

## **The Pattern and Management of Chest trauma at Muhimbili National Hospital, Dar es Salaam.**

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**Source of funding:** Ministry of Health of Tanzania.

**Background:** Chest trauma is common and its pattern varies in different places. Majority of patients are managed mainly conservatively. Tube thoracostomy is a simple procedure but it is associated with significant number of complications. The aim of this study was to evaluate the clinical pattern and its management at Muhimbili National Hospital.

**Methods:** A hospital based prospective study of all consecutive patients admitted with chest trauma at Muhimbili National Hospital between November 2007 and September 2008. Clinical assessment and chest x-ray findings were used to diagnose and to evaluate any complications associated with chest tubes using a structured questionnaire.

**Results:** The majority (95/119) of patients were males. Their age ranged from 12 to 72 years with the mode of 32 years. Motor traffic injury (MTI) was the commonest cause of chest trauma accounting for 72.3% of the cases. Rib fractures were the most clinical type of chest injury and accounted for about 42.9% of cases. Blunt chest injuries were more common (75.6%) than penetrating injuries. Seventy three (61.3%) patients had other associated injuries, in which fracture of extremities (25.2%) and head injury (21.8%) were the commonest. Sixty seven (56.3%) patients were treated with closed tube thoracostomy only. The overall complication rate of the chest tubes was 32.9% of which infection (24.7%) and Nonfunctional tubes (17.4%) were the commonest. High mortality rate of 24.2% was recorded.

**Conclusion:** The clinical pattern and the management of chest injuries in this study was similar with many other series of study, however, the rate of closed tube thoracostomy remained high with many and avoidable complications.

### **Introduction**

Chest injuries cause high morbidities and mortalities because they involve vital organs. They affect mainly the young school age and productive members of the societies<sup>1</sup>. Motor traffic injury is the known worldwide commonest cause of chest injuries in developing and developed countries due to different risk factors<sup>2, 3, 4</sup>. Locally, it has been observed in a pilot study that chest injuries constitute significant number of surgical patients admissions, however little has been documented on its pattern in clinical practice. The pattern here refers to the causes, type of injuries, clinical diagnosis and their associated injuries in relation to the age and sex of the patients. Two different studies in Nigeria, showed different pattern in terms of type of injury one said blunt injury was common due to motor traffic injuries and the other said penetrating injury was common because of penetrating injury following civil war<sup>2, 5</sup>. Most of studies in both developing and developed countries showed that blunt chest injuries are common due to motor traffic injuries<sup>6</sup>. Chest injuries were noted to be common in young and middle age groups where males were commonly affected as compared to females. This was seen in most of the series<sup>6, 7, 8, 9</sup>.

Clinical types of chest injuries varied in different studies depending on the causes; however most of them were associated with other injuries. Majority of patient in almost all of the studies were treated conservatively by no more than a chest tube. Although most of these patients managed to arrive at hospital for treatment, more deaths occurred within the hospital<sup>10</sup>. Closed tube thoracostomy is a simple and a life saving procedure but still is associated with many complications<sup>11, 12, 13, 14, 15</sup>. This has been a challenge to many surgeons on this preventable cause of deaths.

## **Patients and Methods**

This was a hospital based prospective study of all consecutive patients admitted with chest trauma in the surgical and trauma wards between November 2007 and September 2008. Data were filled in a structured questionnaire by the investigator. Information on socio-demographic characteristics that included age, sex, and status of road user were obtained by interviewing the patients or from the patients' files.

