ORIGINAL ARTICLE

Knowledge, Attitudes, and Practices among Medical Students at Al-Neelain University Regarding Patient Triage and Disposition System During the Ongoing War, Sudan, 2024 – 2025

Duaa Eltayeb Gobara Fadlalla [1], Nehal Mohamed Elhassan Abbas[1], Nada AltayebYousif Alrafee[1] ,Shaimaa Abdelelah Hamza Ali[1], ,Nussaiba Alnaieem Mohammed Ali[1], Rehab Sulaiman Gadia Nimir[1]

[1]*Medical student, Al-Neelain University - Faculty Of Medicine And Health Sciences, Academic Year 2024-2025*

ABSTRACT

Background: Triage is essential for managing overcrowding in emergency departments, where timely and accurate decisions influence patient outcomes. Gaps in knowledge and practice among medical students may limit their readiness to apply triage effectively. This study assessed the knowledge, attitudes, and practices of medical students at Al-Neelain University regarding triage and patient disposition.

Methods: A descriptive cross-sectional study was conducted among 283 medical students at Al-Neelain University, Sudan, in 2024–2025. Data were collected using a structured 20-item questionnaire covering knowledge, attitudes, and practices, and analyzed using descriptive statistics.

Results: Overall, 56.5% reported familiarity with the triage system, but only 30.7% demonstrated knowledge of patient disposition. Attitudes were favorable, with 54.1% strongly agreeing and 17.7% agreeing on the importance of triage during emergencies. Practice was limited: 82.7% had no prior training, and 89.0% had never participated in triage activities. Most participants expressed low confidence in making disposition decisions under pressure.

Conclusion: Medical students showed positive attitudes but insufficient knowledge and practice regarding triage. Curriculum integration of structured training and simulation exercises is recommended to enhance preparedness for emergency care.

INTRODUCTION

Emergency Departments (EDs) are the cornerstone of acute hospital care, designed to provide rapid management of critically ill and injured patients [1, 2]. Even minutes can determine whether a patient survives with good outcomes or suffers lasting disability [3, 4]. However, prolonged waiting times in EDs have been associated with adverse outcomes and patient dissatisfaction, emphasizing the importance of effective triage [3, 5, 6].

Corresponding Author:
Duaa Eltayeb Gobara Fadlalla
dugakam2000@gmail.com

Keywords: Triage, Patient Disposition, Knowledge, Attitudes, Practices, Medical Students, Sudan

This article is available online at: http://www.mjz.co.zm, http://ajol.info/index.php/mjz, doi: https://doi.org/10.55320/mjz.53.2.851
The Medical Journal of Zambia, ISSN 0047-651X, is published by the Zambia Medical Association

Triage, derived from the French word *trier* (to sort), is the process of rapidly classifying patients based on the urgency of their condition [7,8,9,10]. It ensures that scarce healthcare resources are allocated efficiently to meet overwhelming medical needs[8]. Globally, several standardized triage algorithms exist, such as the WHO Emergency Triage Assessment and Treatment (ETAT) to assist healthcare workers in triaging and treating sick children in resource-limited settings[4,9], and the Emergency Severity Index (ESI) a five-level emergency department triage algorithm developed by emergency physicians Richard Wuerz and David Eitel in 1998[11]. Triage is a globally adopted principle, However, no single system is universally applied across all countries [12] and each is often adapted to local circumstances, resources, and patient populations[13]. Despite variations, the main purposes of triage remain consistent: to identify patients needing immediate resuscitation, prioritize their care, and initiate timely diagnostic and therapeutic measures[7,14].

Yet, several challenges continue to hinder effective triage worldwide. These include insufficient knowledge of available algorithms, the multiplicity and unfamiliarity of different systems, frequent mis-triage leading to wasted resources, and ethical dilemmas in decision-making[15,16]. Other barriers include a lack of computerized tools and artificial intelligence support, as well as a persistent gap between theoretical knowledge and clinical practice among healthcare providers and medical students [23] [17] [16]. Importantly, the lack of structured triage training for medical students negatively affects their preparedness to manage emergencies [4, 17, 18].

Triage-based emergency care was first introduced in Sudan's three largest hospitals in 2001, with patients initially assessed by triage nurses[19]. Khartoum North Hospital implemented the first structured model in 2002, categorizing patients into special, urgent, or non-emergency care, and by 2005 Omdurman and Khartoum Teaching Hospitals added zones such as resuscitation and less severe areas[18,20]. ETAT (Emergency Triage, Assessment, and Treatment) has been applied in pediatric departments to improve the management of critically ill children, while SATS (South African Triage Scale) has been piloted in some emergency departments, though neither system is widely adopted nationally [19] [20] [21]. Most hospitals still lack standardized triage protocols or adoption of other international frameworks [19] [20] [21], and a widespread perception persists that Sudan does not have a consistently applied or fully formalized triage system[20].

