A REVIEW OF CHEST TRAUMA IN THE EMERGENCY DEPARTMENTS AT HOSPITALS OF A PRIVATE HOSPITAL GROUP IN THE KWAZULU-NATAL FROM 01 JANUARY 2008 TO 31 DECEMBER 2010.

By Aime' Musakay Pukana

SUPERVISOR

Dr Zeyn MAHOMED

MBChB, FCEM, MMScEM

THIS THESIS IS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER IN SCIENCE IN EMERGENCY MEDICINE (MScMed EM), DIVISION OF EMERGENCY MEDICINE, DEPARTMENT OF FAMILY MEDICINE, SCHOOL OF CLINICAL MEDICINE, FACULTY OF HEALTH SCIENCES- UNIVERSITY OF WITWATERSRAND.

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DECLARATION

I, the undersigned, hereby declare that the work contained in this thesis is my own, original work and that I have not previously submitted it, entirely or in part, to any university for a degree.

Signature.........

Date: 18 December 2017

ACKNOWLEDGEMENT

This study would not have been possible without the support and dedication of data bank of a private hospital group.

Special thanks to Dr Alison Bentley and to my supervisor Dr Zeyn Mahomed for their valuable inputs, tireless work.

I am also grateful to my family: my wife Christel Ngamala and my children (Emmanuel and Olivia) for their unconditional support and encouragement.

ABSTRACT

1. BACKGROUND AND SETTING

The study is conducted in hospitals of a private hospital group in the KwaZulu-Natal province in South Africa.

The increasing number of chest injuries in hospitals has led to increased interest in this field and has led me to conduct this study in the province.

Data was collected from clinical records via the national data bank of the private hospital group.

2. AIM

This thesis describes chest trauma in the Emergency departments of hospitals of a private hospital group in the KwaZulu-Natal province from 01 January 2008 to 31 December 2010.

3. METHODS

It is a retrospective cohort study with a total sample size of 238 patients in different Emergency Departments, retrieved from clinical data bank of a private hospital group**.**

4. RESULTS

- People between the age of 20 years and 40 years are more affected by chest trauma.
- Chest trauma is more common in the Black population compared to other racial groups.
- Male sex has the highest occurrence rate in comparison to female sex.
- April and December have been shown to be a high risk period.
- Most of the chest injuries cases happened during week days.
- Motor vehicle accidents represent the major cause of chest injury in this study followed by physical assault.
- Most patients who arrived in the ED had an Injury Severity Score that was ranging from mild to moderate.
- The majority of cases have been associated with a good prognosis.
- There was a mortality rate of 6.7%.

5. CONCLUSION

Chest trauma represents a public health concern that needs to be addressed by the government in consultation/collaboration with the various stakeholders.

1. INTRODUCTION AND BACKGROUND

1.1 SOCIO-DEMOGRAPHIC CONTEXT OF KWAZULU-NATAL

Kwazulu-Natal represents the province with the second largest population in South Africa, with 21.39% of total population living in this province [1]. Kwazulu-Natal comprises 4 main racial groups: 84.9% of population are Black, 8.5% Indian/Asian, 5.1% White, 1.5% Coloured. Of the total population, 52.30% are female and 47.69% male [2].

1.2 LITERATURE REVIEW

Throughout history, chest injuries have been the leading causes of death in modern conflicts throughout military battles [3]. Even in normal society, Trauma represents one of the main causes of death and morbidity particularly during the first four decades of life [4].

Chest trauma is associated with significant mortality and morbidity rates [5, 6], it is the third major cause of death after cancer and cardiovascular diseases, and the major cause of a fatal outcome [7].

Chest trauma is responsible of 25 to 50% of all trauma deaths in the United States of America [5, 8] and furthermore injury to the chest is present in 50% of fatal road accidents [9]. A large number of patients, more specifically victims of thoracic injuries, don't survive even after reaching health care facilities [4]. However, the chance of survival significantly improves if patients are quickly and appropriately managed by trained medical staff [4, 7, 9].

Chest injuries are a result of penetrating chest trauma or blunt chest trauma. More than 50% of injuries to the chest are associated with other injuries i.e. polytrauma [10]. Chest

injuries are responsible for 25% of fatal injuries in trauma; the primary cause in these cases is due to haemorrhage [10].

The incidence of penetrating chest injury cases is increasing [4]. This type of injury is common in stab wounds and in gunshot wounds [8]. Blunt chest injury cases are common in collisions (motor vehicle accidents, motor cycle-pedestrian), assaults, sports or fall. Blunt chest injury remains one of the main causes of morbidity and mortality [6]. Other associated injuries such as abdominal, cardiac and head trauma contribute significantly to fatalities in related chest trauma [10, 11].

In the USA, the cause of blunt thoracic trauma is mainly attributed to motor vehicle accidents, whereas gunshot and stab wounds represent the cause of most penetrating chest injuries [8]. A study done in Brazil reported that the leading cause of thoracic injury was road accidents (24.4%) followed by falls, motorbike accidents and stabbings respectively 20.1%, 12.3% and 10.7%; however, pedestrian-related accidents (5.9%) and gunshots (4.6%) were associated with the highest rate of death compared to other types of causes [5]. Research done in Europe reported that the first main cause of blunt thoracic injury was MVA's, followed by domestic falls and labour-related accidents [9]. In Pakistan, the majority of trauma patients had blunt injury (58% of cases) as compared to penetrating injury (42% of cases); 94% of patients were male; associated injuries involving the head, neck, abdomen and limbs were present in 11% of cases and multiple injuries involving the chest with more than two body systems were present in 7.7% of cases. The patients 'ages ranged between 12 and 70 years with the mean age being 36 years [4].

It was proven in a study done in Thailand that blunt thoracic injury was the most common type of chest injury and that road accidents were the main cause. The ages of these victims were between 21 years to 30 years and men were mostly affected (85.5%). MVA's represented the most common cause of chest injury (45.4%) followed by physical assaults (42.5%). Abdominal injury was the most common associated injury (17.5%). Hospital stays ranged between one day and 198 days with a median stay of 6 days [6].

In third world countries, fatalities and disabilities caused by trauma is rising. However, in African countries, there is a paucity of data on trauma statistics. It is known, however, that trauma is quickly becoming the leading cause of fatality and disability [12]. When assessing chest trauma, the injury severity score (ISS) can be used to grade severity and predict outcomes. More than 6O% of patients in Emergency Department in Cameroun had mild trauma, with an ISS<16 considered as mild severity and an ISS>24 considered as severe trauma [12]. Overall, the management of chest injuries continues to be a challenge in African settings due to limited technology, limited equipment and poor health system organisation[12].

In South Africa, the trauma caseload was estimated to be approximately 1.5 million patients annually in secondary and tertiary level state hospitals with more than 50% of those annual trauma cases attributed to violence [13, 17].

Interpersonal violence throughout South Africa is common and penetrating chest injury is escalating. However most (85%) of chest injuries are managed without surgical procedures [14].

Penetrating injury to the chest, like gunshot wounds and stab wounds, represent one of the main reasons for admission from the ED in South Africa [15, 16].

The fact that trauma is becoming the leading cause of disabilities and fatalities and the fact that chest injuries represent a major contributing factor to trauma-related fatalities with lack of proper documentation in government hospitals in Africa has prompted this research project.

2. STUDY OBJECTIVES

- To describe the demographics of patients with chest trauma, both isolated and associated with multiple trauma, presenting to the Emergency Departments from 01January 2008 to 31December 2010.

- To compare clinical presentation of patients presenting with penetrating chest injury to patients presenting with blunt chest injury to the Emergency Departments from 01January 2008 to 31December 2010.

- To describe and compare the prognosis or outcomes of patients with penetrating chest injury to those with blunt chest injury presenting to the Emergency Departments from 01January 2008 to 31December 2010.

- To compare the demographics and clinical presentation of patients with isolated chest injury to those with multisystem injury presenting to the Emergency Departments from 01 January 2008 to 31 December 2010.

3. STUDY METHODS:

-STUDY DESIGN: A retrospective, observational and cross-sectional study: it will consist of a review of chest injury patients presenting to the Emergency Departments at hospitals of a private Hospital group from 01January 2008 to 31December 2010.

- **STUDY SETTING**: this research will be conducted using the data bank of a private Hospital group in South Africa.

- **STUDY POPULATION**: All patients presenting with chest injuries to the Emergency Departments at hospitals of a private Hospital group in the KwaZulu-Natal from 01January 2008 to 31December 2010 will be included in this study.

Inclusion criteria: all patients with chest trauma presenting to the Emergency Departments at hospitals of a private Hospital group in the Kwazulu-Natal were included in this study: each and every patient that has some trauma to the chest, irrespective of how minor or major, primary or secondary presentation, whatever else is associated will be taken into account.

Exclusion criteria: records incorrectly captured or incompletes were not considered in this study.

The estimated population required for this study is at least 120 patients (N= 120) for a difference of 10 % (with a power of 90 %).

- **SAMPLING AND SELECTION**

This is an observational assignment of patients and 238 participants were included in this study.

- **METHOD AND TECHNIQUE**: consist of review of patients clinical records which were entered into the trauma bank database.

- **Variables:** a data extraction sheet was designed and included the following informations: age, gender, race, arrival date and time in the Emergency Department, type of injury, mechanisms (causes) of injury, ISS score, outcomes (died, discharge, admission, transfer out), associated injury(ies), description of chest injury.

4. DATA ANALYSIS

For objective one and three (descriptive statistics), Means and standard deviations will be used for the analysis of parametric variables and Medians and confidence intervals will be used for non-parametric variables. Frequencies used for categorical variables.

For the comparative element in objective two, three and four, an unpaired t-test will be used to analyze parametric data and Mann-Whitney will be used for non-parametric data. A Fishers exact test will be used to compare categorical variables.

5. ETHICS

This is a retrospective study and as such it did not deal directly with patients. Therefore, there was no need to obtain informed consent from patients. A coding system was used in order to restrict access to patient information and thus preserve confidentiality. In addition, a private computer with a protected password and a locked cupboard was also used in order to restrict access to patient's information. However, an approval from the Human Research Ethics Committee of University of the Witwatersrand and an approval from the Private hospital group Trauma Bank manager to extract data are was obtained.

6. RESULTS

This study was conducted in the ED's of hospitals of a private hospital group in the KwaZulu-Natal province.

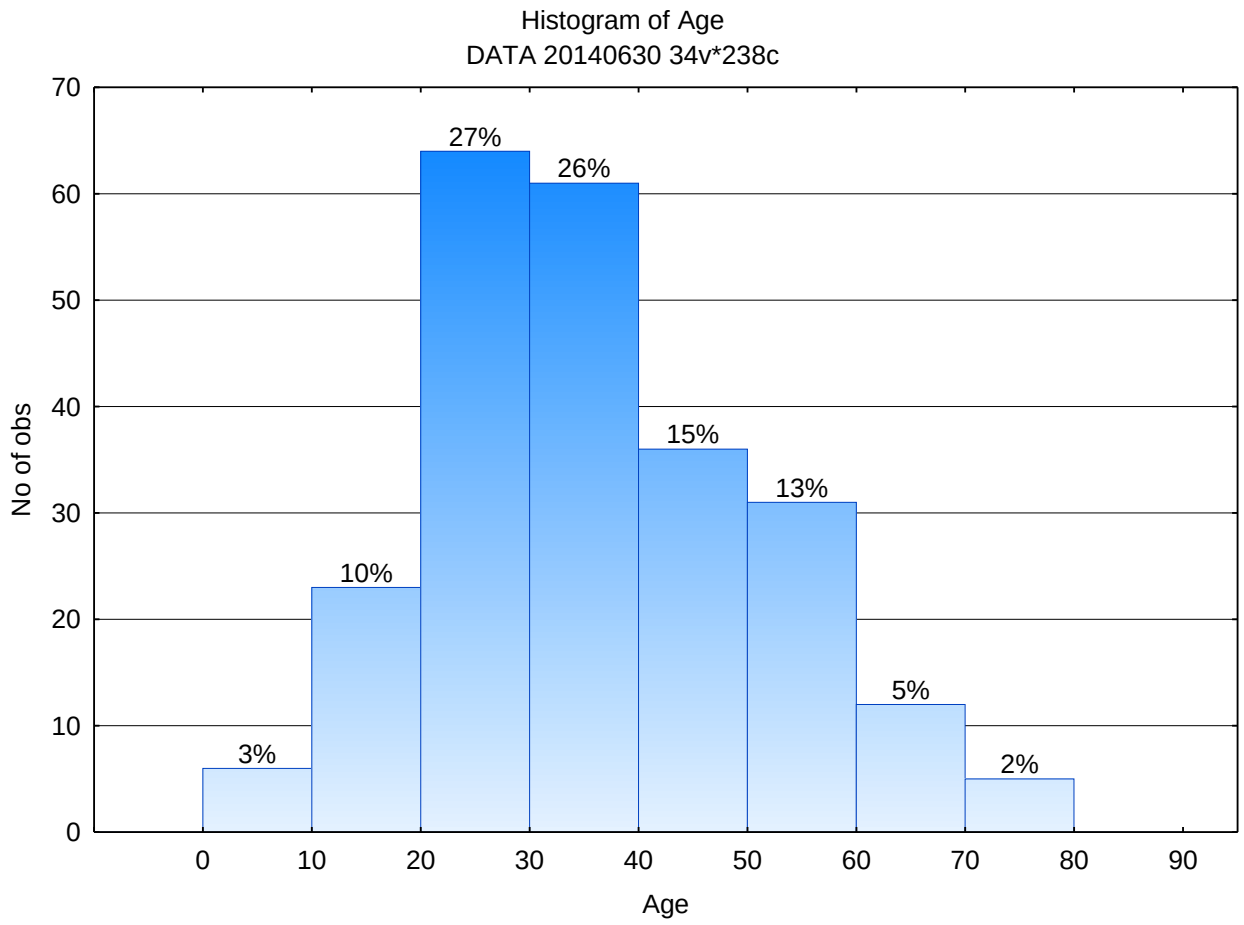
6.1. DEMOGRAPHICS CHARACTERISTICS

The following demographic parameters were analysed:

- Age
- Gender
- Race

6.1.1. AGE DISTRIBUTION

Table 1: Histogram of age



This histogram shows the occurrence of chest trauma in different age groups. Chest injuries have a peak between 20 and 30 years of age, followed by the interval 40 to 50 years of age. The picture is less common before 3 years old and beyond 70 years.

The age group is further divided in categories:

-One: 0 to 12 years of age= Children

-Two: 13 to 19 years of age= Adolescents

-Three: 20 to 39 years of age= Young adults

-Four: 40 to 64 years of age= Middle age

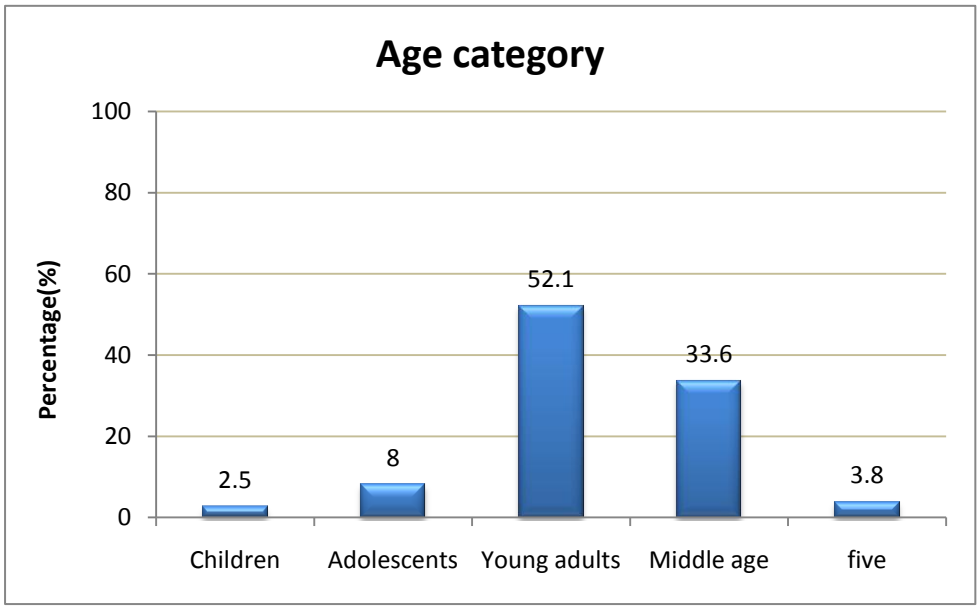
-Five: 65 years of age and above= Old age

This new categorization is presented in the following tables and bar graphs: From this total number of patients, 6(2.5%) were children, 19(8%) were adolescents, 124(52.1) were young adults, 80(33.6%) were middle age people and 9(3.8%) were in category five as shown in the table below.

Table 2: Table of age category

	Frequency	Percentage
1.Children	6	2.5
2.Adolescents	19	8
3.Young adults	124	52.1
4.Middle age	80	33.6
5.Old age	9	3.8
	238	

Table 3. Histogram of age category



The bar graph shows the distribution of the different age groups. It indicates that most of the patients were young adults.

