



## CASE SERIES

# Case Series of Tetanus Diagnosis and Management in Hargeisa City

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## Abstract

**Background:** Tetanus is a global infectious disease caused by tetanospasmin toxin produced by the anaerobic clostridium tetani. It affects the brain stem and spinal cord and leads to high morbidity and mortality if untreated. East Africa reports the highest number of cases and the highest fatalities.

**Objective:** The objective of this study is to report on five inpatient clinical cases at Hargeisa Group Hospital in Hargeisa City with lessons learned for our team, a way to educate others and advocate for a new governmental policy.

**Method:** A descriptive case series study design was used to assess tetanus symptoms, related clinical care and management as well as inform public health policy. Cases were collected from June to November 2019 with diverse age, gender and background.

**Conclusion and recommendations:** The case series highlighted the lack of vaccination in all cases and pointed to the uneven population penetrance of vaccination rate on a national public health level. It underscored the high morbidity and mortality rate in Somaliland as a result. Tetanus is a vaccine preventable disease and the Ministry of Health in Somaliland should announce and undertake a clear universal vaccine campaign against tetanus.

## Keywords

Case series, Tetanus, Vaccine, Somaliland

## Introduction

Globally 38,000 people died from tetanus in 2017 particularly children younger than 5 years of age [1,2]. Tetanus is rare in the developed world though it is associated with a high case mortality worldwide especially in regions where vaccination coverage is incomplete [1,2]. Indeed, the mortality associated with tetanus varies greatly among countries or continents with 80% of deaths occurring in Africa and South East Asia [3]. Twenty million children worldwide missed out on life-saving vaccines such as measles, diphtheria and tetanus in 2018, according to new data from WHO and UNICEF [4]. Most unvaccinated children live in the poorest countries often stricken with conflicts such as Afghanistan, the Central African Republic, Chad, Democratic Republic of the Congo (DRC), Ethiopia, Haiti, Iraq, Mali, Niger, Nigeria, Pakistan, Somalia, South Sudan, Sudan, Syria and Yemen. Having said that, tetanus is a preventable disease with appropriate vaccination. In fact, the vaccine is highly efficient and had allowed for 89% reduction in tetanus cases and deaths since 1990 [1,2,5].

Globally, since 2010, vaccination coverage with three doses of diphtheria, tetanus and pertussis (DTP3) and one dose of the measles vaccine has stalled at around 86 percent. While high, this is insufficient. To

protect against outbreaks of vaccine-preventable diseases, at least 90 percent coverage is needed. [4,6]. According to the latest WHO data published in 2017, in Somalia and South Sudan, the tetanus case rate was greater than 10/100,000 people and the rate of new tetanus infection was more than 30 per 100,000 people. Moreover, the tetanus deaths in Somalia reached 2,055 or 1.64% of total deaths in the country [7]. This ranks Somalia as number 1 in the world for tetanus mortality [1]. Somalia has 25% DPT1 coverage far behind 90% goal for A World Fit for Children [4]. Moreover, in Somalia, immunization coverage is estimated at only 30-40% against six major childhood diseases- tuberculosis, diphtheria, pertussis, tetanus, polio, and measles despite the presence of more than 40 international NGOs supporting immunization activities [8,9].

In this case series, we will discuss the special course of tetanus with a challenging delayed diagnosis in 5 patients of diverse age, gender and background who were hospitalized in Hargeisa, Somaliland. We also highlight the multiple visits to healthcare providers before a diagnosis was made and link the deficiencies in universal tetanus vaccine coverage to the high tetanus morbidity and mortality in the region. Indeed, the vaccination coverage of Somaliland in both children and adults well below the standards. More than 50% of Somaliland reside in rural areas where access to the vaccine is scarce. Somaliland is a self-declared state, internationally considered to be part of Somalia, a Sub-Saharan country located in the Horn of Africa [10]. Hargeissa Group Hospital is located in Hargeissa the capital city of Somaliland. HGH is the largest national referral hospital with 400 inpatient beds. It includes emergency, medical, psychiatry, surgical/orthopedics, ICU, obstetrics and gynecology as well as pediatric wards. It has busy outpatient departments with a renal dialysis unit, ophthalmology and dentistry clinics as well as a radiology department offering CT (computed tomography) scanning, X ray and ultrasound studies. It has an independent pharmacy.