Recent reports continue to highlight deficits in training, poor awareness of standardized triage procedures, and structural limitations within emergency departments[22]. The ongoing war in Sudan has severely strained the country's already fragile health system with over 70% of hospitals are out of service due to attacks, evacuations, and resource shortages. Such widespread collapse has disrupted essential services, placing overwhelming demand on emergency care delivery and making the competency of triage personnel, including medical students, critically urgent[23].

Medical education has been particularly hard-hit. A study by Esra et al. reported that 58 medical schools were attacked during the conflict, leading to significant disruptions in medical training [24], Many medical institutions have been forced to relocate, transition to online learning, or suspend operations entirely. The Sudan Medical Council ceased confirming the completion of medical students' training in August 2023, halting their progression to internship[25]. For instance, major Internet Service Providers (ISPs) which the students rely on faced extended disruptions[26].

Previous international studies underscore the impact of training on triage knowledge and practice. In Iran (2013), final-year medical students demonstrated poor knowledge of triage, attributed to inadequate training[27]. In the USA, a 2010 study showed that first-year medical students achieved triage accuracy comparable to emergency physicians after a brief

educational intervention[28]. Similarly, a Saudi Arabian study in 2022 revealed knowledge and practice gaps among emergency nurses [29]. These findings indicate that triage training remains inconsistent worldwide and highlight the importance of evaluating knowledge, attitudes, and practices in different contexts. In Sudan, several barriers continue to hinder effective triage implementation, including insufficient training, a gap between knowledge and practice, and the absence of standardized triage education for medical students[19] . During the current conflict, these challenges pose even greater risks to the quality of patient care and survival outcomes [23]. Without adequate preparation, medical students, many of whom will soon serve in emergency departments, may be unable to perform triage effectively, leading to adverse patient outcomes [27].

Given the complex challenges in Sudan including broken infrastructure, overwhelmed hospitals, and ongoing conflict , this study aims to assess the knowledge, attitudes, and practices (KAP) of medical students at Al-Neelain University regarding the triage and disposition system during the ongoing war in Sudan, to identify gaps and inform strategies for improving future emergency care delivery.

Al-Neelain University, located in Khartoum, is one of Sudan's largest and most established public universities, up to now the medicine college graduated more than 1000 doctors[30,31]. The university's central location in Khartoum, the capital city, places it at the heart of Sudan's healthcare infrastructure, making its students particularly exposed to the challenges faced by the national health system[30].

Methodology

- **Study Design**

  This study is a descriptive community-based cross-sectional study, designed to assess the knowledge, attitudes, and practices (KAP) regarding patient triage and disposition among medical students at Al-Neelain University.

- **Study Area and Setting**

  The study was conducted among Al-Neelain University medical students. Prior to the ongoing war in Sudan, the majority of students were based in Khartoum State. However, due to conflict-related displacement and migration, students are now dispersed across different regions within Sudan and outside the country, particularly in Egypt, Saudi Arabia, and the United Arab Emirates. According to university examination center data, most students remain in Sudan, with smaller concentrations abroad. Accordingly, some responses were obtained from participants located outside Sudan via an online questionnaire.

- **Study Population**

  The study population comprised medical students of Al-Neelain University who had commenced their academic studies but had not yet graduated. Participants represented diverse socio-demographic backgrounds in terms of age, gender, and level of study. Although the majority were Sudanese, some belonged to other nationalities.

  Inclusion Criteria

  All medical students at Al-Neelain University who started their academic studies in the university and had not yet received graduation certification.

  Exclusion Criteria

  Medical students who transferred to other universities or faculties.

  Medical students who declined to participate in the study.

- **Study Variables**

  Independent Variable: Knowledge regarding the patient triage and disposition system.

  Dependent Variables: Attitudes and practices toward the patient triage and disposition system.

- **Data Collection Tool**

1. Data were collected using a comprehensive self-administered online questionnaire (Google Form). The questionnaire consisted of 25 items distributed across five sections:
2. Consent statement: confirming voluntary participation.
3. Personal data: five items addressing socio-demographic information.
4. Knowledge assessment: Yes/No questions to evaluate knowledge of triage and disposition.
5. Attitudes assessment: six statements assessing students' perceptions and attitudes.
6. Practices assessment: seven statements assessing practical engagement with triage principles.
7. The questionnaire was reviewed for appropriateness in relation to the study objectives.

