Yemen Journal of Medicine

https://yemenjmed.com

Article information

DOI: 10.63475/yjm.v5i1.0313

Article history:
Received: 05 March 2026
Accepted: 20 March 2026
Published: 30 March 2026

Correspondence to:
Abdullahi Adamu
Email: abdoulhie@gmail.com
ORCID: 0009-0005-8031-4492

How to cite this article
Dandela S, Shu'aibu L, Adamu A, Dahiru S. Pattern and management outcomes of neck injuries at a tertiary hospital in northwestern Nigeria. Yemen J Med. Published online March 30, 2026. doi: 10.63475/yjm.v5i1.0313:1-6.

Original Article

Pattern and Management Outcomes of Neck Injuries at a Tertiary Hospital in Northwestern Nigeria

Sani Dandela[1], Lawal Shu'aibu[2], Abdullahi Adamu[1], Suleiman Dahiru[3]

1 Senior Registrar, Department of Ear, Nose, and Throat, Federal Teaching Hospital, Katsina, Nigeria
2 Consultant Ear, Nose, and Throat Head and Neck Surgeon, Department of Ear, Nose, and Throat Federal Teaching Hospital, Katsina, Nigeria
3 Senior Statistician, Department of Community Medicine, Federal Teaching Hospital, Katsina, Nigeria

ABSTRACT

Background: Neck injuries are potentially life-threatening because of the vital structures contained within a small anatomical area, including major blood vessels, the aerodigestive tract, the thyroid gland, and nerves. The pattern and causes of neck trauma vary across regions depending on prevailing risk factors such as violence, road traffic accidents, and occupational hazards. This study aimed to evaluate the pattern, etiology, management, and outcomes of neck injuries in our center.

Methods: This was a 3-year retrospective study of patients presenting with neck injuries at the Department of Otorhinolaryngology, Federal Teaching Hospital Katsina, between January 2023 and December 2025. A total of 21 patients were analyzed. Data collected included demographic characteristics, etiology of injury, type and zonal distribution of neck injuries, interventions offered, and patient outcomes. Descriptive statistics were used to summarize the data, and Chi-square analysis was used to determine associations between etiology and type of injury, injury type and intervention, and intervention and outcome.

Results: Twenty-one patients were studied, with males accounting for 85.7% (n = 18) and females 14.3% (n = 3), a ratio of 6:1. The mean age was 34.7 years. Gunshot/banditry was the most common cause of injury (38.1%), followed by stab injuries (23.8%). Penetrating injuries predominated (81.0%), while blunt injuries accounted for 19.0%. Zone II injuries were the most common (76.2%). Conservative management was employed in 57.1% of patients, while 42.9% underwent surgical intervention. Among surgical procedures, emergency tracheostomy with neck exploration and repair was most frequently performed. Most patients were discharged (76.2%), while 14.3% left against medical advice, 4.8% absconded, and mortality was recorded in 4.8%. There was a statistically significant association between etiology and type of injury ($\chi^2(4) = 16.68$; $P = 0.002$).

Conclusions: Neck injuries in this study predominantly affected young adult males and were mainly caused by violence, particularly gunshot and stab wounds. Penetrating injuries and zone II involvement were most common. Selective conservative management was effective in many patients with generally favorable outcomes. Addressing rising insecurity and strengthening trauma care systems may help reduce the burden of neck injuries in the region.

Key words: Neck injury, gunshot, penetrating, zone II, neck exploration

INTRODUCTION

The management of neck trauma can be interesting and occasionally devastating because of the anatomical structures located in the region. These structures might bring about a diagnostic and therapeutic problem in an emergency. [1] For descriptive and treatment purposes, the neck is divided into three zones: zones I, II, and III. These zones have important anatomical and clinical implications in the evaluation and management of neck trauma. [2–4] **Table 1** summarizes the anatomical boundaries and important structures found in each zone. Since the zoning of the neck is useful in guiding treatment choices, it is better to employ the zone system when describing traumatic injuries. Understanding the anatomy of the neck, particularly the site of vital structures, is indispensable in providing ideal care. Zone I: This is the area between the clavicles or suprasternal notch and the cricoid cartilage. This zone contains important structures, including the innominate vessels, the origin of the common carotid artery, the subclavian vessels and the vertebral artery, the brachial plexus, the trachea, the esophagus, the apex of the lung, and the thoracic duct. Its surgical exposure and access can be challenging because of the protection provided by the clavicle and bony structures of the thoracic inlet. Zone II: is the region between the lower border of cricoid cartilage and the angle of the mandible; the carotid and vertebral arteries, the internal jugular veins, the larynx and pharynx are located in this zone, and it is relatively easier to access for clinical examination and or surgical exploration. It is the biggest and most common injury in the neck. [5, 6] Zone III: This is the area between the angle of the mandible and the base of the skull; structures in this zone are protected by the mandible and other bony structures of the face. Evaluation and surgical treatments of injuries in zones I and III are difficult because of the thoracic cavity and skull base region, respectively. [5] The majority of penetrating injuries occur in zone II, where the major structures are relatively more accessible, as it is the part that is more exposed and, luckily, more accessible for surgical intervention. [7, 8] The magnitude of neck injuries might be underrated by merely observing the site of the wound only, and wide neck injuries, which include many zones, occur with an apparently superficial neck wound. [5] While it is quite rare when compared to other types of injury, the morbidity of penetrating neck injury is obvious, due to the numerous vital structures located in a comparatively minor but significantly exposed area of the neck. [9]