### Case 1

This 21-year-old unvaccinated male presented with generalized body stiffness, breathing difficulty as well as an inability to chew and swallow food for 4 days. The symptoms started as difficulty in chewing solid food and opening his mouth due to a heaviness sensation. He also had slurred speech. Eighteen days before his presentation, he was injured by two long nails while working at a construction site. After multiple visits to the emergency room and diagnoses ranging from stress to muscular pain due to labor and functional disorder, tetanus finally became the working diagnosis once his respiratory function deteriorated and he presented with autonomic instability. Vital signs were stable except for tachycardia at 110/min. He was hydrated with dextrose with normal saline (DNS), treated with intravenous (IV) Metronidazole 500 mg four times a day, IV diazepam 10 mg three



**Figure 1:** Point of entry of nails.

times a day, and 1<sup>st</sup> dose of tetanus vaccine was given at that time. He was not given tetanus immunoglobulin because it was not available. On day 3 of admission, he developed frequent spasm and excessive sweating and he was given magnesium sulphate 5 grams IV with paracetamol tablets up to 10 gm/day in divided doses. Seven days after admission, his symptoms improved with fewer spasms and he was transferred to a single darkened room. Two weeks after admission, he was able to take sips of water and milk. At week 3, he started to ambulate with support and a taper of diazepam was started. On the 35<sup>th</sup> day he was given the 2<sup>nd</sup> dose of the tetanus vaccine and discharged with close follow up and 3<sup>rd</sup> dose of vaccine scheduled. No local treatment was given to the entry wound because it had already healed at the time of presentation. He was back to his baseline with full functionality with continued monitoring over three follow-up visits (Figure 1).

### Case 2

This 16-year-old unvaccinated male presented with high grade fever, excessive sweating and generalized body stiffness more severely affecting the back and neck muscles. The symptoms started 7 days after he was deeply cut by a piece of metal rod at his right sole under the right big toe while he was playing soccer ball. The presenting symptoms were difficulty in chewing food and opening his mouth that progressed to generalized body stiffness with high grade fever and excessive sweating. On exam, he was septic with classic features of opisthotonos, trismus and risus sardonicus (sustained spasms of the facial muscles), His oxygen saturation dropped between 70% and 80% and he was hypoglycemic. He was placed on oxygen and hydrated with Dextrose in water 5%. Given that there is no intensive care unit equipped with mechanical ventilation in Hargeisa Group Hospital, he was admitted to a single darkened room. Treatment with IV metronidazole along with diazepam, magnesium and paracetamol was instituted. Tetanus immunoglobulin is was not given as it was not available. On day 2 of admission, the symptoms worsened, and the spasms became frequent even with the use of high dose of valium. The surgical team was consulted on admission day 3 for wound exploration and

pus was drained from the wound which was left open for daily cleaning. On day 4 after admission, with worsening symptoms, he developed aspiration pneumonia and ceftriaxone 1 gram twice a day was added. Unfortunately, he died 24 hours later from respiratory failure.

### Case 3

35-year-old unvaccinated male presented with generalized body stiffness and profuse sweating. The stiffness started in the right leg and progressed upwards to reach his whole body, affecting more severely his chest and back. He suffered severe muscle contractions whenever he heard a loud noise or experienced bright light. His symptoms started 14 days after a nail injury to the right sole while working at a construction site. On admission, he was alert and breathing spontaneously though he appeared in distress. His vital signs were stable. He was irritated by the slightest touch which led to generalized spasms. Tetanus was the working diagnosis. He was admitted to a single darkened room with minimal stimuli. He was hydrated and administered the protocol of metronidazole, magnesium, diazepam and paracetamol. Tetanus immunoglobulin was not available. On day #5 of admission, he had unstable vitals despite continued treatment of IV magnesium. On day #10 of admission, he finally showed some improvement with reduced sweating and less generalized spasms. He was able to take oral sips of water. On week 3 of admission, the patient started to sit with support IV diazepam was tapered off and switched to oral lorazepam 2 mg three times a day. In addition, he received 1<sup>st</sup> and 2<sup>nd</sup> dose of tetanus vaccine and 3<sup>rd</sup> dose was appointed. He improved after 4 weeks of treatment and was discharged from the hospital on week 6. Of note, he didn't receive local wound treatment as his wound had healed at time of presentation. Only a small scar was left at the nail injury site. He came back for one outpatient follow-up and continued to do well.

### Case 4

This 50-year-old unvaccinated female presented with headache, neck and back pain. The patient's initial presentation was for headache and reduced neck movement associated with excessive sweating. The stiffness progressed to the back and limb muscles and was associated with severe painful muscular spasms aggravated by the slightest movement and loud noise.

