

https://dspace.org/

Comparison of epidemiologic characteristics of maxillofacial fractures between two maxillofacial units

Mogajane, Brampie Mpumpile

2016-03-04
http://hdl.handle.net/10539/19957

Downloaded from a DSpace repository. https://dspace.org/

Comparison of epidemiologic characteristics of maxillofacial fractures between two maxillofacial units.

Brampie Mpumpile Mogajane (571318)

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Dentistry in the branch of Maxillofacial and Oral Surgery.

Johannesburg, 2015

DECLARATION

I, Brampie Mpumpile Mogajane, hereby declare that this research report is my own work. It is being submitted for the degree of Master of Science in Dentistry in the branch of Maxillofacial and Oral Surgery in the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

.....

.....day of....., 2015

DEDICATION

I dedicate this research report to my loving wife Reneilwe, for her unwavering support and motivation to help complete this research report.

ABSTRACT

Aim: The aim of this prospective study was to compare epidemiologic characteristics of maxillofacial fractures between Charlotte Maxeke Johannesburg Academic Hospital (CMJAH) and

Polokwane–Mankweng Hospital Complex (PMHC).

Objective: To compare the patterns; aetiologies and incidences of maxillofacial fractures in patients of all ages between the two units.

Materials and Methods: We present a prospective study of 194 patients with 226 maxillofacial fractures reported and treated between CMJH and PMHC from December 2013 to August 2014. These patients were clinically and radiographically assessed by registrars and a consultant in both units. Variables recorded included Patient's age; file number; sex; socioeconomic status; population group; aetiology; time of injury; identity (whether known or unknown) of assailant; the site of the fracture and associated injuries.

Results: Of the 194 total patients from both units, 159(82.0%) patients were males and 35(18.0%) patients were females, giving overall male to female ratio of 4.54:1. The minimum age was (2) two years and the maximum age was 61 years. In both males and females, the majority (75%) of patients were in the age group of 20-39 years with a peak frequency in the 3rd decade. The overall mean age was 30.6 (10.02). Assaults were by far the leading cause of maxillofacial fractures from our study accounting for 60.3% fractures of the total study population, followed by road traffic accidents accounting for 17.5%. Road traffic accidents accounted for 22.7% maxillofacial fractures in PMHC, a rate higher than CMJAH (14.8%) and overall rate (17.5%). Sport injuries accounted for more (6.1%) maxillofacial fractures in PMHC than CMJH (0.8%). In total, 127(65.8%) patients sustained maxillofacial fractures during the night and 66(34.2%) patients during the day. The mandible was the most frequently fractured facial bone (73.0%), followed by the zygoma. The angle of the mandible was the most common fractured site (35.0%).

Conclusion: Interpersonal violence is by far the leading cause of maxillofacial fractures in South Africa. Prevailing factors like socioeconomic status of patient; industrialisation and geographic location have somewhat influenced the characteristics of maxillofacial fractures in the two units.

ACKNOWLEDGEMENT

I wish to express my gratitude to my supervisors Drs M. Mabongo; E. Rikhotso and J. Masipa for their supervision in this research. My appreciation goes to Dr Mabongo for his selfless support and guidance in preparation of this research report .I would like to acknowledge the registrars and Dr Masipa for their kindness in data collection from both CMJAH and PMHC respectively. I am indebted to everyone's contribution, without which this research report would have not completed.

TABLE OF CONTENTS

Page

DECLARATION..... ii

DEDICATION..... iii

ABSTRACT..... iv

ACKNOWLEDGEMENTS..... v

TABLE OF CONTENTS..... vi-vii

Chapter 1 Introduction and literature review 1

Chapter 2.1 Objectives 6

2.2 Ethical issues 6

2.3 Materials and Methods 6

2.4 Statistics 7

Chapter 3 Results 8

3.1 Demographic data 8

3.2 Gender 9

3.3 Age 10

3.4 Employment status 11

3.5 Race 12

3.6 Aetiologies of maxillofacial fractures 12

3.7 Comparison of aetiology by hospital 13

3.8 Time of injury 15

3.9 Relationship of assailant to patient 16

3.10 The site of fractures 17

3.10.1 Lower third fractures 18

3.10.2 Comparison of sides of mandibular fracture by hospital 19

3.11 Middle third fractures 20

3.12 Upper third fractures 21

3.13 Multiple fractured sites 21

3.14 Associated injuries 22

Chapter 4 Discussion 23

Chapter 5 Conclusion 28

Chapter 6 References 29

LIST OF FIGURES..... viii

LIST OF TABLES..... ix

LIST OF FIGURES

Page

Figure 3.1 Distribution of patients by hospital..... 8

Figure 3.2 Distribution of the patients by sex by hospital..... 9

Figure 3.3 Age distribution of the overall patients..... 10

Figure 3.4 Employment status of the patients..... 11

Figure 3.5 Distribution of the patients by ethnicity..... 12

Figure 3.6 Aetiologies of maxillofacial fractures..... 13

Figure 3.7 Comparison of aetiology of maxillofacial fractures by hospital..... 14

Figure 3.8 Time of injury..... 15

Figure 3.9 Relationship of assailant and patient..... 16

Figure 3.10 Distribution of maxillofacial fractures by site frequency..... 17

Figure 3.10.1 Comparison of fractures to different sites of the mandible by hospital..... 18

Figure 3.11 Comparison of middle third fracture proportions by hospital..... 21

LIST OF TABLES

Page

Table 3.1 Relationship of assailants to patients..... 17

CHAPTER 1

Introduction and literature review

The maxillofacial skeleton, because of its exposure is vulnerable to injury, thus trauma to this region continues to attract the attention of the maxillofacial surgeons (Ajike *et al* 2005). This is the area where important organs are located and where the digestive and respiratory systems start, that is why the injuries to this region may result in serious dysfunctions. Due to an anatomical proximity, damages to the central nervous system often occur as a result of maxillofacial injuries. It must be emphasized that facial traumas are often the reasons of further aesthetic disturbances. Thus, the psychological aspects of injuries to the maxillofacial region are of importance. That is why the special attention is focused on etiologic factors and the trauma mechanisms to successfully prevent these injuries (Malara *et al* 2006). The causes of the maxillofacial trauma include assault, motor vehicle accidents, falls, gunshot wounds, sport related injuries, industrial injuries and animal attacks. The variability in the global incidence of the facial fractures is attributed to a variety of factors such as sex, age, level of industrialisation, socioeconomic status of the patient, geographical location and seasonal variation (Sojat *et al* 2001; Majumder *et al* 1996), and this incidence also varies from one region to another within a country.

