

Clinicians' and Patients' Factors Affecting the Implementation of Focused Assessment with Sonography in Trauma Scans Examination in Diagnosing Visceral Injury Among Trauma Patients at the Emergency Department: A Retrospective Study at a Tertiary Hospital in Northern Tanzania

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Abstract

Background: Focused Assessment using Sonography for Trauma (FAST) is commonly employed to identify visceral organ injuries once traumatic accidents have occurred. Implementation of the FAST scan is used to evaluate the existence of visceral organ injuries, though some clinicians overestimate the real needs of the FAST scan examination when they order it for trauma not involving thoracic and abdominal cavities, and this leads to ineffective implementation of it and leads to delay of patient management and unnecessary costs. Therefore, this study aimed to assess clinicians' and patients' factors affecting the implementation of focused assessment with Sonography in trauma (FAST) scan examinations in diagnosing visceral injury among trauma patients at the Emergency Department (EMD) in a tertiary hospital in Northern Tanzania.

Methodology: The hospital-based retrospective study was employed at EMD at Kilimanjaro Christian Medical Center (KCMC), covering a period of one year. Data were obtained using a data extraction tool from patients' medical files who had an accident and attended the emergency department in one year. At a CI of 95%, data were analyzed using SPSS version 25.0, and statistical significance was set at $P < 0.05$.

Results: Out of 110 trauma patients who were enrolled, 81 (73.6%) of them were incorrectly subjected to FAST scan examination. And of these patients, 15.50% had abdominal and chest injuries, while the rest had other injuries. Effective implementation of FAST scan examination is affected by clinician factors such as education level, working experience, training of FAST scan examination, and performing physical examination before FAST scan examination.

While patient factors affecting the effective implementation of the FAST scan examination include the patient's condition, site of injury, and mechanism of injury.

Conclusions: The result of the study shows that there is ineffective implementation of FAST scan examination among trauma patients who attended the EMD department at KCMC. More than half of the patients were incorrectly subjected to FAST scan examination, and this was influenced by both clinician and patient factors. There is a need for collaboration among senior staff and junior and regular provision of refresher training to overcome the problem of ineffective implementation of FAST scan examinations.

Keywords: ineffective implementation, FAST scans visceral injuries

INTRODUCTION

Trauma is the leading cause of morbidity and hospitalization in African countries, especially the developing countries, Tanzania being one of them. The main reasons for the trauma are mainly due to road traffic accidents contributed by road infrastructures and road users; also, interpersonal violence has been reported to police departments and also presented in health facilities. Immediate diagnosis of internal bleeding is vital in minimizing and reducing the preventable deaths in the country (1).

In rescuing and preventing the deaths related to trauma, the Focused Assessment with Sonography in Trauma (FAST) examination is performed to diagnose internal bleeding or accumulation of fluids in trauma patients. The implementation of FAST scan examinations worldwide has been effectively utilized in both developed and developing countries, though in developing countries the practical use still remains a challenge; therefore, there is a need for investing in diagnostic ultrasound training and ensuring a reliable power supply in the low-resource setting to ensure the quality of life is improved (2). The implementation of point-of-care ultrasound has significantly impacted the evaluation and treatment of patients. It has considerable advantages and is a reliable mode to assess the trauma patient, as it can be available bedside and is easy to use. Also, it is non-invasive, employs no radiation or contrast agents, and is inexpensive (3).

Trauma and injuries occur everywhere due to many reasons. And most of the patients presented in an emergency department are accidents and need attention and medical care, including a FAST scan examination and it has been recommended as a proper and timely transfer of trauma patients for further management, especially in low-resource areas (4). Though little is known in the Tanzanian setting regarding the implementation of the effective use of FAST scan examination among the trauma patients in the emergency department,

Therefore, the current study intended to assess clinicians' and patients' factors affecting the implementation of focused assessment with Sonography in trauma (FAST) scan examinations in diagnosing visceral injury among trauma patients at the emergency department in a tertiary hospital in Northern Tanzania.

