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Review Article

Clinical Features and Management of Tetanus

Abdul Majid Amin[1*] | Syed Zulqarnain Mehdi[2]| Maria Shah[3] | Niaz Ahmed Wassan[4] | Mishqat Ullah[5]

[*1]District Health Officer Barkhan Ph.D. Scholar (Public Health) Health Services Academy Islamabad
Email: majidamin2009@gmail.com
[2]Founder/CEO Daman Medical Institute
PhD Scholar (Public Health), Health Services Academy Islamabad
Email: zulqarnain.mehdi@yahoo.com
[3]Department of Pharmacy, University of Swabi, Swabi Pakistan
Email: mariashah44321@gmail.com
[4]Senior Medical Officer District Head Quarter Hospital Mianwali
Email: niazwasan@gmail.com
[5]Deputy Medical Superintendent, District Head Quarter Hospital, Tank, KPK, Pakistan
Email: mishqatullahkundi123@gmail.com

Correspondence
Abdul Majid Amin
Email : majidamin2009@gmail.com

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ABSTRACT:

Background: Compared to developed nations, tetanus has remained common in poor and emerging nations over the past few decades. In underdeveloped nations like Pakistan, a low rate of Tetanus Toxoid (TT) immunization has resulted in a significant morbidity and mortality rate due to Tetanus among women and children. **Purpose:** The purpose of this article is to highlight the Clinical features and Management of tetanus. **Material & Methods:** Systematic literature review has been conducted for this study. Web of Science, PubMed, and Scopus data basses were used to extract titles, abstracts, articles, thesis and books published on this topic. **Findings:** Nonetheless, it continues to be a significant global cause of death and is linked to a high case mortality rate, especially in developing nations. Even if the frequency is low in developed nations, individuals over 60 years old, who are the group most at risk of developing the illness, nonetheless have a mortality rate above 50%. Acute respiratory failure should no longer be fatal thanks to current intensive care management, but additional causes of death and cardiovascular problems brought on by autonomic instability still pose a challenge.

KEYWORDS:

Clinical features, Management of tetanus, autonomic dysfunction, Supportive intensive care, rigidity and spasms

1 | INTRODUCTION

Most cases of tetanus occur following a recognized wound. Soil, dung, or rusted metal can contaminate wounds and cause tetanus. It can worsen intramuscular injections, burns, ulcers, middle ear infections, septic abortions, gangrene, delivery, and necrotic snakebite wounds. mild damages are possible; up to 50% of accidents occur indoors and/or are thought to be too mild to necessitate medical care. Fifteen to twenty-five percent of people have no visible signs of a recent wound.[1] The clinical triad consists of muscle spasms, stiffness, and, in more severe cases, autonomic dysfunction. Early symptoms include painful throats, stiff necks, and difficulty opening the mouth. Lockjaw or trismus is caused by masseter spasm.[2] Spasm gradually spreads to the swallowing muscles, resulting in dysphagia, and the face muscles, giving the classic expression known as the "risus sardonicus". The head retracts when the neck muscles are rigid. Truncal rigidity can cause breathing difficulties and opisthotonus due to a reduction in chest wall compliance. Elevated muscle tone is accompanied with periodic muscular spasms. These tonic contractions, which resemble convulsions, impact both agonist and antagonist muscle groups.[3] They could

occur on their own or be brought on by tactile, visual, auditory, or emotional stimulation. While the frequency and intensity of spasms might vary, they can be powerful enough to result in tendon avulsions and fractures. Eleven Respiratory failure may result from nearly constant spasms. Aspiration and potentially fatal acute airway blockage are linked to pharyngeal spasms, which are frequently succeeded by laryngeal spasms.[4] All the body's muscles are impacted by generalized tetanus, the most frequent type of tetanus. Usually, the head and neck muscles are impacted initially, followed by a progressive caudal spread of stiffness and spasm that affects the entire body. Hysteria, hypocalcemia, dystonic medication reactions, orofacial infections, and strychnine poisoning are among the differential diagnoses.[5]