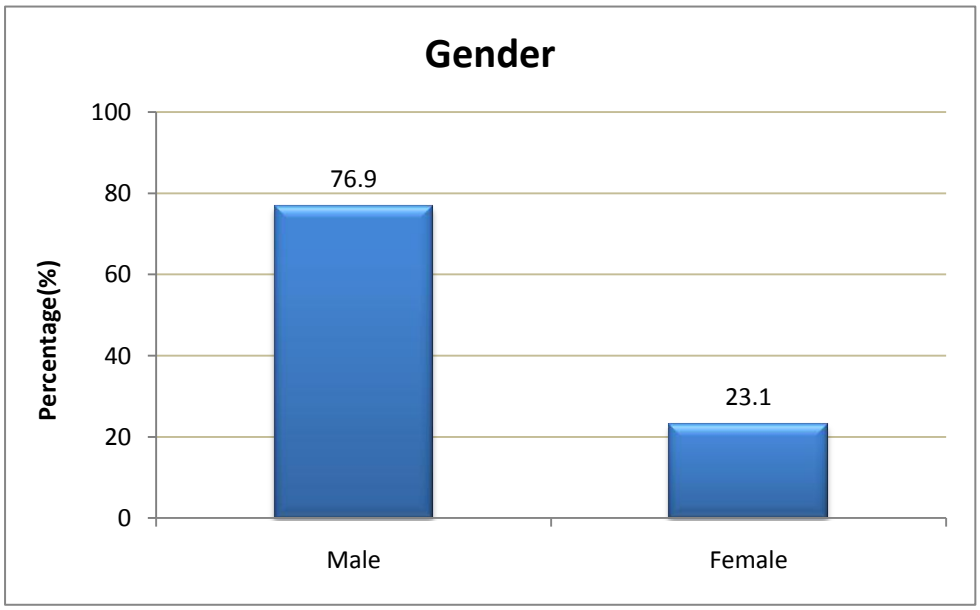
6.1.2. GENDER DISTRIBUTION

There were a total of 238 participants in this study. From this number, 183 of them were males representing 76.9% of the participants while 55 of them are females representing 23.1% of the total sample.

Table 4: Table of gender

	Frequency	Percentage
Male	183	76.9
Female	55	23.1

Table 5: Histogram of gender



The bar graph shows the distribution of males and females in the study. It shows that there were more males than females.

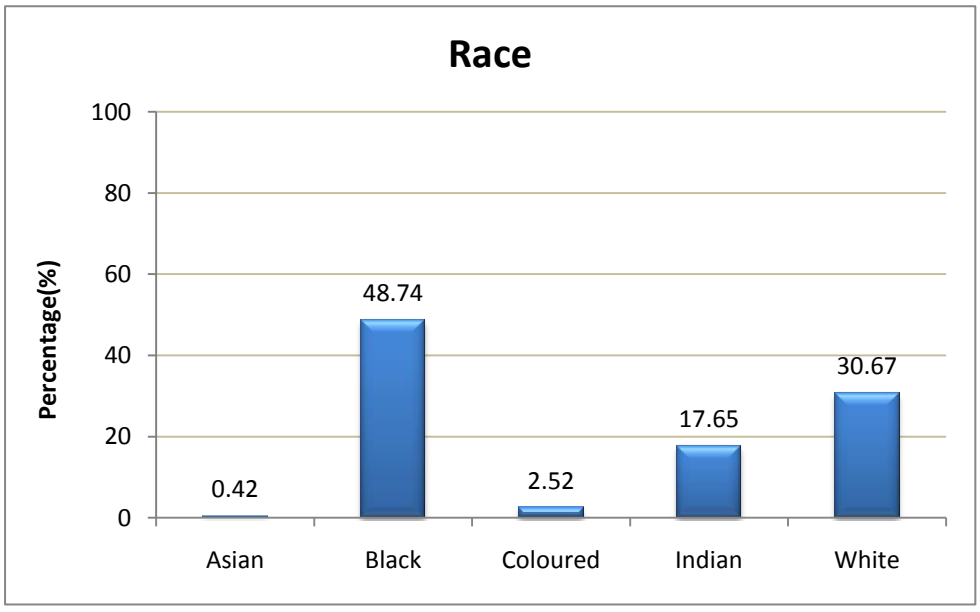
6.1.3. RACE DISTRIBUTION

From this total number of patients in this study, 1(0.42%) was Asian, 116(48.74%) were blacks, 6(2.52%) were coloured, 42(17.65%) were Indians and 73(30.67%) were white as shown in the table below.

Table 6 Table of race

	Frequency	Percentage
Asian	1	0.42
Black	116	48.74
Coloured	6	2.52
Indian	42	17.65
White	73	30.67

Table 7: Histogram of race



The bar graph indicates that the majority of the patients were blacks.

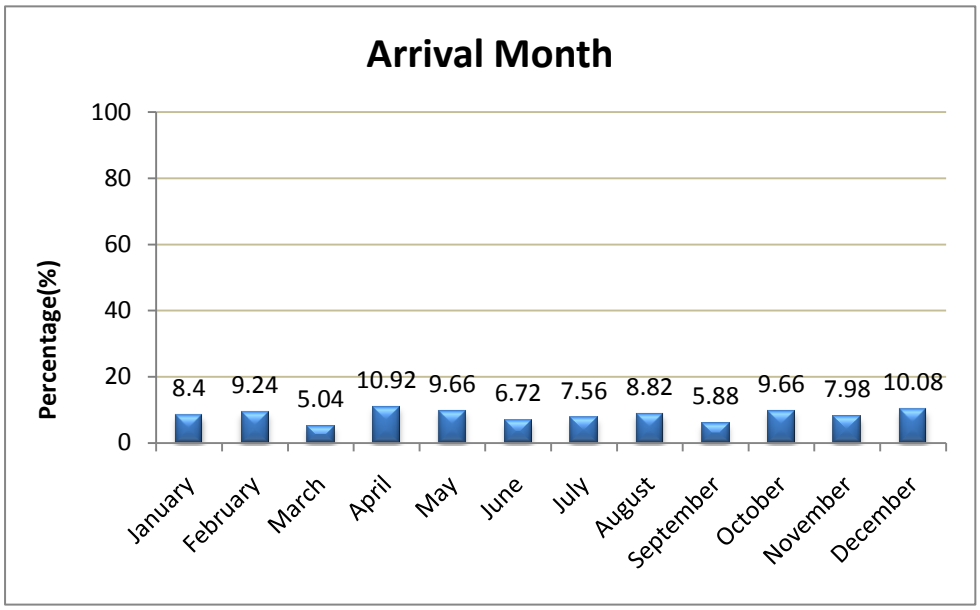
6.2. ARRIVAL TIME

The table below shows the arrival rate of patients per month. From the table below, the highest arrival month was in April followed by December. The least number of cases were recorded in March.

Table 8: Table of arrival rate per month

	Frequency	Percentage
January	20	8.4
February	22	9.24
March	12	5.04
April	26	10.92
May	23	9.66
June	16	6.72
July	18	7.56
August	21	8.82
September	14	5.88
October	23	9.66
November	19	7.98
December	24	10.08

Table 9: Histogram of arrival rate per month

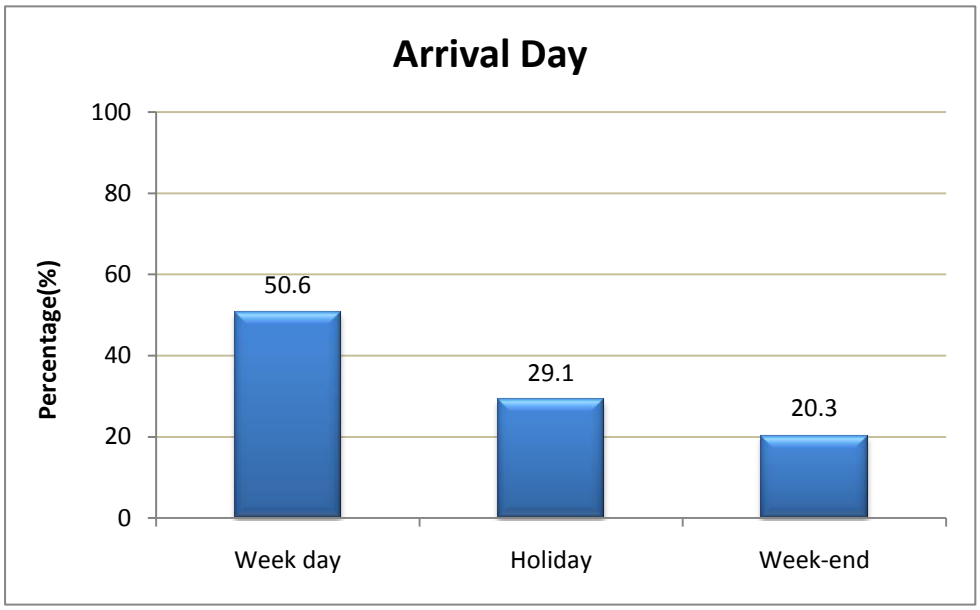


From the total of participants who visited the hospital, 120(50.6%) visited the hospital on week day, 69(29.1%) visited the hospital during the holiday and 48(20.3%) visited the hospital during the week-end.

Table 10: Table of arrival rate per day category

	Frequency	Percentage
Week day	120	50.6
Holiday	69	29.1
Week-end	48	20.3

Table 11: Histogram of arrival rate per day category



From the bar graph, it shows that majority of the patients visited the hospital during the week day.

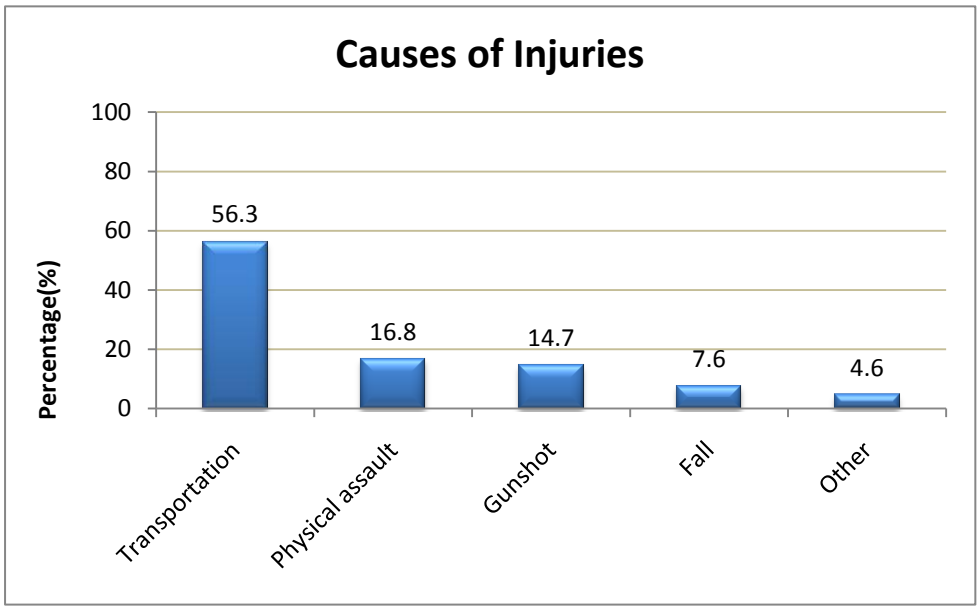
6.3. CAUSES OR MECANISMS OF INJURIES

The table indicates that majority of chest injuries is caused through transportation. Injuries caused through transportation were 134(56.3%), 40(16.8%) of the injuries were caused through physical assault, 35(14.7%) of the injuries were through gunshot, 18(7.6%) were caused through falling while 11(4.6%) were caused by other factors.

Table 12: Table of causes of chest injuries

	Frequency	Percentage
Transportation	134	56.3
Physical assault	40	16.8
Gunshot	35	14.7
Fall	18	7.6
Other	11	4.6

Table13: Histogram of causes of chest injuries



The bar graph indicates that majority of the injuries were caused through transportation.

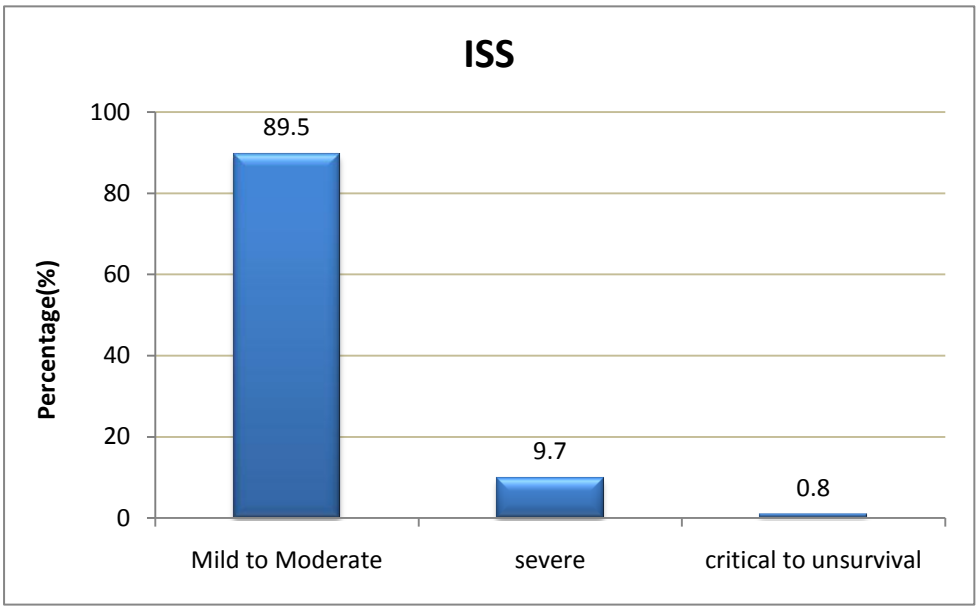
6.4. INJURY SEVERITY SCORE (ISS)

Table 14: Table of Injury Severity Score

From the table, the highest ISS score is mild to moderate with a total of 213(89.5%) of the patients, 23(9.7%) were severe and 2(0.8%) were critical to unsurvival.

	Frequency	Percentage
Mild to Moderate	213	89.5
severe	23	9.7
critical to unsurvival	2	0.8

Table 15: Histogram of Injury Severity Score (ISS)

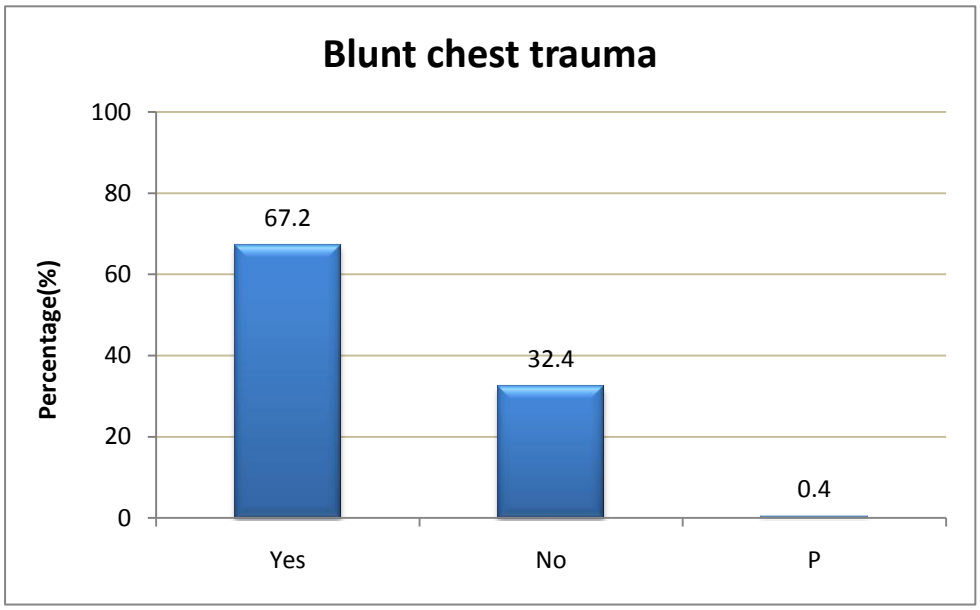


6.5. BLUNT CHEST TRAUMA

Table 16: Frequency table of blunt chest injury

	Frequency table: Blunt (DATA in DATA 20131			
Category	Count	Cumulative Count	Percent	Cumulative Percent
Y	160	160	67.2268	67.2269
N	77	237	32.3529	99.5798
P	1	238	0.4201	100.000

Table 17: Histogram of blunt chest injury



The table above indicates that from the injuries sustained by the patients, 160 which represents 67.2% were caused by blunt chest trauma, 77 representing 32.4% were not caused by blunt trauma while 1 representing 0.4% was caused by P (other types: burn, etc....).

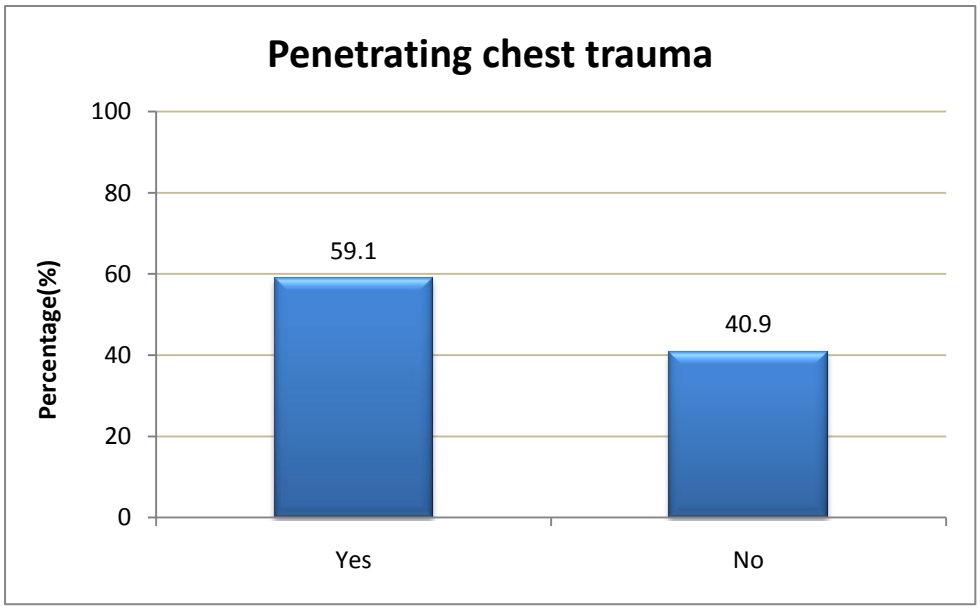
6.6. PENETRATING CHEST TRAUMA

Table 18: Frequency table of Penetrating chest injury

The table below shows that from the injuries sustained by the patients, 140 which representing 59.1% were caused by penetrating chest trauma, 97 representing 40.9% were not caused by penetrating chest trauma.