We noted that the symptoms started 4 weeks after being injured by a piece of wood lodging between 2 of her right toes. On admission she was alert and breathing spontaneously with partial pressure of oxygen ( $pO_2$ ) of 92% on room air. Vital signs were stable, but she had reduced neck movement and exhibited hyperextension to her legs and partially flexed her arms with a hunched back. Tetanus was the presumed diagnosis. She was admitted to a single darkened room with minimal stimuli and treated with metronidazole, magnesium, diazepam

and paracetamol. She was not given tetanus immunoglobulin because it was not available. She didn't receive any local wound treatment as her wound had already healed and left a hard scar. On the 4<sup>th</sup> day of admission she showed minimal improvement with reduced neck stiffness and proceeded to receive IV magnesium and on the 7<sup>th</sup> day of admission she was switched to oral baclofen at 10 mg three times a day for 3 weeks and lorazepam 2 mg two times a day for 10 days with good improvement after 2 weeks with the above regimen. Of note, on admission, she was given the first dose of the tetanus vaccine followed by the second dose during the fourth week of admission. The third dose was appointed, and she was discharged from the hospital on week 4. She came back for follow-up three times and was back to baseline.

### Case 5

This 18-year-old unvaccinated male farmer presented with generalized body stiffness more severe in the lower limbs and back. He complained of excessive sweating. The symptoms were aggravated by movements and loud noises. His symptoms started 3 weeks after noticing a large edematous collection on his right medial thigh. The collection ruptured discharging pus and contaminated soil debris. He presented to an outpatient clinic and was treated with antibiotics. As his symptoms progressed with muscular pain and excessive sweating, he presented to the hospital. On admission he was alert and breathing spontaneously. His vital signs were stable, but he was in distress with hyper extended neck and stiffened lower extremities and a large open oozing wound at the level of his right thigh, medial aspect right above the knee. He developed severe spasms during the examination. A diagnosis of tetanus was made. He was admitted to a single darkened room and started the regimen of metronidazole, magnesium, diazepam and paracetamol. He also received his first dose of the tetanus vaccine. On day #7 of admission, he showed some improvement though remained tachycardic and tachypneic and had excessive sweating and fluctuating blood pressure. He also received tetanus immunoglobulin as it became available. During the 2<sup>nd</sup> week of his admission, the patient's muscular spasms and stiffness improved but his overall condition was complicated by pressure sores at the level of the hips and the development of a new left thigh abscess which was surgically drained. From the pus and left open for daily cleaning and healing by secondary intention. Over-time, the wound diminished in size and healed by week 8 when he was discharged to the community with instructions given to the family for continued care. Unfortunately, he was lost to follow-up.

### Discussion

Tetanus is a rare condition in the western world, primarily due to widespread vaccination programs from infancy to adulthood. In many developing nations, tet-

anus, as with other preventable diseases, is still common [11,12]. Tetanus is an infectious disease caused by a toxin produced by the anaerobic bacteria *Clostridium tetani* which under favorable conditions produce toxin called tetanospasmin affecting the brain stem and spinal cord. *C. tetani* belongs to the clostridia genus, a diverse group of anaerobic spores forming gram positive bacilli. *C. tetani* is an obligate anaerobic bacillus and its spores are extremely stable, some surviving unless autoclaved at 120 °C, 1.5 bar, for 15 minutes [13,14]. Tetanus enters through deep penetrating wounds where anaerobic bacterial growth is facilitated. Wounds on the lower limbs, postpartum or post abortion infections of the uterus, non-sterile intramuscular injections, and compound fractures are most common portals of entry. Even minor trauma can cause tetanus in up to 30% of patients no portal of entry is apparent [14,15]. Tetanus presents clinically under four categories: Generalized, localized, cephalic and neonatal [11]. Generalized tetanus is the most common clinical presentation and accounts for 80% of all tetanus cases. Spasm of jaw muscles or “lockjaw” is usually the first clinical sign to appear. Painful spasms may also involve the muscles of neck, trunk, and extremities. Generalized seizure activities and convulsions can occur in severe cases. Mortality rate is 10-20% in modernized intensive care facilities. Localized tetanus is another presentation affecting a specific site or location of the body. Symptoms are localized to the point of entry of the tetanus infection and usually affect individuals with partial immunity. However, care must be taken as it could also be a prodromal form to the generalized tetanus. Cephalic tetanus is the least common form of tetanus. It is localized to the “head” as its name implies and is linked to injuries of the head or face or associated with otitis media. Contrary to other forms of tetanus, cephalic tetanus causes flaccid cranial nerve palsies rather than spasm. Spasm of the jaw muscles may also be present. Cephalic tetanus may go on to generalized tetanus [16].

