Research Square

Preprints are preliminary reports that have not undergone peer review.
They should not be considered conclusive, used to inform clinical practice,
or referenced by the media as validated information.

Tetanus Toxoid-Induced Anaphylaxis Complicated by Cardiac Arrest In a 21-Year-Old Female in a Tanzanian Emergency Department; a case report

Bahati James Msige
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Nasoro Peter Mlelwa
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Joseph Vandelin Mallya
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Sixberth John Bugeraha
Department of Pharmacy, Consolata Hospital Ikonda Njombe, Tanzania
Rehema Charles Mwenda
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Eva Sunday Mkeleja
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Kenneth Cosmas Kwanja
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Thomas Raphael Acley
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Jesca Charles Mhagama
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Melkizedek Joseph Msovela
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Christina Saki Kinyau
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Faraja Hamza Mera
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania
Janet Jebichii Sugut
Department of Emergency Medicine, Kenyatta National Hospital, Nairobi, Kenya
Humphrey Godwin Medarakini
humphreymedarakini@gmail.com

Department of Emergency Medicine, Muhimbili University of Health and Allied Sciences, Tanzania
https://orcid.org/0009-0006-3318-7184

Agnes Lucas Mlawa
Department of Emergency Medicine, Consolata Hospital Ikonda Njombe, Tanzania

Case Report

Keywords: Tetanus Toxoid, Anaphylaxis, Cardiac Arrest, Resuscitation, Case report

Posted Date: April 28th, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9534243/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License.
Read Full License

Additional Declarations: The authors declare no competing interests.

Abstract

Background

Anaphylaxis following tetanus toxoid immunization is extremely rare but potentially life threatening without rapid recognition and treatment, with progression to cardiac arrest is even more uncommon.

Case presentation

We report a 21-years-old previously healthy Tanzanian female who developed a rapid-onset anaphylaxis reaction within five minutes after receiving a 0.5 ml intramuscular tetanus toxoid (TT) injection for wound prophylaxis. She deteriorated into pulseless electrical activity (PEA) cardiac arrest shortly after symptom onset. Eight cycles of cardiopulmonary resuscitation (CPR), including adrenaline administration, airway control (intubation), aggressive intravenous fluids and corticosteroids resulted into return of spontaneous circulation (ROSC). The patient was monitored in the intensive care unit (ICU), extubated within 24 hours, and recovered with intact neurological outcomes by 72 hours.

Conclusion

Vaccine-related anaphylaxis reactions, although rare, prompt recognition, management, and preparedness are very important to prevent severe adverse events.

Background

Anaphylaxis is an acute, severe, and potentially life-threatening systemic hypersensitivity reaction characterized by rapid onset of airway compromise, circulatory collapse and mucocutaneous involvement, typically mediated by immunoglobulin E (IgE)-dependent mast cell and basophil activation with release of histamine and other vasoactive mediators [1]. Although vaccines remain among the safest and most effective public health interventions, immediate hypersensitivity reactions may occur. Large surveillance studies in high-income countries estimate anaphylaxis rates of approximately 1-2 cases per million vaccine doses [2]. Among tetanus – containing vaccines, anaphylaxis is exceedingly rare, with most reported reactions being mild or moderate.

In low- and middle- income countries (LMICs) including Tanzania, published data on vaccine- related anaphylaxis are limited despite widespread tetanus toxoid (TT) use for wound prophylaxis and maternal immunization. Tanzania's Expanded Programme on Immunisation reports high TT coverage among women of reproductive age, yet documented cases of TT-induced anaphylaxis are nearly absent from indexed literature, suggesting possible under-recognition or under-reporting [3]. Although tetanus toxoid is considered safe, hypersensitivity reactions including IgE-mediated responses to tetanus antigens or vaccine excipients have been reported in isolated global case studies [4].

Progression of vaccine-associated anaphylaxis to **cardiac arrest**is exceptionally rare. Published reports describe anaphylaxis requiring resuscitation after various vaccines, but TT-induced anaphylaxis leading

to pulseless electrical activity (PEA) arrest is scarcely documented. To our knowledge, no such case has been previously reported in Tanzania or the East African region.

We report a case of **tetanus toxoid induced anaphylaxis complicated by cardiac arrest** in a previously healthy 21-year-old woman, highlighting rapid onset, resuscitation course, and recovery. This case contributes valuable local evidence and highlights the need for emergency preparedness at all immunization delivery points in resource-limited settings.

Case Presentation

A 21-years-old previously healthy Tanzanian female presented to the procedure room for cleaning of a superficial wound (punctured wound to the foot caused by a nail), having unremarkable primary survey and received a 0.5 mL intramuscular TT vaccine injection for prophylaxis *(figure 2)*. She had no prior history of allergies, asthma, atopy or adverse reactions to vaccines, neither a family history of allergies or previous TT dose history nor on any medication use as reported by the patient.