Shayyab *et al* in 2012 looked on the trends in the pattern of facial fractures in different countries of the world and found that most patients affected by facial fractures were young adult males with the mean age of 24.4 years. These results are in agreement with many other results from both local and international studies (Beaumont *et al* 1985; Singh *et al* 2009; Gupta *et al* 2006). The possible explanation for this is that individuals between the ages of 21 and 30 years frequently take part in dangerous exercises and sports, drive motor vehicles carelessly and are more likely to be involved in violence (Oji 1999). In men the third decade of life is an active period when they are more

energetic, involved in high-speed transportation and engaged in outdoor activities, which are leading causes of maxillofacial trauma (Cheema & Amin 2006).

Shayyab *et al* in 2012 also showed that the incidence of facial fractures in different countries of the world was higher in males (81.3%) than in females. The male to female ratio of patients with facial fractures was greater in developing countries than that in developed countries, this can be attributed to the high percentage of women who are used to stay at home, not working in outdoor and high risk occupations in developing countries, thus becoming less exposed to road traffic accidents and other causes of maxillofacial injuries (Fasola *et al* 2003b; Ahmed *et al* 2004). These results concur with those achieved in developing countries (Al-Balbissi 2003; Ahmed *et al* 2004; Ghaffar *et al* 2004; Hofman *et al* 2005). In contrast, in developed countries where women participate directly in social activities and consequently are more susceptible to traffic accidents and urban violence (Lindqvist *et al* 1986; Thom *et al* 1986; Gassner *et al* 1999), the male to female ratio incurring maxillofacial injuries reached as low as 2,1:1 (Gassner *et al* 1999). Women's facial injury rates in developed countries are more than that in developing countries, showing that certain socioeconomic conditions are necessary for women to play a more active part in these developed societies (Lindqvist *et al* 1986; Thom *et al* 1986; Peden *et al* 2005; Kruger *et al* 2006). Ajike *et al* (2005) conducted a survey in Kaduna, Nigeria. The survey included 543 patients with 820 maxillofacial fractures, the age range was from 3 years to 67 years (mean=39.7) with a peak incidence in the 4th decade (n=197,36.3%), and male to female ratio was 3.7:1.

Adeyemo *et al* (2005) analysed trends and characteristics of maxillofacial injuries in Nigeria based on a systematic review of the literature. The peak age of incidence of maxillofacial fractures was 21-30 years in most centres, this is consistent with several studies (Shayyab *et al* 2012; Gupta *et al* 2009, Singh *et al* 2009, Desai and Lownie 2010), in contrast, Ajike *et al* (2005) reported the peak

age of 4th decade. A tendency towards an equal male to female ratio was observed between earlier and later studies in most urban centres.

Two South African studies by Singh *et al* (2009) and Desai and Lownie (2010) showed the highest male to female ratio of 6.6:1 and 6:1 respectively, this is in contrast with Bamjee et al (1996)'s 2.3:1 when they reported on maxillofacial injuries in South African youth of under 18 years.

When Shayyab *et al* (2012) was examining the trends in the pattern of facial fractures in different countries of the world, they found that road traffic accidents was the major cause of facial injuries in developing countries (65,8%). These findings were consistent with reports from other developing countries (Fasola *et al* 2003b; Ahmed *et al* 2004 and Nwoku & Oluyadi 2004; Kobusingye 2004; Ajike *et al* 2005) and assault was the major cause of facial fractures in developed countries (40,2%), these findings are in agreement with reports from other developed countries where assaults and interpersonal violence have replaced road traffic accidents as the major cause of maxillofacial injuries (McDade *et al* 1982; Fasola *et al* 2003b; King *et al* 2004). These findings are however in contrast to several reports of studies done in South Africa, which is also a developing country (Singh *et al* 2009; Desai & Lownie 2010; Bamjee *et al* 1996; Snijman 1963; Beaumont *et al* 1985; Rikhotso & Ferreti 2008; Roode *et al* 2007) where assault is still a major cause of facial injuries. This confirm the violent nature of our society and the very high crime rate and lack of respect for human life. Adeyemo *et al* (2005) reported road traffic accident as the major cause of maxillofacial injuries in both children and adults in all the centres across Nigeria except north eastern states where assault was the major cause of injuries. The two factors that have consistently been associated with increased levels of assault, and subsequent maxillofacial injuries are excessive alcohol consumption and poor socio-economic status, particularly male unemployment.

A study by Beaumont *et al* (1985) in Johannesburg area showed that majority of facial fractures in children and elderly patients were the results of falls. Similarly, Bamjee's study in 1996 showed that accidental falls was the most common cause of facial fractures in children under 12 years of age. In contrast, Van As *et al* (2006) reported that fall accounted for 19% of facial fractures of 107 children included in the study and treated at the trauma unit of the Red Cross War Memorial Children's Hospital from March 1989 to January 2004, this is closely equal to 22.3% falls reported by Ajike *et al* (2005) in Kaduna, Nigeria.

In most statistical studies reviewed, the mandible was the most common fractured site (Ajike *et al* 2005; Singh *et al* 2009; Adeyemo *et al* 2005; Shayyab *et al* 2012; Bamjee *et al* 1996), this is the result of both its prominence and its selection as a target of intentional violence. These findings are however in contrast with those by Gupta *et al* (2009), who reported zygoma the most affected maxillofacial bone, followed by mandible. It can be postulated that the reason for the preponderance of unilateral left-sided fractures of the mandible appears to be that many patients treated were the victims of assault by right-handed assailants (Beaumont *et al* 1985). The site of mandibular fracture depend on different aetiological agents responsible for causing maxillofacial fractures, violence account for mostly body or angle fracture, whereas motor vehicle accidents account for mostly symphyseal and parasymphyseal fractures (Singh *et al* 2009).

