ISSN 2073-9990 East Cent. Afr. J. surg

Patterns and Short Term Outcomes of Chest Injuries at Mbarara Regional Referral Hospital in Uganda

M M Mwesigwa, D Bitariho, D Twesigye
Department of Surgery, Mbarara Regional Referral Hospital, Mbarara Uganda.
Mbarara University of Science and Technology /Mbarara Regional Referral Hospital.
Correspondence to: M M Mwesigwa, Email: mmmwesigwa83@gmail.com

Background: ***This study was conducted to establish the causes, injury patterns and short-term outcomes of chest injuries at Mbarara Regional Referral Hospital.***
Methods: ***This was a prospective study involving chest injury patients admitted to Mbarara Regional Referral Hospital (MRRH) for a period of one year from April 2014 to 31st March 2015.***
Results: ***A total of 71 chest injury patients were studied. Males (91.6%) were the majority and the ages ranged from 8 to 76 years (mean 32.9 years (+/- 14.0). Majority of the patients (57.7%) sustained blunt injury. RTA was the most common cause of injury, affecting 49.3%.The commonest injury patterns were chest wall injuries and lung and pleural injuries accounting for 69.0% and 64.8 respectively. Rib fractures were the commonest chest wall injury (71.4%) while hemopneumothorax was the commonest (34.9%) finding among those with lung and pleural injury. Associated injuries were found in 64.2% and out of these, abdominal injuries were the commonest extra thoracic injury (39.1%) followed by head injury(37.0%),cuts and lacerations(37%) andfractures (28.3%).The commonest abdominal organs injured were spleen(44.4%), liver (27.8%) and stomach (16.7%). Majority of the patients had thoracostomy (47.9%) while 33.8% had non surgical treatment. Laparotomy and thoracotomy were done in 11(15.5%) and 3 (4.2%) of the patients respectively. Complications occurred in 20(28.2%) and the commonest complication was pneumonia 6 (30%).The mean length of stay was 7.14 days, SD=±6.1) and the mortality was 16.9%.The significant determinants of mortality were associated injuries (X^2=4.57, F.E=0.046), complications (X^2=36.82, F.E=0.000) and severe head injury (X2=13.85, F.E=0.001).***
Conclusion: ***The causes, patterns and short-term outcomes of this study are similar to those observed in other developing countries. Chest injury in our setting causes high mortality and measures to reduce road traffic accidents are urgently required.***

Key words: Chest injury, pattern, outcomes
DOI: http://dx.doi.org/10.4314/ecajs.v21i3.6

Introduction

Thoracic trauma comprises 10-15% of all traumas worldwide. It directly accounts for approximately 25% of trauma related mortality and is a contributing factor in another 25 % [1]. In a study by Galukande et al[2] carried out at Mulago Hospital, Accident and Emergency wards, on patients involved in bodaboda (motorcycle) related road traffic crushes, chest injuries were the fourth (following soft tissue injuries, fractures and head injuries respectively) commonest injuries , contributing 34.7 % . Chalya et al[3] in Tanzania found chest injuries to account for 44% of RTA injuries.

In a study in Tanzania by Massaga et al[4], chest injuries had a mortality rate of 24.2%. The same study blamed this high mortality rate on associated injuries, complications and delayed patient care. Chest injuries are also often associated with other extra thoracic injuries including head, abdomen and orthopedic injuries[5, 6]. Several studies[4, 5, 7] show that RTA is the commonest cause except in war areas and communities with high crime rates. Fortunately, the majority of the chest injuries are successfully managed with simple surgical procedures with a few requiring thoracotomy[7]. According to Stewart et al[8] the commonest complications are pneumonia and pleural sepsis. Segers et al[9] found that the ISS was the most significant factor determining survival (P < 0.0001) followed by neuro trauma (P=0.05).

Patients and Methods

This was a prospective study involving chest injury patients admitted to Mbarara Regional Referral Hospital (MRRH) for a period of one year from April 2014 to 31st March 2015. All patients admitted at

ISSN 2073-9990 East Cent. Afr. J. surg

MRRH with chest injury diagnosed clinically and/or imaging were recruited by consecutive sampling. Excluded chest injury caused by isolated burns, spinal injury, lacerations limited to subcutaneous fat and inhaled or swallowed foreign bodies.

Results

A total of 71 patients with thoracic injuries were studied. Table 1 shows the age distribution. The peak incidence was in the 31 – 40 years age group. Only 14 (20%) were aged above 40 years. There was a predominance of males with a M : F ratio of 11 : 1.

