

## Neonatal tetanus – report of a case

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Neonatal tetanus is a severe, often fatal disease caused by the toxin *Clostridium tetani*. Neonatal tetanus is a generalized tetanus, which occurs in a neonate between 3-28 days of life. The findings indicated that tetanus in a newborn of an unvaccinated mother occurred after the application of non-sterile clay to the umbilical cord. This case was a seven-day-old male baby with progressive difficulty in feeding, trismus, hypertonicity, opisthotonos, and heart murmur. The patient was afebrile and eupneic, and had a history of non-sterile home delivery. In the past, the area of Bujanovac, Medvedja and Presevo had been exposed to mass immigration (especially due to the war in the territory of former Yugoslavia), which caused a serious problem for general practitioners, who had to be vigilant and ensure that all patients registered in their practice were fully immunized. This case has provided a clear indication of the necessity for strategies of both vaccination and ensuring hygienic conditions throughout pregnancy and delivery to prevent neonatal tetanus.

**Key words:** neonatal tetanus, infection, death, case report.

Neonatal tetanus is a severe, often fatal disease caused by the toxin *Clostridium tetani*, a ubiquitous spore-forming bacterium found in high concentrations in the soil and animal excrements (including human beings)<sup>1,2</sup>. Neonatal tetanus is a generalized tetanus, which occurs in a neonate between 3-28 days of life, and is sometimes referred to as the disease of the seventh day<sup>2,3</sup>. The newborn usually exhibits irritability, poor feeding, rigidity, facial grimacing, and severe spasms of touch<sup>2-4</sup>. Characteristic features are early spasms of the facial muscles (trismus or "lock-jaw" and "risus sardonicus") followed by the spasm of the back muscles (opisthotonos) and sudden, generalized tonic seizures (tetanospasms)<sup>5-8</sup>. Glottis spasm, respiratory failure, and autonomic instability can result in death<sup>5</sup>.

During 2007, out of 17,012 tetanus cases reported worldwide, 6067 occurred in a neonate<sup>1,7</sup>. Tetanus cases primarily occur in underdeveloped countries and account for up to

one-half of all neonatal deaths. Although easily prevented by maternal immunization with tetanus toxoid vaccine and aseptic obstetric and postnatal umbilical cord care practices, maternal and neonatal tetanus persists as a public health problem in 48 countries, mainly in Asia and Africa. Of the estimated 28 countries in the world that account for 90% of neonatal cases, 16 are in the African region<sup>1,8</sup>. In these countries, activities are being undertaken to eliminate the disease in the near future.

Neonatal tetanus is associated with non-sterile delivery and umbilical cord care of newborns whose mothers do not have sufficient antitoxin levels to protect the neonates by transplacental transfer of maternal antibody<sup>6,8-10</sup>. Risk factors for neonatal tetanus incidence are related to prenatal (lack of antenatal care for the pregnant women in a health facility, failure of immunization with tetanus toxoid), perinatal (delivery at home, births followed by untrained persons, failure of simple measures

such as hand washing, cleaning of the cord-cutting tool, use of multiple cord ties, the vaginal use of coconut oil, etc.) and neonatal factors (unhygienic newborn and cord care, infant's weight less than 2.5 kg)<sup>11-14</sup>. Case fatality rates vary (range: 10-100%), depending on treatment, age and general health of the patient<sup>5,6,8,9,15,16</sup>. Infants who survive can have residual neurological injury (e.g. cerebral palsy and psychomotor retardation).

The findings indicated that tetanus in a newborn of an unvaccinated mother occurred after the application of a non-sterile clay to the umbilical cord. The purpose of this work is to describe one case of neonatal tetanus in Serbia.

### Case Report

On February 12, 2009, a seven-day-old male baby was admitted to the Intensive Care Unit of the Clinic for Children's Internal Diseases in Nish with progressive difficulty in feeding, trismus, hypertonicity, opisthotonos, and heart murmur. The patient was afebrile and eupneic, weighing 2800 g, and had a history of non-sterile home delivery. Neonatal tetanus was diagnosed based on the clinical characteristics and history. The course of the disease can be classified as very severe.