	Frequency table: Penetrating (DATA in DATA			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	140	140	59.0717	59.071
Y	97	237	40.9282	100.000

Table 19: Histogram of Penetrating chest injury



The bar graph shows the distribution of the type of injuries caused. It indicates that majority of the injuries were caused through penetrating chest trauma.

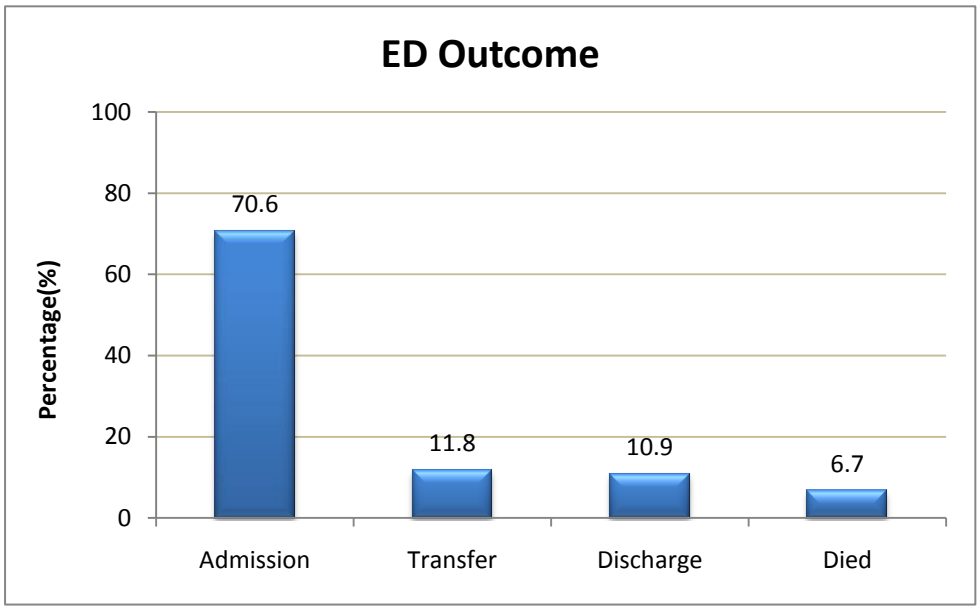
6.7. EMERGENCY DEPARTMENT OUTCOME

Table 20: Frequency table of ED outcome

The table below shows the distribution of patients in the emergency department disposition. Out of the total number, 168 (70.6%) were on admitted, 11.8% were transferred out, 26(10.9%) were discharged while 16(6.7%) died.

	Frequency table: ED Outcome (DATA in DATA			
Category	Count	Cumulative Count	Percent	Cumulative Percent
Admission	168	168	70.5882	70.588
Transfer	28	196	11.7647	82.352
Discharge	26	222	10.9243	93.277
Died	16	238	6.7226	100.000

Table 21: Histogram of ED outcome



The bar graph shows that majority of the patients were admitted while the lowest percentage of them died.

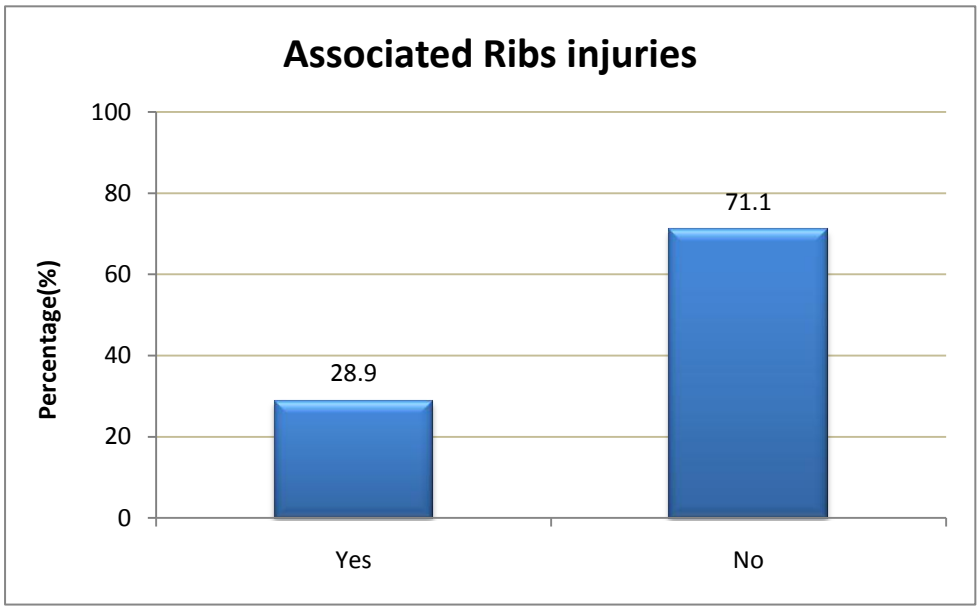
6.8. ASSOCIATED RIB(S) INJURY

Table 22: Frequency table of associated rib fracture

The table below shows that there were 68(28.9%) out of the total number of 235 patients who had associated rib injuries while 167 (71.1%) of the total number of patients had no rib injuries.

	Frequency table: RIB (DATA in DATA 20131			
Category	Count	Cumulative Count	Percent	Cumulative Percent
Y	68	68	28.9361	28.936
N	167	235	71.0638	100.000

Table 23: Histogram of associated rib fracture



The bar graph indicates that majority of the patients with chest injuries did not have any rib injuries.

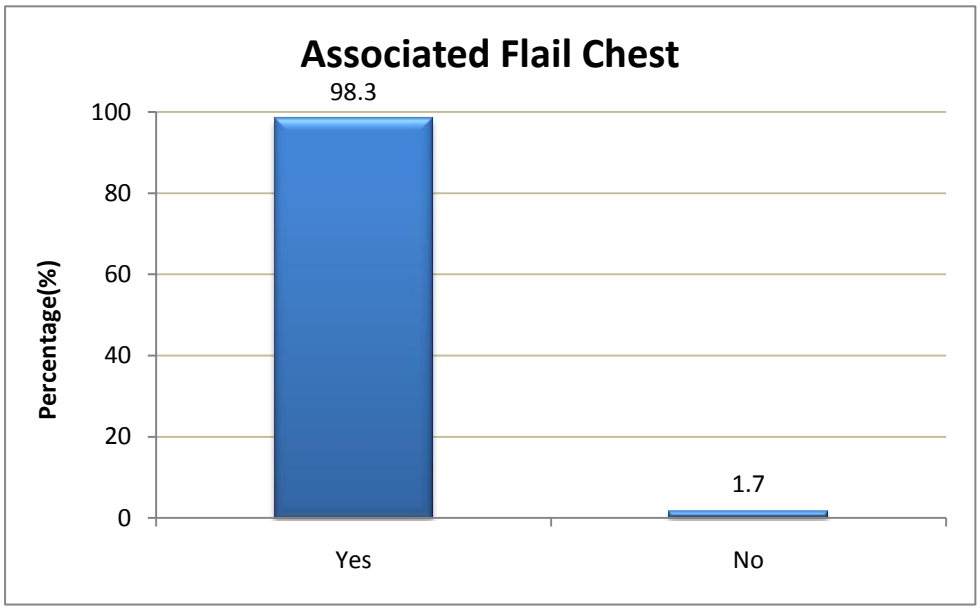
6.9. FLAIL CHEST

Table 24: Frequency table of flail chest

The table below shows that there were 234(93.3%) out of the total number of 238 patients who had flail chest injuries while 4(1.7%) of the total number of patients had no flail chest injuries.

	Frequency table: FLAIL CHEST (DATA in DAT			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	234	234	98.3193	98.319
Y	4	238	1.6806	100.000

Table 25: Histogram of flail chest



The bar graph shows that most of the patients had flail chest.

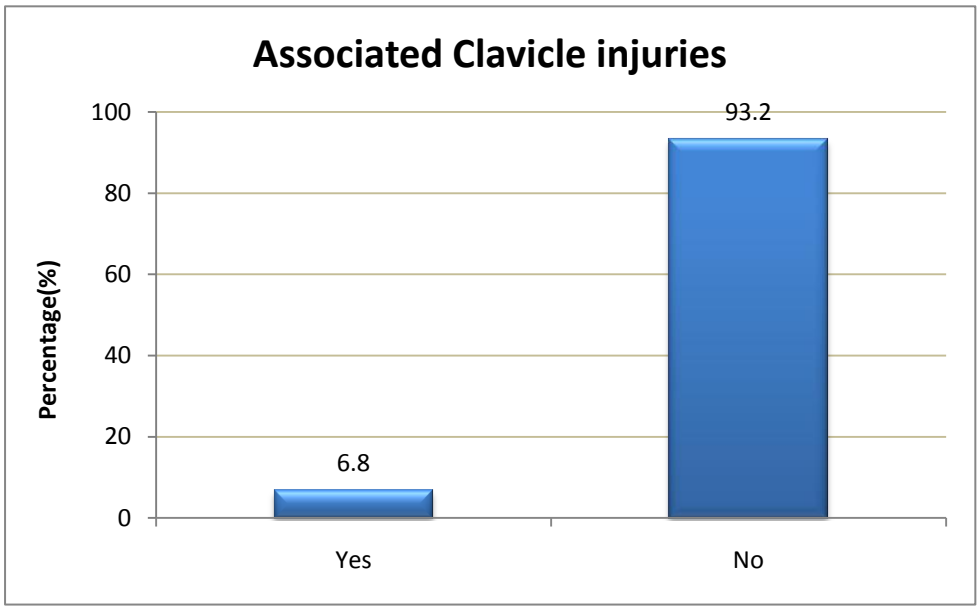
6.10. ASSOCIATED CLAVICLE INJURY

Table 26: Frequency table of associated clavicle injury

The table below shows that there were 16(6.8%) out of the total number of 237 patients who had clavicle injuries while 221(93.2%) of the total number of patients had no clavicle injuries.

	Frequency table: CAVICLE (DATA in DATA 20			
Category	Count	Cumulative Count	Percent	Cumulative Percent
Y	16	16	6.7510	6.751
N	221	237	93.2489	100.000

Table 27: Histogram of associated clavicle injury



Majority of the patients in the study had no cases of clavicle injuries as shown in the bar graph.

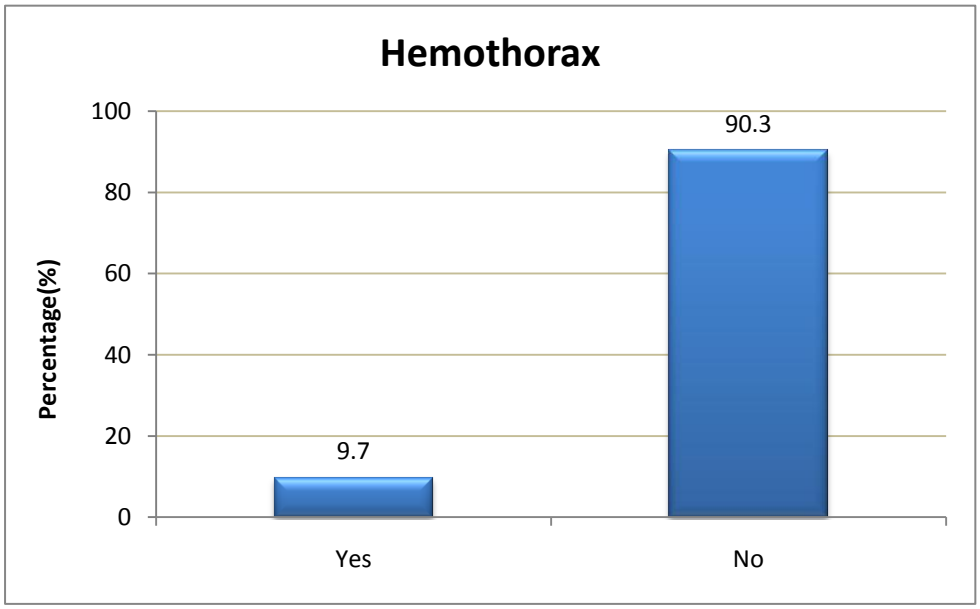
6.11. HEMOTHORAX

Table 28: Frequency table of hemothorax

The table below shows that there were 215(90.3%) patients who had no hemothorax while 23(9.7%) of the total number of patients had hemothorax.

	Frequency table: HEMOTHORAX (DATA in DA			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	215	215	90.3361	90.336
Y	23	238	9.6638	100.000

Table 29: Histogram of hemothorax



The bar graph shows the hemothorax distribution of patients. According to the graph, majority of the patients had no hemothorax.

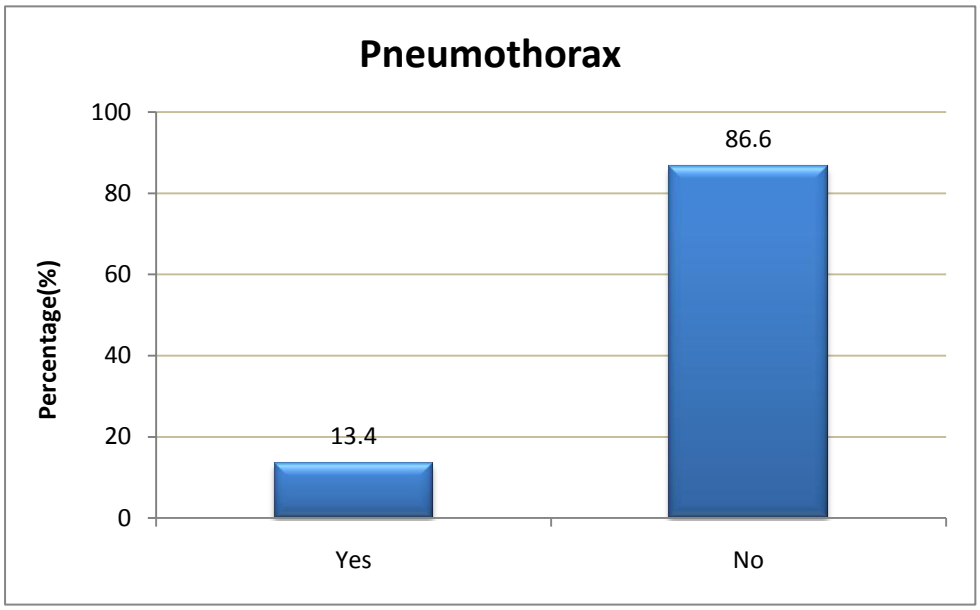
6.12. PNEUMOTHORAX

Table 30: Frequency table of pneumothorax

The table below shows that there were 206(90.3%) patients who had no pneumothorax while 32(13.4%) of the total number of patients had pneumothorax.

	Frequency table: PNEUMOTHORAX (DATA in			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	206	206	86.5546	86.554
Y	32	238	13.4453	100.000

Table 31: Histogram of pneumothorax



The bar graph shows the pneumothorax distribution of patients. According to the graph, majority of the patients had no pneumothorax.

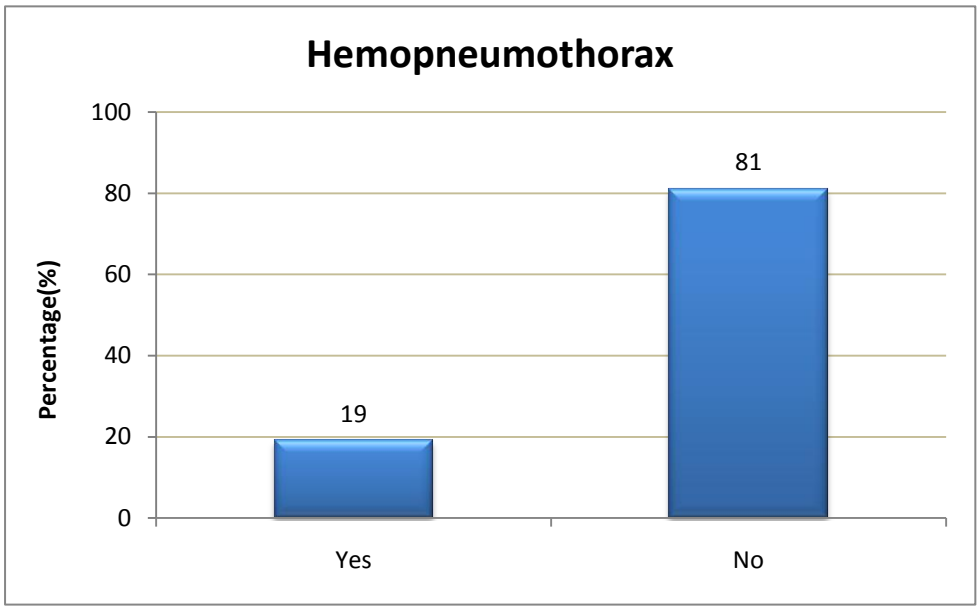
6.13. HEMOPNEUMOTHORAX

Table 32: Frequency table of hemopneumothorax

The table below shows that there were 192(81%) patients who had no hemopneumothorax (Hpneumothorax) while 45 (19%) of the total number of patients had Hemopneumothorax.

	Frequency table: HPNEUMOTHORAX (DATA i			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	192	192	81.0126	81.012
Y	45	237	18.9873	100.000

Table 33: Histogram of hemopneumothorax



The bar graph shows that majority of the patients had no Hemopneumothorax.