The incubation period can be as quick as 24 hours to many months after inoculation. This interval reflects the distance traveled by the toxin within the nervous system or is related to the quantity of toxin released. The period of onset is the time between the first symptom and the start of spasms. The shorter the incubation period the more severe the disease [14]. The toxin interferes with the function of the reflex arc by inhibiting gamma aminobutyric acid (GABA) at presynaptic sites in the spinal cord and brainstem [17] resulting in the loss of central inhibition. Autonomic hyperactivity with sympathetic over activity occurs and uncontrolled muscle contractions happen in response to normal stimuli such as noises or lights [5,14]. The spasms are excruciatingly painful and could become uncontrollable leading to respiratory arrest and death. Spasms are most prominent in the first 2 weeks and the autonomic disturbance usually starts few days after the spasms and is maximum

during the second week of the disease. Rigidity may last beyond the duration of both spasms and autonomic disturbance [14,17].

Tetanus diagnosis can be a clinical challenge in psychiatric settings. The physician may suspect that the patient is suffering from a psychosomatic disorder with muscular pain complaints appearing early on as over elaborated. With this in mind, psychiatric clinicians should always broaden their differential diagnoses and include serious conditions such as atraumatic tetanus that can occasionally mimic psychosomatic symptoms and somatic symptom disorder [18]. There are other diagnostic challenges. Conditions that suggest meningitis can turn out to be tetanus [19] and malignant catatonia can look like tetanus [20]. In our case series, muscle spasms and autonomic disturbance presentations were more prominent than the lockjaw syndrome. In addition, some of the cases presented with slurred speech and dysarthria, rare manifestations of tetanus [21].

## Management of Tetanus

The treatment of tetanus is multidimensional and revolves around supportive care, hemodynamic management, control of the toxin production and symptomatic treatment of the muscular spasms [9,17].

### Supportive care and hemodynamic management

Respiratory failure is a major cause of mortality in many developing countries given the lack of ventilators. Airway management is crucial. Beware during the introduction of an endotracheal tube as it may exacerbate spasms. Consideration should be given to early tracheostomy.

### Management of muscle spasm

IV benzodiazepines are the mainstay of therapy (lorazepam or diazepam) for their GABA agonist action. They also provide sedation. Propofol is another alternative. In addition, magnesium reduces the requirement for other medications used for muscle spasm and cardiovascular instability [11].

### Management of autonomic disturbances

Autonomic instability is a challenging component of tetanus management and is a common cause of death in the course of a disease [5,22]. Unfortunately, little research addresses this autonomic syndrome and the optimal treatment remains unclear. “Autonomic storms,” present as extreme hypertension and tachycardia and can occur without a precipitating event. Acetylcholine excess may also be the cause of the autonomic dysregulation [11]. Autonomic storms are often followed by severe, treatment-resistant hypotension, bradycardia, and sometimes asystole [16].

### Control of the toxin

It involves targeting to reduce the load of the clos-

tridium bacteria with wound aeration and debridement to decrease the anaerobic conditions that favor the growth of the clostridium bacilli [11,15]. Antibiotics are administered. Penicillin remains the standard therapy for tetanus in most parts of the world. The dose is 100,000-200,000 IU/kg/day intramuscularly (IM) or intravenously (IV) for 7 to 10 days. Penicillin IV could cause convulsions as the structure of penicillin, is similar to GABA and acts as a competitive antagonist to GABA causing CNS hyper excitability [17]. In tetanus, penicillin could synergize with the action of the toxin in blocking transmitter release at GABA neurons. Metronidazole is a safe alternative and is now considered as the first line therapy. It can be administered rectally as well for rapid bioavailability and causes fewer spasms than IV or IM injections [5].

Treatment of circulating tetanus toxin is done with human tetanus immunoglobulin (HTIG) or equine antiserum. This does not affect the toxin already present in neurons. The half-life of HTIG is 23 days, and recommendations for dosing intervals vary. Repeat dosing is still subject to debate. The optimal route and dose are also debated [23,24]. Severe allergic reactions such as anaphylaxis can occur with equine antitoxin which is readily more available in developing countries [11].