To the best of our knowledge, there are no publications on the prevalence, causes, and outcome of treatment of neck trauma in the area under study. Thus, this study aimed to evaluate the pattern, etiology, management, and outcomes of neck injuries presenting to a tertiary hospital in Northwestern Nigeria.

MATERIALS AND METHODS

Study Design, Setting, and Population

This was a retrospective review of patients who presented with neck trauma from various causes at the Department of Otorhinolaryngology, Federal Teaching Hospital, Katsina, Nigeria, over a period of 3 years between January 2023 and December 2025, with data collection completed before manuscript preparation and submission in March 2026. The study population included all patients who presented with neck injury and had one intervention or the other at Federal Teaching Hospital Katsina during the period under study. Patients who had incomplete or missing information were excluded from the study.

Sample Size, Technique, and Data Collection

All patients within the study period were included—achieving total enumeration—using a purposive sampling approach. Data were obtained from patient case files retrieved from the medical records department. The collected information covered age, sex, tribal background, occupation, injury mechanism, location of neck injury, clinical condition at initial assessment, first aid administered before arrival, initial resuscitation efforts, necessity for immediate surgical exploration, intraoperative observations, outcomes, and follow-up details.

Management of Neck Injuries

All procedures were performed under general anesthesia, with or without a prior tracheostomy. The surgeries were conducted by ear, nose, and throat specialists, sometimes working alongside cardiothoracic surgeons. Postoperative care was managed by otorhinolaryngology residents in coordination with trained nursing staff. Patients who underwent pharyngeal repair received feeding via a nasogastric tube for five days. Decannulation of the tracheostomy took place once the initial medical need had resolved and airway stability was confirmed. The first follow-up appointment was arranged for 2 weeks after hospital discharge.

Table 1: Anatomical zones of the neck and major structures.

Zone	Anatomical boundaries	Important structures	Clinical significance
Zone I	From the clavicles and suprasternal notch to the lower border of the cricoid cartilage	Subclavian vessels, origin of the common carotid artery, vertebral artery, trachea, esophagus, thoracic duct, apex of the lung	Surgical exposure is difficult because of the thoracic inlet; injuries may require advanced imaging or thoracic surgical approaches.
Zone II	From the lower border of the cricoid cartilage to the angle of the mandible	Carotid arteries, internal jugular veins, larynx, trachea, pharynx, esophagus, vagus nerve	Most commonly injured zone; easier to assess clinically and surgically explore
Zone III	From the angle of the mandible to the base of the skull	Distal carotid artery, vertebral artery, salivary glands, cranial nerves IX–XII, pharynx	Surgical access is difficult because of the skull base; imaging or endovascular approaches may be required

Statistical Analysis

The statistical analysis was done using Statistical Product and Service Solution version 23.0 software (SPSS Inc., Chicago, Illinois). The mean ± standard deviation (SD), median, and ranges were calculated for continuous variables, whereas proportions and frequency tables were used to summarize categorical variables. A Chi-squared test was used to determine the *P* value and to test statistical significance, which was set at $P < 0.05$.

Ethical Approval

Ethical approval for this study was obtained from the Federal Teaching Hospital Katsina Research Ethics Committee.

RESULTS

A total of 21 patients with neck injuries were analyzed during the study period. The mean age was 34.7 years, with males predominating at 18 patients (85.7%), while females accounted for 3 patients (14.3%), resulting in a male-to-female ratio of 6:1.

The etiology of neck injuries showed that gunshot/banditry was the most common cause (38.1%), followed by assault with stab injuries (23.8%). Road traffic accidents (RTA) and attempted suicide each accounted for 14.3%, while clothesline injuries constituted 9.5% of cases.