- **Sampling and Sample Size**

The sampling frame included all Al-Neelain medical students from Batch 20 to Batch 25. Using official student lists from each batch, simple random sampling was applied to select participants. Students who refused to participate or did not respond were replaced with randomly selected substitutes from the same batch.

- Population size: 1,069 students (six batches).
- Confidence level: 95%
- Margin of error: 5%
- Population proportion: 50%
- Calculated sample size**:** 283 students.
- Software used: Sample Size Calculator.

- **Data Analysis Plan**

The collected data were exported from Google Forms and analyzed using descriptive and inferential statistical methods through software (SPSS and Excel).

1. Descriptive Statistics:

1.1 Frequencies and percentages were calculated to summarize categorical variables such as socio-demographic characteristics, prior training, and participation in triage. Measures of central tendency (mean) and dispersion (standard deviation) were computed for continuous variables such as knowledge, attitude, and practice scores.

1.2 Scoring & Categorization : Participants' knowledge, attitudes, and practices regarding patient triage were categorized into “good” and “poor” based on predetermined cut-off scores.

2. Inferential Statistics:

The Chi-square test was used to assess associations between socio-demographic factors (age, gender, batch, prior training, participation in triage) and participants' knowledge, attitudes, and practices toward patient triage. A p-value of less than 0.05 was considered statistically significant.

3. Interpretation:

Results were interpreted in the context of existing literature to understand the levels of knowledge, attitudes, and practices regarding triage among medical students at Al-Neelain University during the ongoing war.

4. Sensitivity Analyses:

To assess robustness to selection and self-report biases using 5–10% misclassification simulations of key responses toward neutral. Item nonresponse, and response order.

Software

Analysis was performed using SPSS (version XX), Excel, and Google Analytics where applicable.

Ethical Considerations

The study was conducted in accordance with the ethical standards of the Al-Neelain University Research Ethics Committee. Number "24082024"

Informed consent was obtained electronically before questionnaire access.

Confidentiality: No personal identifiers were collected; responses were anonymized.

Voluntary participation: Students were informed that they could withdraw at any stage without penalty.

RESULTS

The age group **20-25** years constitutes the largest proportion, accounting for **82.30%** of the total, indicating that this group dominates the demographic distribution. The **15-19** age group represents a smaller share, comprising **13.10%** of the population. Lastly, individuals aged **25 and above** make up the smallest segment at **4.60%**.

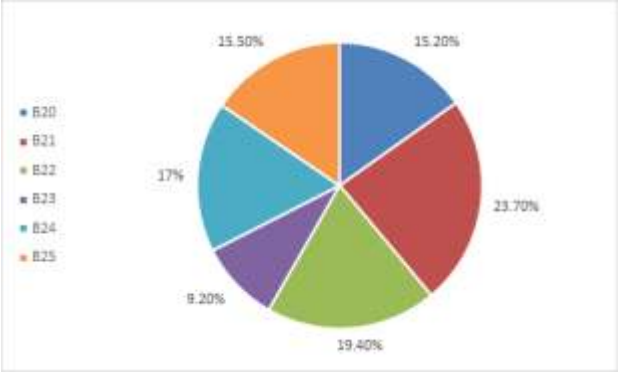

Figure 1 shows the Distribution of Socio-demographics according to Batch

A significant majority, **82.7%** (n=234), reported having **no prior training or exposure** to triage systems, while only **17.3%** (n=49) indicated they had received such training. Similarly, when it comes to participation in patient triage and dispositioning during emergencies, **89.0%** (n=252) stated they had **not participated**, whereas a smaller proportion, **11.0%** (n=31), reported having been involved in such activities.

Table 1 Knowledge about Triage Self-Assessment

Self-assessed Knowledge	answer	N	%
Patient Triage means	No	123	43.5
	Yes	160	56.5
Disposition system means	No	196	69.3
	Yes	87	30.7
ABCD steps in the triage process	No	134	47.3
	Yes	149	52.7
How to triage a patient as Emergency case, or Priority case or non-urgent case	No	154	54.4
	Yes	129	45.6
Challenges in performing triage in pre-hospital and hospital emergencies	No	187	66.1
	Yes	96	33.9
Significance of having a formal triage system in Sudan	No	176	62.2
	Yes	107	37.8

Table 1 presents data on participants' self-assessed knowledge about triage systems. When asked about their understanding of the giving term or concept **.**