There are several reports in the literature regarding multisystem trauma and facial fractures (Conforti *et al* 1993; Hohlrieder *et al* 2003; Ajike *et al* 2005; Holmgren *et al* 2004). Head injuries are commonly associated with facial fractures, and facial fractures can be markers for brain injury (Holmgren *et al* 2004). A survey conducted in Kaduna, Nigeria by Ajike *et al* (2005) found that concomitant injuries were 8.5% with orthopaedic injuries accounting for the majority (67.10%).

There have been a number of epidemiological studies of maxillofacial fractures done mostly in Gauteng and Western Cape Provinces, which are the economic hub of our country, but little or no similar studies were done in Limpopo Province, which is one of the poorest in the country. This study therefore seeks to analyse and compare epidemiologic characteristics of maxillofacial fractures between the Gauteng based CMJAH and Limpopo PMHC.

CHAPTER 2

2.1 Objectives

To compare the patterns; aetiologies and incidences of maxillofacial fractures in patients of all ages between two units: CMJAH and PMHC.

2.2 Ethical issues

Ethical clearance (M130842) for this prospective study was obtained from the Human Research Ethics Committee (Medical) of both the University of the Witwatersrand and University of Limpopo, Polokwane Campus. Permission to conduct a study was also obtained from relevant authorities of both institutions. Informed consent was obtained from each patient for their inclusion in the study. There was no envisaged harm to patients who were willing to participate in this study.

2.3 Material and Methods

The study included patients presented with maxillofacial fractures to maxillofacial units of both CMJAH and PMHC. The study covered a period of nine months, from December 2013 to August 2014. Patients were excluded from the study if they were not willing to participate; presented with maxillofacial fractures secondary to pathological lesions or had isolated soft tissue injuries. The patients were assessed clinically and radiographycally by registrars in CMJAH and a consultant in PMHC. Variables recorded in the data collection sheet were: patient's age; file number; sex; socioeconomic status (i.e. employed or unemployed); population group; cause of trauma; identity (whether known or not) of assailant and relationship with the patient. . The sites of the fractures were anatomically recorded as:

- Lower third- dentoalveolar; angle; body; condyle; coronoid process; parasymphysis and symphysis fractures.

- Middle third- Le Forte I or II or III; dentoalveolar; nasal bones; zygoma; zygomatic arch; maxilla; orbit and naso-orbito-ethmoid fracture.
- Upper third- frontal bone fracture.

Associated injuries included neurologic; ophthalmologic; orthopaedic and others.

2.4 Statistics

All data collected was entered into REDcap and transferred into Statistica (version 12.5) software for analysis. Frequencies and percentages were used to describe categorical variables while continuous variables are presented as means and standard deviations. The student t-test was used to assess differences between means. Differences in proportions were assessed using the Fischer's exact test and relationships between categorical variables were assessed using the Chi-squared test. All analyses were performed at the 95% confidence interval.

CHAPTER 3

RESULTS

3.1 Demographic data

In a period of nine (9) months, data from 194 patients with 226 fractures from both units were recorded and analysed. Out of these patients, 128(66.0 %) patients with 155 (68.6%) fractures were from CMJAH and 66 (34.0 %) patients with 71(31.4%) fractures were from PMHC (Fig 3.1).

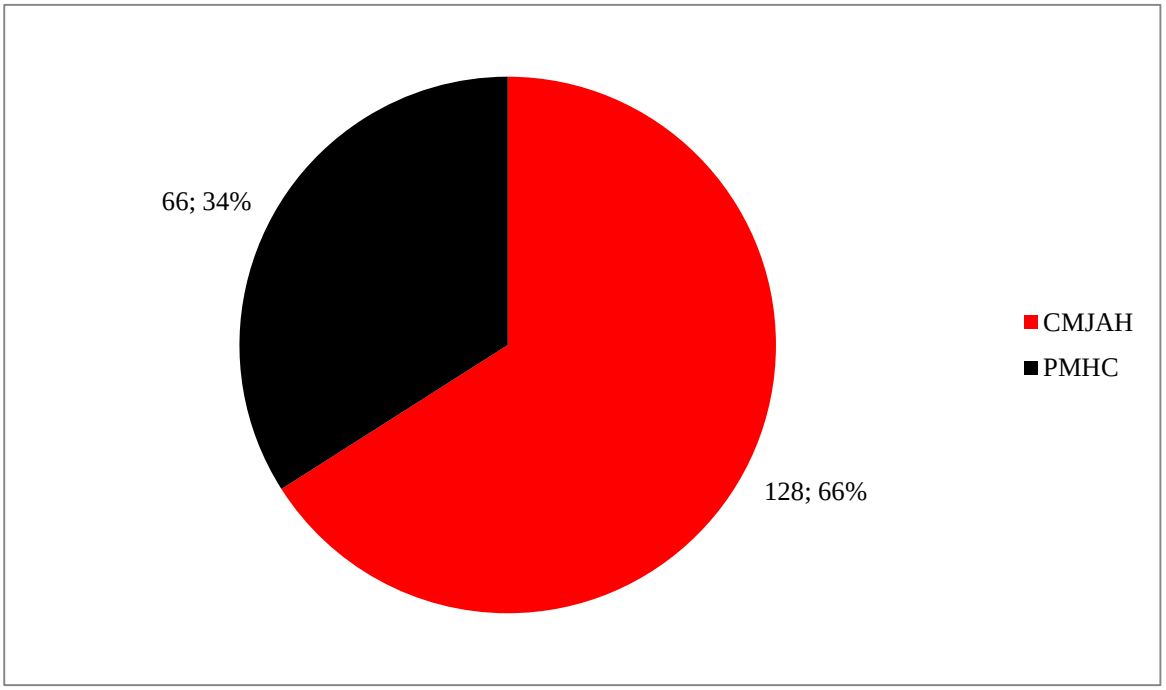

Figure 3.1 Distribution of patients by hospital

3.2 Gender

Out of the 194 total patients, 159(82.0%) patients were males and 35(18.0%) were females, giving overall male to female ratio of 4.54:1. Of the 159 male patients, 107(67.3%) were from CMJAH, constituting 83.6% from that unit and 52(32.7%) were from PMHC, constituting 78.8% of patients from that unit. Of the 35 patients of the total females, 21(60.0%) were from CMJAH, constituting 16.4% of patients and 14(40.0%) were from PMHC, constituting 21.2% of patients. There was no significant difference (P=0.410) in proportions of the female patients between the two units

(Fig 3.2).