With respect to injury type, penetrating injuries predominated (81.0%), while blunt injuries accounted for 19.0%.

The zonal distribution of injuries revealed that zone II was the most frequently affected region (76.2%), followed by zone III (14.3%) and zone I (9.5%).

In terms of management, conservative treatment was employed in 57.1% of patients, while 42.9% required surgical intervention. Among the surgically managed patients, emergency tracheostomy with neck exploration and repair was the most common procedure (77.8%), followed by neck exploration with repair alone (22.2%).

Regarding outcomes, the majority of patients were successfully discharged (76.2%), while three patients (14.3%) left against medical advice (LAMA). One patient absconded (4.8%), and one mortality (4.8%) was recorded.

There was a statistically significant association between etiology and type of injury ($\chi^2(4) = 16.68$; $P = 0.002$). However, no significant association was found between injury type and intervention ($\chi^2(1) = 1.86$; $P = 0.173$), nor between intervention and outcome ($\chi^2(3) = 2.97$; $P = 0.397$). These relationships are summarized in **Tables 2–5**.

DISCUSSION

This study evaluated the pattern, management, and outcomes of neck injuries among 21 patients. The findings demonstrate a predominance of young adult males, violence-related mechanisms, penetrating trauma, zone II involvement, and favorable discharge outcomes with selective management.

Males constituted 85.7% of patients with a mean age of 34.7 years. This marked male predominance and the peak age in the 3rd and 4th decades of life is consistent with reports from Nigerian tertiary centers in Zaria and Kano, where young males represent the majority of victims due to greater exposure to interpersonal violence, occupational risks, and road traffic trauma. [5, 10] Similar trends have been documented in Lagos. [11] Indian studies also report similar

Table 2: Demographic and clinical characteristics of patients with neck injuries (n = 21).

Variable	Category	Frequency (n)	Percentage (%)
Sex	Male	18	85.7
	Female	3	14.3
Etiology of injury	Gunshot/banditry	8	38.1
	Assault (Stab)	5	23.8
	RTA/trauma	3	14.3
	Attempted suicide	3	14.3
	Clothesline	2	9.5
Type of injury	Penetrating	17	81.0
	Blunt	4	19.0
Zonal distribution	Zone I	2	9.5
	Zone II	16	76.2
	Zone III	3	14.3
Intervention offered	Conservative	12	57.1
	Surgical	9	42.9
Outcome	Discharged	16	76.2
	LAMA	3	14.3
	Absconded	1	4.8
	Died	1	4.8
Surgical procedure (n = 9)	Emergency tracheostomy + neck exploration and repair	7	77.8
	Neck exploration + repair	2	22.2

LAMA: left against medical advice, RTA: road traffic accidents.

findings. [12] Globally, trauma registries continue to show that cervical trauma disproportionately affects economically productive males. [13]

Gunshot/banditry accounted for 38.1% of cases, followed by stab injuries (23.8%), with violence-related mechanisms totaling 61.9%. This reflects the growing burden of firearm-related injuries in parts of Nigeria affected by insecurity. Earlier Nigerian series reported stab wounds as more common than gunshots [1] but recent data suggest an increasing contribution from firearms. [11] Several literature reports have penetrating trauma as the dominant mechanism. [5, 10, 11, 14]

In contrast, Western trauma series report a higher proportion of blunt cervical injuries, largely resulting from motor vehicle crashes, falls, and other blunt mechanisms, reflecting differences in injury epidemiology compared with developing countries, where penetrating trauma is more common. [15, 16] In this study, RTA accounted for only 14.3%, indicating regional epidemiologic variation.

In line with the reported findings in the literature, this study reports that the mechanism of injury strongly determines injury pattern, and this aligns with established trauma principles, where firearms and sharp objects produce penetrating injuries, while RTAs and clothesline injuries more commonly cause blunt trauma. [6, 14]

Zone II injuries were the most common (76.2%). This finding aligns with classical surgical literature, which indicates that zone II is the most frequently injured area because it is anatomically exposed and less protected by bony structures. [6, 16] Several studies have similarly reported zone II as the main site. [5, 10–12] Contrary to this finding, Fox and colleagues in a study on military-associated penetrating cervical trauma of 63 patients over 2 years observed an equal proportion of patients having zone II and III injuries. [17]

In our center, conservative management was employed in 57.1% of patients, while 42.9% underwent surgery. This supports the growing adoption of selective non-operative management (SNOM) for stable patients without hard signs of vascular or aerodigestive injury. [5, 6, 10, 14] The lack of a statistically significant association between injury type and intervention (p=0.173) may be due to the institutional policy of SNOM, where clinical stability and absence of hard signs of vascular or aerodigestive injury guide treatment decisions rather than the mechanism of injury alone. However, this finding should be interpreted cautiously because the relatively small sample size may limit the statistical power to detect significant associations.