Tetanus toxoid immunization should always be given for long-term immunity, as neither the disease itself nor HTIG confer immunity. This can be administered during treatment for acute tetanus though at a different site from HTIG to avoid interaction. The WHO guidelines for tetanus toxoid vaccine push suggest 3 doses for protective immunity in infants. Although tetanus antibody level is high after the third dose given to infants, they decline over time. Additional booster doses are needed in adolescence to induce immunity that last at least for 10 more years [7]. The adolescents and adults with NO previous immunization including pregnant women should receive their first dose of the tetanus vaccine as early as possible followed by the second dose at four weeks, a third dose after 6 months and the 4<sup>th</sup> and 5<sup>th</sup> dose at least one year apart for a total of 5 doses [7,24,25].

In our case series, we highlighted major delays in the correct diagnosis with patients presenting at least three times to the hospital before the staff recognized the tetanus disease constellation of signs and symptoms. For that reason, the doctors lost crucial time needed to save their patients' lives. Patients often presented to multiple settings including private clinics and public government facilities and hospitals with no resolution of their symptoms. We found that patients were finally given the correct tetanus disease diagnosis when symptoms worsened to the point of generalized continued painful muscular spasms, a dangerous progression of the disease. Moreover, our patients did not present with the common lockjaw syndrome although they complained of stiffness in the jaw or jaw spasms accompanying reflex spasms defined as severe involuntary uncontrollable

muscle contractions in response to external stimuli. They all had generalized body stiffness with significant autonomic dysfunction. They all reported deep cuts from nails, metal and wood injuries. Most of them lived in rural Somaliland and were farmers or construction workers with high exposure to rusted material or bacteria contaminated soil products putting them at high risk for the disease, one of them lived in the city. The reasons why so many people in rural Somaliland contract the disease are due to poor access to the vaccine only at ~ 47% [26] in its needed 3 injection/booster regimen and a low level of literacy and health education to request and follow-up on what is their right for preventative lifesaving measures [26]. Sadly too, there is no clear public health policy allowing for the universal access to the tetanus vaccine for Somaliland population.

Since tetanus often causes neurologic findings and psychiatric distress, neuropsychiatrists can offer these patients comprehensive care with thorough complex-level consultations. This can result in best practices for these patients' care, which is crucial due to the lack of intensive care specialists and the scarcity of neurologists in the country.

## Conclusion and Recommendations

This short case series points to the seriousness of tetanus infection in Somaliland, which may have the highest prevalence of tetanus in the world. This report also suggests that the tetanus vaccination and availability in Somaliland is far below international standards. We also highlighted the differential diagnosis and the presentation of generalized body stiffness and autonomic dysfunction in our case series rather than the well-known lockjaw prominent symptom. In resource-limited settings the patient can be treated with antimicrobials, muscle relaxants, antipyretics with tight control of environmental stimulations such as nursing the patient in darkened and quiet rooms. When there is no access to assisted ventilation, cases with decompensated respiratory status have a high mortality rate. Pediatric cases remain the group with the highest mortality rate. With the lack of critical care specialists in Somaliland, neuropsychiatrists have an important role to play at the frontline of care for complex and serious diseases, tetanus included. We continue to push for awareness that tetanus is a preventable disease and its mortality and morbidity could be eradicated with proper vaccination and sanitization.

## Recommendations

1. Tetanus is a vaccine preventable disease and the Ministry of Health in Somaliland should announce a clear universal countrywide vaccine policy against tetanus. We especially recommend full access to pregnant mothers and children.
2. Public health awareness programs pertaining to tetanus disease prevention and presentation should be

emphasized.

3. Childhood immunizations should be encouraged by the ministry of health using community elders and religious leaders.
4. Pregnant mothers should be educated about tetanus and the benefits of the tetanus vaccine- or the risks if they decline it.
5. Health care professionals should keep in mind that tetanus is common in Somaliland and they should think about the diagnosis quickly when seeing this constellation of symptoms.
6. Midwives and traditional birth attendants should be trained for safe procedures during delivery such as using clean sanitized instruments to cut the umbilical cord and clean handling of newborns.
7. The wound care basics should be taught to all health-care workers.
8. Additional research is needed to establish the prevalence of tetanus in Somaliland.

## Consent

Verbal permission was obtained for the picture in case 1 and this work was subjected to the standards of ethics of Hargeisa College of medicine. This work was not funded.

## Conflicts of Interest

The authors have nothing to declare.

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