There is a significant death rate and widespread spasms. The disease is caused by improper umbilical cleanliness, although it is completely avoidable by immunizing mothers, even when they are pregnant. Before artificial ventilation was developed, acute respiratory failure claimed the lives of numerous individuals suffering from severe tetanus.[6] It became clear that acute tetanus was linked to significant autonomic instability with the advent of intensive care. Most notably, the sympathetic nervous system is impacted. In clinical terms, hypertension and prolonged tachycardia are brought on by elevated sympathetic tone. There is a noticeable vasoconstriction and fever.[7]

2 | LITERATURE REVIEW

2.1 | Classification of Tetanus Severity

Table 1 Tetanus Severity & Classification

S#	Symptoms
1	**Mild**: little to no dysphagia, general spasticity, no respiratory embarrassment, no spasms, mild to moderate trismus.
2	**Moderate symptoms** include small dysphagia, mild trismus, conspicuous rigidity, mild to moderate but transient spasms, and moderate respiratory embarrassment with an elevated respiratory rate higher than thirty.
3	**Apneic episodes**, severe dysphagia, tachycardia greater than 120, reflex prolonged spasms, increased respiratory rate greater than 40, and severe trismus are examples of severe symptoms.
4	**Extremely severe**: autonomic abnormalities involving the cardiovascular system that are grade III and aggressive. severe tachycardia and hypertension interspersed with bradycardia and relative hypotension, either of which could be chronic.

Catecholamine levels in basal plasma are elevated. When "autonomic storms" happen, there is pronounced cardiovascular instability. Bradycardia, severe hypotension, and repeated cardiac arrest can occur in tandem with severe hypertension and tachycardia. Rather than heart function or beating, these changes are mostly caused by quick changes in systemic vascular resistance. Plasma catecholamine levels during these storms can increase up to ten times, reaching levels akin to those observed in phaeochromocytomas.[8] More so than adrenaline, norepinephrine is impacted. Neuronal hyperactivity appears to be more common than adrenal medullary hyperactivity. Other autonomic effects besides the cardiovascular system include increased bronchial secretions and excessive salivation. Autonomic dysfunction can be linked to diarrhea, ileus, gastric stasis, and high output renal failure. It is established that the sympathetic nervous system is involved. Less is known about the parasympathetic nervous system's function. It has been observed that tetanus causes lesions in the vagal nuclei8, and that a toxin given locally can cause an overabundance of vagal activity. Increased vagal tone and activity can result in asystole, bradycardia, and hypotension.[9]

2.2 | Management of Tetanus

Three management principles underpin treatment strategies: toxin outside the central nervous system (CNS) should be neutralized; organisms already present in the body should be eliminated to stop more toxin release; and the effects of toxin already inside the CNS should be reduced. Deactivation of free toxin 3±6000 units of human tetanus immune globulin are administered i.m.[10]

2.3 | Elimination of the Infection's Source

Whenever visible wounds are found, they should be surgically debrided. Although penicillin has been used extensively for a long time, it is a GABA antagonist and has been linked to convulsions. Probably the best antibiotic

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is metronidazole. It's safe, and tests comparing it to penicillin indicate that the results are at least as excellent.[2] As acceptable substitutes, erythromycin, tetracycline, chloramphenicol, and clindamycin are recognized. Control of tenseness and convulsions While benzodiazepine sedation is the cornerstone of treatment, avoiding needless stimulation is imperative. Through the inhibition of an endogenous inhibitor at the GABA A receptor, benzodiazepines increase GABA agonism.[11] Despite being widely used, cheap, and amenable to multiple administration methods, long-acting metabolites like desmethyldiazepam and oxazepam have the potential to accumulate and induce a prolonged coma. Reports of doses up to 100 mg h±1 have been made. There hasn't been as much noticeable accumulation since midazolam was used. Anticonvulsants, particularly phenobarbitone (which increases GABAergic activity) and phenothiazines (often chlorpromazine), can cause increased sedation. Propofol has been used to make people drowsy, and when the infusion is discontinued, the patient quickly recovers. When sedation is insufficient on its own, a prolonged course of intermittent positive pressure breathing, and neuromuscular blocking medications may be required.