METHODOLOGY

Study design

The employed retrospective study design to assess clinicians' and patients' factors affecting the implementation of focused assessment with sonography in trauma scans examination in diagnosing visceral injury among trauma patients at the Emergency Department in a tertiary hospital in Northern Tanzania covered one year.

Study setting

A study was conducted at Kilimanjaro Christian Medical Centre, which is located in the foothills of the

snowcapped Mount Kilimanjaro, Tanzania. It was opened in March 1971 by the Good Samaritan Foundation, who planned and raised large funds to build and equip it. KCMC is a referral hospital for over 15 million people in Northern Tanzania. The hospital is a huge complex with 500-800 inpatients in 630 official beds, 90 canvas beds, 40 baby incubators, 1852 students, 1300 staff, and 1000 visitors and companions daily.

Study population

The study population consisted of all trauma patients who attended the emergency department (KCMC), were subjected to a FAST scan by a clinician, and have complete records that are accessible in the hospital database, while excluding non-trauma patients who attended the emergency department during the study period.

Sample size and sampling technique

Between January 2020 and December 2020, 200 trauma patient files were expected to be reviewed for this study, which assesses the effectiveness of the implementation of the FAST scan among emergency medicine clinicians at KCMC hospital. About 90 files had incomplete documentation of what kind of trauma patients had suffered, so they did not provide information on whether the procedure was effective or ineffective when applied; therefore, these were excluded.

About 110 patients whose files were completed were assessed on the performance of the FAST scan examination and whether it was effectively/ineffectively implemented.

Data collection

Data were collected using a structured questionnaire tool from patients' electronic databases, including notes, request forms, and register books in the radiology department. Information collected includes clinicians' education level, experience, if they have undergone training, if they performed a physical assessment before conducting a FAST scan, and patients' information on consciousness, mechanism of injury, and injury site.

Data analysis

Data were analyzed using SPSS version 25. Categorical variables were summarized using percentages and frequencies. A chi-square test was used to determine clinician and patient factors affecting the implementation of the FAST scan. A P-value < 0.05 was considered statistically significant.

Ethical clearance

Ethical clearances were granted by the KCMU Research Committee, and permission to carry out the study was sought from the KCMC Department of Radiology and Emergency Medicine. Although the analyses presented in this report consisted only of secondary unlinked data analysis, no contact with human subjects occurred.

RESULT

Both male and female clinicians who worked at the emergency department had equal chances of attending to trauma patients, so attendance to trauma patients was stratified by working experience, where 72.7% of ineffective implementation was requested by clinicians with less than 3 years of working experience, and of all clinicians with less than 3 years of working experience, 71.8% of them were on internship. In training on FAST scan examination, clinicians with no training requested 90% of ineffective implementation of FAST scan.

Proportion of ineffective implementation of FAST scan in ED – KCMC

Of all 110 patients in the Emergency Department, 84.5% of the ineffective FAST scan patients were rel-

ated to other injuries, while only 15.5% were related to abdomen and chest injuries. Refer to figure 1.

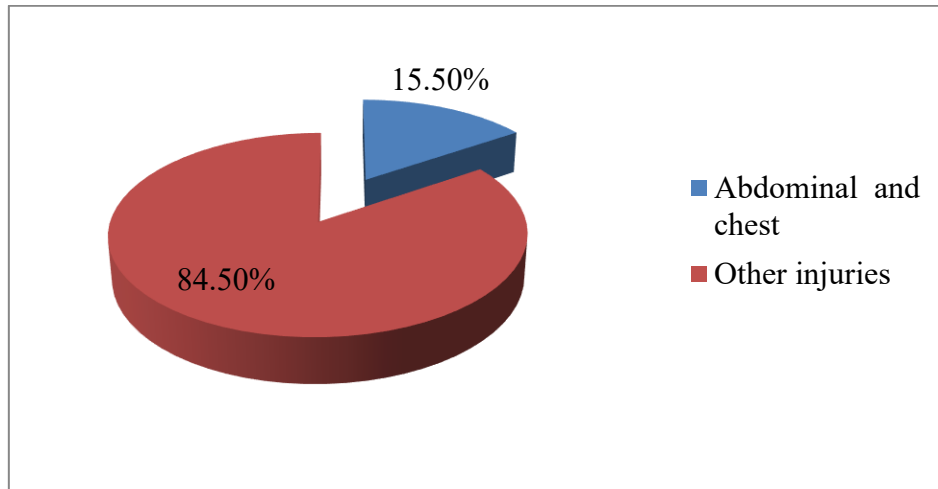


Figure 1: Proportion of ineffective implementation of FAST scan in ED – KCMC (N=110)