Table 1. Distribution of Patients by Social Demographic Characteristics (N =71)

Variable	Frequency(N=71)	Percentage (%)
Age	**32.9(+/- 14.0)**	
≤10	2	2.8
11-20	11	15.5
21-30	18	25.3
31-40	26	36.6
≥41	14	19.7
Sex		
Male	65	91.6
Female	6	8.4
Occupation		
Peasants	43	60.6
Students	11	15.5
Driver/rider	5	7.0
Security personnel	3	4.2
Others	9	12.7
Residence		
Mbarara	21	29.6
Isingiro	19	26.8
Ntungamo	9	12.7
Sheema	5	7.0
Kiruhura	3	4.2
Others	14	19.7

ISSN 2073-9990 East Cent. Afr. J. surg

Causes

Figure 1 shows the causes of chest trauma. Road traffic crashes accounted for 49% of the cases. Four (6%) of patients were injured by animals with wild and domestic animals contributing 2 cases each. Falls were the causes of chest injury in 5 patients, 4 of them being aged below 20 years.

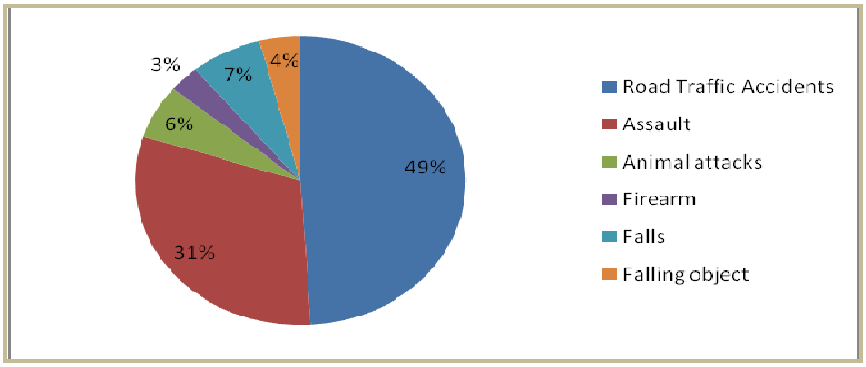

Figure 1. Distribution of patients by the cause of Chest injury (n =71)

Patterns of injury

Blunt trauma accounted for 41 (57.7%) of the chest injuries, 23 (32.4%) were penetrating chest injuries while 7 (9.9%) were neither blunt nor penetrating. Among the 35 patients with rib fractures, 28 (80%) of them had 1-4 ribs fractured while 7 (20%) had 5-9 ribs fractured.

Associated injuries

Other associated injuries were present in 46 (64.8%) of the cases while 25 (35.2%) had isolated the chest injury. Among the 46 patients found with associated injuries, 18 (39.1%) had abdominal injuries, 17 (37%) had cuts and lacerations, head injuries were present in 17(37%) and fractures in 13 (28.3%). Table 2 shows the specific injured abdominal organs. Eight patients had associated splenic injury.

Treatment

As regards to the various treatment options for the chest injuries, 47(66.2%) were surgical while 24(33.8%) were non surgical. Only two out of five patients with tension pneumothorax had emergency needle decompression before chest tube insertion. The various treatment procedures used to treat the chest injuries are shown in Figure 4.

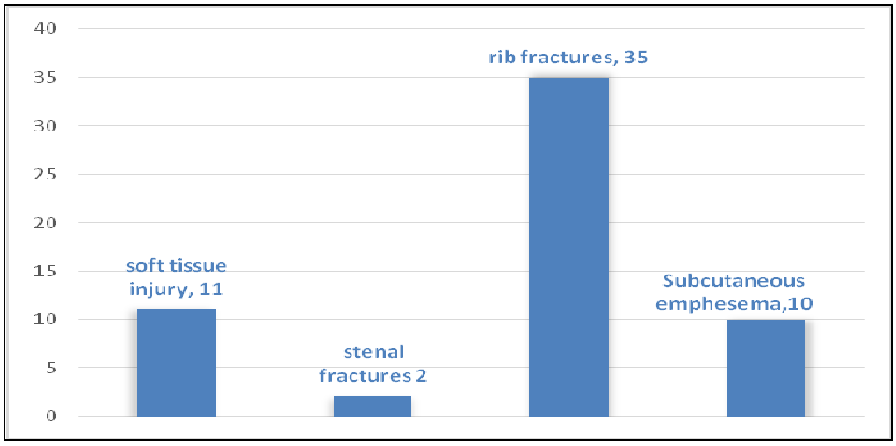

Figure 2. Distribution of Types of Chest Wall Injuries (n =49)