Beyond the initial clinical assessment, imaging plays a big role in figuring out and managing neck trauma. Modern trauma management increasingly relies on computed tomography angiography (CTA) for the evaluation of vascular and aerodigestive injuries in hemodynamically stable patients. CTA gives you a fast, reliable assessment of the blood vessels in the neck and the surrounding structures, thereby facilitating SNOM and reducing unnecessary surgical exploration. [18] Several studies have shown that following imaging-based protocols really improves diagnostic accuracy and helps make appropriate treatment decisions, especially in penetrating neck injuries. [19] However, in many under-resourced locations, procedures such as CT angiography are not widely available.

Our center does not have CTA on site, meaning patients often have to travel to distant diagnostic facilities to undergo the procedure. On top of that, the cost of the procedure can be prohibitively expensive for certain patients and further delay patients' management. Because of these realities, in our center, we still rely heavily on a really thorough clinical assessment and very close observation to guide how we manage neck trauma.

Among surgically treated patients, emergency tracheostomy with neck exploration and repair was the most common procedure (77.8%), reflecting airway compromise in severe

Table 3: Relationship between etiology of injury and type of neck injury.

Etiology	Penetrating injury (n)	Blunt injury (n)	Total
Gunshot/banditry	8	0	8
Assault (stab)	5	0	5
RTA/trauma	1	2	3
Attempted suicide	3	0	3
Clothesline	0	2	2
Total	17	4	21

Values (n) represent the number of patients in each category.

RTA, road traffic accidents.

Table 4: Injury characteristics and management of neck injuries (n = 21).

Variable	Category	Conservative (n)	Surgical (n)	Total
Type of injury	Penetrating	8	9	17
	Blunt	4	0	4
Zonal distribution	Zone I	1	1	2
	Zone II	8	8	16
	Zone III	3	0	3

Values (n) represent the number of patients in each category.

Table 5: Intervention and patient outcomes.

Intervention	Discharged (n)	LAMA (n)	Absconded (n)	Died (n)	Total
Conservative	10	1	1	0	12
Surgical	6	2	0	1	9
Total	16	3	1	1	21

Values (n) represent the number of patients in each category.

LAMA, left against medical advice.

penetrating trauma. Similar findings have been reported in other studies. [5, 10, 11, 13, 14]

The discharge rate in our study was 76.2%, comparable to outcomes reported by other authors [5, 10, 11], with a mortality rate of 4.8%. This mortality rate is comparable to what was reported in previous studies. [10, 11, 13] Mortality occurred in a surgically managed patient; however, the association between intervention and outcome was not statistically significant ($P = 0.397$).

The relatively high rate of LAMA (14.3%) reflects socioeconomic barriers to care, a recurring issue in Nigerian trauma literature. [5, 11, 14] Strengthening health insurance coverage and trauma systems may improve continuity of care.

Limitations

This study has several limitations. First, as a retrospective analysis, it may be affected by incomplete records and potential information bias. Second, the small sample size restricts the ability to generalize the results and diminishes statistical power in identifying significant associations. Third, being conducted at a single center, the findings might not accurately reflect the patterns of neck injuries in other regions.

CONCLUSIONS

Neck trauma predominantly affected young adult males in the third and fourth decades of life, reflecting the high exposure of this group to violence, occupational hazards, and other risk factors. Penetrating neck injuries were more common than blunt injuries, and zone II was the most frequently affected part of the neck. Many patients were successfully managed with conservative treatment, while some required surgery, particularly emergency tracheostomy with neck exploration. Early diagnosis, proper clinical assessment, and appropriate treatment are important in improving outcomes of neck injuries. Addressing the growing problem of insecurity and violence, as well as strengthening trauma care systems, may help reduce the burden of neck injuries in our environment.

AUTHORS' CONTRIBUTION

Each author has made a substantial contribution to the present work in one or more areas, including conception, study design, conduct, data collection, analysis, and interpretation. All authors have given final approval of the version to be published, agreed on the journal to which the article has been submitted, and agree to be accountable for all aspects of the work.

SOURCE OF FUNDING

None.

CONFLICT OF INTEREST

None.