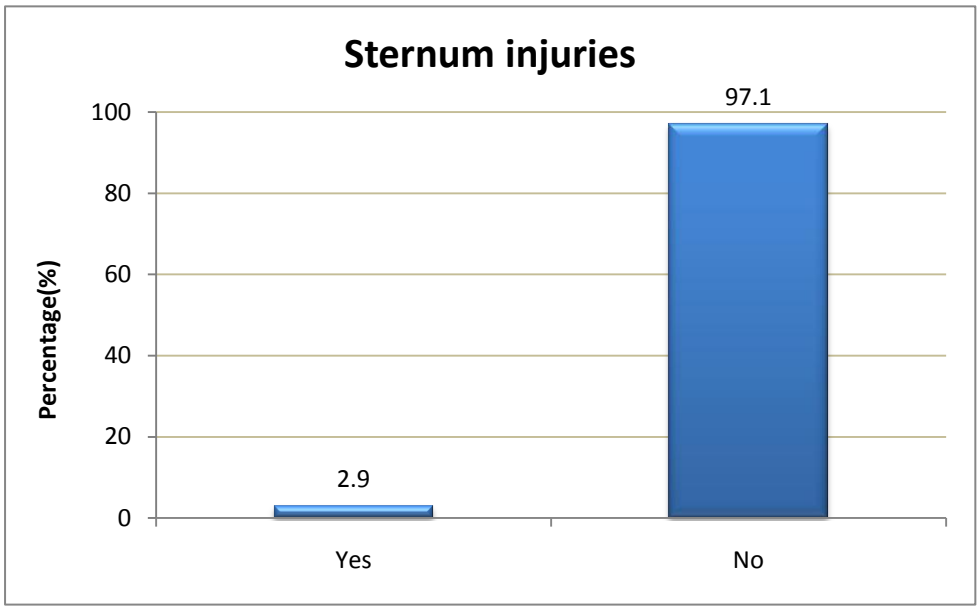
6.14. STRNUM INJURIES

Table 34: Frequency table of sternum injuries

The table below shows that there were 231(97.1%) patients who had no sternum injuries while 7(2.9%) of the patients had sternum injuries.

	Frequency table: STERNUM (DATA in DATA 2			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	231	231	97.0588	97.058
Y	7	238	2.9411	100.000

Table 35: Histogram of sternum injuries



The bar graph shows that majority of the patients had no sternum injuries.

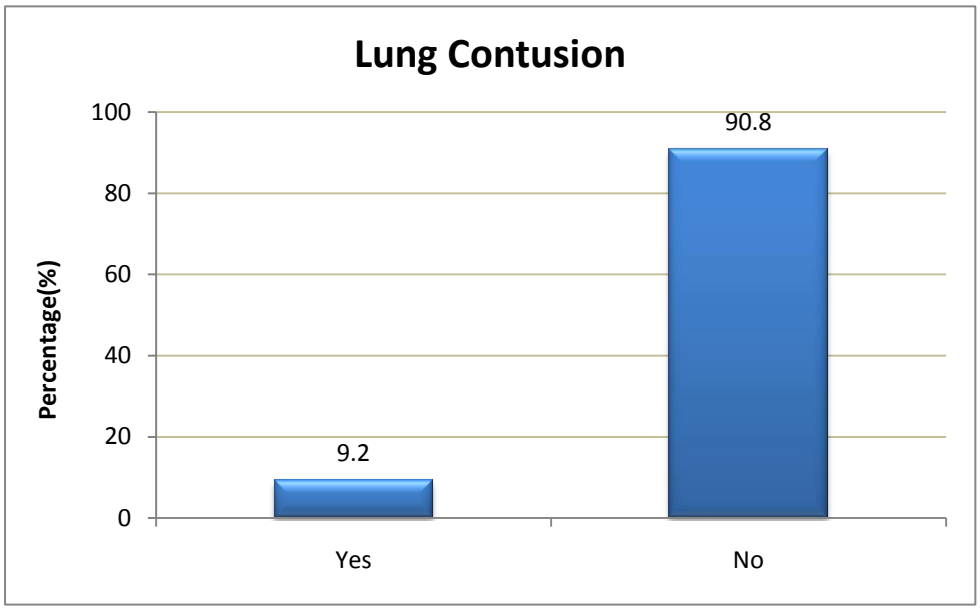
6.15. LUNG CONTUSION

Table 36: Frequency table of lung contusion

The table below shows that there were 216(90.8%) patients who had no lung contusion while 22(9.2%) of the patients had lung contusion.

	Frequency table: LUNG CONTUSION (DATA i			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	216	216	90.7563	90.756
Y	22	238	9.2437	100.000

Table 37: Histogram of lung contusion



There were more patients who did not have lung contusion compared to those with lung contusion.

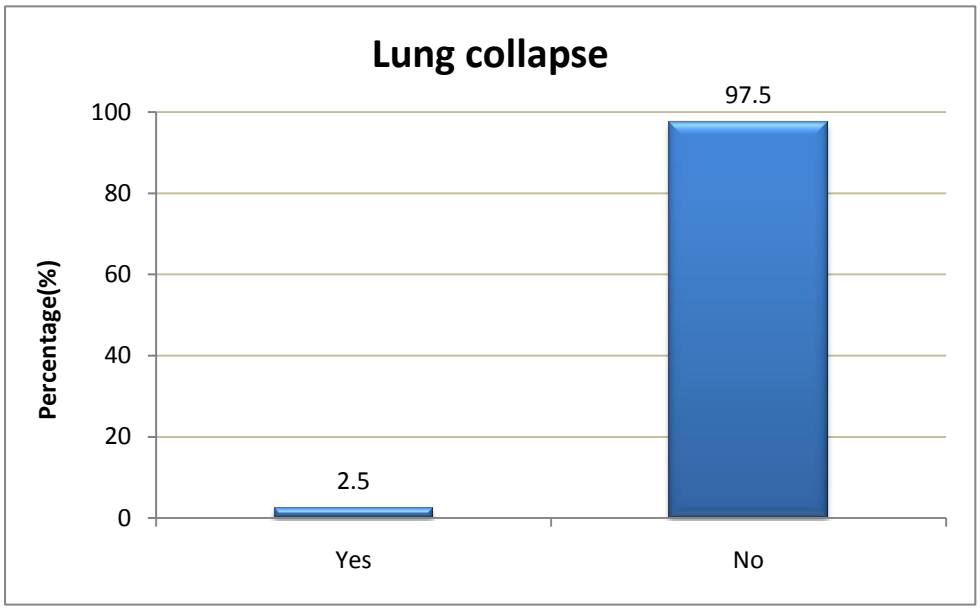
6.16. LUNG COLLAPSE

Table 38: Frequency table of lung collapse

The table shows that out of the total of 238 patients, 232(97.5%) had lung collapse cases while 6(2.5%) had no lung collapse cases.

	Frequency table: LUNG COLLAPSE (DATA in			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	232	232	97.4789	97.479(
Y	6	238	2.5210:	100.000(

Table 39: Histogram of lung collapse



The bar graph shows that most patients did not have lung collapse.

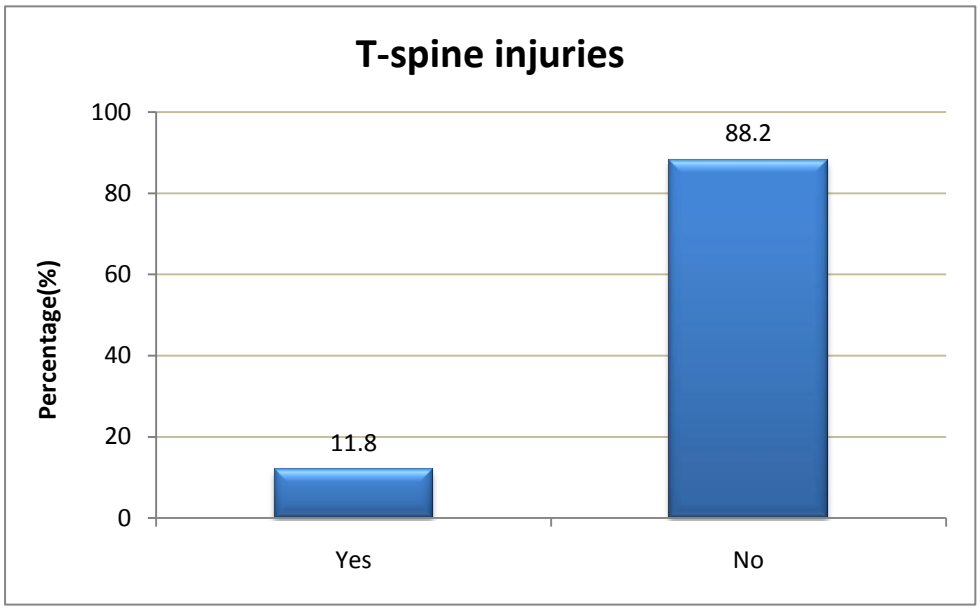
6.17. THORACIC SPINE INJURIES

Table 40: Frequency table of associated T-spine injuries

From the table, 209(88.2%) of the patients had no T-spine while 28(11.2) had T-spine. It shows that majority of the patients did not have T spine.

	Frequency table: T-spine (DATA in DATA 201			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	209	209	88.1856	88.185
Y	28	237	11.8143	100.000

Table 41: Histogram of associated T-spine injuries



The graph shows the distribution of T-spine injuries. It shows most patients had no T-spine injuries.

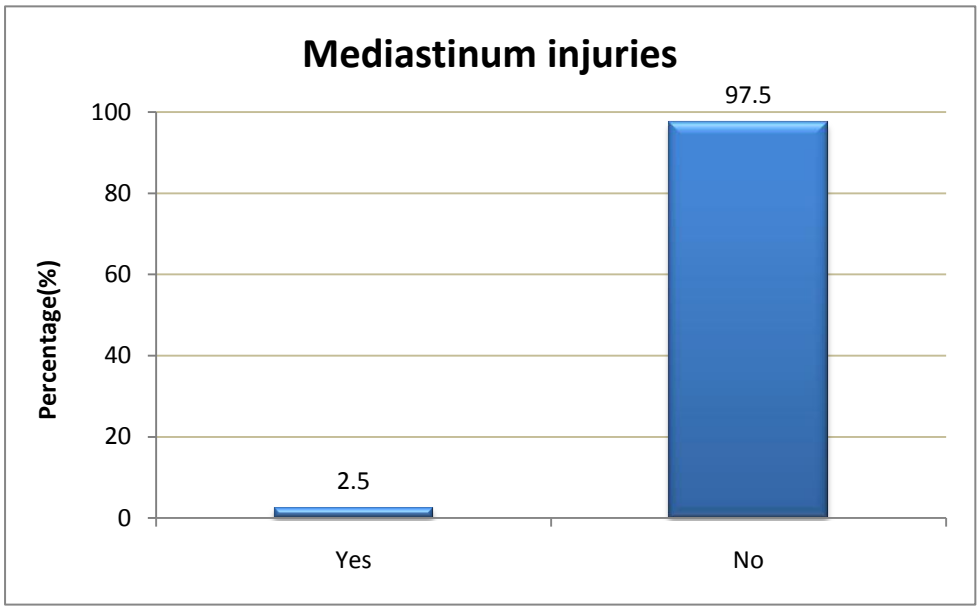
6.18. MEDIASTINUM INJURIES

Table 42: Frequency table of associated Mediastinum injuries

The table indicates that 232 representing 97.5% of the total 238 patients had no Mediastinum injuries while 6 representing 2.5% of the total number of patients had Mediastinum injuries.

	Frequency table: Mediastinum (DATA in DAT			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	232	232	97.4789	97.479(
Y	6	238	2.5210:	100.000(

Table 43: Histogram of associated Mediastinum injuries



Most of the patients had no Mediastinum injuries as demonstrated in the bar graph.

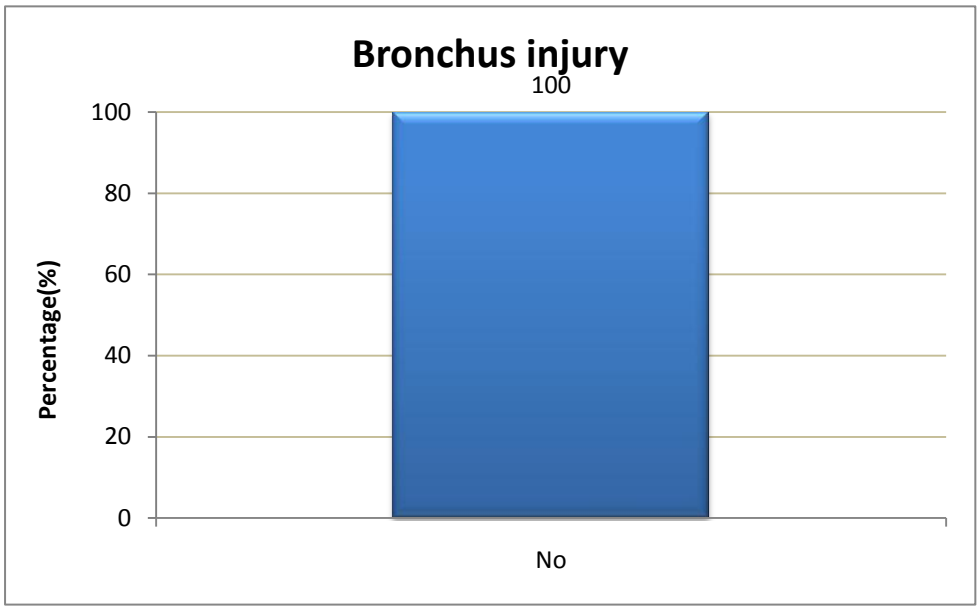
6.19. BRONCHUS INJURY

Table 44: Frequency table of bronchus injury

From the table, it is evident that all the patients did not have bronchus injury.

	Frequency table: Bronchus (DATA in DATA 20			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	238	238	100.000	100.000

Table 45: Histogram of bronchus injury



The bar graph shows that all the patients in the study had no cases of bronchus injury.

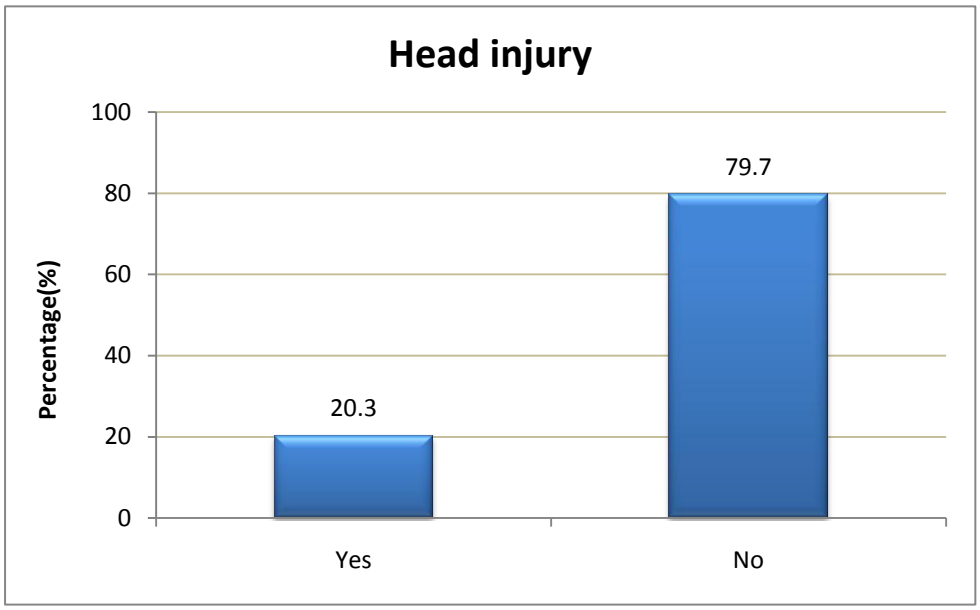
6.20. ASSOCIATED HEAD INJURY

Table 46: Frequency table of associated head injury

The table indicates that there were 48(20.3%) patients with head injury while 188(79.7%) had no head injury.

	Frequency table: Head (DATA in DATA 20131			
Category	Count	Cumulative Count	Percent	Cumulative Percent
Y	48	48	20.3389	20.339(
N	188	236	79.6610	100.000(

Table 47: Histogram of associated head injury



The bar graph indicates that most of the patients in the study did not have head injury.

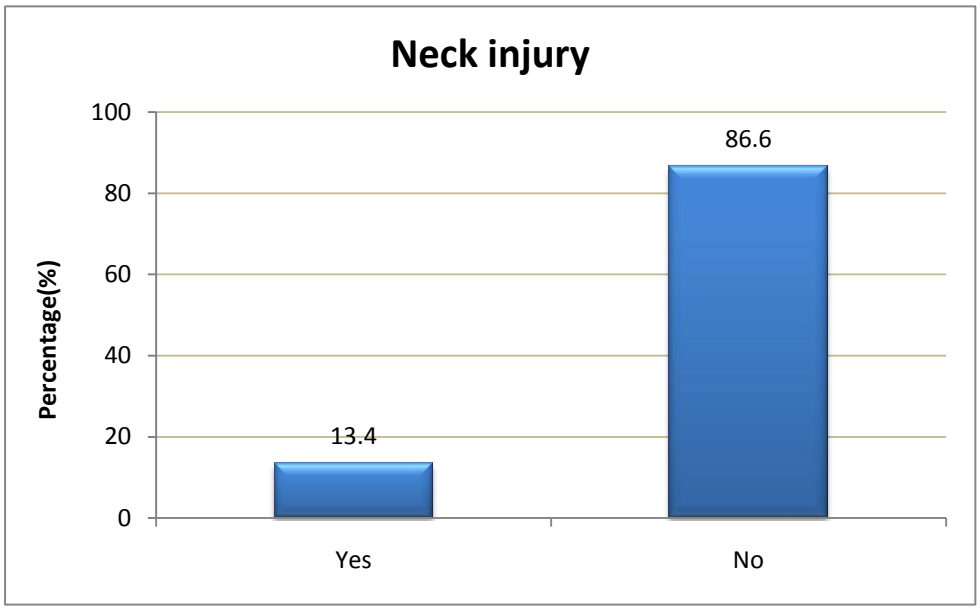
6.21. ASSOCIATED NECK INJURY

Table 48: Frequency table of associated neck injury

The table indicates that there were 32(13.4%) patients with neck injury while 206(86.6%) had no neck injury.