ISSN 2073-9990 East Cent. Afr. J. surg

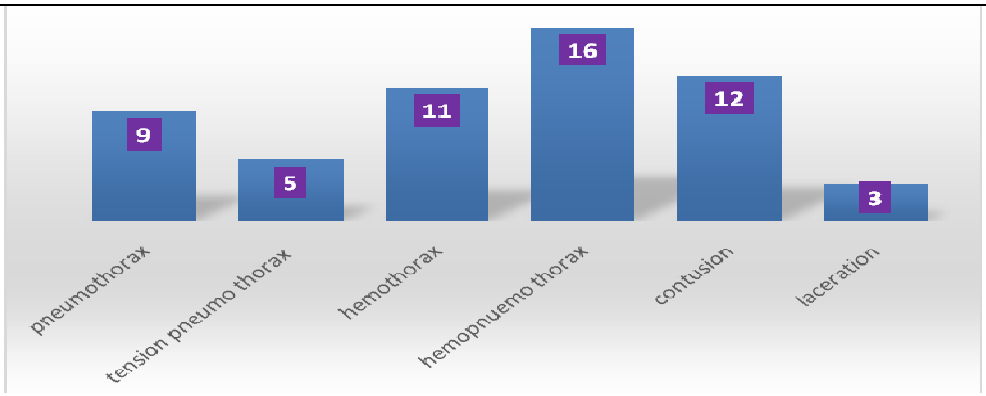

Figure 3. Distribution of Types of Lung and Pleural Injuries (n=46)

Table 2. The Specific Injured Abdominal Organs.

Abdominal injury	Frequency(n=18)	Percentage (%)
Spleen	8	44.4
Liver	5	27.8
Stomach	3	16.7
Others	2	11.1

.

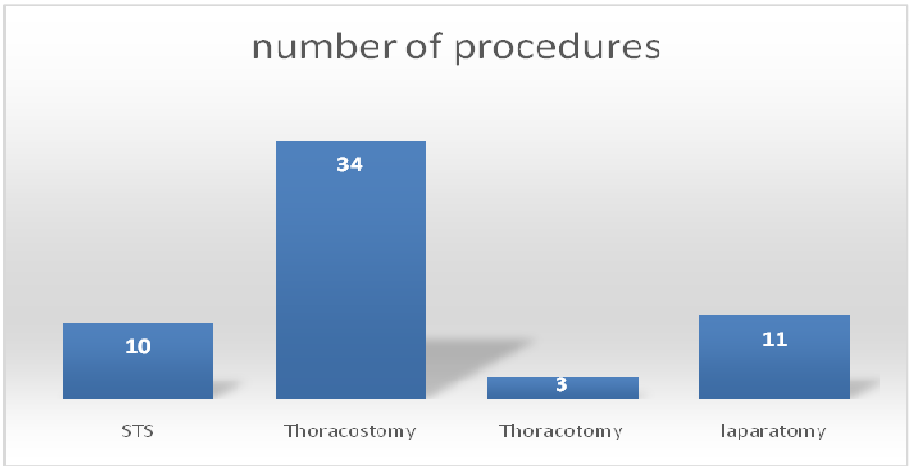

Figure 4. Distribution of Surgical Procedures among Patients who received surgical treatment (n =47)

Short Term Outcomes of Chest Injuries

Fifty one (71.8%) of the patients had no complications as result of chest injury while 20 (28.2%) had complications. These complications included pneumonia 6 (30%), surgical emphysema 5 (25%), clot from inadequately drained haemothorax 2 (10%), empyema 2 (10%), wound sepsis 3 (15%) and hypovolaemic 2 (10%).

The mean length of hospital stay was 7.14 days, (SD=±6.1) and 12 (16.9%) of the patients died as a result of the chest injuries while the majority 59 (83.1%) survived. Among those who survived, 56 (95%) were discharged, 2(3.3%) had run away from the hospital facility and 1 (1.7%) was referred for further management.