Within approximately 5 minutes of vaccination with the available vaccine *(figure 1)*, she developed generalized pruritus, dizziness, shortness of breath and blurred vision, followed by sudden collapse with a Glasgow coma scale score of 3/15. Examination revealed generalized urticaria, diaphoresis, peripheral cyanosis, cold and clammy extremities and stridor but no wheezes, hypotensive (BP unrecordable) and tachycardic (HR 142 bpm) with thread pulse, tachypnea (RR 32b/min) with oxygen saturation (SpO2) unrecordable on room air, body temperature was 36.7□ C, within two minutes from the onset of the symptoms she rapidly deteriorated into pulseless electrical activity (PEA) cardiac arrest.

Immediate intramuscular (IM) adrenaline 0.5 mg was administered at symptom recognition. Bag-valve-mask ventilation was initiated. Upon confirmation of PEA, CPR was initiated as per advanced cardiac life support (ACLS) guidelines. A total of eight cycles of CPR were required before ROSC was achieved.

Following ROSC, the patient was intubated and mechanically ventilated. An intravenous adrenaline infusion was started at 0.05 mcg/kg/min. She received 3 L of normal saline bolus and intravenous (IV) hydrocortisone 200mg. post-ROSC the patient vital signs were recorded as follows: BP 87/61mmhg, PR 124bpm, SPO2 98% on mechanical ventilator, RR 18bpm.

Due to rapid clinical deterioration, no laboratory investigations were obtained before cardiac arrest. The arterial blood gas (ABG) immediately post-ROSC demonstrated a severe mixed acidosis (pH 6.999) characterized by marked hypercapnic respiratory acidosis (PCO_2 81.9 mmHg) and a concurrent metabolic acidosis (HCO_3^- 13 mmol/L) with elevated lactate (3.6 mmol/L), consistent with profound hypoventilation and tissue hypoperfusion during anaphylactic shock and PEA arrest.

The patient was transferred to the intensive care unit (ICU) for ongoing post resuscitation care and anaphylaxis monitoring. Over the following 24 hours, she stabilized hemodynamically and was successfully extubated. By 72 hours, she exhibited full neurological recovery and was transferred to the

ward, where she completed monitoring for potential biphasic reactions before being discharged home on day five with follow-up instructions on the potential risks of future tetanus-containing vaccines, and the importance of allergology follow-up

Discussion

The case represents a rare but clinically significant instance of tetanus-toxoid induced anaphylaxis progressing to cardiac arrest in a young, previously healthy adult. Consistent with the literature, the onset of symptoms occurred within minutes of inoculation, aligning with known patterns in which the majority of vaccine-associated anaphylactic reactions occur within the first **30 minutes** post-administration [5]. Immediate clinical diagnosis is required and intramuscular epinephrine remains the cornerstone of anaphylaxis treatment and has been shown to reduce morbidity and mortality. Delayed administration is linked to worse outcomes, including cardiac arrest and biphasic anaphylaxis [1], a recurrence of symptoms after initial resolution, has been reported in a minority of patients, and guideline panels recommend several hours of observation commonly 4–12 h with severe cases may warrant longer monitoring [6]. Adjunctive treatments like antihistamines or corticosteroids do not replace adrenaline.

Anaphylactic arrest is primarily due to distributive shock leading to cardiovascular collapse, rather than a primary cardiac pathology [1]. The patient rapid progression from symptoms to pulseless electrical activity (PEA) reflects this pathophysiology. Immediate intramuscular epinephrine remains the only intervention proven to reduce mortality in anaphylaxis [7], while as per 2020 advanced cardiac life support (ACLS) guidelines, cardiac arrest typically PEA or asystole should be treated with IV **adrenaline 1 mg every 3–5 minutes**, consistent with non-shockable rhythm protocols. Airway compromise due to laryngeal edema or bronchospasms can progress rapidly, and ACLS recommends **early airway management**, preferably endotracheal intubation, once feasible during resuscitation [8]. The guidelines also emphasize **aggressive fluid resuscitation**, as anaphylaxis causes extreme vasodilation and capillary leak. After return of spontaneous circulation (ROSC), continued hypotension should be managed with **vasopressor infusions**, principally adrenaline, and patients require **ICU-level monitoring** for potential biphasic reactions or post-arrest complications(6). Our patient's management including early IM adrenaline, prolonged and high-quality CPR, crystalloid resuscitation, adrenaline infusion, and ICU monitoring follows ACLS recommendations precisely, demonstrating the applicability of international guidelines even in low-resource settings.