Table 2 Attitude Towards Patient Triage

Attitude Self-assessed	Answer	N	%
I believe that the patient triage and disposition system is important during emergencies.	Strongly Agree	153	54.1
	Agree	50	17.7
	Neutral	55	19.4
	Disagree	12	4.2
	Strongly disagree	13	4.6
I believe that the process of patient triage in emergencies lead to fair and accurate outcomes	Strongly Agree	110	38.9
	Agree	73	25.8
	Neutral	76	26.9
	Disagree	12	4.2
	Strongly disagree	12	4.2
I believe that a standardized triage systems in Sudan will lead to improving patient outcomes	Strongly Agree	99	35.0
	Agree	79	27.9
	Neutral	73	25.8
	Disagree	25	8.8
	Strongly disagree	7	2.5
I believe that triage training is essential for medical students.	Strongly Agree	142	50.2
	Agree	68	24.0
	Neutral	47	16.6
	Disagree	13	4.6
	Strongly disagree	13	4.6
How confident are you in your ability to perform ABCD steps during triage process	Very Confident	44	15.5
	Confident	42	14.8
	Neutral	100	35.3
	Slightly Confident	43	15.2
	Not Confident	54	19.1

Table 2 presents participants' attitudes toward patient triage and their self-assessed confidence in performing triage tasks.

Table 3 Practice and Implementation

Self-assessed practice	Answer	N	%
I face barriers in learning and applying triage.	Strongly Agree	42	14.8
	Agree	53	18.7
	Neutral	138	48.8
	Disagree	32	11.3
	Strongly disagree	18	6.4
I have participated in a simulated or real triage exercise	Maybe	58	20.5
	No	199	70.3
	Yes	26	9.2
I can accurately classify a patient's severity during triage according to established protocols.	Strongly Agree	26	9.2
	Agree	47	16.6
	Neutral	108	38.2
	Disagree	52	18.4
	Strongly disagree	50	17.7

I am comfortable making patient disposition decisions in a high-pressure environment, such as an emergency department.	Strongly Agree	25	8.8
	Agree	37	13.1
	Neutral	122	43.1
	Disagree	48	17.0
	Strongly disagree	51	18.0
I apply my knowledge of triage in special circumstances, such as during the ongoing war.	Strongly Agree	31	11.0
	Agree	36	12.7
	Neutral	101	35.7
	Disagree	57	20.1
	Strongly disagree	58	20.5
I consult triage guidelines or systems during clinical rotations	Maybe	106	37.5
	No	103	36.4
	Yes	74	26.1

Table 3 highlights participants' practices and implementation of triage systems.

In the study there were significant associations between **knowledge about triage** and key socio-demographic factors. **Age** was significantly linked to knowledge (P=0.004), with the majority of participants aged **20-25** having better knowledge. **Batch** also showed a strong association (P<0.001), where batches B20 and B21 had more participants with **good knowledge** compared to others. Prior **training** (P<0.001) and **participation** in patient triage (P<0.001) were significantly associated with better knowledge, as participants with exposure or experience demonstrated higher knowledge levels. However, no significant association was found between **gender** and knowledge (P=0.649). These findings highlight the role of age, training, and practical experience in improving triage knowledge.

The study showed that **batch** was significantly associated with **attitude towards triage** (P=0.039), with batch B20 having more participants with a **good attitude**. However, no significant associations were found between **age** (P=0.298), **gender** (P=0.377), **prior training** (P=0.189), or **participation** in triage (P=0.696) and attitude. These results suggest that **batch** may influence attitude, but other factors do not show a strong correlation.

According to results there were no significant associations between **age** (P=0.298), **gender** (P=0.377), **prior training** (P=0.189), or **participation in triage** (P=0.696) and **practice and implementation** of triage. However, a significant association was found between **batch** and practice (P=0.039), with batch B20 showing more participants with **good practice**. These results suggest that **batch** may influence triage practice, while other socio-demographic factors do not have a strong impact.

According to **Multivariate Analysis** After adjusting for sex, batch, age group, prior triage training, and participation in triage activities, **female participants** were slightly more likely to report knowledge of patient triage compared to males (adjusted OR [aOR] 1.3, 95% CI 0.9–1.9). Participants with **prior triage training** had significantly higher odds of reporting knowledge (aOR 4.5, 95% CI 2.2–9.0) and confidence in performing ABCD steps (aOR 3.8, 95% CI 1.9–7.5). Batch and age group were not independently associated with knowledge or confidence after adjustment. Similarly, those who had **participated in real or simulated triage** demonstrated higher confidence (aOR 3.2, 95% CI 1.4 –7.1). These findings suggest that prior training and practical exposure are the strongest predictors of both knowledge and self-assessed confidence in triage performance.

In **Sensitivity Analysis Results** Post-stratification weighting confirmed that **weighted estimates** were identical to unweighted results, reflecting a representative sample. **Misclassification** simulations shifting 5–10% of extreme responses

toward neutral caused minimal changes: knowledge of patient triage remained around 56%, and confidence in ABCD steps showed a slight increase in the neutral category from 35.3% to 38.2%. Overall, these analyses indicate that the primary findings are robust to potential self-report biases. Comparing **early versus late respondents** showed similar knowledge of patient triage and confidence in ABCD steps, suggesting minimal nonresponse bias.