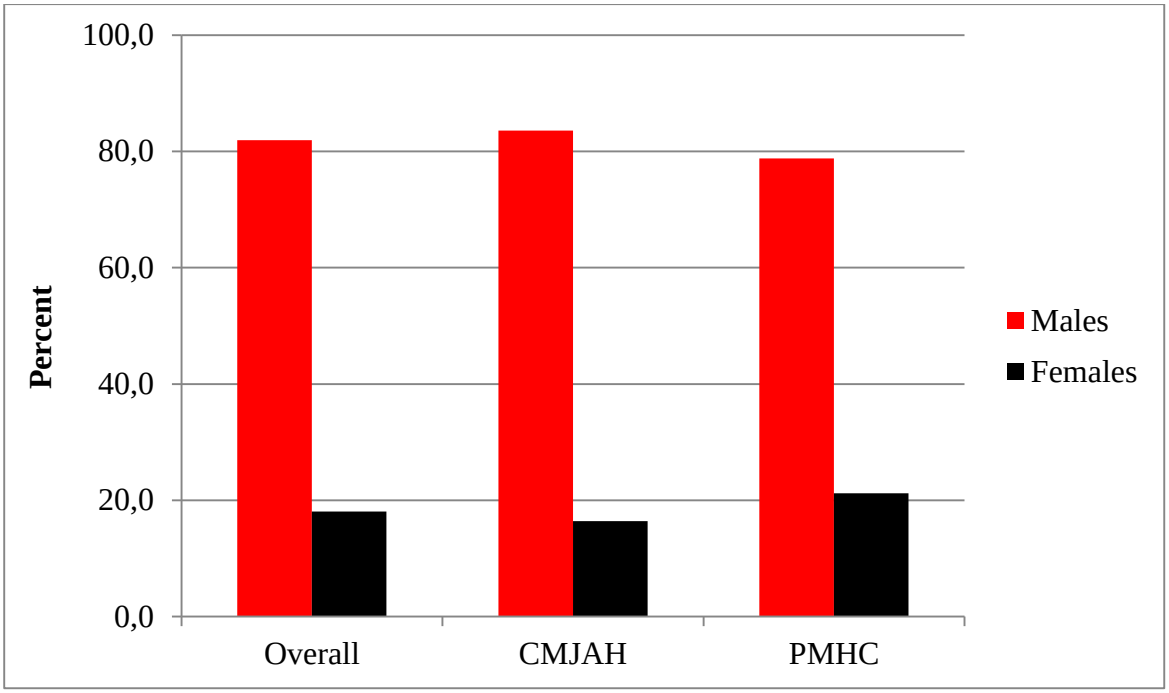

Figure 3.2 Distribution of the patients by sex by hospital

3.3 Age

The age distribution of the overall patients is shown in Figure 3.3.

The minimum age was two (2) years and the maximum age was 61 years. In both males (82%) and females (18%), the majority (75%) of patients were in the age group of 20-39 years with a peak frequency in the 3rd decade. The overall mean age was 30.6 (10.02).

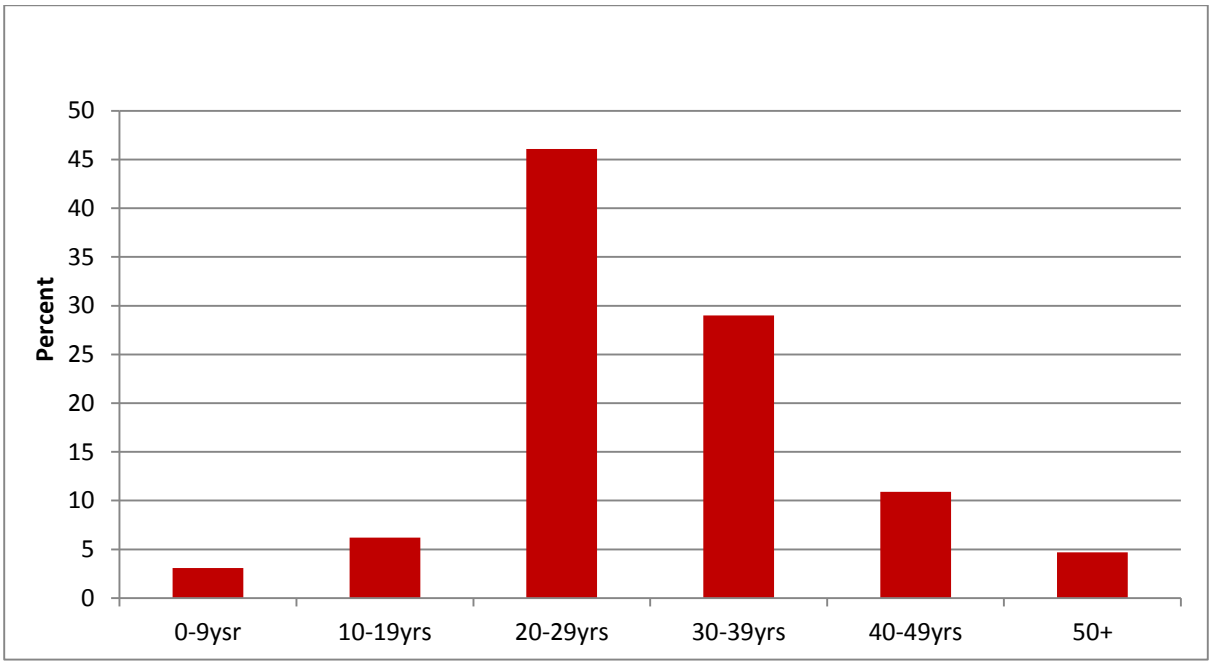

Figure 3.3 Age distribution of total study population

3.4 Employment status

In overall, 82(43.2%) patients were employed and 108(56.8%) were unemployed. In CMJAH, 56 (44.8%) patients were employed and 69(55.2%) patients were unemployed. In PMHC, 26(40.0%) patients were employed and 39(60.0%) patients were unemployed, with the unemployment rate higher than overall rate. This rate was however not statistically significant (P=0.6790 (Fig. 3.4).