TT-related anaphylaxis cases are rare and generally do not progress to cardiac arrest. A case from Thailand reported anaphylaxis after concurrent TT, rabies vaccine and immunoglobulin but did not involve PEA cardiac arrest [4]. In Tanzania, the Tanzania Medicines and Medical Devices Authority (TMDA) – adverse event following immunization (AEFI) guideline, 2023 lists anaphylaxis as a reportable adverse event following immunization and provides case definitions, investigation procedures and national reporting forms [9]. The Ministry of Health, Tanzania's emergency/triage clinical guidance includes algorithmic recognition of anaphylaxis in acute care settings [10]. While there is recognition of anaphylaxis in Tanzania's policy documents, peer-reviewed published case reports especially of

tetanus-toxoid induced anaphylaxis have not been documented or reported, emphasizing the rarity or underreporting of such events locally. This underscores the importance of reporting this case and contributing to local knowledge and surveillance towards safe vaccination practices.

The case demonstrates how rapidly vaccine induced anaphylaxis can progress to cardiac arrest. The achievement of ROSC after eight cycles of CPR emphasizes the reversibility of anaphylaxis with aggressive management. The case underscores critical gaps in preparedness at immunization administration points in LMICs, where emergency kits may be unavailable, training among vaccination staff on early recognition and prompt management, AEFI documentation, investigation and publication to improve vaccine – safety surveillance.

Conclusion

Anaphylaxis following tetanus toxoid administration, though extremely rare, can progress rapidly to cardiovascular collapse and cardiac arrest. Emergency departments and immunization services in low-resource settings, must maintain readiness to recognize and treat anaphylaxis promptly. Continuous post-resuscitation monitoring, and strategic planning for future immunizations are essential components of comprehensive care. Reporting of such cases strengthens local surveillance and informs national guidelines for immunization safety.

Abbreviations

ABG	Arterial Blood Gas
ACLS	Advanced Cardiac Life Support
AEFI	Adverse Event Following Immunization
BP	Blood Pressure
CPR	Cardiopulmonary Resuscitation
HR	Heart Rate
ICU	Intensive Care Unit
IgE	Immunoglobulin E
IM	Intra-muscular
IV	Intra-venous
LMIC	Low – and Middle-Income Countries
PEA	Pulseless Electrical Activity
ROSC	Return Of Spontaneous Circulations
RR	Respiratory Rate
TT	Tetanus Toxoid

Declarations

Ethical approval and consent to participate

Not applicable

Consent for publication

Written informed consent was obtained from the patient for publication of this case report, accompanying images and de-identified information. A copy of the written consent is available for review by the Editor-in-chief of this journal.

Availability of data and materials

The data used to write the case report are available from the corresponding author on request by the Editor-in-chief of this journal

Competing interests

The authors declare no conflict of interest

Funding

The authors declare that no funds, grants, or other support were received during the preparation of this case report

Authors contributions

BJ, NM, JM, SB, RM, EM, KK, TR, JM, MM, CK, FM and AM were all responsible for the patient's clinical management, performed the initial diagnosis and collected the clinical data and follow up. BJ, HM and JS drafted the initial manuscript and all revisions. SB contributed to the discussion of the pharmacological aspects of the case. All authors approved the version to be published and agreed to be accountable for all aspects of the work

Acknowledgements

Heartfelt appreciations to the Consolata Hospital Ikonda emergency medical team, ICU team under Dr Lusekelo Mwalukambwe and Salma A. Mkeya, Medical Department team under Dr Costantino Dulle, for their collaborative management of this case. And Eng. Theresia E Sulley, for her moral support.

References

1. Simons FER. Anaphylaxis : Recent advances in assessment and treatment. J Allergy Clin Immunol. 2011;124(4):625–36.
2. McNeil MM. Vaccine-Associated Anaphylaxis. Curr Treat Options Allergy. 2019;6(3):297–308.
3. Mboya EA, Ndumwa HP, Amani DE, Nkondora PN, Mlele V, Biyengo H, et al. Critical illness at the emergency department of a Tanzanian national hospital in a three- year period, 2019 – 2021. BMC Emerg Med; 2023;1–10.
4. Sampao S, Kotcharat K. A patient who developed anaphylaxis after receiving Tetanus toxoid , Rabies vaccine , and Immunoglobulin : Difficulties in assessing and managing adverse drug reactions in the absence of alternative vaccines. J Med Health Sci. 2021;28(2):121–34.
5. Mcneil MM, Weintraub ES, Duffy J, Sukumaran L, Bednarczyk RA, Destefano F. Risk of anaphylaxis after vaccination in children and adults. J Allergy Clin. 2011;137(3):868–878.
6. Ichikawa M, Kuriyama A, Urushidani S, Ikegami T. Incidence and timing of biphasic anaphylactic reactions: a retrospective cohort study. Allergy Asthma Clin Immunol. 2021;17:1–9.
7. Resuscitation Council UK. Emergency treatment of anaphylaxis. guidelines for healthcare providers. London: RCUK; 202.
8. Drennan IR, Hirsch KG, Kudenchuk PJ, Kurz MC, Morley PT, Neil BJO, et al. Circulation Part 3 : Adult Basic and Advanced Life Support Resuscitation and Emergency Cardiovascular Care. Circulation. 2020;142(Suppl 2):S366-S468.