Clinician factors associated with ineffective implementation of FAST SCAN at KCMC

Factors such as clinician education level (p<0.001), working experience (p<0.001), training on FAST SCAN (p<0.001), and physical examination before FAST scan (p<0.001) were significantly associated with ineffective implementation of FAST scan. Refer to table 1

Table 1 : Clinician factors associated with ineffective implementation of FAST SCAN (N=110)

	Effective implementation		Total	p-value
	No	Yes		
Factors	n (%)	n (%)	n (%)	
Education level				
Intern	74 (91.4)	5 (17.2)	79 (71.8)	
Registrar	6 (7.4)	15 (51.7)	21 (19.1)	
Resident	1 (1.2)	9 (31.1)	10 (9.1)	<0.001
Working experience				
< 3	75 (92.6)	5 (17.2)	80 (72.7)	
≥ 3	6 (7.4)	24 (82.8)	30 (27.3)	<0.001
Trained on FAST scan				
No	80 (98.8)	19 (65.5)	99 (90.0)	
Yes	1 (1.2)	10 (34.5)	11 (10.0)	<0.001
Physical examination before FAST scan				
No	44 (54.3)	1 (3.5)	45 (40.9)	
Yes	37 (45.7)	28 (96.5)	65 (59.1)	<0.001
Clinician doing the FAST SCAN				
Radiologist	65 (80.3)	27 (93.1)	92 (83.6)	
Non radiologist	16 (19.7)	2 (6.9)	18 (16.4)	0.147

Patients’ factors associated with ineffective implementation of FAST SCAN

Factors such as patients’ condition (p=0.012), patients’ mechanism of injury (p=0.024), and patients’ injury site (p<0.001) were significantly associated with ineffective implementation of FAST SCAN. Refer to table 2.

Table 2 : Patients’ factors associated with ineffective implementation of FAST SCAN (N=110)

	Effective implementation		Total	p-value
	No	Yes		
	n (%)	n (%)	n (%)	
Factors	81 (73.6)	29 (26.4)	n (%)	p-value
Patient's condition				
Conscious	71 (87.7)	19 (65.5)	90 (81.8)	
Unconscious	10 (12.3)	10 (34.5)	20 (18.2)	0.012
Patients mechanism of injury				
Motor vehicle	22 (27.2)	13 (44.8)	35 (31.8)	
Moto cycle	35 (43.2)	5 (17.2)	40 (36.4)	
Falls	12 (14.8)	3 (10.3)	15 (13.6)	
Assault	3 (3.7)	5 (17.2)	8 (7.3)	
Pedestrian / others	9 (11.1)	3 (10.3)	12 (10.9)	0.024
Patients injury site				
Polytrauma / abdominal	0 (0.0)	17 (58.6)	17 (15.5)	
Other body parts	81 (100.0)	12 (41.4)	93 (84.5)	<0.001

DISCUSSION

FAST scans are routinely used to diagnose visceral injuries in patients who present at the hospital, but some clinician either due to lack of enough information or less experience in medical field orders FAST scan to any traumatic patients even not involves the abdomen or chest. A previous study on Focus Abdominal Sonography for trauma (FAST) in blunt pediatric abdominal trauma identified FAST scan as important device pick high grade solid and hollow viscous injury (3), this corresponds to another study in Singapore on evaluating utility of FAST scan in Acute Blunt Abdominal Trauma in the emergency department for twenty years which identifies FAST scan as important and primary preliminary radiological assessment for blunt abdominal trauma (5).