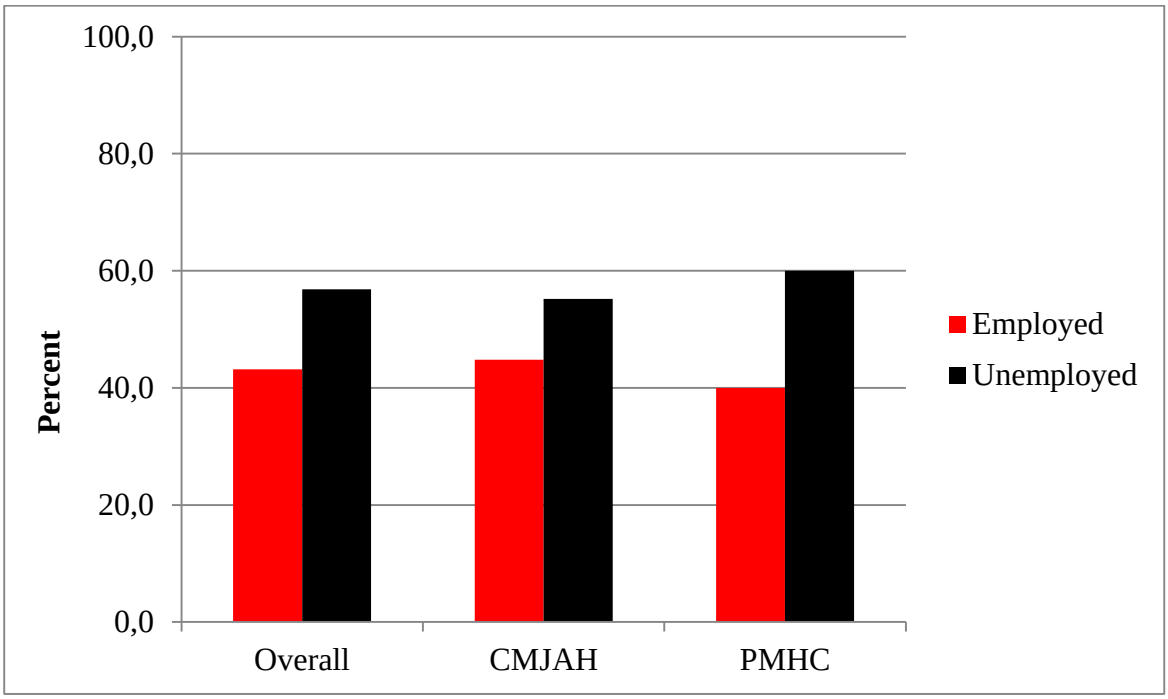

Figure 3.4 Employment status of the patients

3.5 Race

In overall, majority (91.1%) of patients were black, 3.6% were whites and 5.2% were others. In CMJAH, blacks constituted 87.5% of patients; 5.5% patients were whites and 7.0% were others. In PMHC, there was a significant high proportion (98.4%) of black patients than in CMJAH (P=0.011), the remaining 1.6% patients were others (Fig 3.5).

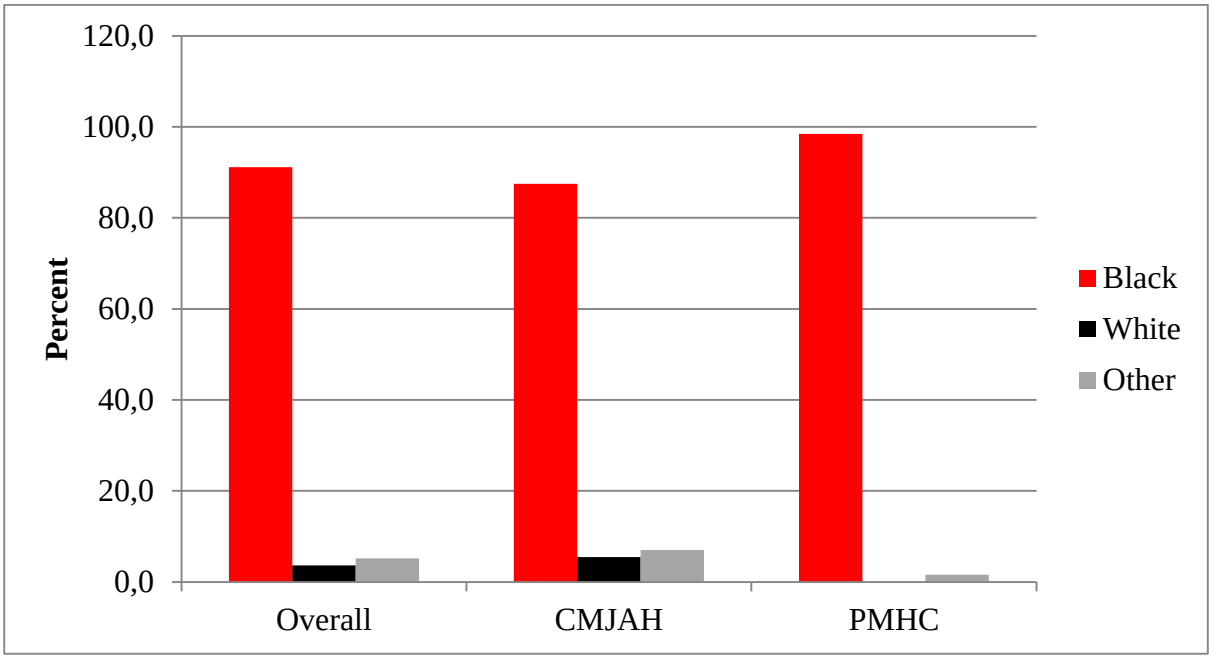

Fig 3.5 Distribution of the patients by ethnicity

3.6 Aetiologies of maxillofacial fractures

The overall aetiological agents responsible for the maxillofacial fractures in both units are shown in figure 3.6. The data show that assaults (60.3%) accounted for majority of fractures, followed by motor vehicle accidents accounting for 17.5%, pedestrian vehicle accidents accounting for 7.5%, falls with 4.6%, gunshot wounds with 4.1%, others with 3.1%, sport injuries with 2.6%. Sport injuries accounted for least fractures with only 0.5%.