ISSN 2073-9990 East Cent. Afr. J. surg

Relationship Between Associated Injuries and Patient Outcomes

The presence of associated injuries was found to have statistically significant association with mortality (X^2=4.57, F.E=0.046), OR 95% CI = .047(.142-.017). This meant that the more one had an associated injury the more they were likely to die. Furthermore, among those participants that had head injuries (n=17), 12 participants had mild head injuries while 6 had severe head injuries, 12 (70.6%) survived while 5 (29.4%) died. Among those who had severe head injuries 5 (83.3%) died while 1 (16.6%) run away. Severe head injury was found to be a statistically significant predictor of outcome. There the participants who had chest injury associated with severe head injury were more likely to die (X^2=13.85, F.E=0.001).

Relationship between Complications and Patient Outcome

There was a statistically significant relationship between complications and mortality (X^2=36.82, F.E=0.000). This implies that the more a participant had complications as a result of chest injury, the more they were likely to die.

Table 3. Multivariate Analysis of Vital Signs and Patients Survival

Variable	Odds Ratio	P-value	95% CI
Pulse rate	1.8	0.461	(0.36 - 9.46)
Systolic Bp	1.6	0.464	(0.44 - 5.84)
SpO2	1.6	0.612	(0.25 - 10.73)
Respiratory rate	0.1	0.104	(0.01 - 1.57)
Glasgow Coma Scale	21	0.033*	(1.28 - 370.12)

F.E value <0.05 is statistically significant in the table above *indicates statistically significant

Discussion

Lema et al[5] and many other authors also observed that males in their productive ages were predominantly affected by chest injuries. The males being more involved in the risky daily activities to earn a living for their homes explains their predominance. Most of the patients were from Mbarara (29.6%) and its immediate neighboring districts due to their proximity to the regional referral hospital. Peasants (60.6%) and students or pupils (15.5%) were the most affected by chest injuries. Chalya et al[6] in Tanzania studied RTA and also found that the students (58.8%) and businessmen (35.9%) were the main victims. These people opt for the cheapest means of transport (walking and motorcycle) which also happen to be more dangerous.[10]

All the participants in this study did not receive any pre-hospital while majority arrived to hospital in private/hired cars. Chalya et al[11] also found that none of the patients received pre-hospital care and majority (58.8%) was also brought to hospital by relatives and good Samaritans. Murad et al[12]found pre-hospital care to be a significant contributor to survival.

In this study, the commonest cause of chest injuries were Road Traffic Accidents with motorcycles used for commercial transport accounting for the majority. In a study on patients involved in bodaboda (motorcycle) related road traffic crushes, chest injuries contributing 34.7%[2] while Nwadiaro et al[13] found motorcycles to contribute 30% of morbidity and mortality arising from RTA. World Health Organization notes the escalating road traffic accidents in developing countries, and gives the increasing motorization, poor road infrastructure, not complying to traffic laws and driving or riding under the influence of recreational substances as some of the major reasons for this trend[14, 15]. The increased usage of motorcycle for commercial transportation is favored by the cheapness, ability to beat heavy traffic jams,

ISSN 2073-9990 East Cent. Afr. J. surg

access to remote non-motorable areas and poverty. Adeghehingbe et al[16] and Solagberu et al[17] studied motorcycle accidents and found that poor licensing, non adherence to traffic rules, at times reckless riding by largely illiterate motorcycle users as the factors responsible for the increased motorcycle accident injuries.

Blunt injury (57.7%) represented the majority of the trauma mechanism while chest wall (69.0%) and lung and pleura (64.8%) injuries occurred the most. Rib fractures were the most chest wall injures while hemopneumothorax were the major lung and pleura injuries. Massaga et al[4] found in their study that majority of the chest injuries were blunt with rib fractures in 42.9% as the main contributors. Atri et al[18] also found rib fractures as the commonest chest injury contributing 60%. Otieno et al[19] documented hemopneumothorax as one of the main injuries sustained in the Kenyan rural population.

Our study found number of rib fractures not to be a significant determinant of outcome. Whitson et al[20] also found that increasing number of rib fracture among chest injury patients was not an independent prognostic factor. Similarly, Huber et al[21] found no effect of rib fractures on survival although the same study found bilateral flail chest to be a significant predictor of outcome.

In this research, there were only 5 (7.0%) diaphragmatic injuries and 4 (80%) of them were diagnosed intraoperative. Okugbo et al[22] showed diaphragmatic injuries to be in only 8% of the chest injury participants. The diagnosis of blunt trauma diaphragmatic rupture begins with clinical suspicion.[23] Tariq et al[24] also found that about 50% of the diaphragmatic injuries were diagnosed for the first time at laparotomy or thoracotomy for other concomitant injuries.