	Frequency table: Neck (DATA in DATA 20131			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	206	206	86.5546	86.554(
Y	32	238	13.4453	100.000(

Table 49: Histogram of associated neck injury



The bar graph indicates that most of the patients in the study did not have neck injury.

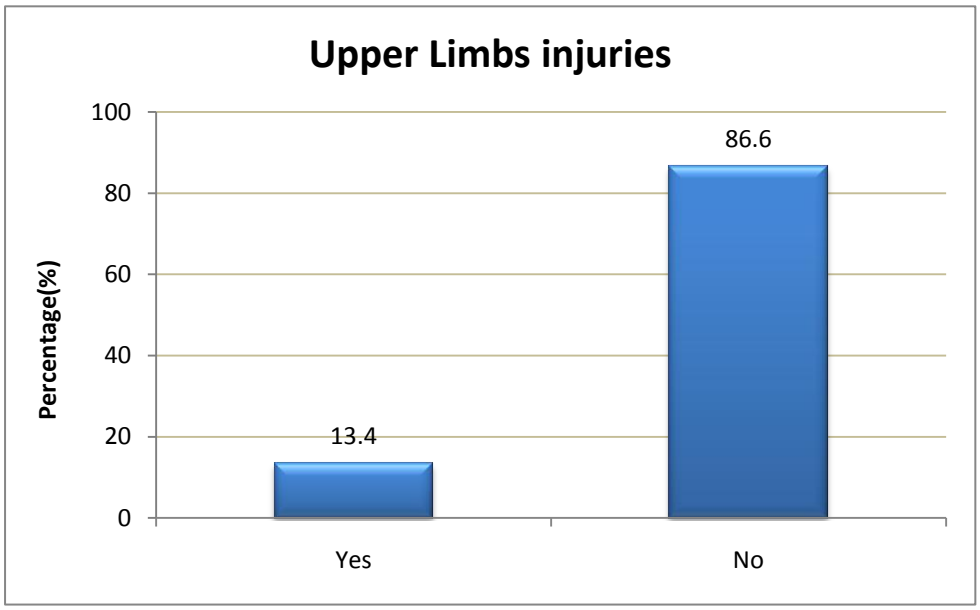
6.22. ASSOCIATED UPPER-LIMBS INJURIES

Table 50: Frequency table of associated upper-limbs injuries

The table indicates that out of the 238 patients, there were 32(13.4%) patients with upper-limbs injuries while 206(86.6%) had no upper-limbs injuries.

	Frequency table: Upper-limbs (DATA in DATA			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	206	206	86.5546	86.554
Y	32	238	13.4453	100.000

Table 51: Histogram of associated upper-limbs injuries



The bar graph indicates that most of the patients in the study did not have upper limbs injury.

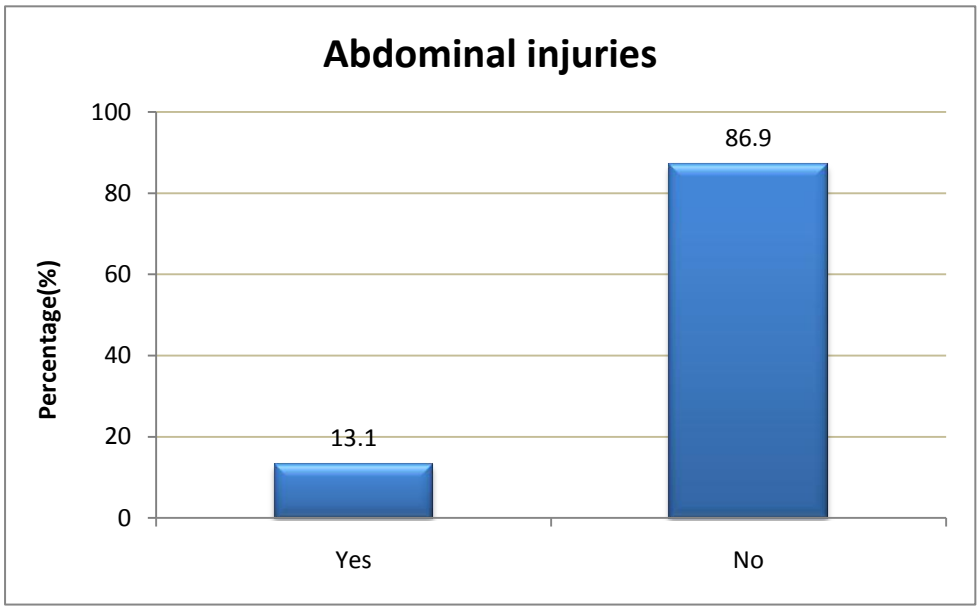
6.23. ASSOCIATED ABDOMINAL INJURIES

Table 52: Frequency table of associated abdominal injuries

The table indicates that there were 31(13.1%) patients with associated abdominal injuries while 205(86.9%) had no issues with their abdomen.

	Frequency table: Abdomen (DATA in DATA 2(			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	205	205	86.8644	86.864
Y	31	236	13.1355	100.000(

Table 53: Histogram of associated abdominal injuries



Majority of the patients had no issues with their abdomen as indicated in the graph .

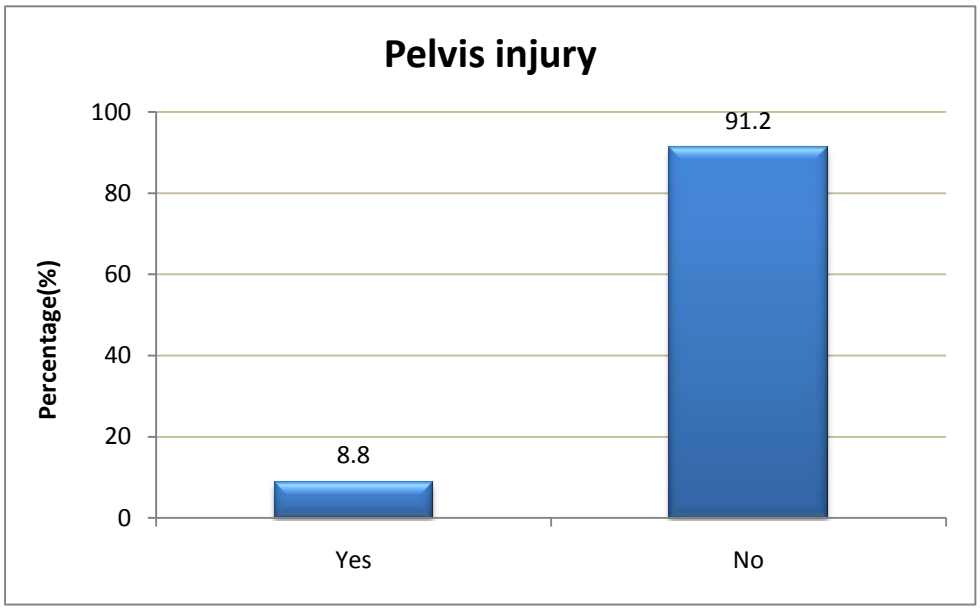
6.24. ASSOCIATED PELVIS INJURIES

Table 54: Frequency table of associated pelvis injuries

The table indicates that there were 21(8.8%) patients with pelvis injuries while 217(91.2%) had no issues with their pelvis.

	Frequency table: Pelvis (DATA in DATA 2013:			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	217	217	91.1764	91.176
Y	21	238	8.8235	100.000

Table 55: Histogram of associated pelvis injuries



The bar graph shows that most patients had no issue with their pelvis.

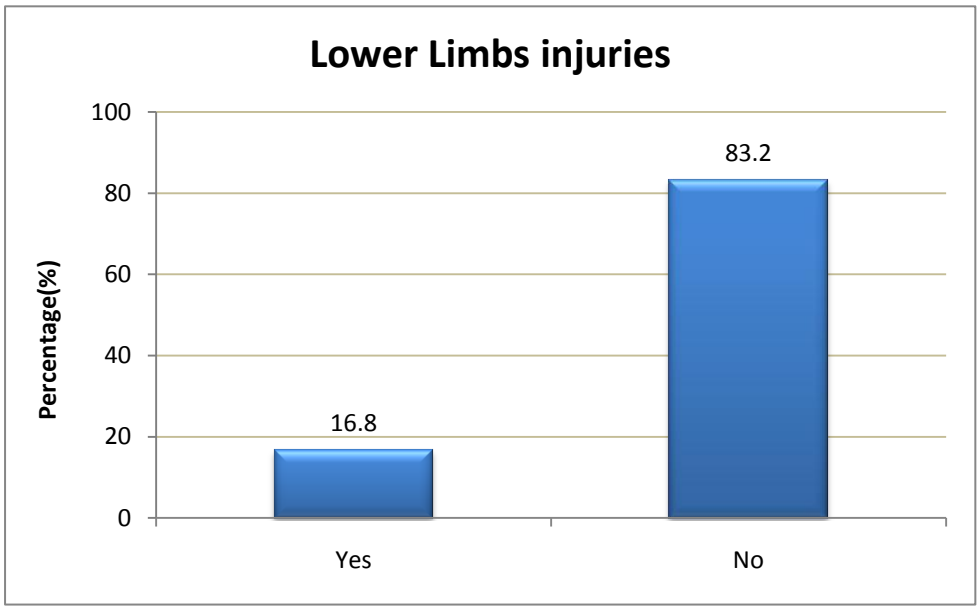
6.25. ASSOCIATED LOWER-LIMDS INJURIES

Table 56: Frequency table of associated lower limbs injuries

The table shows that there were 40(16.8%) patients with lower limbs injuries while 198(83.2%) had no issues with their lower limbs.

	Frequency table: Lower-limbs (DATA in DATA			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	198	198	83.1932	83.193
Y	40	238	16.8067	100.000

Table 57: Histogram of associated lower limbs injuries



It is evident from the graph that, most of the patients did not have associated lower limb injuries.

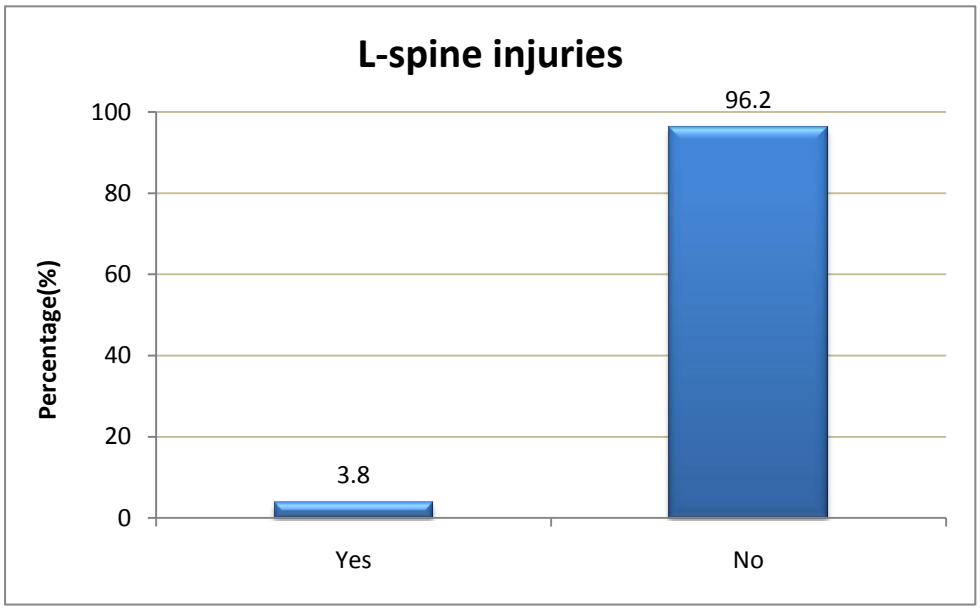
6.26. ASSOCIATED LUMBAR SPINE INJURIES

Table 58: Frequency table of associated L-spine injuries

From the table below, a total of 9 representing 3.8% of the patients had associated L-spine injuries while 229 representing 96.2% had no issues with their L-spine.

	Frequency table: L-spine (DATA in DATA 201			
Category	Count	Cumulative Count	Percent	Cumulative Percent
N	229	229	96.2184	96.218
Y	9	238	3.7815	100.000

Table 59: Histogram of associated L-spine injuries



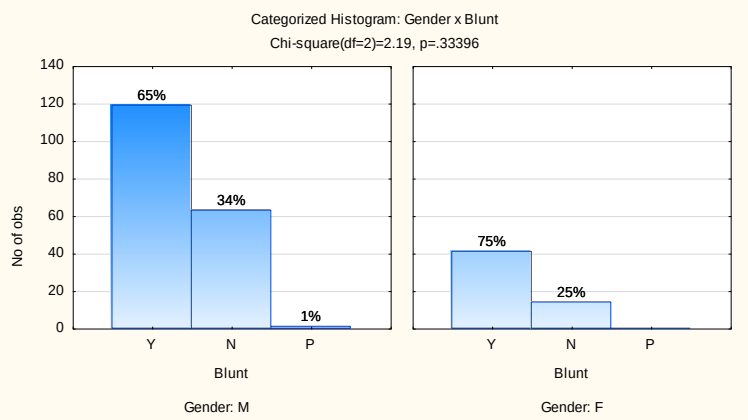
The distribution of L-spine shows that majority of the patients did not have any associated issues with their L-spine.

6.27. BLUNT CHEST INJURIES vs GENDER

Table 60: 2-Way Summary Table: Observed frequencies

	Marked cells have counts > 10. Chi-square(df=2)=2.19, p=.33			
Gender	Blunt Y	Blunt N	Blunt P	Row Totals
M	119	63	1	183
Row %	65.03%	34.43%	0.55%	
F	41	14	0	55
Row %	74.55%	25.45%	0.00%	
Totals	160	77	1	238

Table 61: Categorized Histogram: Gender x Blunt



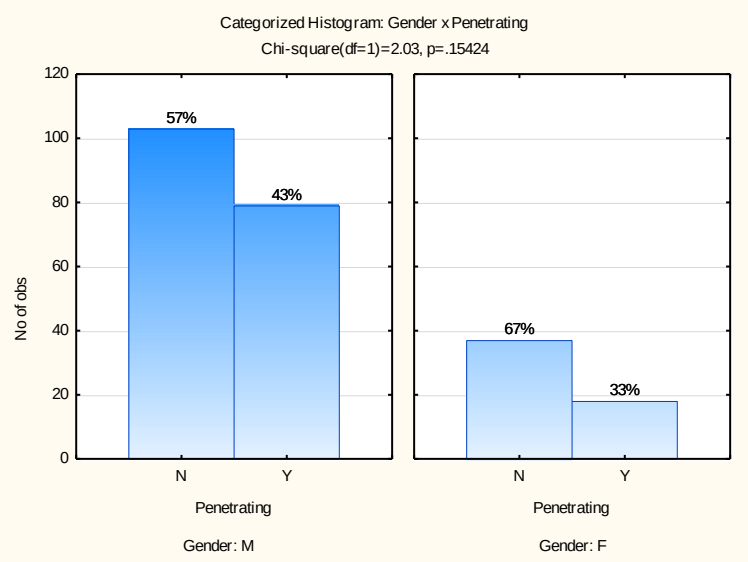
From the table, we can see here that $\chi(1) = 2.19$, $p = .333$. This tells us that there is no statistically significant association between Gender and blunt chest trauma; that is, both Males and Females equally suffer blunt.

6.28. PENETRATING CHEST INJURIES vs GENDER

Table 62: 2-Way Summary Table: Observed frequencies

	Marked cells have counts > 10. Chi-square(df=1)=2.03, p=.15		
Gender	Penetrating N	Penetrating Y	Row Totals
M	103	79	182
Row %	56.59%	43.41%	
F	37	18	55
Row %	67.27%	32.73%	
Totals	140	97	237

Table 63: Categorized Histogram: Gender x Penetrating



From the table, the $\chi(1) = 2.03$, $p = .1542$. This tells us that there is no statistically significant association between Gender and penetrating chest trauma; that is, both Males and Females equally suffer penetrating.

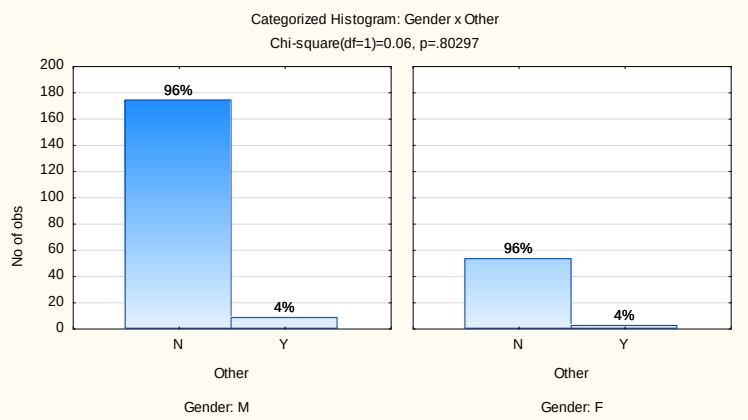
6.29. OTHER CHEST INJURIES vs GENDER

Table 64: 2-Way Summary Table: Observed frequencies

Marked cells have counts > 10. Chi-square(df=1)=0.06, p=.80

Gender	Other N	Other Y	Row Totals
M	174	8	182
Row %	95.60%	4.40%	
F	53	2	55
Row %	96.36%	3.64%	
Totals	227	10	237

Table 65: Categorized Histogram: Gender x Other



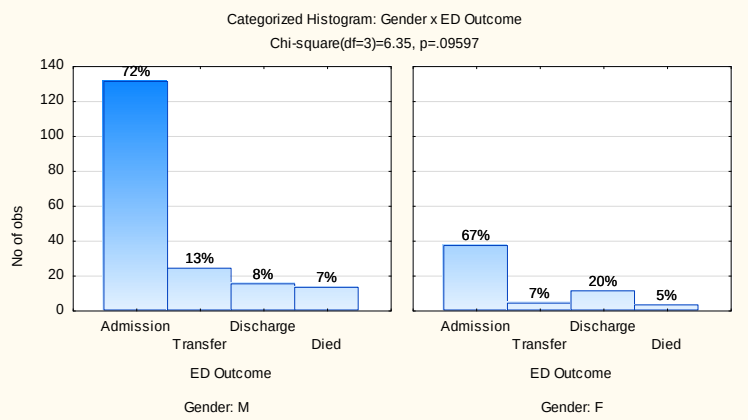
From the table, the $\chi(1) = 0.06$, $p = .8029$. This tells us that there is no statistically significant association between Gender and other; that is, both Males and Females equally suffer other.