Pancuronium, a long-acting medication, has been utilized historically.[12] On the other hand, pancuronium decreases catecholamine re-uptake and, in extreme situations, may exacerbate autonomic instability. A $GABA_B$ agonist called intrathecal baclofen has been described in a few short series with variable degrees of efficacy. Doses were administered as boluses or infusions, with a daily range of 500 to 2000 mg. More side effects were linked to larger dosages and boluses. A considerable proportion of patients experienced respiratory depression requiring ventilation and went into coma in every report.[12] 99 Although this is not dependable, there have been instances where side effects were reversible after using the $GABA_A$ antagonist umazenil. The procedure is expensive and intrusive, and artificial ventilation facilities need to be ready right away.[13]

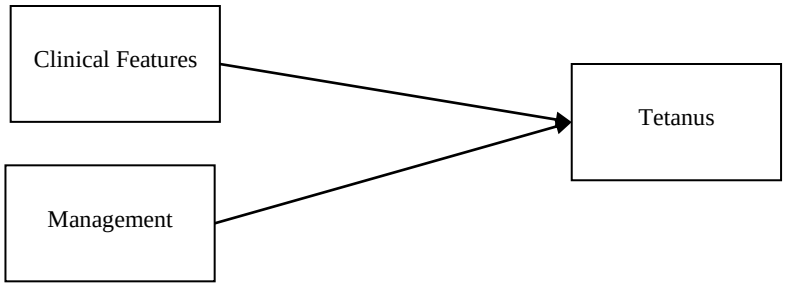

Figure 1: Conceptual Framework

2.4 | Control of Autonomic Dysfunction

There have been numerous reported methods for treating autonomic dysfunction. The majority are given as brief series or case studies. Studies that are controlled or comparative are scarce. Generally speaking, hemodynamic data rather than survival or morbidity have been the only outcome metrics used. Autonomic instability can be prevented non-pharmacologically by fluid loading up to 8 liters per day1.[14] The first therapy is frequently sedation. Anticonvulsants, morphine in particular, and benzodiazepines are commonly utilized. Given that cardiovascular stability can occur without cardiac impairment, morphine is very advantageous. The range of dosages is 20–180 mg day±1. The replacement of endogenous opioids, a decrease in reflex sympathetic activity, and histamine release are some of the suggested mechanisms of action.[15] Another effective sedative is phenothiazines, especially chlorpromazine; anticholinergic and adrenergic antagonistic effects may promote cardiovascular stability.

One symptom of severe tetanus is sudden cardiac death. While the exact cause is still unknown, several likely theories include storms, sudden loss of sympathetic drive, and heart injury brought on by catecholamines. Acute cardiac failure could result from persistent beta block due to Particularly when Sympathetic crises are associated with negative inotropism, unopposed vasoconstrictor activity, significant systemic vascular resistance, and either normal or poor heart function.[14] Therefore, it is not advisable to utilize long-acting medications in isolation for b-adrenergic inhibition. Trimetaphan, phenoxybenzamine, and serpine are examples of comparable drugs that have been used well with propranolol, as have Drugs such as bethanidine, guanethidine, and phentolamine that suppress adrenergic and postganglionic transmission. Rebound hypertension following withdrawal, tachyphylaxis, and possibly difficult-to-reverse caused hypotension are the disadvantages of this family of drugs. With varying degrees

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of efficacy, clonidine, an α_2-adrenergic agonist, has been administered parenterally or orally.[11] By acting centrally, it lowers sympathetic outflow, which lowers heart rate, arterial pressure, and adrenal medullary catecholamine output.[16] It prevents norepinephrine from being released from pre-junctional nerve terminals on the periphery. Considerable sedation and anxiolysis are additional beneficial effects. less people die in the clonidine-treated group than in the standard treatment group when they are randomly assigned to receive it.