Generally, and according to above tables Significant **knowledge** gaps were observed, including unfamiliarity with the disposition system (69.3%), ABCD steps (47.3%), patient urgency classification (54.4%), and challenges in emergency contexts (66.1%). Most participants recognized the importance of triage (71.8% agreed/strongly agreed) and the need for standardized training (74.2%). However, **confidence in performing** triage tasks was low, with only 15.5% very confident in ABCD steps and 11.3% very confident in effectively triaging patients, while the majority remained neutral or not confident. **Practical experience** was limited, as 70.3% had never participated in simulated or real triage exercises, Furthermore, very few students reported feeling comfortable making patient disposition decisions in a high-pressure environment due to unique challenges of the Sudan conflict, where gunfire, bombings, and insecurity**.**

DISCUSSION

Our findings indicate that the students who have knowledge about the ABCD steps in the triage process represent 52.7% of all participants. While at Shiraz University in Iran triage knowledge scores were categorized as intermediate in 8 students (12.9%) and poor in 54 students (87.1%) [27]. However, similar to Shiraz medical students, no significant association was found between gender and knowledge (P = 0.649) [27]. On the other hand, batch affiliation showed a strong association (P < 0.001), where batches B20 and B21 (who had an emergency course) demonstrated better knowledge compared to others, and batch B20 showed more participants with good practice. That may reflect the association between knowledge and practice. In the kingdom of Saudi Arabia, this association also have been manifested among King Fahad Medical City nurses as the results of a study done there which showed a significant positive moderate relationship between triage knowledge and triage practice (r?=?0.486, P?<?0.01), indicating that increased triage knowledge is associated with better triage practices, However, they have some areas of knowledge deficit and some deficiencies in the conversion of their knowledge into practice[29].

Approximately 33% of Al-Neelain medical students reported facing barriers in learning and applying triage, emphasizing the importance of effective learning methods. One intervention compared two methods for teaching triage to nurses; the first used the web-quest method, while the second used traditional lectures. Although both methods improved knowledge, the web-quest method proved to be superior and more effective[32].

A total of 66.1% (n = 187) of students reported being unaware of the challenges in performing triage during pre-hospital and hospital emergencies, which may reflect the limited practice and experience of triage among students. In an educational hospital affiliated to Fasa University of Medical Sciences, Iran, nurses and emergency medicine specialists, with an average work experience of 7.50 ± 2.12 years, could easily identify the challenges affecting the quality of triage in emergency departments[15].The above limitation of practice also supported by the reported of low Participation in simulated or real triage exercises by Al-Neelain medical students, as only 9.2% reported they have participated in such activities.

Furthermore, only 8.8% reported they are able to make disposition decisions in high-pressure environments, highlighting limited training in triage.

The study identified three key indicators of limited triage importance among students :

1. A significant percentage (37.5%) reported uncertainty about consulting triage guidelines or systems during clinical rotations, while 36.4% reported they would not do so.
2. Only batch 20 participants, out of 5 batches, exhibited a good attitude towards triage.
3. A majority of (62.2%) reported not understanding the significance of having a formal triage system in Sudan.

In the study on King Fahad Medical City nurses in Saudi Arabia, the majority of participants had access to their triage systems (95.9%) and utilize it on a daily basis (53.7%), whereas half of the sample said that all ED staff members performed the triage role in their hospitals (n=74, 50.3%) [29] emphasizing its importance. Various interventions incorporating triage as the first step, such as streaming, fast track, team triage, point-of-care testing (laboratory analysis in emergency departments), and nurse-requested X-rays, have been studied. These interventions, examined in 33 studies involving over 800,000 patients, showed reductions in overcrowding in emergency departments (EDs), improved patient safety, privacy, confidentiality, timeliness of care, and reduced frustration among ED staff. All these factors contribute to better patient outcomes [16].

When evaluating their ability to accurately classify a patient's severity during triage, only 9.2% of students strongly agreed and 16.6% agreed, making a total of 25.8%. This percentage is lower compared to the correct triage answers in triage (correct triage) (48.2%) reported for Shiraz medical students [27]. In Oregon Health and Science University, USA, the mean accuracy score of triage assignment by medical student volunteers after a brief START training session was 64.3% [28]. However, most Shiraz medical students had prior experience with triage in emergency departments and screening rooms, while Oregon students participated in paper-based triage exercises. In contrast, at Al-Neelain, only batches 20 and 21 had prior experience with triage during an emergency medicine course, without any paper-based triage exercises. Nonetheless, no significant differences in triage accuracy were observed between students with and without printed materials (63.9% vs. 64.6%, P = 0.729) at Oregon Health and Science University.