9. Tanzania Medicines and Medical Devices Authority (TMDA). Guidelines for surveillance of adverse events following immunization. 2nd ed. Dodoma: TMDA 2022;255(56).
10. United Republic of Tanzania, Ministry of Health. National Guideline on Oxygen therapy. Dar es Salaam: Ministry of Health; 2022;

Figures

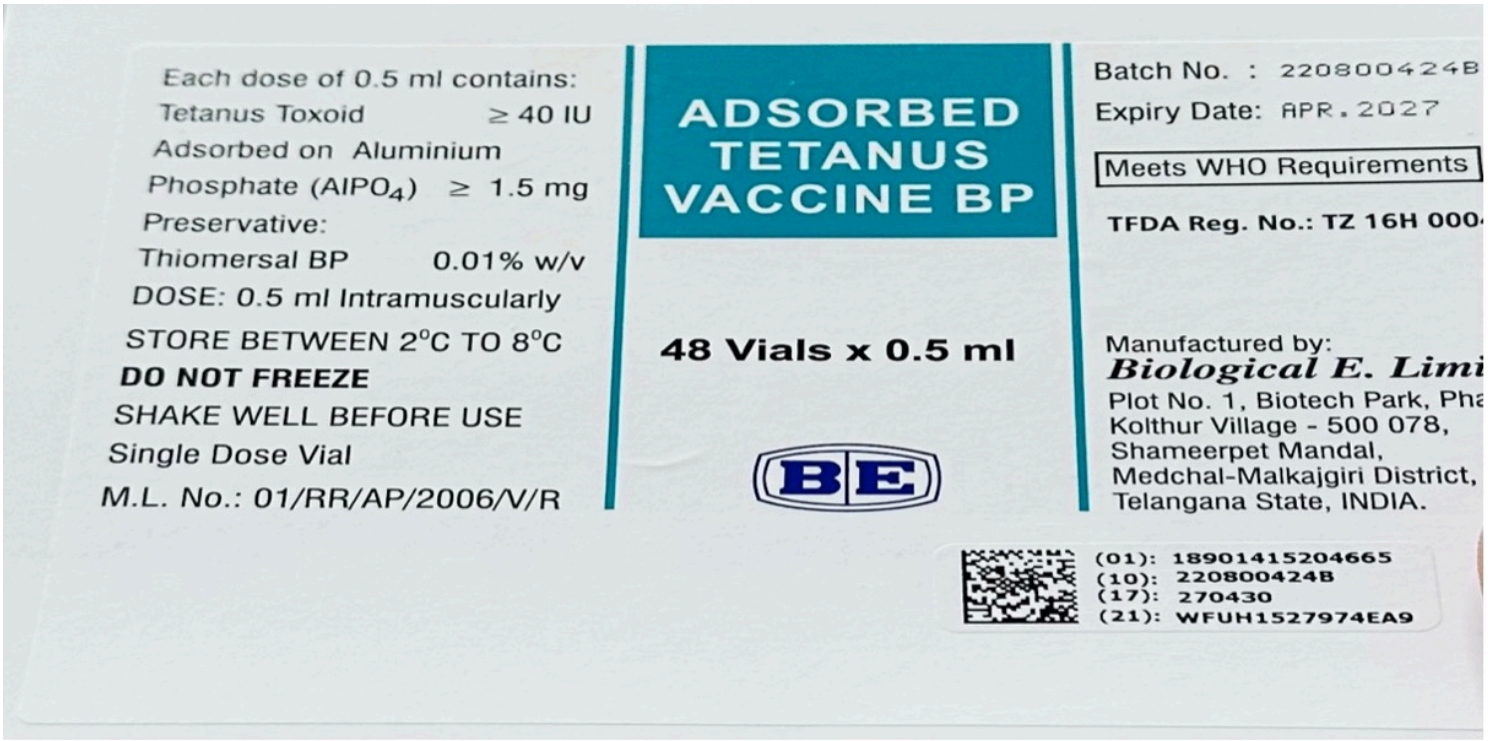


Figure 1

Composition and instruction for use of Tetanus toxoid vaccine administered to a patient



Figure 2

Tetanus toxoid vaccine administered to a patient

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- Annex1.docx