The study found that only 15.5% of patient had abdominal and chest injuries and were correctly subjected to implementation of FAST scan examination while 84.5% had other injuries and had ineffective implementation of FAST scan since were not at risk of visceral organ injuries. This would increase cost to the patients for ultrasound and waiting time for procedure rather than continuing management.

The clinician factors associated with ineffective implementation of FAST scan at Emergency department include; education level, working experience, Training of FAST scan examination, and performing physical examination before FAST scan examination.

Similarly a study on FAST scan examination found the misinterpretation and miss diagnosis due to inexperienced hands, education, and this has limited the practice of FAST scan examination (6).

A prospective study conducted in Thailand found that adequate training on FAST scan among clinician is useful and technical interpretation pronounced as challenges which physician should be aware of it in preventing the ineffective implementation of FAST scan examination (7). Practicability of Integrating the Focused Assessment with Sonography for Trauma (FAST) Scan as Part of medical student course in Malaysia found to be useful, satisfied and improving students ultrasound skills and practices though this was affected by equipment and inadequate clinical practices exposure (8).

Patient's factors which are statistically significant with ineffective implementation of FAST scan examination were; patient's condition, site of injury and mechanism of injury. Unlike study conducted in Thailand on FAST scan examination limitation exist in pediatric group, and those caring patient should be provided with an adequate training (7)

FAST scans are routinely used to diagnose visceral injuries in patients who present at the hospital, but some clinicians, either due to lack of enough information or less experience in the medical field, order FAST scans for any traumatic patients, even if they do not involve the abdomen or chest. A previous study on Focus Abdominal Sonography for trauma (FAST) in blunt pediatric abdominal trauma identified the FAST scan as an important device to pick up high-grade solid and hollow viscous injury (3); this corresponds to another study in Singapore on evaluating the utility of the FAST scan in Acute Blunt Abdominal Trauma in the emergency department for twenty years, which identifies the FAST scan as an important and primary preliminary radiological assessment for blunt abdominal trauma (5).

The study found that only 15.5% of patients had abdominal and chest injuries and were correctly subjected to the implementation of a FAST scan examination, while 84.5% had other injuries and had ineffective implementation of the FAST scan since they were not at risk of visceral organ injuries. This would increase the cost to the patients for ultrasound and the waiting time for the procedure rather than continuing management.

The clinician factors associated with ineffective implementation of the FAST scan at the emergency department include education level, working experience, training in the FAST scan examination, and performing a physical examination before the FAST scan examination.

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A prospective study conducted in Thailand found that adequate training on FAST scans among clinicians is useful, and technical interpretation is pronounced as a challenge that physicians should be aware of in preventing the ineffective implementation of FAST scan examinations (7). The practicability of integrating the Focused Assessment with Sonography for Trauma (FAST) scan as part of a medical student course in Malaysia was found to be useful, satisfying, and improving students' ultrasound skills and practices, though this was affected by equipment and inadequate clinical practices exposure (8).

Patient factors that are statistically significant with ineffective implementation of the FAST scan examination were the patient's condition, site of injury, and mechanism of injury. Unlike the study conducted in Thailand on FAST scan examinations, limitations exist in the pediatric group, and those caring for patients should be provided with adequate training (7).

Study limitation

Limitations of this study were recall bias due to the study population used and the area of study used, a single clinician attending several patients and ordering the same investigation for different patients, and incomplete information, which qualified only 110 patients out of 200 who were attended in 2020.

CONCLUSION AND RECOMMENDATION

The proportion of ineffective implementation of FAST scans was high, and this was influenced by both clinicians' and patients' factors. Clinician factors include education level, working experience, training in FAST scan examination, and performing physical examination before FAST scan examination. And patient factors, including the patient's condition, site of injury, and mechanism of injury, contributed to the ineffective implementation of the FAST scan examination for the injured patient admitted to the Emergency Department at KCMC. Therefore, the clinicians should undergo refresher training, junior staff and interns should be coached by senior staff, and they should also perform routine physical examinations on the trauma patients with an injury before ordering the FAST scan examination so as to avoid unnecessary delay in patient management and reduce patients' costs.

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