None of the participants had esophagus, tracheobronchial, cardiac and great vessels injuries. Injuries involving the heart and great vessels cause sudden death and are therefore rarely seen in the chest injury patient.[25]

In this study 64.2% of the participants had associated injuries, with abdominal injury being the commonest. Splenic and liver injuries were the most common abdominal injuries observed. These 3 abdominal organs are anatomically in close proximity which explains the above trends. Subedi et al[26] found that rib fractures were a good indicator of underlying liver and spleen injuries. Ibenzi et al[27] studied patterns of abdominal injury at Muhimbili Hospital and found chest injury as the second most common associated extra-abdominal injury while Chalya et al[28] in Tanzania also found chest injuries (75%) to be the most common associated injury among patients with splenic injuries.

The commonest complication encountered was pneumonia. Stewart et al[8] also found pneumonia and pleural sepsis as the commonest complication blaming it on retained clots, contamination from open wounds and insertion of the chest tubes. There was no statistically significant relationship between hospital stay and associated injuries or hospital stay and complications. Lema et al[5] also found complications were a significant determinant of mortality but not hospital stay.

The mortality was 16.9% which is high and the statistically significant predictors of mortality included associated injuries, severe head injury and complications. Mezue et al[29]found a high mortality rate of 43% among head injury patients who had associated chest injuries. While Lema et al[5] in Tanzania had a much less mortality of 3.3 %, Massaga et al[4] reported a much higher mortality of 24.2% and documented severity of injury, associated injuries and delayed medical care as being responsible for this outcome. Lema et al[5] attributed non severe chest injuries (unless there were serious associated extra-thoracic injuries) on the low mortality rate but also the hospital the research was carried out does not offer free services like ours.

Conclusions

The causes, patterns and outcomes of chest injuries observed in this study are not very different from those made in other series done in developing countries. Road traffic accidents are the commonest causes and measures to reduce them are urgently needed. Chest injury causes high mortality rate and also mainly affecting males in their most productive ages. Associated injuries and complications are significant determinants of mortality.

ISSN 2073-9990 East Cent. Afr. J. surg

Limitations

There was inadequacy in diagnostic capacity and emergency and intensive care services.

Acknowledgement

This stundy was *funded by* Massachusetts General Hospital- Mbarara University of Science and Technology collaboration. To both institutions we are very grateful.