2.5 | Supportive Intensive Care Treatment

Tetanus causes weight loss in all cases. The difficulty to swallow, changes in gastrointestinal function brought on the autonomic nervous system, elevated Long-term critical illness, muscle activity, and elevated metabolic rate from pyrexia are all significant factors. Nutrition must therefore be introduced as soon as practical. Compared to parenteral nutrition, enteral nutrition is less expensive and has a lower incidence of problems.[1] Under anesthesia, percutaneous gastrostomy can be easily performed in the intensive care unit and perhaps prevent the difficulties associated with nasogastric tube feeding. Tetanus frequently results in infectious consequences of prolonged critical illness, such as ventilator-associated pneumonia.[17] It makes sense to reduce this risk by protecting the airway as soon as possible in illness and avoiding infection and aspiration. Since artificial breathing is frequently required for a few weeks, tracheostomy is typically carried out following intubation. For patients suffering from tetanus, the percutaneous dilatational method seems to be very appropriate.[9] By following this simple bedside technique, the risk of inducing autonomic instability during transfers to and from the surgery room is eliminated. Thorough oral hygiene, chest physical therapy, and routine tracheal suctioning are also important in preventing respiratory problems, especially when salivation and bronchial secretions are elevated. Prior to such treatments, patients who are at risk of uncontrollably spasming, autonomic disturbance, or balance problems must get enough sedative.[18] As with any chronic critical disease, prophylaxis of thrombosis, gastro-intestinal hemorrhage, and pressure sores are crucial adjuncts to normal therapy of tetanus patients. It's important to recognize the value of psychological assistance.

3 | MATERIAL AND METHODS

Formulating a research question, searching databases extensively for relevant research materials for possible inclusion, choosing which studies to evaluate based on predetermined inclusion and exclusion criteria, evaluating the quality of the selected studies and extracting pertinent information, conducting the analysis, and presenting the results are the five main steps that typically make up a systematic review process.[19] Formulation of the Question (a) Which management techniques and clinical characteristics have been researched in connection with tetanus?. An initial review of the existing literature was conducted in order to determine the extent and accessibility of research on the connection between tetanus, management techniques, and clinical characteristics. The investigation's findings demonstrated that there had never before been a systematic review of the literature on the subject. After a sufficient number of testings with different strings, the following search phrase was developed to look at articles inside the selected databases. Two well-known databases, Web of Science and Scopus, were searched.

3.1 | Inclusion and Exclusion

comprehensive literature review included both quantitative and qualitative studies that offered significant insights into the clinical characteristics and management approaches for tetanus control. Our selection criteria included books, dissertations, book chapters, research articles, and erratum. We first conducted searches using titles, abstracts, and keywords before closely examining the entire texts to determine article relevancy. The original sample was further assessed using the following exclusion criteria. First, in line with previous systematic literature studies, only peer-reviewed, full-text publications were considered for inclusion.[13 17 20] Retractions, bibliographical items, book reviews, editorials, extended abstracts, letters, notes, brief surveys, research papers, and meeting abstracts were excluded. Second, studies that were not published in English were not included in the initial search. Thirdly, our study looks at empirical research (including mixed-methods, qualitative, and quantitative studies) as well as conceptual and literature review studies that exhibit methodological and theoretical rigor.

3.2 | Study Selection and Data Extraction

The two screening stages—title/abstract and full text—led to the inclusion of 90 papers in this review. For every qualified study, a data extraction form was filled out to gather information such as the first author's name and the

publication year. Lastly, articles that were redundant were removed. The research papers that comprised this systematic literature review were therefore sourced from reputable sources, particularly PubMed, Web of Science and Scopus, which enhanced the review's strength and dependability and offered a comprehensive and trustworthy foundation for comprehending the connection between tetanus, clinical features, and management.