The laboratory evaluation revealed a C-reactive protein level of 25.3 mg/L: (normal values 0.00–5.00 mg/L), elevated creatine phosphokinase of 871 U/L (normal values 24-195 U/L), lactate dehydrogenase of 1035 U/L (normal values 230-460 U/L), and total serum bilirubin of 108.06 mmol/L (normal values 0-20.52 mmol/L), while other routine laboratory studies such as serum glucose, urea, creatinine, electrolytes (sodium, potassium, calcium, phosphorus), serum protein, serum albumin, alkaline phosphatase, aspartate aminotransferase, and alanine transaminase were within normal values. His white blood cell count was elevated to 25,900 cells/ul (normal values 9000–19000 cells/ul), with 70% granulocytes (normal values 45-50%). Heart ultrasound revealed dilated right atrium and dislocated tricuspid valve toward the apex of the right ventricle that was strongly suspected as Ebstein anomaly. Chest X-ray revealed enlarged cardiac silhouette (Fig. 1). Abdominal X-ray revealed bilateral retraction of



Figure 1. Chest X-ray reveals enlarged cardiac silhouette. Abdominal X-ray reveals bilateral retraction of abdominal musculature.

abdominal musculature (Fig. 1). Culture from the umbilical cord grew several aerobic bacterial species (*Staphylococcus aureus* and *Streptococcus beta haemolyticus B*). No organisms grew in the blood culture. From culture of the conjunctivae, *Haemophilus* species was isolated. The rest of the examination was unremarkable.

Immediately after admission, human tetanus immunoglobulin (Tetagam IM, 250 IU as a single dose), antibiotics (metronidazole and ceftazidime) and muscle relaxant (midazolam in continuous intravenous infusion of 0.08 mg/kg/h) were administered. End tracheal intubation was done and assisted ventilation started.

Seizures, characterized by sudden, severe tonic contractions of the muscles triggered by minimal stimuli such as light, noise or touch appeared after 48 hours. During the next several days, extreme hypertonia refractory to muscle relaxant therapy developed with consecutively shorter and shorter amplitude of respiratory movements, apnea and respiratory failure. Seven days after admission, the child died.

This baby was delivered at home. He was the thirteenth child from the thirteenth pregnancy. He was born from an uneventful pregnancy. Birth endured about half an hour, relieved by the husband. The mother cut the umbilical cord with a new razor and tied it with a knitting string. The newborn did not start

crying right away and was cyanotic. The first suckle was 2-3 hours afterwards. He sucked the breast normally for 5 days, when suddenly he developed disinclination to sucking with braking of the jaws; he could not open his mouth and had difficulty opening the eyelids.

The mother, a 37-year-old woman born in Serbia, had no certificates of immunization, and it was therefore presumed that she had never been vaccinated. All thirteen births were at home. The first child died in the fourth month of life, the third child in the eighth and the fourth child in the tenth month. The causes of death of these children were unknown. The fifth child died presenting all symptoms and signs like the current patient. The other eight children, the patient's elder brothers and sisters, were healthy and had immunization following the normal schedule.

A low-income family, they lived at home without a supply network; they were supplied with drinking water from a public drink fountain. Both of the parents were unqualified and unemployed. They had a state health insurance.

Previously, the area of Bujanovac, Medvedja and Presevo had been exposed to mass immigration (especially due to the war in the territory of former Yugoslavia), which caused a serious problem for general practitioners, who had to be vigilant and ensure that all patients registered in their practice were fully immunized.

## Discussion

In Serbia, neonatal tetanus is rare. The last two cases were reported in 1997<sup>17</sup>. This decline is associated with improvements in birth practices and increased level of population immunity following the initiation of routine tetanus toxoid vaccination since 1951.

Neonatal tetanus results from cord contamination during unsanitary delivery conditions, coupled with a lack of maternal immunization.