References

1. Veysi VT, Nikolaou VS, Efstathopoulos N, Giannoudis PV., 2009. Prevalence of chest trauma, associated injuries and mortality: a level I trauma centre experience. *International Orthopedics (SICOT); 33(5):1425-1433.*
2. Galukande et al., 2009.Boda-boda Injuries a Health Problem and a Burden of Disease in Uganda: a Tertiary Hospital Survey. *East and Central African Journal of Surgery Volume 14 Number 2.*
3. Chalya PL, Mabula JB, Dass RM, Mbelenge N, Ngayomela IH, Chandika AB, Gilyoma JM., 2012: Injury characteristics and outcome of road traffic crash victims at Bugando Medical Centre in Northwestern Tanzania*. J Trauma Manag Outcome; 6:1*
4. Massaga, F. A., and M. Mchembe., 2010 . "The Pattern and Management of Chest Trauma at Muhimbili National Hospital, Dar Es Salaam."
5. Lema MK, Chalya PL, Mabula JB, Mahalu W., 2011: Pattern and outcome of chest injuries at Bugando Medical Centre in Northwestern Tanzania. *J Cardiothoracic Surg, 6:7*
6. Edaigbini S A, Delia I Z, Aminu M B, Shehu H H., 2011. Profile of chest trauma in Zaria Nigeria: A preliminary report. *Niger J Surg; 17:1-4*
7. Misauno MA, Sule AZ, Nwadiaro HC,Ozoilo KN, Akwaras AL, Ugwu BT., 2007.Severe chest trauma in Jos, Nigeria: Pattern & outcome of management. *Nigerian Journal of Orthopedics and Trauma ;6(2):64-66.*
8. Stewart RM, Corneille MG., 2008. Common complications following thoracic trauma: their prevention and treatment. *Semin Thorac Cardiovasc Surg ;20:69*
9. Segers et al., 2001. Thoracic trauma; an analysis of 187 patients. *Acta Chir Belg; 1001(6):277-82*
10. Koornstra MK, 2003.Transport safety performance in EU. Brussels, European Transport safety council, Transport accident statistics Working party.
11. Chalya et al., 2013 Citywide Trauma Experience in Mwanza, Tanzania: A Need for Urgent Intervention. *Journal of Trauma Management & Outcomes;* 7: 9.
12. Murad, Mudhafar Karim, Dara B. Issa, Farhad M. Mustafa, Hlwa O. Hassan, and Hans Husum, 2012. "Prehospital Trauma System Reduces Mortality in Severe Trauma: A Controlled Study of Road Traffic Casualties in Iraq." *Prehospital and Disaster Medicine* 27, no. 01: 36–41. doi:10.1017/S1049023X11006819.
13. Nwadiaro, H. C., K. K. Ekwe, I. C. Akpayak, and H. Shitta, 2011. "Motorcycle Injuries in North-Central Nigeria." *Nigerian Journal of Clinical Practice* 14, no. 2: 186–89.
14. Kibogong and Kisia. 2011. Motorcycle-related road traffic crashes in Kenya: Facts and figures. *World Health Organization report*
15. World Health Organization, 2004. World report on road traffic injury prevention: Summary.
16. Adegbehingbe BO,Oluwadiya KS, Adegbehingbe OO., 2004.Motorcycle associated ocular injuries in lle-lfe, Nigeria, *Afr J Trauma; 2:35-9*
17. Solagberu BA, Ofoegbu CK,Nasir AA, Ogundipe OK, Adekanye AO,Abdur-Radiman LO, 2006. Motorcycle injuries in a developing country and the vulnerability of riders, passengers and pedestrians*. Inj Prev;12:266-8*
18. Atri, Mohan, Gurjit Singh, and Arvind Kohli., 2006. "Chest Trauma in Jammu Region an Institutional Study." *Indian Journal of Thoracic and Cardiovascular Surgery;* 22, no. 4: 219–22.
19. Otieno T,Woodsfield J, Bird P, Hill A, 2004.Trauma in rural Kenya. *Injury ; 35:1228-1233*
20. Veysi VT, Nikolaou VS, Efstathopoulos N, Giannoudis PV., 2009. Prevalence of chest trauma, associated injuries and mortality: a level I trauma centre experience. *International Orthopedics (SICOT); 33(5):1425-1433.*

ISSN 2073-9990 East Cent. Afr. J. surg

21. Stephan Huber, Peter Biberthaler, Patrick Delhey, Heiko Trentzsch, Hanke Winter, Martijn Van Griensven, Rolf Lefering, Stefan Huber-Wagner and Trauma Register DGU., 2014. Predictors of poor outcomes after significant chest trauma in multiply injuried patients:a retrospective analysis from the German Trauma Register. *Scandinavian Journal of Trauma, resuscitation and emergency medicine; 22: 52*
22. Okugbo, S. U., E. Okoro, and P. E. Irhibogbe, 2012. "Chest Trauma in a Regional Trauma Centre." *Journal of the West African College of Surgeons* 2, no. 2: 91.
23. Al-Refaie, R. E., E. Awad, and E. M. Mokbel., 2009 "Blunt Traumatic Diaphragmatic Rupture: A Retrospective Observational Study of 46 Patients." *Interactive CardioVascular and Thoracic Surgery*; no. 1: 45–49.
24. Tariq Ahmed M et al., 2014. Delayed Presentation of Diaphragmatic Rupture: Our Experience with Six Cases. *Sch. J. App. Med. Sci; 2(2A):516-521.*
25. Pretre R, Chilcott M., 1997. Blunt trauma to the heart and great vessels. *N Engl J Me ; 336(9):626-632.*
26. Subedi N, Yadav BN, Jha S., 2014. Liver and spleen injuries and associated rib fractures: Autopsy study. *J Forensic Res; 5:240 doi:10.4172/2157-7145.1000240*
27. Ibenzi 2012. Pattern and early treatment outcome of abdominal injuries at Muhimbiri National Hospital Dar ea salaam, Tanzania.
28. Chalya et al., 2012 Splenic injuries at Bugando Medical Centre in northwestern Tanzania: a tertiary hospital experience*. BMC Research Notes;5:59*
29. Mesue WC, Ndubuisi CA, Erechukwu UA and Ohaegbulam SC., 2012.Chest injuries associated with head injury. *Niger J Surg ;18:8-12*