Details about the cause, type of injury, clinical diagnosis, associated injuries and the treatment given were obtained from the patients file, x-ray films and ward register. All Chest tubes were inserted in the 6<sup>th</sup> or 7<sup>th</sup> Mid-axillary line. Relevant data about chest tube insertion procedure and materials used were also documented. All patients were given prophylactic antibiotics. Patients were followed up while in the ward and at the clinic after 2 weeks of discharge. Clinical and radiological assessment was done to look for any associated complication of the tubes. Complications associated with tube thoracostomy were either insertional (trauma to the other internal organ such as vessel- bleeding), positional (not in the pleural cavity, too high or too low), functional (blocked due to kinking, bending or clot such as in retained hemothorax) or infective. Local wound discharge (pus) suggested superficial wound infection. Empyema was diagnosed clinically (fevers, cough and dyspnoea) with radiological evidence on the chest x-ray. Nonfunctional tubes were either related to position (malpositions) or to function of the tube (malfunctions)

Positional related complications were evaluated using chest x-ray findings. Dislodging of the tube was observed and recorded while patients were in the ward. Insertional and functional related complications were also assessed clinically and radiologically when necessary. The outcome of the treatment was documented whether patient was cured and discharged or died. Data collected were entered into statistical package of social sciences (SPSS) version 15.0. This was analyzed to determine the types of chest injury according to age, sex and causes. Types of the treatment given and the associated complications of the chest tubes were analyzed in terms of percentages.

## **Results.**

One hundred and nineteen patients were studied. Their ages ranged from 12 years and 72 years with a mode of 32 years. There were 95 males and 24 females giving a male to female ratio (M: F) of 6.7:1. Commonest age groups were 10-29 and 30 - 49 yrs. Motor traffic injury (MTI) was the commonest cause of chest injuries accounting for 72.3% of the cases. Majority of patients were passengers and pedestrians (63%) Blunt chest injury occurred in 90 (75.6%) cases while penetrating injury was encountered in 29 (24.4%) patients. Other causes were assault, gunshot and fall from height seen in 16%, 7.6% and 4.4% of cases respectively. Rib fracture was the most clinical type of injury and accounted for about 42.9% of cases followed by pneumohemothorax in 39(32.9%) cases. Other common injuries encountered were chest wall contusion 10(8.4%), hemothorax and lung contusion in 25(21%) cases each.

Rare injuries such as cardiac contusion (1 patient), esophageal perforation (5 patients), diaphragmatic rupture (4 patients), thoracic duct injury (1 patient) and sternal fracture (1 patient) were also encountered in 12(10.2%) patients.

Seventy three (61.3%) patients had other associated injuries. Fractures of the extremities and head injuries were the most common associated injuries encountered in 30(25.2%) and 26(21.8%) patients. Other associated injuries were abdominal visceral injury (ruptured spleen, perforated bowel, liver laceration, kidney and urinary bladder injury) (16.8%), soft tissue injury (9.2%), pelvic (9.2%) and spine fractures (5.0%). Sixty seven (56.3%) patients were treated with closed tube thoracostomy only, 5(4.2%) had thoracotomy and one patient had laparotomy due to ruptured diaphragm and spleen. The overall complication rate of the chest tubes was 32.9% of which infection and nonfunctional tubes were the commonest, noted in 18(24.7%) and 13(17.4%) respectively. Infection was treated with antibiotics, except in one case of empyema thoracis who required thoracotomy.

**Table1.** The Age and Sex Distribution of the study Population.

	Males		Female		No	%
	No	%	No	%		
<b>10-29</b>	31	32.6	11	45.8	42	35.3
<b>30-49</b>	43	45.3	9	37.5	52	43.7
<b>50-69</b>	17	17.9	3	12.5	20	16.8
<b>70+</b>	4	4.2	1	4.2	5	4.2
<b>Total</b>	<b>95</b>	<b>100.0</b>	<b>24</b>	<b>100.0</b>	<b>119</b>	<b>100.0</b>

**Table2.** Causes of Chest by Sex Distribution

	Male		Female		No	%
	No	%	No	%		
<b>MTI</b>	64	67.4	22	91.7	86	72.3
<b>Assault</b>	17	17.9	2	8.3	19	16.0
<b>Gunshot</b>	9	9.5	0	.0	9	7.6
<b>Fall</b>	5	5.3	0	.0	5	4.2
<b>Total</b>	<b>95</b>	<b>100.0</b>	<b>24</b>	<b>100.0</b>	<b>119</b>	<b>100.0</b>