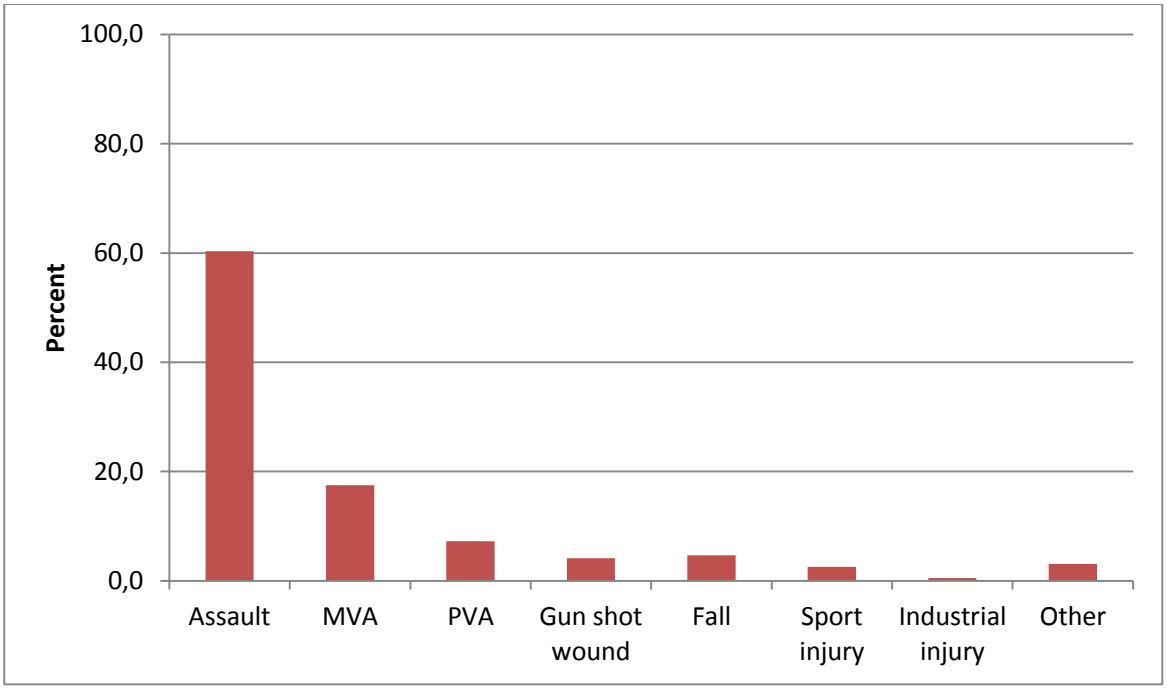

Figure 3.6 Aetiologies of maxillofacial fractures

3.7 Comparison of aetiology by hospital

Figure 3.7 below shows the comparison of percentages of aetiologies of maxillofacial fractures between the two units. Assaults in both units accounted for majority of maxillofacial fractures, accounting for 53.0% fractures in PMHC and 64.1% fractures in CMJAH, a rate slightly higher than the overall percentage (60.3%). Motor vehicle accidents followed with 22.7% in PMHC, a rate higher than CMJAH (14.8%) and overall rate(17.5%), however this rate was not statistically significant (P=0.167) when comparing the two units. Pedestrian vehicle accidents accounted for 8.6% of maxillofacial fractures in CMJAH, a rate higher than PMHC (4.5%) and overall rate of 7.2%. Gunshot wounds accounted for 5.5% in CMJAH, a rate higher than PMHC (1.5%) and overall rate of 4.1%. Falls accounted for 6.1% of maxillofacial fractures in PMHC, a rate higher than CMJAH (3.9%) and overall rate (4.6%). More patients (6.1%) sustained maxillofacial fractures due to sport injuries in PMHC than patients (0.8 %) in CMJAH, there was a significant difference

(P=0.028) in proportions of patients sustained fractures due to sport injuries between the two units. The one patient sustained maxillofacial fractures due to industrial injury was recorded from CMJAH. Other aetiological agents accounted for 6.1% maxillofacial fractures in PMHC and 1.6% in CMJAH.