6.30. OUTCOME vs GENDER

Table 66: 2-Way Summary Table: Observed frequencies

	Marked cells have counts > 10. Chi-square(df=3)=6.35, p=.095				
Gender	ED Outcome Admission	ED Outcome Transfer	ED Outcome Discharge	ED Outcome Died	Row Totals
M	131	24	15	13	183
Row %	71.58%	13.11%	8.20%	7.10%	
F	37	4	11	3	55
Row %	67.27%	7.27%	20.00%	5.45%	
Totals	168	28	26	16	238

Table 67: Categorized Histogram: Gender x ED Outcome



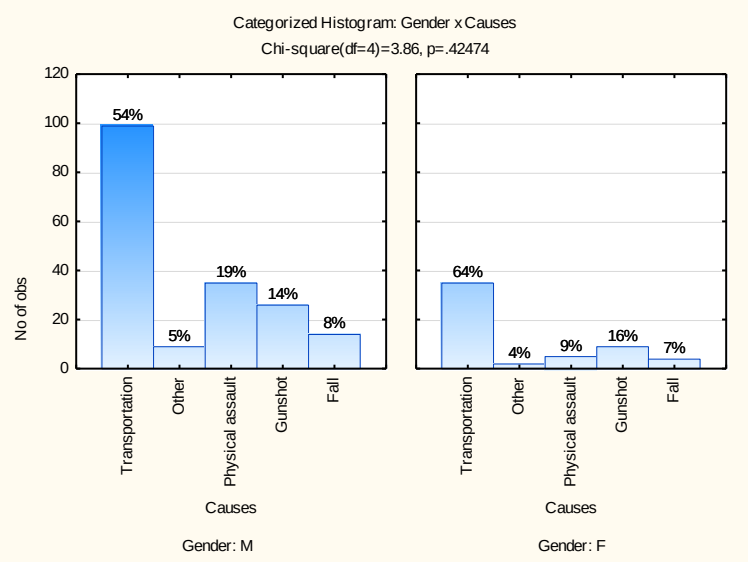
From the table, the $\chi(1) = 6.35$, $p = .09597$. This tells us that there is no statistically significant association between Gender and ED outcome

6.31. CAUSES vs GENDER

Table 68: 2-Way Summary Table: Observed frequencies

Gender	Marked cells have counts > 10. Chi-square(df=4)=3.86, p=.42474					
	Causes Transportation	Causes Other	Causes Physical assault	Causes Gunshot	Causes Fall	Row Totals
M	99	9	35	26	14	183
Row %	54.10%	4.92%	19.13%	14.21%	7.65%	
F	35	2	5	9	4	55
Row %	63.64%	3.64%	9.09%	16.36%	7.27%	
Totals	134	11	40	35	18	238

Table 69: Categorized Histogram: Gender x Causes



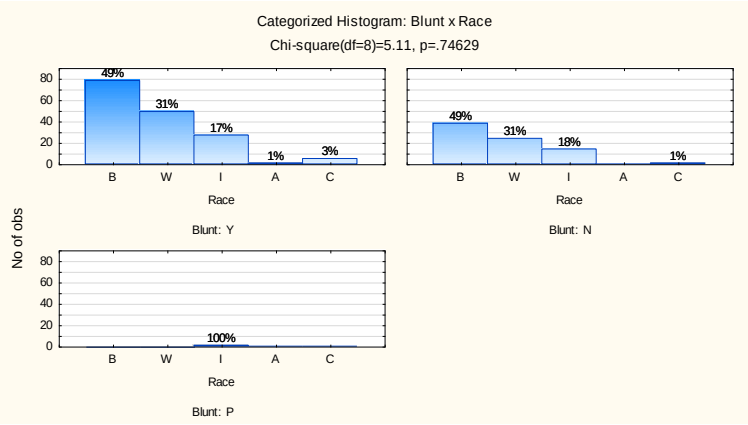
From the table, the p = 0.42474. This tells us that there is no statistically significant association between Gender and the causes of death.

6.32. RACE vs BLUNT CHEST INJURIES

Table 70: 2-Way Summary Table: Observed frequencies

Blunt	Marked cells have counts > 10. Chi-square(df=8)=5.11, p=.746					
	Race B	Race W	Race I	Race A	Race C	Row Totals
Y	78	49	27	1	5	160
Row %	48.75%	30.63%	16.88%	0.63%	3.13%	
N	38	24	14	0	1	77
Row %	49.35%	31.17%	18.18%	0.00%	1.30%	
P	0	0	1	0	0	1
Row %	0.00%	0.00%	100.00%	0.00%	0.00%	
Totals	116	73	42	1	6	238

Table 71: Categorized Histogram: Blunt x Race



From the table, the $\chi(1) = 5.11$, $p = .7462$. This tells us that there is no statistically significant association between blunt and race.

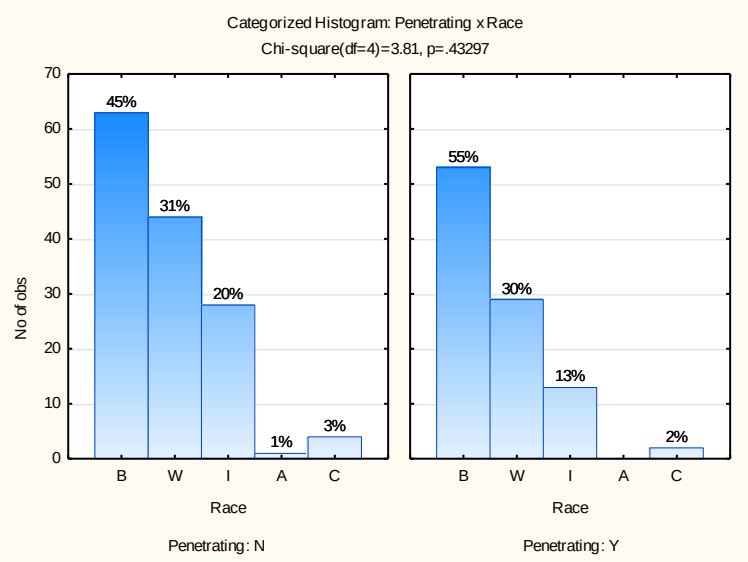
6.33. RACE vs PENETRATING CHEST INJURIES

Table 72: 2-Way Summary Table: Observed frequencies

Marked cells have counts > 10. Chi-square(df=4)=3.81, p=.43

Penetrating	Race B	Race W	Race I	Race A	Race C	Row Totals
N	63	44	28	1	4	140
Row %	45.00%	31.43%	20.00%	0.71%	2.86%	
Y	53	29	13	0	2	97
Row %	54.64%	29.90%	13.40%	0.00%	2.06%	
Totals	116	73	41	1	6	237

Table 73: Categorized Histogram: Penetrating x Race



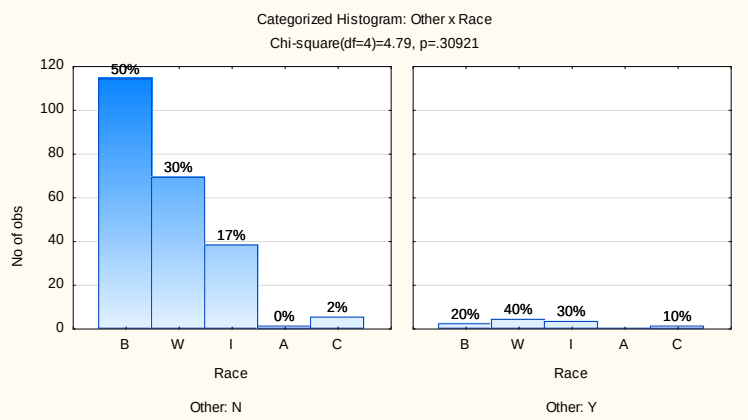
From the table, the $\chi(1) = 5.11$, $p = .4329$. This tells us that there is no statistically significant association between penetrating and race.

6.34. RACE vs OTHER CHEST INJURIES

Table 74: 2-Way Summary Table: Observed frequencies

Other	Marked cells have counts > 10. Chi-square(df=4)=4.79, p=.30					
	Race B	Race W	Race I	Race A	Race C	Row Totals
N	114	69	38	1	5	227
Row %	50.22%	30.40%	16.74%	0.44%	2.20%	
Y	2	4	3	0	1	10
Row %	20.00%	40.00%	30.00%	0.00%	10.00%	
Totals	116	73	41	1	6	237

Table 75: Categorized Histogram: Other x Race



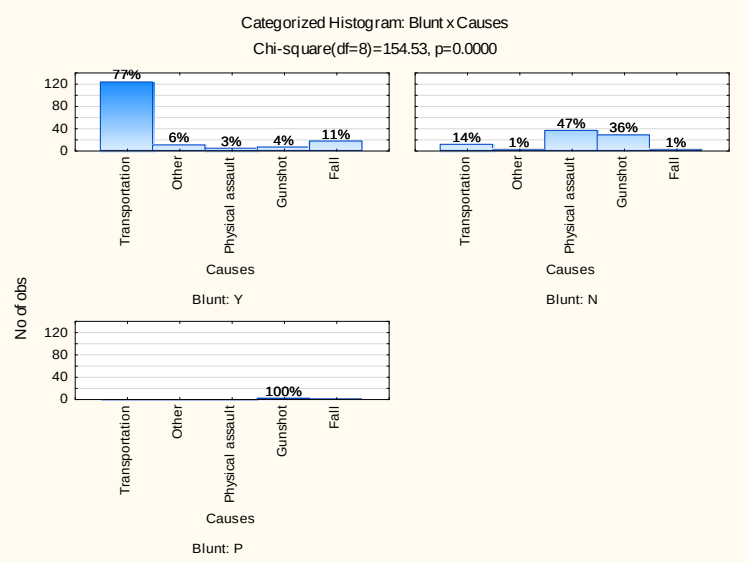
From the table, the $\chi(1) = 4.79$, $p = .30921$. This tells us that there is no statistically significant association between other and race.

6.35. CAUSES vs BLUNT CHEST INJURIES

Table 76: 2-Way Summary Table: Observed frequencies

Blunt	Marked cells have counts > 10. Chi-square(df=8)=154.53, p=0.0000 Causes Transportation	Causes Other	Causes Physical assault	Causes Gunshot	Causes Fall	Row Totals
Y	123	10	4	6	17	160
Row %	76.88%	6.25%	2.50%	3.75%	10.63%	
N	11	1	36	28	1	77
Row %	14.29%	1.30%	46.75%	36.36%	1.30%	
P	0	0	0	1	0	1
Row %	0.00%	0.00%	0.00%	100.00%	0.00%	
Totals	134	11	40	35	18	238

Table 77: Categorized Histogram: Blunt x Causes



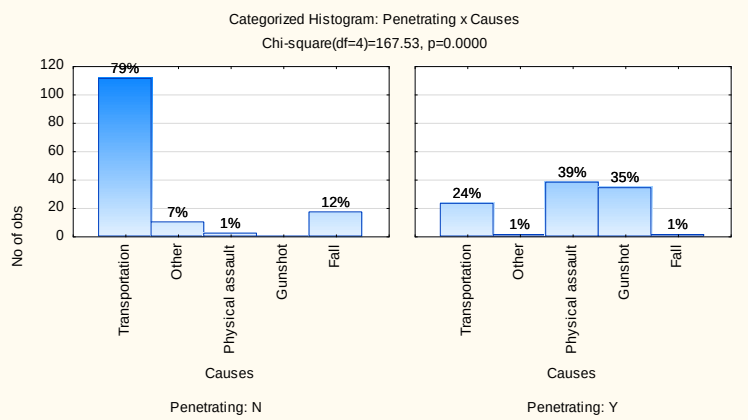
From the table, the $\chi(1) = 154.53$, $p = 0.0000$. This tells us that there is a statistically significant association between blunt and the causes

6.36. CAUSES vs PENETRATING CHEST INJURIES

Table 78: 2-Way Summary Table: Observed frequencies

Penetrating	Marked cells have counts > 10. Chi-square(df=4)=167.53, p=0.0000					
	Causes Transportation	Causes Other	Causes Physical assault	Causes Gunshot	Causes Fall	Row Totals
N	111	10	2	0	17	140
Row %	79.29%	7.14%	1.43%	0.00%	12.14%	
Y	23	1	38	34	1	97
Row %	23.71%	1.03%	39.18%	35.05%	1.03%	
Totals	134	11	40	34	18	237

Table 79: Categorized Histogram: Penetrating x Causes



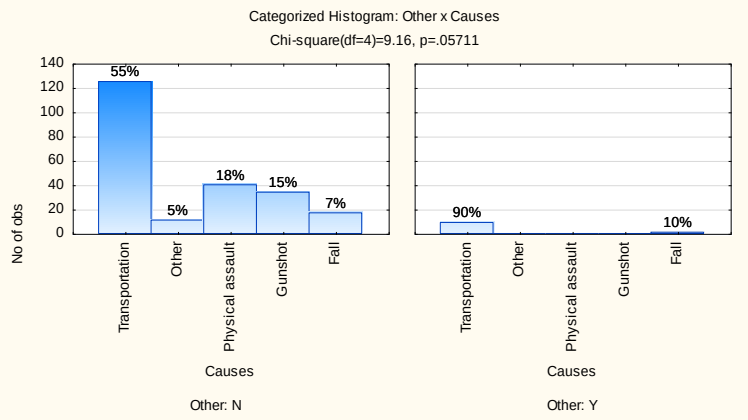
From the table, the $\chi(1) = 167.53$, $p = 0.0000$. This tells us that there is a statistically significant association between penetrating and the causes.

6.37. CAUSES vs OTHER CHEST INJURIES

Table 80: 2-Way Summary Table: Observed frequencies

Other	Marked cells have counts > 10. Chi-square(df=4)=9.16, p=.05711					
	Causes Transportation	Causes Other	Causes Physical assault	Causes Gunshot	Causes Fall	Row Totals
N	125	11	40	34	17	227
Row %	55.07%	4.85%	17.62%	14.98%	7.49%	
Y	9	0	0	0	1	10
Row %	90.00%	0.00%	0.00%	0.00%	10.00%	
Totals	134	11	40	34	18	237

Table 81: Categorized Histogram: Other x Causes



From the table, the $\chi(1) = 9.16$, $p = 0.5711$. This tells us that there is no statistically significant association between other and the causes.

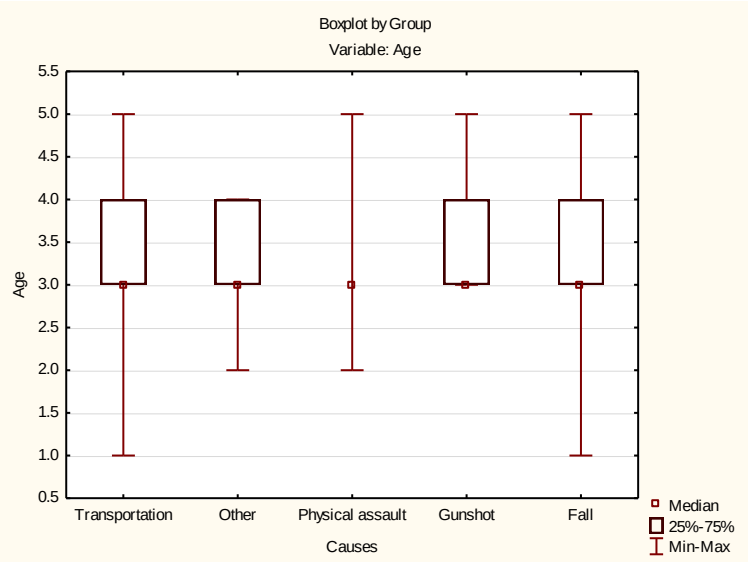
6.38. CAUSES OF CHEST INJURIES vs AGE

Table 82: Kruskal-Wallis test AGE vs CAUSES OF CHEST INJURIES

	Kruskal-Wallis ANOVA by Ranks; Age (DATA in DATA 2013120 Independent (grouping) variable: Causes Kruskal-Wallis test: H (4, N= 238) =8.130971 p =.0869			
Depend.: Age	Code	Valid N	Sum of Ranks	Mean Rank
Transportation	101	134	16520.5(	123.2873
Other	102	11	1125.5(	102.3182
Physical assault	103	40	3890.5(	97.2625
Gunshot	104	35	4637.0(	132.4857
Fall	105	18	2267.5(	125.9722

The Kruskal-Wallis test shows that there was no statistically significant difference (p-value=0.0869) in the age between chest injuries caused by transportation, other, physical assault, gunshot and fall.

Table 83: Boxplot AGE vs CAUSES OF CHEST INJURIES



The boxplot shows that there was no significant difference in the ages of the different causes of chest trauma.