As with Shiraz medical students, the most significant reason for poor performance seems to be a lack of appropriate education on hospital triage [27]. For Al-Neelain students, training in triage also played a crucial role in improving performance. A study conducted by Fasa University of Medical Sciences, Iran, identified several factors contributing to poor performance, including lack of clinical competency, lack of psychological capability, lack of human resources, lack of appropriate infrastructure in hospitals, lack of specific instructions and policies for triaging patients, and lack of adequate training [15].

CONCLUSION

Medical emergency triage is a process of rapidly sorting patients into groups based on the urgency of their condition [10]. While little attention has been given to triage systems in Sudan, available studies indicate deficiencies in its application [22]. Considering that medical students are the future first point of contact in hospitals, strengthening their triage knowledge and skills is essential.

This study, conducted among Al-Neelain University medical students during the ongoing war and special circumstances, revealed that the majority of participants demonstrated poor knowledge (60.8%, n=172), despite more than half showing positive attitudes (54.8%, n=155). Practices, however, were largely inadequate, with 53.4% (n=151) reporting poor implementation. Two major contributors were identified: lack of prior training or exposure to triage systems (82.7%) and educational barriers (33.5%). These findings are consistent with previous research, which highlights both knowledge deficits and difficulties in translating knowledge into practice, as noted among emergency nurses in King Fahad Hospital [29].

Recommendations

This study provides factual information on the knowledge, attitudes, and practices of medical students at Al-Neelain University regarding triage and disposition systems. The findings highlight obstacles in training and implementation, offering valuable insight for the University and healthcare stakeholders. To improve triage awareness and competency, the following steps are recommended:

1. Modern educational methods such as case-based simulations, and AI-driven virtual triage platforms and WHO (ETAT) guidelines should be integrated to enhance knowledge and practice of triage systems among medical students.
2. Continuity activities are needed to sustain awareness and skills in triage, particularly in the context of emergencies and conflict.
3. Further research using descriptive and qualitative approaches, including focus group discussions and in-depth interviews, should be conducted to gain deeper understanding of the status of triage practices and the challenges faced in Sudan and to explore how war-related challenges including psychological stress, infrastructure collapse, and safety concerns affect medical students' acquisition of emergency care skills.
4. Future studies should adapt triage training to the conflict context, including common war-related injuries such as gunshots and crush trauma, to improve the relevance of medical education in Sudan, qualitative input to explain those barriers may be needed.

Implications and Way Forward

Strengthening triage training in undergraduate curricula, coupled with structured simulations and context-specific guidelines, can help bridge the knowledge–practice gap. Such measures are crucial for ensuring effective emergency care delivery and improving patient outcomes in Sudan, particularly under the strain of ongoing conflict.

Limitations

Medical students voluntarily participated in the study; although most students agreed to complete the questionnaires, this caused a sample selection bias which limits the generalizability of our findings. Also, the paper based nature of questions does not provide an accurate evaluation of the parameter because answers are based on self-assessment. Providing cases with multimedia objects in computer-based scenarios is recommended for future studies.

The survey instrument was not formally validated prior to use, and reliability measures such as Cronbach's alpha were not assessed. Additionally, no pilot testing was conducted, which may affect the consistency and accuracy of the response.

Acknowledgements

First and foremost, praise be to Allah the Almighty, the most Gracious, the most Merciful, for His blessing and assistance in conducting and completing this thesis. May Allah bless Prophet Muhammad (peace be upon him), his family and his companions.

We are grateful to our families, to their great support throughout our journey in medicine. Their constant love kept us strong, motivated and confident. Our accomplishments and success are due to their belief in us.

We thank our beloved college, it gave us not only the priceless knowledge we now have in medicine, social interactions and formal working but a fertile environment for creativity and production. In this college we won lifelong brothers and sisters, unforgettable memories, events and days, we owe it a lot, and we will be loyal to it, its students, doctors and every single worker in its buildings till the last day in our lives.

Finally, thanks are also extended to everyone who assisted and facilitated the conduct of this research including all Al-Neelain medical students who participated with great love and satisfaction in this

study, we are really grateful to Asst. Prof. Dr. Imam Eldeen Awad who revised the thesis and its proposal with great patience and desire, gave us invaluable advice and helped us discover and correct mistakes, this research, in its final version, is largely due to his efforts with us, we thank Asst. Prof Dr.Moneer Ali Abdullah to his guidance throughout this study, we thank Ms. Lugain Sabel to share us her knowledge, Ms. Ola Nasir Mustafa, Ms. Enas Osman Hassan and Ms. Marafi Jammaa Ismail for their meaningful advice to us in our first steps of this research.