**Table3.** The Clinical Types of Chest Injuries

	Number	%	
<b>Pneumothorax</b>	12	6.3	10.1
<b>Hemothorax</b>	25	13.0	21.0
<b>Pneumohaemothorax</b>	39	20.3	32.8
<b>Rib #</b>	51	26.6	42.9
<b>Clavicle #</b>	18	9.4	15.1
<b>Lung contusion</b>	25	13.0	21.0
<b>Chest wall contusion</b>	10	5.2	8.4
<b>Others</b>	12	5.6	10.4
<b>Total</b>	<b>192</b>	<b>100.0</b>	<b>161.3</b>

**Table 4.** The Associated Injuries

<b>Associated Injuries</b>	<b>Number of Patients</b>		<b>% Of Cases</b>
	<b>No</b>	<b>%</b>	
Head and neck	26	17.3	21.8
Extremities #	30	20.0	25.2
Pelvis injury	11	7.3	9.2
Spine injury	6	4.0	5.0
Abdomen visceral	20	13.3	16.8
Soft tissue injury	11	7.3	9.2
No Associated injury	46	30.7	38.7
<b>Total</b>	<b>150</b>	<b>100.0</b>	<b>126.1</b>

**Table 5.** The Treatment Modalities Given to Patients.

	<b>Number</b>	<b>%</b>
Conservative	46	38.7
Tube thoracostomy	67	56.3
Laparotomy	1	0.8
Thoracotomy	5	4.2
<b>Total</b>	<b>119</b>	<b>100.0</b>

**Table 6.** The Types of Complications Associated with Chest Tubes.

<b>Complications</b>	<b>Number of Patients</b>		<b>% of Cases</b>
	<b>Number</b>	<b>%</b>	
Nonfunctional tube	13	15.3	17.4
Wound infection	11	12.9	15.1
Empyema	7	8.2	9.6
Bleeding	1	1.2	1.4
No complication	53	62.3	72.8
<b>Total</b>	<b>85</b>	<b>100.0</b>	<b>116.4</b>

Most of Nonfunctional tubes required some adjustment and in most cases were functional after adjustment. The average duration of tube stay was 4days (range 1- 32days) while the average hospital stay of the patients was 9days (range 1- 131days). A mortality rate of 24.4% was recorded and mostly were from the severely injured patients with associated injuries (3patients had esophageal perforation and 1 had diaphragmatic rupture).

### **Discussion**

Significant number of chest trauma patient (119) were encountered in this study, this were the in-patients only. The results of this study about the clinical pattern of chest trauma and its management was in conformity with many other series done both in developing and developed countries<sup>6,8,11,12,13,14,15</sup>. The distribution of chest injury by age and sex was the similar with many series. Young male individuals were commonly involved in chest trauma. This is the active age group, either at their school age or those involved in many activities of the society<sup>1</sup>.

The commonest cause of chest injury was Motor traffic injuries, a finding seen in many other series which were mainly blunt injury<sup>6,8,9</sup>. This study was done in the urban area where motor traffic injuries are common. Few studies have shown penetrating injury to be the commonest cause of chest trauma. Ali and Gali (Nigeria study) showed penetrating injury occurred in 61.5% of cases and these were mainly due to the civil wars and trauma by bandits<sup>5</sup>. Maxwell et al has shown similar findings, penetrating injuries accounting for 77% in one of the multicenter study<sup>16</sup>. Other causes of injuries like gunshot, stab wounds and fall from height were not commonly encountered in this study. However fall injuries are common in rural areas<sup>10</sup>. Among the road users, passengers and pedestrian were commonly injured seen in 35.3% and 27.7% respectively. Zargar et al<sup>17</sup> also had similar results. This could be due to the fact that car accidents involve public transport which occurs frequently in our setup with many passengers. In the developing countries like Tanzania infrastructures are poor, overcrowded by pedestrians such as petty traders who are at high risk of been knocked by the cars. In contrast, Misauno et al reported that drivers were mostly affected and this was due to their occupational exposure.<sup>2</sup>