In newborns, the common nidus of infection is the umbilical cord, especially a septic umbilicus or any superficial wound; in many cases, it may not be detectable<sup>15,18</sup>. Most cases follow an acute injury, such as a puncture

wound, a laceration or an abrasion. Although the use of a new razor was found to be significantly protective for neonatal tetanus appearance<sup>10,11</sup>, this association has been refuted in some studies<sup>19,20</sup>. Home delivery, the mother's education, a cleaned cutting tool, the application of antibiotics at delivery, and hand washing by the delivery attendant remained protective<sup>11-14</sup>.

In this case, the mother cut the umbilical cord with a new, but non-sterile razor and tied it with knitting string. The umbilical cord was very poorly treated and the umbilicus showed signs of inflammation on admission, when omphalitis was noticed. In this newborn, the nidus of infection was probably a septic umbilicus or any superficial wound (microabrasion) around the cord, as was noticed in other reports<sup>11,20,21</sup>. The spores need tissue with the proper anaerobic conditions to germinate; the ideal media are wounds with tissue necrosis. *Clostridium tetani* is recovered from wounds in only some 30% of cases, and the organism is sometimes isolated from patients who do not have tetanus<sup>5,22</sup>. In this case, *Clostridium tetani* was not revealed, but culture from the umbilical cord grew several aerobic bacterial species (*Staphylococcus aureus* and *Streptococcus beta haemolyticus B*). This active infection, such as those with dead or devitalized tissue, was ideal for germination of the spores and release of toxin. Intermediate determinants of omphalitis may have included hygiene-related practices.

Data analysis suggests that the main source of *Clostridium tetani* may be the hands of the birth attendant, while the main mode of contamination may be the dressing of the wound stump<sup>10-14</sup>. In this case, poor personal hygiene maintenance, including type of birthing surface, cord care (tying, cutting, topical applications), infant bathing practices, attendants' hand washing practices, and skin-to-skin contact between mother and newborn were noticed.

Mothers with previous history of neonatal tetanus babies were shown to have a significantly increased risk, and accounted for more than one-third of all cases<sup>19,23,24</sup>. In this case, one child died presenting all the symptoms and signs as observed in the current patient. This may indicate the importance of both poor hygienic condition and lack of mother's immunization.

According to the literature data, the vaccination itself, though indispensable, may not be enough for the prevention of neonatal tetanus; the need for hygienic care of the umbilical stump is equally important. Tetanus can occur in the presence of “protective” levels of antitoxin ( $\geq 0.1$  IU/ml); therefore, serology can never exclude the diagnosis of tetanus<sup>25,26</sup>. In a literature review, Dietz et al.<sup>27</sup> verified cases of neonatal tetanus in infants born to immunized mothers. In these cases, the suggested probable causes of the vaccine inefficiency were: error in the interval of administration between the first and the second dose, the administration of only one dose, which reduced the efficiency of the vaccine in 70%, or poor maternal immune response<sup>25-28</sup>. In 1989, the World Health Organization called for the elimination of neonatal tetanus<sup>18,29</sup>. The Advisory Committee of Immunization Practices recommended giving a booster dose of Td to previously vaccinated pregnant women who had not received a Td vaccination within the preceding 10 years, and completion of the primary series of three doses of Td in unvaccinated or partially vaccinated pregnant women<sup>4</sup>. In addition, targeted education regarding the importance and safety of tetanus vaccination is necessary among parents and direct-entry midwifery groups; parents and health-care providers should avoid applying non-sterile products to the umbilical cord of newborns<sup>29</sup>. A factor that contributes to low coverage is that most pregnant women in Serbian rural areas never practice the medical follow-up throughout pregnancy and delivery.

The presence of numerous risk factors (home delivery, untrained assistant, infected cord, lower birth weight, younger age at onset of symptoms, the presence of opisthotonos, and risus sardonius, etc.), as in the described case, were associated with a higher mortality rate<sup>5,15,21</sup>.

Neonatal tetanus is fortunately a rare disease in Serbia. This form of tetanus has a very poor survival prognosis. In eradication of this serious disease, it is very important that vaccination strategies are effectively implemented. This case highlights the importance of both vaccination among women of childbearing age who might become pregnant and maintenance of hygienic conditions throughout pregnancy and delivery.

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