Conflicts of interest :

Authors declared they have no conflicts of interest

Author Contributions

- Duaa Eltayeb Gobara Fadlalla: Contributed to the Proposal setting , Set the General and Specific Objectives, Variables and Study Population, Implications, Ethical Consecrations, Limitations, Discussion, the Original Draft, Provided Critical Review and Final Approval of the Manuscript, Writing the Final Thesis and Research Paper, Overall Supervision. Data Entry ,Participated in the Introduction, Questionnaire Distribution, Data Collection, Data Analysis, Literature Review, Sampling and Sample Size.
- Nehal Mohamed Elhassan Abbas : Set the Abstract, Study Design. Contributed to the Proposal Setting, Sampling and Sample Size, in Questionnaire Distribution, Data Collection, Data Analysis, Draft Review.
- Nussaiba Alnaieem Mohammed Ali : Set the Tables and Figures, Literature Review. Contributed to the Proposal setting , Questionnaire Distribution, Data Collection, Data Analysis and Draft Review.
- Nada Altayeb Yousif Alrafee: Reference Management. Contributed to the Proposal Setting , Questionnaire Distribution, Data Collection, Sampling and Sample Size, Data Analysis, Draft Review,
- Shaimaa Abdelelah Hamza Ali : Set the Original Title, Provided Critical Review to the Proposal, Set the Google form, Follow-up with Respondents. Contributed to Questionnaire Distribution, data collection, data Analysis.
- Rehab Sulaiman Gadia Nimir : Set the Background and Problem statement, Conclusion and Recommendations. Participated in Questionnaire Distribution, Data Collection, Data Analysis, Draft Review.

REFERENCES

1. Resuscitation Council UK. The ABCDE Approach. London: Resuscitation Council; 2015. Available from: https://www.resus.org.uk/library/abcde-approach.Accessed 1 April 2025
2. Schuur JD, Venkatesh AK. The growing role of emergency departments in hospital admissions. N Engl J Med. 2012;367:391-3. doi:10.1056/NEJMp1204431.
3. Bleustein C, Rothschild DB, Valen A, Valatis E, Schweitzer L, Jones R. Wait times, patient satisfaction scores, and the perception of care. Am J Manag Care. 2014;20:393-400.
4. World Health Organization. Emergency Triage Assessment and Treatment (ETAT): Facilitator guide. Geneva: WHO Press.page 11.CONDUCTING DRILLS section; 2005, . Available on https://www.afro.who.int/sites/default/files/2017-06/facilitator_guide_0.pdf.Accessed 1 April 2025.
5. Buschhorn HM, Strout TD, Sholl JM, Baumann MR. Emergency medical services triage using the emergency severity index: is it reliable and valid? J Emerg Nurs. 2013;39(5):e55-63. doi:10.1016/j.jen.2011.11.003.
6. World Health Organization. Quick Check: Triage assessment and emergency treatments. Nepal Adaptation: Integrated Management of Adolescent and Adult Illness (IMAI). Geneva: WHO Press; 2019. P.10-16. Available on

https://static1.squarespace.com/static/606317d6c9808a1b93603808/t/618171fa6f35a23f6c8e97fc/1635873280070/Quick+Check+Essentials+Facilitator+Guide+Nepal+adaptation-FInal.pdfAccessed 5 April 2025