Rib fracture was the most commonly encountered clinical type of chest injury. This is related to the anatomical location of the ribs. One study in Australia has shown that rib fractures are common in elderly women due to the aging and osteoporosis<sup>3</sup>. Misauno et al<sup>2</sup> revealed that chest wall contusion was the commonest clinical type of chest injury. This was followed by pneumothorax with the assumption that most of the rib fractures are associated with pleural or vascular injury due to their anatomical relations. Lung contusion and hemothorax were also common similar to many other series.<sup>6,7,14,15</sup>. Rare but life threatening conditions such as esophageal perforation, cardiac injury and diaphragmatic rupture were encountered in a few patients, a similar finding to other studies<sup>6,7,15</sup>. These injuries frequently have high mortality usually at the scene.<sup>10</sup> Fractures of extremities and head injuries were the commonest associated injuries reported in many other series. Ali and Gali study has shown fractures of extremities and abdominal visceral injuries to be the commonest associated injuries. This was related to the cause of the injury, since motor traffic injuries frequently results into multiple injuries<sup>5</sup>.

Majority of patients were treated conservatively with close observation and closed tube thoracostomy. More than a half of cases (56.3%) had closed tube thoracostomy, 5 (4.2%) cases had thoracotomy and laparotomy was done in one patient. This was in conformity in occurrence and proportional with many other series<sup>5,8,17</sup>. The overall complication rate was high, (32.9%) compared to the many studies (Bailey RC 30%, Cakan et al 4.6% and Avlwin CJ et al 2-25 %.) Infection was the commonest complication noted followed by nonfunctional tubes. Infection rate and nonfunctional tubes were unacceptably high, 24.7% and 17.4 % respectively. In this study, these complications were probably related with improper and unsterile techniques used; however this was not evaluated in this study. Malpositions probably could be more than what has been revealed here because chest x-ray can detect only 55% of positional complications<sup>18</sup>. In Heng et al study<sup>14</sup> the complications were only positional (5.2%) and infective (2.4%) while in Bailey et al study<sup>12</sup> were only infective (2%) For those patients treated with closed tube thoracostomy, the average tube stay was 4days with a range of 1-32days. Prolonged tube stay partly was contributed by complications and the associated injuries. Hospital stay also was influenced by the similar factors; longest period was 3 months in 2 patients who had severe head injury admitted in the ICU. Misauno et al<sup>2</sup> reported almost similar findings with the longest hospitalization of 168 days. Bergaminelli et al<sup>19</sup> showed the average tube stay of 11days and a range of 4-18days.

The mortality rate of chest injuries was found to be very high (24.4%) when compared with other studies. This can be explained by the severity of injuries, associated injuries and late management of the patients. This needs another study for its justification. The mortality rate was lower in similar studies. (Misauno study<sup>2</sup> 4.5% and Cakan et al<sup>20</sup> 1.3%). Other studies also have shown mortality to be related with severity of injury, mechanism of injury, associated injuries, age of the patient and complications of the treatment<sup>1</sup>.

### **Conclusion**

1. The pattern of chest trauma and its management was almost similar to many series.
2. Chest trauma involves mainly males and young active members of the society.
3. Passengers and pedestrians often suffer this injury following blunt MTI.
4. Closed tube thoracostomy is commonly done but is associated with high complication rate.
5. High mortality was noted.

### **Recommendations**

1. Further research on the causes of chest injury to establish the reason why MTI is the commonest cause and hence to establish the preventive measures on this preventable cause.
2. Young school age group individuals and productive members of the society are affected mostly; there is a need of a big research on this age group to establish the risk factors. This will help to establish and give the necessary information on the preventive measures on this risk age group.

3. Clinical types of chest injuries are similar in most series, management protocol or guideline review is suggested to have better and early intervention of which closed tubes thoracostomy is the main stay.
4. Closed tubes thoracostomy is simple but yet is associated with many complications; there is a need for further research. Patients, doctors and facilities related factors should be looked upon.

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