REFERENCES

1. Shkrum MJ. Blunt trauma. In: Jacques R, ed. Forensic Pathology: Death Investigation, Bioethics and Other Medicolegal Principles. Cham: Springer International Publishing; 2024 [cited 2025 Dec 3]. p. 189-232. Available from: https://doi.org/10.1007/978-3-031-42038-2_7
2. Forner D, Noel CW, Guttman MP, Haas B, Enepekides D, Rigby MH, et al. Blunt versus penetrating neck trauma: A retrospective cohort study. Laryngoscope. 2021;131(4):E1109-E1116. https://doi.org/10.1002/lary.29088
3. Dodds N, Hollis S, Islam M, Thompson J. Anatomical injury patterns, demographics and outcomes data for blunt and penetrating neck injuries on the Trauma Audit and Research Network database. Bull R Coll Surg Engl. 2023;105(2):70-75. https://doi.org/10.1308/rcsbull.2023.27
4. Alao T, Waseem M. Neck trauma. In: StatPearls. Treasure Island, FL: StatPearls Publishing; 2025 [cited 2025 Dec 3]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK470422/
5. Ajiya A, Shuaibu IY, Anka HM. An audit of surgical neck explorations for penetrating neck injuries in northwestern Nigeria: Experience from a teaching hospital. Niger J Surg. 2021;27(1):48-54. https://doi.org/10.4103/njs.njs_63_20
6. Shilston J, Evans DL, Simons A, Evans DA. Initial management of blunt and penetrating neck trauma. BJA Educ. 2021;21(9):329-335. https://doi.org/10.1016/j.bjae.2021.04.002
7. Kendall JL, Anglin D, Demetriades D. Penetrating neck trauma. Emerg Med Clin North Am. 1998;16(1):85-105. https://doi.org/10.1016/s0733-8627(05)70350-3
8. Loss L, Henry R, White A, Matsushima K, Barrett C, Lammers D, et al. Penetrating neck trauma: A comprehensive review. Trauma Surg Acute Care Open. 2025;10(1):e001619. https://doi.org/10.1136/tsaco-2024-001619
9. Nottidge TE, Nottidge BA, Udomesiet IC, Uduehe EE. Developing a low-resource approach to trauma patient care—findings from a Nigerian trauma registry. Niger J Surg. 2021;27(1):9-15. https://doi.org/10.4103/njs.njs_67_19
10. Ahmed A. Selective observational management of penetrating neck injury in Northern Nigeria. S Afr J Surg. 2009;47:80, 82-85.
11. Nwawolo CC, Asoegwu CN. Experience with managing penetrating anterior neck injuries in Lagos, Nigeria. J West Afr Coll Surg. 2017;7(3):1-23.
12. Vishwanatha B, Sagayaraj A, Huddar SG, Kumar P, Datta RK. Penetrating neck injuries. Indian J Otolaryngol Head Neck Surg. 2007;59(3):221-224. https://doi.org/10.1007/s12070-007-0065-7
13. Demetriades D, Theodorou D, Cornwell E, Berne TV, Asensio J, Belzberg H, et al. Evaluation of penetrating injuries of the neck: Prospective study of 223 patients. World J Surg. 1997;21(1):41-47. https://doi.org/10.1007/s002689900191
14. Aliyu D, Iseh RK, Stephen SY, Baba SA, Abdullahi M, Mercy A, et al. Neck trauma: A profile of experience from otorhinolaryngology unit of a referral hospital in northwestern Nigeria. Int Surg J. 2019;6(10):3525-3529. https://doi.org/10.18203/2349-2902.isj20194403
15. Sethi RKV, Kozin ED, Fagenholz PJ, Lee DJ, Shrime MG, Gray ST. Epidemiological survey of head and neck injuries and trauma in the United States. Otolaryngol Head Neck Surg. 2014;151(5):776-84. https://doi.org/10.1177/0194599814546112

16. Levy DB. Neck trauma management: Background, etiology, pathophysiology [Internet]. 2026 Feb 23 [cited 2026 Mar 4]. Available from: https://emedicine.medscape.com/article/827223-overview
17. Fox CJ, Gillespie DL, Weber MA, Cox MW, Hawksworth JS, Cryer CM, et al. Delayed evaluation of combat-related penetrating neck trauma. J Vasc Surg. 2006;44(1):86-93. https://doi.org/10.1016/j.jvs.2006.02.058
18. Petrone P, Velaz-Pardo L, Gendy A, Velcu L, Brathwaite CEM, Joseph DK. Diagnosis, management and treatment of neck trauma. Cir Esp (Engl Ed). 2019;97(9):489-500. https://doi.org/10.1016/j.ciresp.2019.06.001
19. Madsen AS, Laing GL, Bruce JL, Oosthuizen GV, Clarke DL. An audit of penetrating neck injuries in a South African trauma service. Injury. 2016;47(1):64-69. https://doi.org/10.1016/j.injury.2015.07.032