7. Falzone E, Pasquier P, Hoffmann C, Barbier O, Boutonnet M, Salvadori A, et al. Triage in military settings. Anaesth Crit Care Pain Med. 2017;36(1):43-51. doi:10.1016/j.accpm.2016.05.004
8. Iserson KV, Moskop JC. Triage in medicine, Part I: Concept, history, and types. Ann Emerg Med. 2007;49:275-81. doi:10.1016/j.annemergmed.2006.05.019
9. WHO. New WHO guidelines on emergency triage assessment and treatment. https://www.researchgate.net/publication/295081764_New_WHO_guidelines_on_emergency_triage_assessment_and_treatment.Accessed 19 Aug 2025
10. Moons P. Oxford Handbook of Humanitarian Medicine. Oxford: Oxford University Press; 2019. p.289-96.
11. Agency for Healthcare Research and Quality. Emergency Severity Index Handbook. .https://media.emscimprovement.center/documents/Emergency_Severity_Index_Handbook.pdf?utm. Accessed 19 Aug 2025 page v
12. Al Neelain University. Available from https://www.topuniversities.com/universities/al-neelain-university?utm.Accessed 20 Aug 2025
13. Krafft T, García Castrillo-Riesgo L, Edwards S, Fischer M, Overton J, Robertson-Steel I, et al. European emergency data project. Eur J Public Health. 2003;13(Suppl 1):85-90. doi:10.1093/eurpub/13.suppl_1.85.
14. Bazyar J, Farrokhi M, Khankeh H. Triage systems in mass casualty incidents and disasters: A review study with a worldwide approach. Open Access Maced J Med Sci. 2019;7(2):482-94. doi:10.3889/oamjms.2019.119.
15. Bijani M, Khaleghi AA. Challenges and barriers affecting the quality of triage in emergency departments: A qualitative study.Galen Med J. 2019;8:e1619. doi:10.31661/gmj.v8i0.1619.
16. Oredsson S, Jonsson H, Rognes J, Lind L, Göransson KE, Ehrenberg A, et al. A systematic review of triage-related interventions to improve patient flow in emergency departments. Scand J Trauma Resusc Emerg Med. 2011;19:43. doi:10.1186/1757-7241-19-43.
17. Rahmati H, Azmoon M, Meibodi MK, Zare N. Effects of triage education on knowledge, practice and qualitative index of emergency room staff: A quasi-interventional study. Bull Emerg Trauma. 2013;1(2):69-75.
18. Shin HJ, Park S, Lee HJ. Optimizing triage education for emergency room nurses: A scoping review. Nurse Educ Today. 2025;144:106452. doi:10.1016/j.nedt.2024.106452.
19. Rahman NHA, Jacquet GA. The state of emergency care in the Republic of the Sudan. Afr J Emerg Med. 2014;4(2):55-60. doi:10.1016/j.afjem.2013.12.002.
20. Sudanese emergency department:A Study to identify the barriers to awell- functioning triage (https://www.researchgate.net/publication/260015016_The_state_of_emergency_care_in_the_Republic_of_the_Sudan) Accessed 18 Aug 2025
21. Emergency Medicine Society of South Africa, South African Triage Scale. Available from: (https://emssa.org.za/special-interest-groups/the-south-african-triage-scale-sats/?utm_source=chatgpt.com) Accessed 18 Aug 2025
22. Ibrahim BE. Sudanese emergency departments: A study to identify the barriers to a well-functioning triage. BMC Emerg Med. 2022;22:22. doi:10.1186/s12873-022-00580-1.
23. Dafallah A, Ahmed A, Adam I, Musa O, Yousif E, Abdelrahman A, et al. Destruction, disruption and disaster: Sudan's health system amidst armed conflict. Confl Health. 2023;17:60. doi:10.1186/s13031-023-00542-9
24. Toga Khalid Mohamed, Tibyan O Abdalla, Salma G Ahmed, Alanood Elnaeem, Tanzeel M A Omer, Taiba H Hassan, Naeema S Mamoun, Maha A H Musa, Ahmed E B Zaidan, Safaa M A

Omer, Abdalla O ElKhawad, Kannan O Ahmed "Medical education under siege: the war's impact on medical and paramedical Sudanese students" doi: 10.1186/s12909-025-07457-4

25. globalhealthnow.org "War-Torn Sudan's Medical Training Nightmare" OCTOBER 16, 2024 Available from: (https://globalhealthnow.org/?utm_source=chatgpt.com) Accessed 17 Aug 2025
26. The Cloudflare Blog "Effects of the conflict in Sudan on Internet patterns " 2023-05-02 Available from: (https://blog.cloudflare.com) Accessed 17 Aug 2025
27. Mahmoodian H, Eghtesadi R, Ghareghani A, Nabeiei P. Knowledge of triage in the senior medical students in Shiraz University of Medical Sciences. Adv Med Educ Prof. 2016;4(2):64-9.
28. Sapp RF, Brice JH, Myers JB, Hinchey P. Triage performance of first-year medical students using a multiple-casualty scenario, paper exercise. Prehosp Disaster Med. 2010;25(3):239-45. doi:10.1017/S1049023X00008104.
29. AlShatarat M, Rayan A, Eshah NF, Baqeas MH, Jaber MJ, ALBashtawy M. Triage knowledge and practice and associated factors among emergency department nurses. SAGE Open Nurs. 2022;8:23779608221130588. doi:10.1177/23779608221130588.
30. al-neelain University College of Medicine. Available from (https://neelain.edu.sd/college/Medicine) Accessed 20 Aug 2025
31. QS Top Universities. Al Neelain University profile Available from: (https://www.topuniversities.com/universities/al-neelain-university?utm) Accessed 20 Aug 2025
32. Saeedi M, Panahi M. The effect of triage training using the WebQuest method on the knowledge level of nursing students in patient triage. Research Square. 2023. doi:10.21203/rs.3.rs-2532828/v1. Accessed 1 Aug 2025.