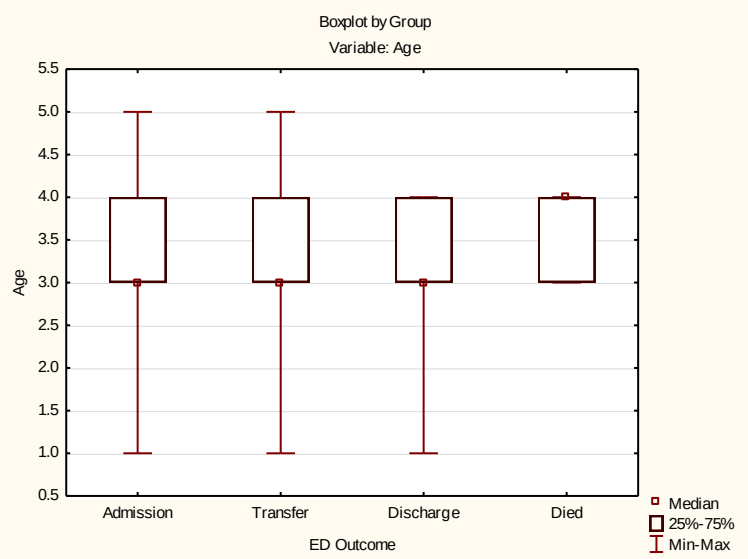
6.39. AGE vs EMERGENCY DEPARTMENT OUTCOME

Table 84: Kruskal-Wallis test AGE vs ED OUTCOME

	Kruskal-Wallis ANOVA by Ranks; Age (DATA in DATA 2013120E Independent (grouping) variable: ED Outcome Kruskal-Wallis test: H (3, N= 238) =5.783778 p =.1226			
Depend.: Age	Code	Valid N	Sum of Ranks	Mean Rank
Admission	101	168	19665.5(	117.056
Transfer	102	28	3736.5(	133.446
Discharge	103	26	2721.0(	104.653
Died	104	16	2318.0(	144.875

From the table, the Kruskal-Wallis test shows that there was no statistically significant difference (p-value=0.1226) in the age between patients who were admitted, transferred, discharged and died.

Table 85: Boxplot AGE vs ED OUTCOME



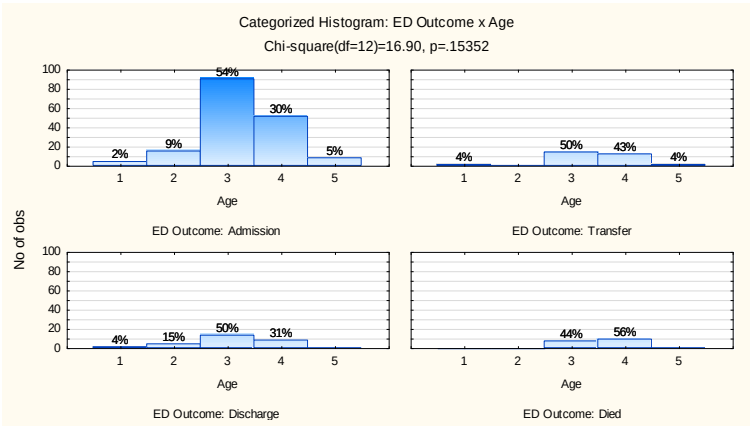
The box plot indicates that there was no significant difference between age and ED outcome.

6.40. AGE CATEGORIES vs EMERGENCY DEPARTMENT OUTCOME

Table 86: 2-Way Summary Table: Observed frequencies

ED Outcome	Marked cells have counts > 10. Chi-square(df=12)=16.90, p=.1					
	Age 1	Age 2	Age 3	Age 4	Age 5	Row Totals
Admission	4	15	90	51	8	168
Row %	2.38%	8.93%	53.57%	30.36%	4.76%	
Transfer	1	0	14	12	1	28
Row %	3.57%	0.00%	50.00%	42.86%	3.57%	
Discharge	1	4	13	8	0	26
Row %	3.85%	15.38%	50.00%	30.77%	0.00%	
Died	0	0	7	9	0	16
Row %	0.00%	0.00%	43.75%	56.25%	0.00%	
Totals	6	19	124	80	9	238

Table 87: Categorized Histogram: ED Outcome x Age



From the table, the $\chi(1) = 16.90$, $p = 0.153$. This tells us that there is no statistically significant association between ED outcome and the different age categories.

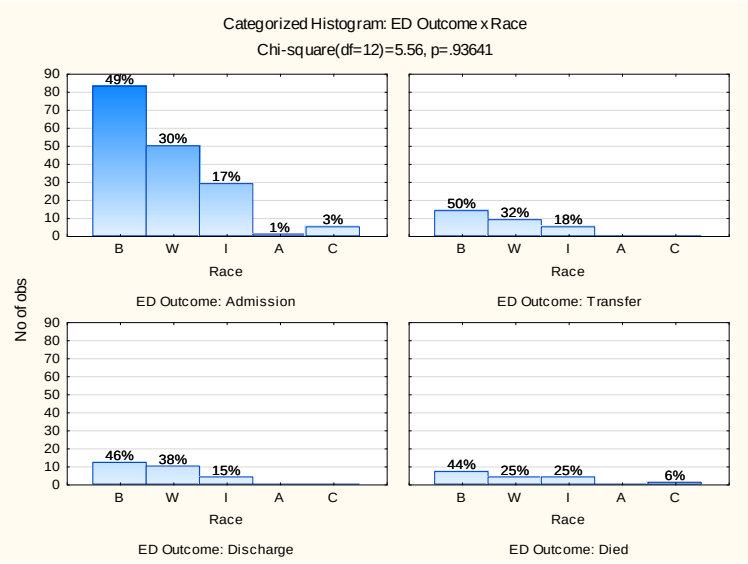
6.41. RACE vs EMERGENCY DEPARTMENT OUTCOME

Table 88: 2-Way Summary Table: Observed frequencies

Marked cells have counts > 10. Chi-square(df=12)=5.56, p=.9

ED Outcome	Race B	Race W	Race I	Race A	Race C	Row Totals
Admission	83	50	29	1	5	168
Row %	49.40%	29.76%	17.26%	0.60%	2.98%	
Transfer	14	9	5	0	0	28
Row %	50.00%	32.14%	17.86%	0.00%	0.00%	
Discharge	12	10	4	0	0	26
Row %	46.15%	38.46%	15.38%	0.00%	0.00%	
Died	7	4	4	0	1	16
Row %	43.75%	25.00%	25.00%	0.00%	6.25%	
Totals	116	73	42	1	6	238

Table 89: Categorized Histogram: ED Outcome x Race



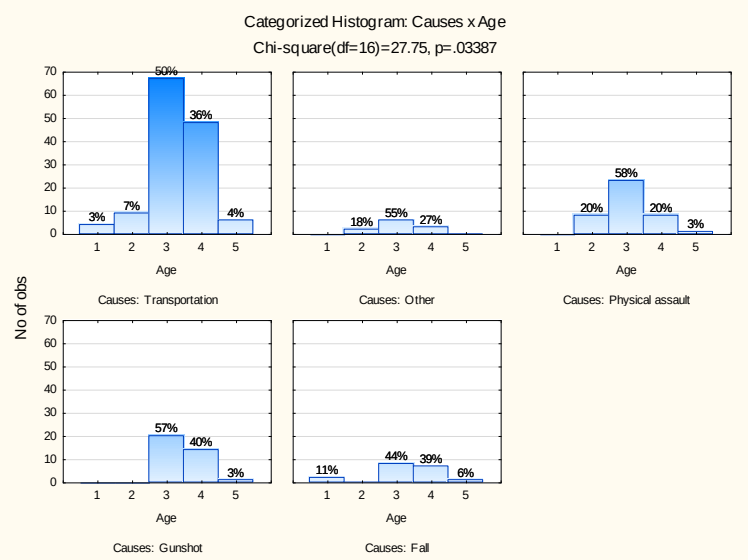
From the table, the $\chi(1) = 5.56$, $p = 0.93641$. This tells us that there is no statistically significant association between ED outcome and the different races.

6.42. AGE CATEGORIES vs CAUSES OF CHEST INJURIES

Table 90: 2-Way Summary Table: Observed frequencies

Causes	Marked cells have counts > 10. Chi-square(df=16)=27.75, p=.033					
	Age 1	Age 2	Age 3	Age 4	Age 5	Row Totals
Transportation	4	9	67	48	6	134
Row %	2.99%	6.72%	50.00%	35.82%	4.48%	
Other	0	2	6	3	0	11
Row %	0.00%	18.18%	54.55%	27.27%	0.00%	
Physical assault	0	8	23	8	1	40
Row %	0.00%	20.00%	57.50%	20.00%	2.50%	
Gunshot	0	0	20	14	1	35
Row %	0.00%	0.00%	57.14%	40.00%	2.86%	
Fall	2	0	8	7	1	18
Row %	11.11%	0.00%	44.44%	38.89%	5.56%	
Totals	6	19	124	80	9	238

Table 91: Categorized Histogram: Causes x Age



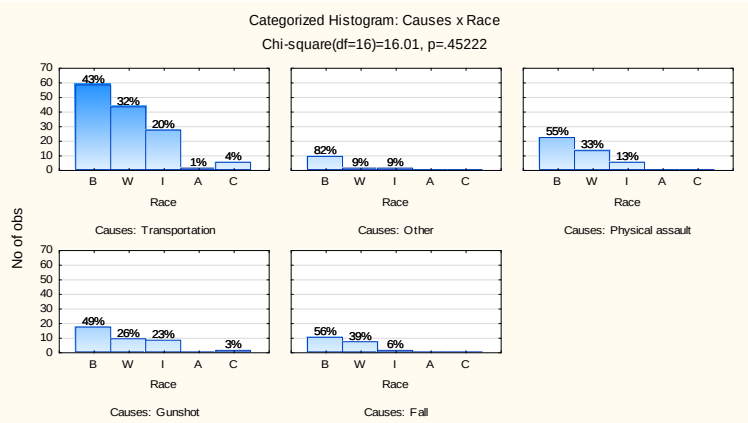
From the table, the $\chi(1) = 27.75$, $p = 0.033$. This tells us that there is a statistically significant association between causes and the different age categories.

6.43. RACE vs CAUSES OF CHEST INJURIES

Table 92: 2-Way Summary Table: Observed frequencies

Causes	Marked cells have counts > 10. Chi-square(df=16)=16.01, p=.4					
	Race B	Race W	Race I	Race A	Race C	Row Totals
Transportation	58	43	27	1	5	134
Row %	43.28%	32.09%	20.15%	0.75%	3.73%	
Other	9	1	1	0	0	11
Row %	81.82%	9.09%	9.09%	0.00%	0.00%	
Physical assault	22	13	5	0	0	40
Row %	55.00%	32.50%	12.50%	0.00%	0.00%	
Gunshot	17	9	8	0	1	35
Row %	48.57%	25.71%	22.86%	0.00%	2.86%	
Fall	10	7	1	0	0	18
Row %	55.56%	38.89%	5.56%	0.00%	0.00%	
Totals	116	73	42	1	6	238

Table 93: Categorized Histogram: Causes x Race



From the table, the $\chi(1) = 16.01$, $p = 0.45222$. This tells us that there is no statistically significant association between causes of chest injuries and the different races.

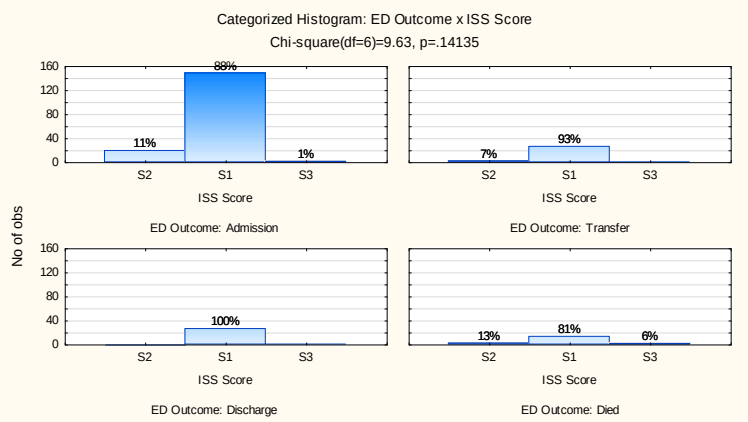
6.44. INJURY SEVERITY SCORE vs EMERGENCY DEPARTMENT OUTCOME

Table 94: 2-Way Summary Table: Observed frequencies

ED Outcome	ISS Score S2	ISS Score S1	ISS Score S3	Row Totals
Admission	19	148	1	168
Row %	11.31%	88.10%	0.60%	
Transfer	2	26	0	28
Row %	7.14%	92.86%	0.00%	
Discharge	0	26	0	26
Row %	0.00%	100.00%	0.00%	
Died	2	13	1	16
Row %	12.50%	81.25%	6.25%	
Totals	23	213	2	238

Marked cells have counts > 10. Chi-square(df=6)=9.63, p=.14

Table 95: Categorized Histogram: ED Outcome x ISS



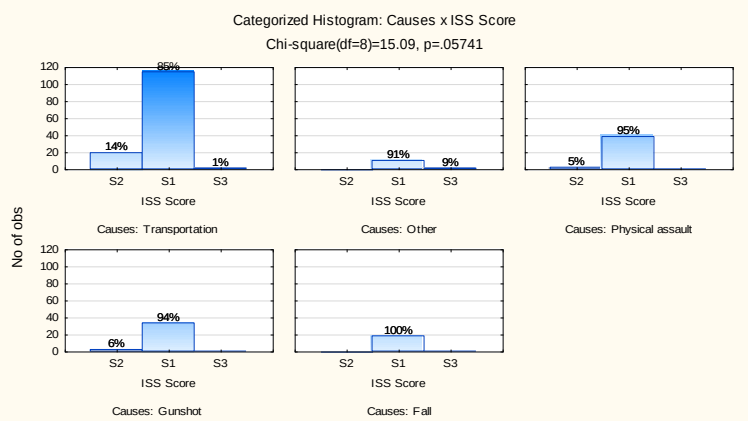
The result of the Chi-square test indicates that there is no statistically significant association (p-value=0.14135) between ED outcome and the different categories of ISS.

6.45. INJURY SEVERITY SCORE vs CAUSES OF CHEST INJURIES

Table 96: 2-Way Summary Table: Observed frequencies

	Marked cells have counts > 10. Chi-square(df=8)=15.09, p=.05			
Causes	ISS Score S2	ISS Score S1	ISS Score S3	Row Totals
Transportation	19	114	1	134
Row %	14.18%	85.07%	0.75%	
Other	0	10	1	11
Row %	0.00%	90.91%	9.09%	
Physical assault	2	38	0	40
Row %	5.00%	95.00%	0.00%	
Gunshot	2	33	0	35
Row %	5.71%	94.29%	0.00%	
Fall	0	18	0	18
Row %	0.00%	100.00%	0.00%	
Totals	23	213	2	238

Table 97: Categorized Histogram: Causes x ISS



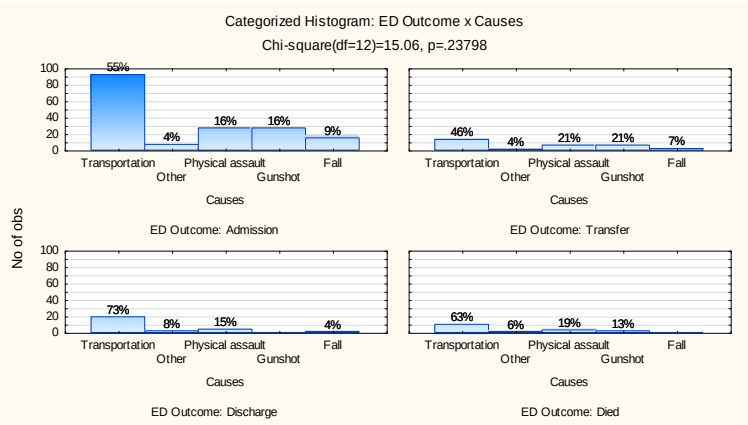
The result of the Chi-square test indicates that there is no statistically significant association (p-value=0.0574) between causes of chest trauma and the different categories of ISS.

6.46. ED OUTCOME vs CAUSES OF CHEST INJURIES

Table 98: 2-Way Summary Table: Observed frequencies

ED Outcome	Marked cells have counts > 10. Chi-square(df=12)=15.06, p=.23798					
	Causes Transportation	Causes Other	Causes Physical assault	Causes Gunshot	Causes Fall	Row Totals
Admission	92	7	27	27	15	168
Row %	54.76%	4.17%	16.07%	16.07%	8.93%	
Transfer	13	1	6	6	2	28
Row %	46.43%	3.57%	21.43%	21.43%	7.14%	
Discharge	19	2	4	0	1	26
Row %	73.08%	7.69%	15.38%	0.00%	3.85%	
Died	10	1	3	2	0	16
Row %	62.50%	6.25%	18.75%	12.50%	0.00%	
Totals	134	11	40	35	18	238

Table 99: Categorized Histogram: ED Outcome x Causes



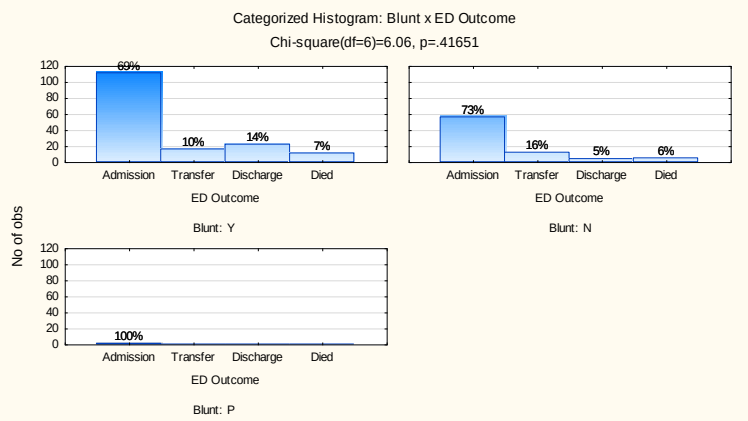
The result of the Chi-square test indicates that there is no statistically significant association (p-value= 0.23798) between ED outcome and the different categories of causes of death.

