should be continued. Our examinations indicate a developing gradually and fortunate decline in the number of suspected cases in this area [37-38]. However, it should not be forgotten that undetected or unreported cases are still occur. Therefore, we are still far from the ideal situation of elimination, which will need nationwide attempt for good program of large-scale immunization.

Conclusion

NNT; despite the fact that; still presents in the KSA. Also, the number of patients used to indicate this to the WHO is minor, which will encourage the prevention of the disease. There is a pressing need for collecting more epidemiological facts on NNT nationwide. Until these facts are accessible, it is essential to start the operation for complete maternal anti-tetanus vaccine during antenatal management. The combinations of immunization during the antenatal management need to be rearranged so that pregnant women are educated regarding the importance of immunization and the harms of house delivery. Pregnant women and those of child-bearing age should be the first targets for these actions. Proper documentation of the history of NNT patients, including maternal immunization and details regarding house delivery, are the ways to prevent this disease in our nation.

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