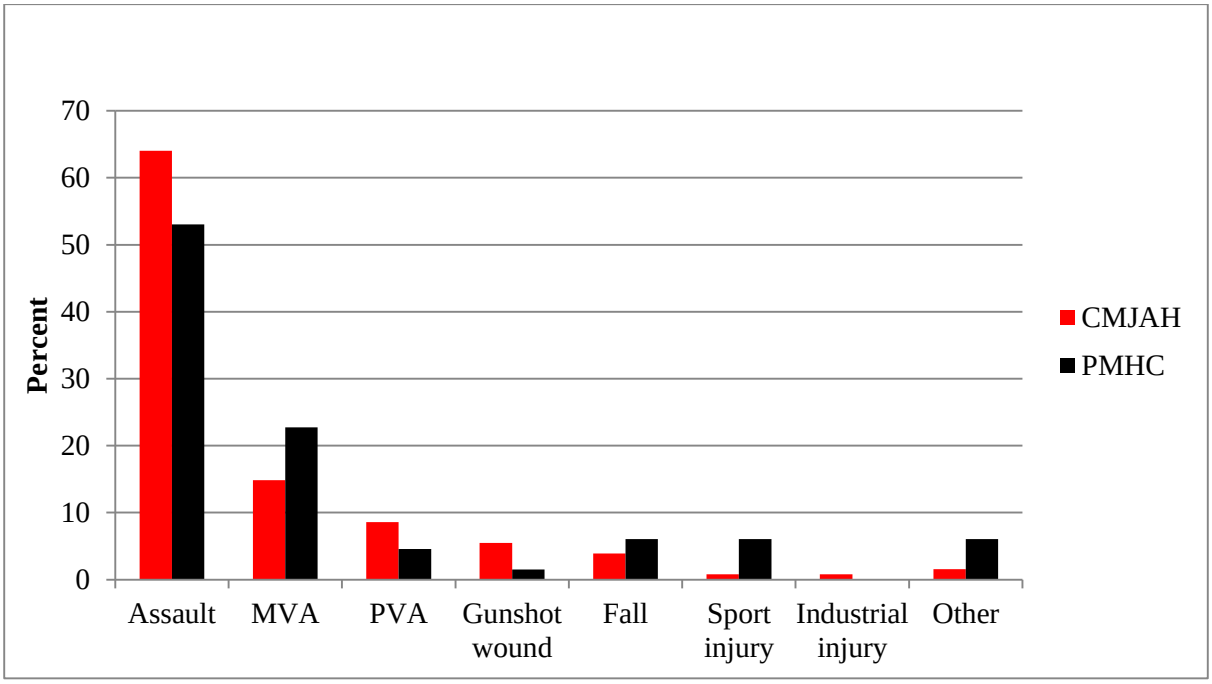

Fig 3.7 Comparison of aetiology of maxillofacial fractures by hospital

3.8 Time of injury.

The figure 3.8 below shows time of injury in both units. A highly significant proportion (P=0.0017) of patients sustained injuries during the night in overall, 66 (34.2%) patients sustained maxillofacial fractures during the day and 127 (65.8%) patients during the night. In CMJAH, 41(32.0%) patients sustained fractures during the day and 87(68.0%) patients sustained fractures during the night. In PMHC, 25(38.50%) patients sustained fractures during the day and 40 (61.5%) patients sustained fractures during the night.

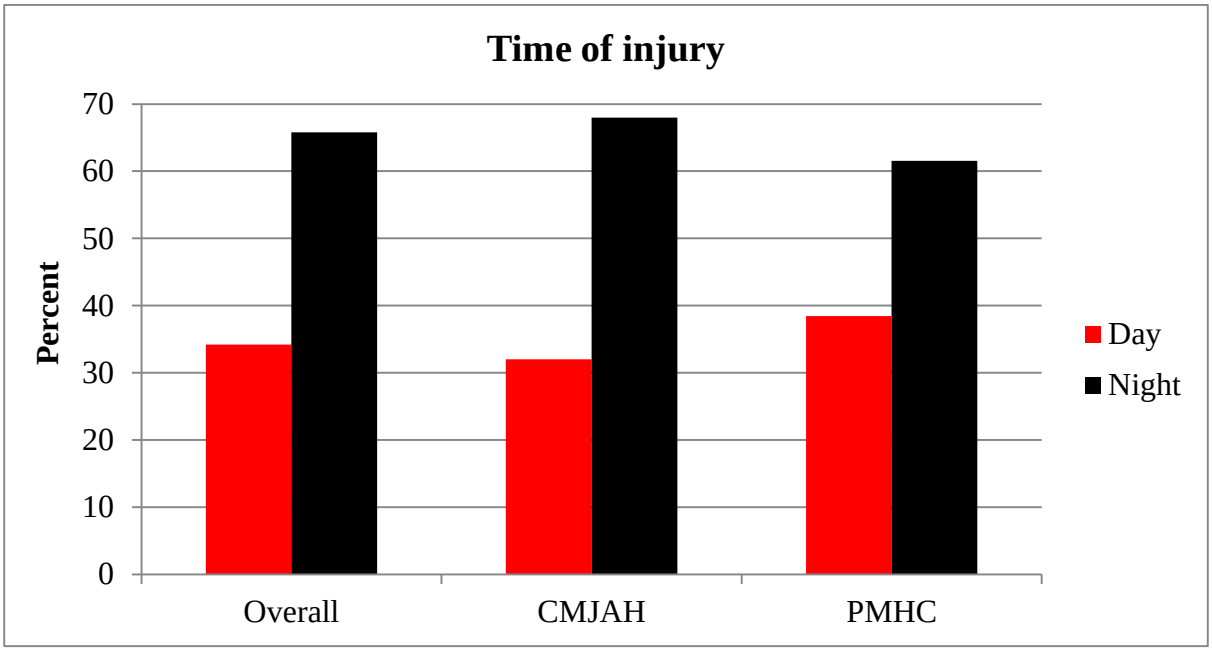

Figure 3.8 Time of injury

.

3.9 Relationship of assailant to patient.

Figure 3.9 and Table 3.1 below show relationship of assailant to patient.

Of the 116 (60.3%) patients sustained maxillofacial fractures due to assault, 60 (51.7%) patients knew the assailants and 56 (48.3%) patients did not know the assailants. In CMJAH, 43 (53.1%) patients knew the assailants and 38 (46.9%) patients did not know the assailants. In PMHC 17(48.6%) patients knew the assailants and 18 (51.4%) patients did not.