6.47. EMERNGENCY DEPARTMENT OUTCOME vs BLUNT CHEST INJURIES

Table 100: 2-Way Summary Table: Observed frequencies

Blunt	Marked cells have counts > 10. Chi-square(df=6)=6.06, p=.416				
	ED Outcome Admission	ED Outcome Transfer	ED Outcome Discharge	ED Outcome Died	Row Totals
Y	111	16	22	11	160
Row %	69.38%	10.00%	13.75%	6.88%	
N	56	12	4	5	77
Row %	72.73%	15.58%	5.19%	6.49%	
P	1	0	0	0	1
Row %	100.00%	0.00%	0.00%	0.00%	
Totals	168	28	26	16	238

Table 101: Categorized Histogram: Blunt x ED Outcome



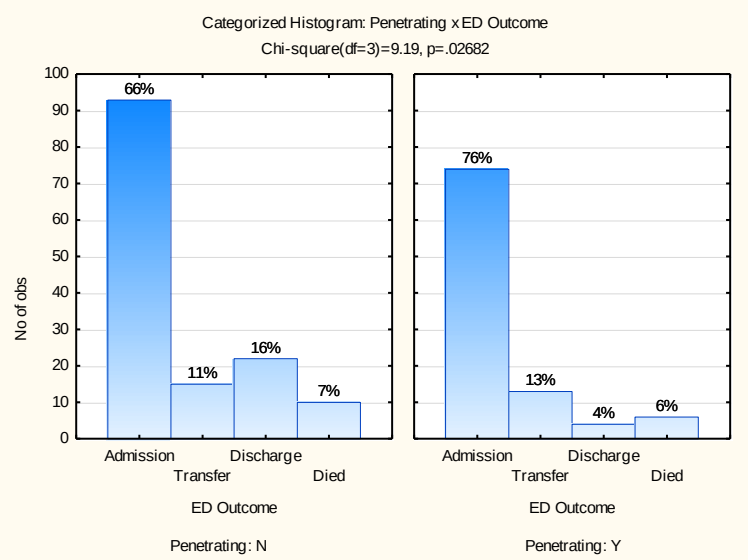
The result of the Chi-square test indicates that there is no statistically significant association (p-value=0.23798) between blunt chest trauma and ED outcome.

6.48. ED OUTCOME vs PENETRATING CHEST INJURIES

Table 102: 2-Way Summary Table: Observed frequencies

Penetrating	Marked cells have counts > 10. Chi-square(df=3)=9.19, p=.026				
	ED Outcome Admission	ED Outcome Transfer	ED Outcome Discharge	ED Outcome Died	Row Totals
N	93	15	22	10	140
Row %	66.43%	10.71%	15.71%	7.14%	
Y	74	13	4	6	97
Row %	76.29%	13.40%	4.12%	6.19%	
Totals	167	28	26	16	237

Table 103: Categorized Histogram: Penetrating x ED Outcome



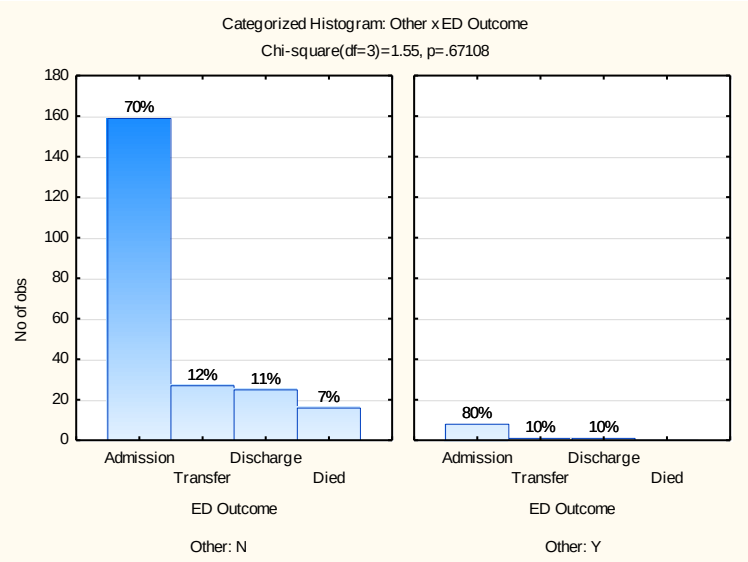
The result of the Chi-square test indicates that there is a statistically significant association (p-value=0.02682) between penetrating chest trauma and ED outcome.

6.49. ED OUTCOME vs OTHER CHEST INJURIES

Table 104: 2-Way Summary Table: Observed frequencies

Other	Marked cells have counts > 10. Chi-square(df=3)=1.55, p=.671 ED Outcome Admission	ED Outcome Transfer	ED Outcome Discharge	ED Outcome Died	Row Totals
N	159	27	25	16	227
Row %	70.04%	11.89%	11.01%	7.05%	
Y	8	1	1	0	10
Row %	80.00%	10.00%	10.00%	0.00%	
Totals	167	28	26	16	237

Table 105: Categorized Histogram: Other x ED Outcome



The result of the Chi-square test indicates that there is no statistically significant association (p-value=0.67108) between other chest injuries (burn, etc...) and ED outcome.

7. DISCUSSIONS

7.1. MAIN FINDINGS

7.1.1. AGE DISTRIBUTION

More than 50% of cases of chest injury in this study occurred in patients between the age of 20 years and 40 years with a peak between 20 and 30 years.

However, only 2.5% of chest injury occurred in children and 3.5% in old age category.

7.1.2. GENDER DISTRIBUTION

77% of chest injuries were observed the in male category whereas 23% in females.

7.1.3. RACE DISTRIBUTION

Black population has been more affected by chest trauma (48.74%), followed by white population (30.67%) then Indians (17.65%), however Coloured population and Asian were less affected with respectively 2.52% and 0.42%.

7.1.4. ARRIVAL MONTH

The highest number of patients with chest injuries were seen in April (10.92%) and December (10.08%) followed by May (9.66%), and October (9.66%) then May (9.24%). The least number of cases were recorded in March (5.04%).

7.1.5. ARRIVAL DAY

The majority of the patients visited the hospital during the week day (50.6%).

7.1.6. CAUSES OR MECANISMS OF CHEST INJURY

Transportation represents the major cause of chest injury in this study (56.3%) followed by physical assault and gunshot respectively accounting each for 16.8% and 14.7%. Other causes of chest injury (burn, etc...) represent only 4.6%

7.1.7. Injury severity score (ISS)

The highest number of patients who arrived in the ED had an ISS that was mild to moderate (89.5% of the patients); 9.7% were in severe group and 0.8% were in critical to unsurvival group.

7.1.8. EMERGENCY DEPARTMENT OUTCOME

The majority of the patients with chest injuries in this study were admitted (70.6%) while the lowest percentage of them died (6.7%).

7.1.9. RIBS INJURIES

The majority of the patients (71.1%) affected by chest injuries did not have any associated rib injuries.

7.1.10. FLAIL CHEST

Most of the patients in this study had flail chest (93.3%) associated to chest injuries.

7.1.11. CLAVICLE INJURIES

The majority of the patients (93.2%).in this study had no associated clavicle injuries.

7.1.12. HEMOTHORAX

Only 9.7% of patients with chest injuries in this study developed hemothorax. The majority of the patients had no hemothorax.

7.1.13. PNEUMOTHORAX

Only 13.4% of patients with chest injuries in this study developed pneumothorax. The majority of the patients had no pneumothorax.

7.1.14. HEMOPNEUMOTHORAX

The majority of patients (81%) had no Hemopneumothorax.

7.1.15. STERNUM INJURIES

The majority of the patients (97.1%)) had no sternum injuries.

7.1.16. LUNG CONTUSION

Only 9.2% of patients with chest trauma had associated lung contusion.

7.1.17. LUNG COLLAPSE

The majority of patients (97.5%) with chest trauma had lung collapsed.

7.1.18. THORACIC SPINE INJURIES

Most patients affected with chest trauma (88.2%) had no T-spine injuries

7.1.19. MEDIASTINUM INJURIES

Mediastinum injuries were seen in only 2.5% of the total number of patients with chest trauma.

7.1.20. BRONCHUS INJURIES

None of patients in the study had associated bronchus injury.

7.1.21. HEAD INJURY

The majority of patients (79.7%) had no associated head injury.

7.1.22. NECK INJURY

The majority of patients (86.6%) had no associated neck.

7.1.23. UPPER LIMBS INJURIES

Only 13.4% of patients in this study were affected with associated upper limbs injuries

7.1.24. ABDOMINAL INJURIES

Only 13.1% of patients in this study were affected with associated abdominal injuries.

7.1.25. PELVIS INJURIES

The majority of patients (91.2%) in this study had no associated pelvis injuries.

7.1.26. LOWER LIMBS INJURIES

Most of the patients ((83.2%) did not have associated lower limb injuries.

7.1.27. LUMBAR SPINE INJURIES

Only 3.8% of the patients had associated L-spine injuries.

7.1.28. AGE x BLUNT CHEST INJURY

There is no significant statistically difference in age between blunt and non-blunt chest traumas

7.1.29. AGE x PENETRATING CHEST INJURY

There is no significant statistically difference in age between penetrating and non-penetrating traumas

7.1.30. Gender x BLUNT CHEST INJURY

Males and Females equally suffer from blunt chest injuries. The difference is not statistically significant (p = .333)

7.1.31. Gender x PENETRATING CHEST INJURY

Males and Females equally suffer from penetrating chest injuries. The difference is not statistically significant (p = .1542).

7.1.32. GENDER x OUTCOME

This study shows that there is no statistically significant (*p* = .09597) association between Gender and ED outcome. Majority of patients with chest injury are admitted in this study and only few died, in both males and females.

7.1.33. GENDER x CAUSES

The association between Gender and the causes of death is not statistically significant (*p* = 0.42474) in this study. Transportation remains the main cause of chest injuries in both males and females.

7.1.34. BLUNT CHEST INJURIES x RACE

Black population is more affected by blunt chest injuries, followed by white population then Indian and coloured, and lastly by Asian group. But there is no statistically significant association (*p*= 0.7462) between blunt chest injury and race.

7.1.35. PENETRATING CHEST INJURIES x RACE

Black population is more affected by penetrating chest injuries, followed by white population then Indian and coloured, and lastly by Asian group. But there is no statistically significant association (p=0.4329) between penetrating chest injury and race.

7.1.36. CAUSES x BLUNT CHEST INJURIES

There is a significant difference *(p* = 0.0000) in cause of injury and whether the trauma is blunt or not; transportation has a lot more blunt traumas than other causes.

7.1.37. CAUSES x PENETRATING CHEST INJURIES

There is a significant difference (p = 0.0000) in cause of injury and whether the trauma is penetrating or not – transportation has a lot more penetrating traumas than other causes

7.1.38. AGE x CAUSES OF CHEST INJURIES

There is no significant association between age and causes of chest trauma.

7.1.38. AGE x OUTCOME OF CHEST INJURIES

Statistically, there is no significant association between age and outcome (p-value=0.1226); and there is no statistically significant association between ED outcome and the different age categories (p = 0.153).

7.1.39. RACE x OUTCOME

With p = 0.93641, this tells us that there is no statistically significant association between ED outcome and the different races.

7.1.40. AGE CATEGORIES x CAUSES OF CHEST INJURIES

There is a statistically significant association between causes and the different age categories (p = 0.033).

7.1.41. RACE x CAUSES OF CHEST INJURIES

With a p = 0.45222, the association between causes of chest injuries and the different races is not statistically significant.

7.1.42. ED OUTCOME x INJURY SEVERITY SCORE

The p-value=0.14135 indicates that there is no statistically significant association between ED outcome and the different categories of ISS score.

7.1.43. CAUSES OF CHEST INJRIES x INJURY SEVERITY SCORE

There is no statistically significant association (p-value=0.0574) between causes of chest trauma and the different categories of ISS.

7.1.44. CAUSES OF CHEST INJRIES x ED OUTCOME

There is no statistically significant association (p-value= 0.23798) between ED outcome and the different categories of causes of death.

7.1.45. BLUNT CHEST TRAUMA x ED OUTCOME

The association between blunt chest trauma and ED outcome not statistically significant (p-value=0.23798).

7.1.46. PENETRATING CHEST TRAUMA x ED OUTCOME

The association between penetrating chest trauma and ED outcome is statistically significant (p-value=0.02682). There are significant higher cases of admission for penetrating traumas compared to other outcomes.

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7.2. COMPARISON WITH OTHER STUDIES

This study reveals the following findings:

- People between the age of 20 years and 40 years are more affected by chest trauma.
- Chest trauma is more common in Black population compared to other racial groups in this KwaZulu-Natal private hospitals group.
- Male sex has the highest occurrence rate in comparison to female sex.
- April and December have been shown to be a high risk period.
- Most of chest injuries cases happened during week days.
- Transportation represents the major cause of chest injury in this study followed by physical assault.
- Most patients who arrived in the ED had an ISS that was ranging from mild to moderate.
- The majority of cases have been associated with good prognosis.
- .Majority of patients (70.6%) with chest injuries are admitted in this study, only few died (6.7%)
- Chest injuries are associated in the majority of cases with flail chest and/or lung collapsed. However associated hemothorax and pneumothorax, including hemopneumothorax, were not common in this study.
- Most cases of admission are due to penetrating chest trauma.

Most of these findings are not new and have reported in most of the literatures consulted.

7.3. STRENGHS AND WEAKNESSES OF THE STUDY

This should be the first time that this type of study has been conducted in the KwaZulu-Natal and we expect it to lead to further similar studies especially in the prospective point of view.

There have been some limitations due to the fact that this study is conducted in private heath institutions setting in a province where the majority of population is financially poor and therefore cannot afford medical care in private health institutions.

8. CONCLUSION AND RECOMMENDATIONS

8.1. Transportation represents the major cause of chest injuries in this study followed by physical assault.

8.2. Young adult group (20 years to 40 years old) is more affected by chest trauma.

8.3. The majority of the patients affected by chest trauma in this study are blacks.

Therefore chest trauma represents a serious public health issue, thus requiring intervention to be addressed at both local and national level.

Here are some recommendations suggested to counter-act this crisis:

- Enforce road safety laws
- Create forum where community members, leaders and authorities can interact and discuss the impact of transportation (especially MVA) and violence on the community and develop strategies to counter-act the rising of chest trauma.

8.4. The findings of this study will be made available to the healthcare workers, local authorities and community to highlight the repercussion of chest trauma in the KwaZulu-Natal.

8.5. There is a pressing need for the government to invest in and improve record keeping at public health facilities in order to motivate researchers to conduct retrospective studies at these facilities and assist in designing recommendations that will help the government in improving the health status of local communities.

9. REFERENCES

1. Statistics South Africa. [2011]. Mid-year population estimates 2011. Available: http://www.statssa.gov.za/publications/statsdownload.asp?PPN=P0302&SCH=4986 [Accessed 01.04.2012].

2. PROVIDE Project. [August 2005]. A profile of KwaZulu-Natal: Demographics, poverty, inequality and unemployment. Available: http://www.elsenburg.com/provide/documents/BP2005_1_5%20Demographics%20KZ.pdf [Accessed 01.04.2012].

3. Round, J.A., Mellor, A.J. Anaesthetic and Critical Care Management of Thoracic Injuries. *JR Med Corps* 2010; 156(3): 145-149.

4. Khan, M.L.Z., Haider, J., Alam, S.N., *et al*. Chest Trauma Management: Good outcomes possible in a general surgical unit. *Pak J Med Sci* 2009; 25(2): 217-221.

5. Cury, F., Baitello, A.L., Echeverria, R.F., *et al.* Rates of thoracic trauma and mortality due to accidents in Brazil. *Ann Thorac Med* 2009; 4:25-26.

6. Somcharit, L. Thoracic trauma at Siriraj Hospital 1997-2006. *J Med Assoc Thai* 2010; 93(1): 73-76.

7. Khan, I.A., Ghaffar, S., Asif, S., *et al.* Management of Thoracic Trauma: Experience at Ayub Teaching Hospital, Abbottabad. *J Ayub Med Coll Abbottabad* 2009; 21(1): 152-154.

8. Khandhar, S.J., Johnson, S.B., Calhoon, J.H. Overview of Thoracic Trauma in the United States. *Thorac Surg Clin* 2007; 17: 1-9.

9. Galan, G., Penalver, J.C., Paris, F., *et al*. Blunt chest injury in 1696 patients. *Eur J Cardiothorac surg.* 1992; 6: 284-287.

10. O'Connor, J.V., Adamski, J. The Diagnosis and Treatment of Non-cardiac Thoracic Trauma. *JR Med Corps* 2010; 156(1): 5-14.

11. Janson, J.T., Harris, D.G., Pretorius J., *et al*. Pericardial rupture and cardiac herniation after blunt chest trauma. *Ann Thorac Surg* 2003; 75: 581-582.

12. Mefire, A.C., Pagbe, J.J., Guifo, M.L. *et al.* Analysis of epidemiology, lesions, treatment and outcome of 354 consecutive cases of blunt and penetrating trauma to the chest in African setting. *SAJS* 2010; 48 (3): 90-93.

13. Smith, Z.A., Postma, N., Wood, D. FAST scanning in developing world emergency department. *S Afr Med J* 2010; 100: 105-108.

14. Cubasch, H., Degiannis, E. The Deadly Dozen of Chest Trauma. *CME* 2004; 22 (7):369-372.

15. Cooper, C., Hardcastle, T. Xpand chest drain: assessing equivalence to current standard therapy- a randomised controlled trial. *SAJS* 2006; 44 (4): 132-135.

16. Loogna, P., Bonanno, F., Bowley, D.M. *et al*. Emergency thoracic surgery for penetrating, non-mediastinal trauma. *ANZ J. Surg* 2007; 77: 142-145.

17. Matzoppoulos, R.G., Prinsloo, M.R., Butchart A., *et al*. Estimating the South African trauma caseload as a basis of injury surveillance. *Int J Inj Contr Saf Promot* 2006; 13: 49-51.