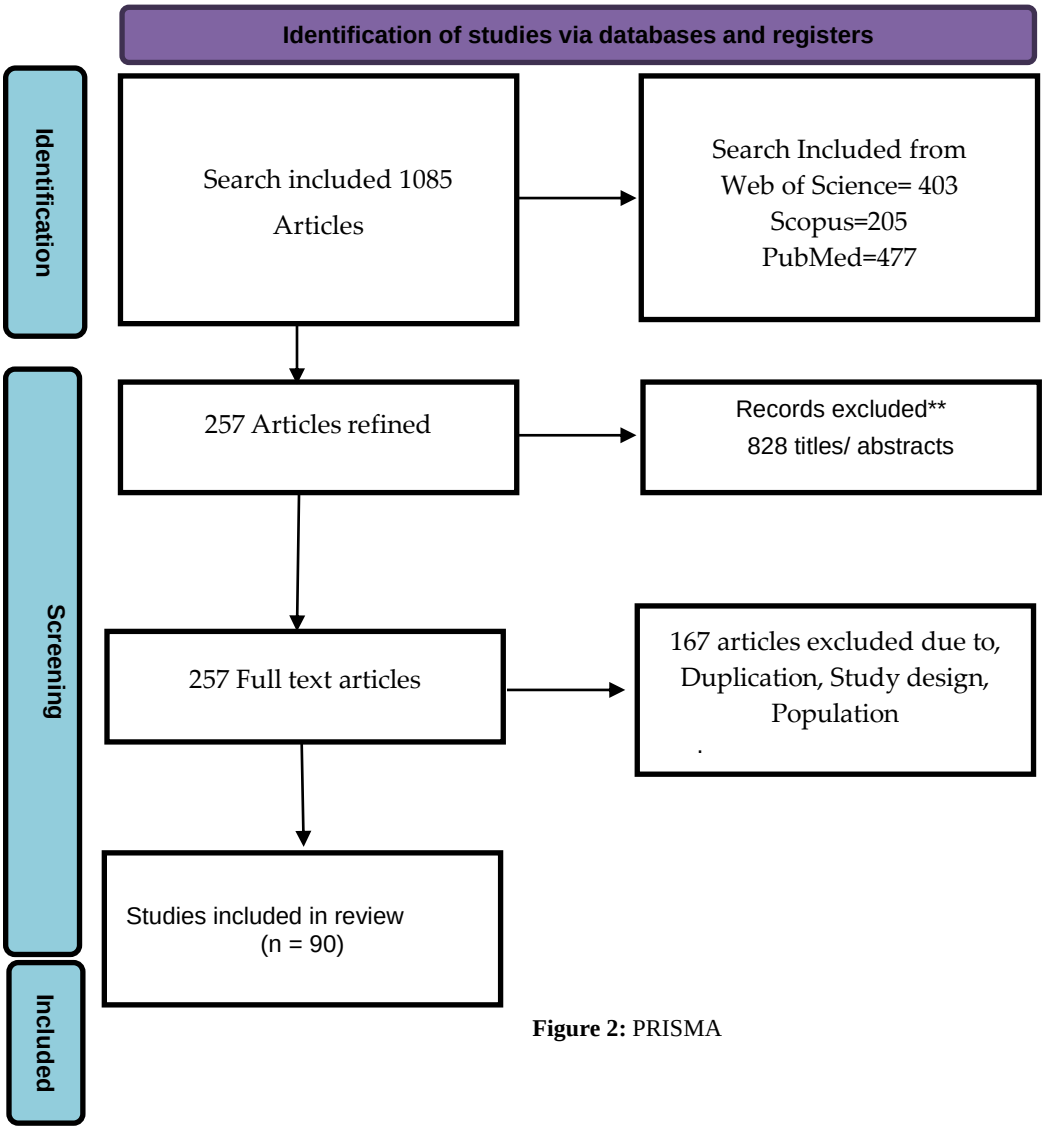

Figure 2: PRISMA

4 | CONCLUSION

Tetanus can be completely avoided with immunization. It is still a significant global health issue (WHO, 12 July 2024; CDCP, 2024). Numerous cases occur annually in wealthy nations among the elderly and those without immunity. In these circumstances, mortality is still quite high. Long-term intensive care assistance might be required, although most treatments have suspended supporting data. Controlling muscle rigidity and spasms, treating autonomic disruption, and preventing consequences from protracted critical illness are the main therapeutic problems. Those who make it through should be able to resume their regular activities.

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