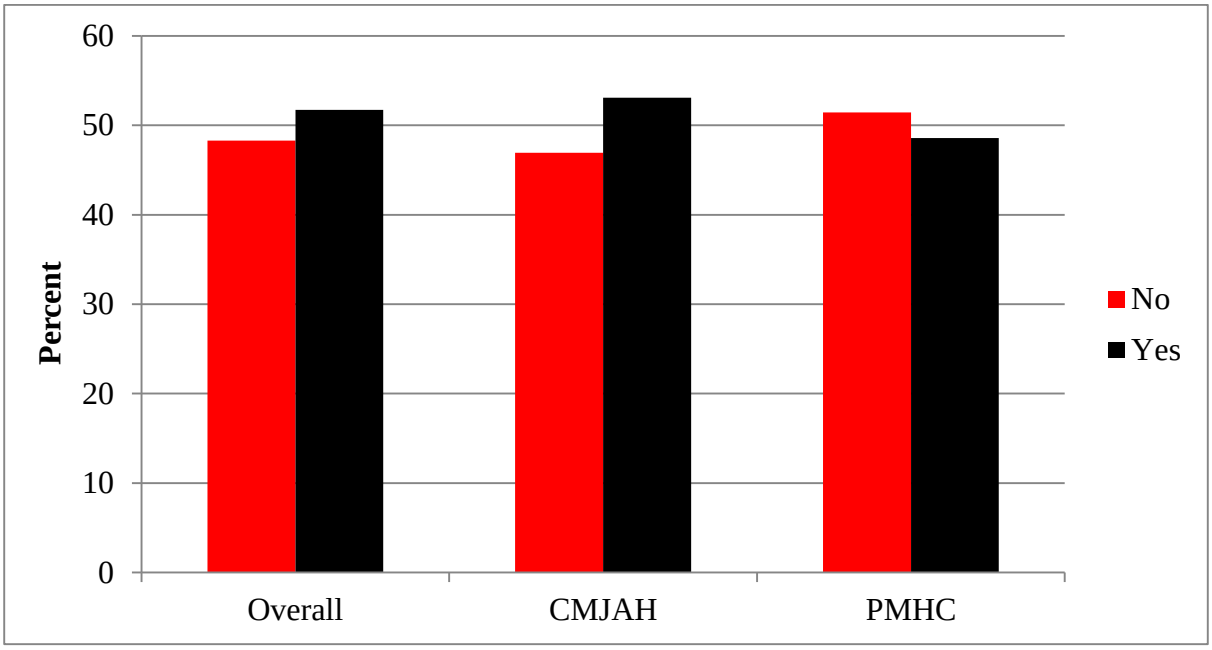

Fig 3.9 Relationship of assailant and patient.

Out of the 60 patients who knew the assailant, 9.3% from CMJAH and 11.8% from PMHC were assaulted by their partners. Ten patients, 18.6% from CMJAH and 11.8% from PMHC were assaulted by family members. Five patients, 7.0% from CMJAH and 11.8% from PMHC were assaulted by friends. Thirty nine patients, 65.1% from CMJAH and 64.7% from PMHC were assaulted by other assailants known to them but not related to them.

Table 3.1 Relationship of assailant to patients

	Frequency			Percent		
	Overall	CMJAH	PMHC	Overall	CMJAH	PMHC
Partner	6	4	2	10.0	9.3	11.8
Family member	10	8	2	16.7	18.6	11.8
Friend	5	3	2	8.3	7.0	11.8
Other	39	28	11	65.0	65.1	64.7

3.10 The site of fracture

In the entire sample, a high proportion (73.0%) of fractures occurred in the lower third, followed by middle third (19.0%), multiple sites (7.0%) and upper third (1.0%), (figure 3.10).

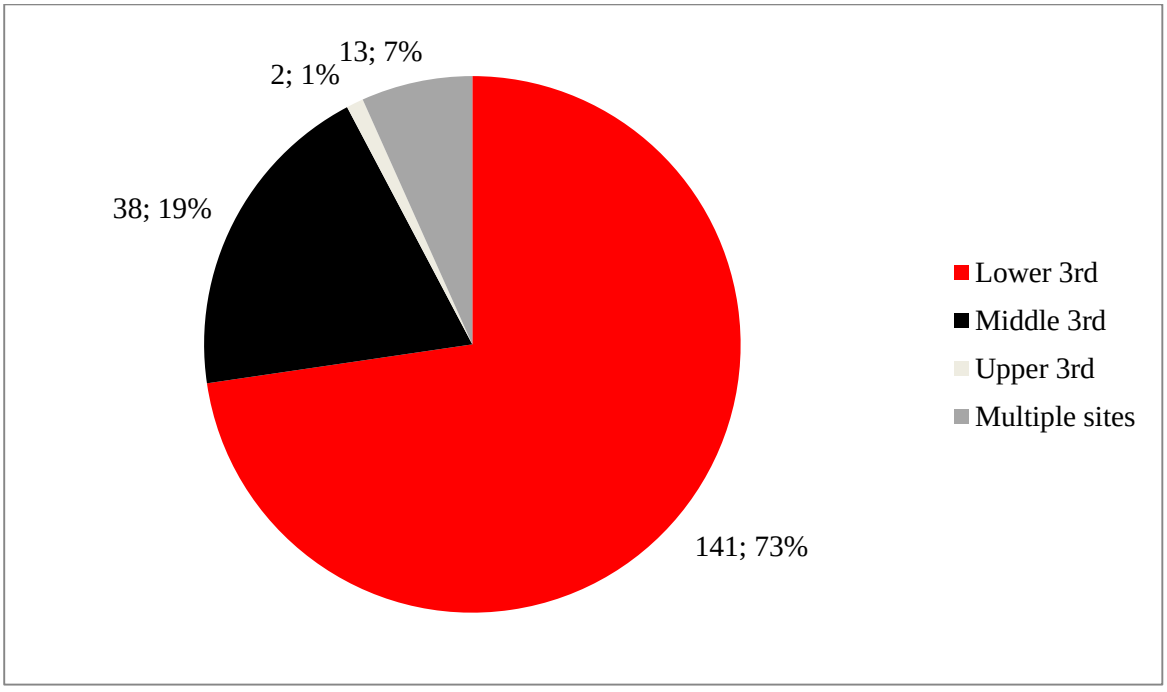

Figure 3.10 Distribution of maxillofacial fractures by site frequency

3.10.1 Lower third fractures

Of the 141 mandibular fractures, an angle of the mandible was the most (35.0%) common site affected in both hospitals, 35.5% angle fractures from CMJAH and 33.8% from PMHC. Followed by the body (25.7%) of the mandible, majority (32.9%) of which occurred in CMJAH and only 9.9% occurred in PMHC. When comparing the proportions of mandibular body fractures between the two units, the difference was found to be statistically significant (P=0.002). Symphysis fracture

(13.7%), majority (15.5%) of which occurred in CMJAH and only 9.9% in PMHC. Parasymphysis (11.9%), a significantly higher proportion (P=0.0002) of which occurred in PMHC (23.9%) as compared to CMJAH (6.5%). Condyle (11.1%), 15.5% from PMHC and 9.0% in CMJAH. Dentoalveolar (1.8%), the four fractures are from PMHC and Coronoid process (0.9%) with one fracture from each hospital.

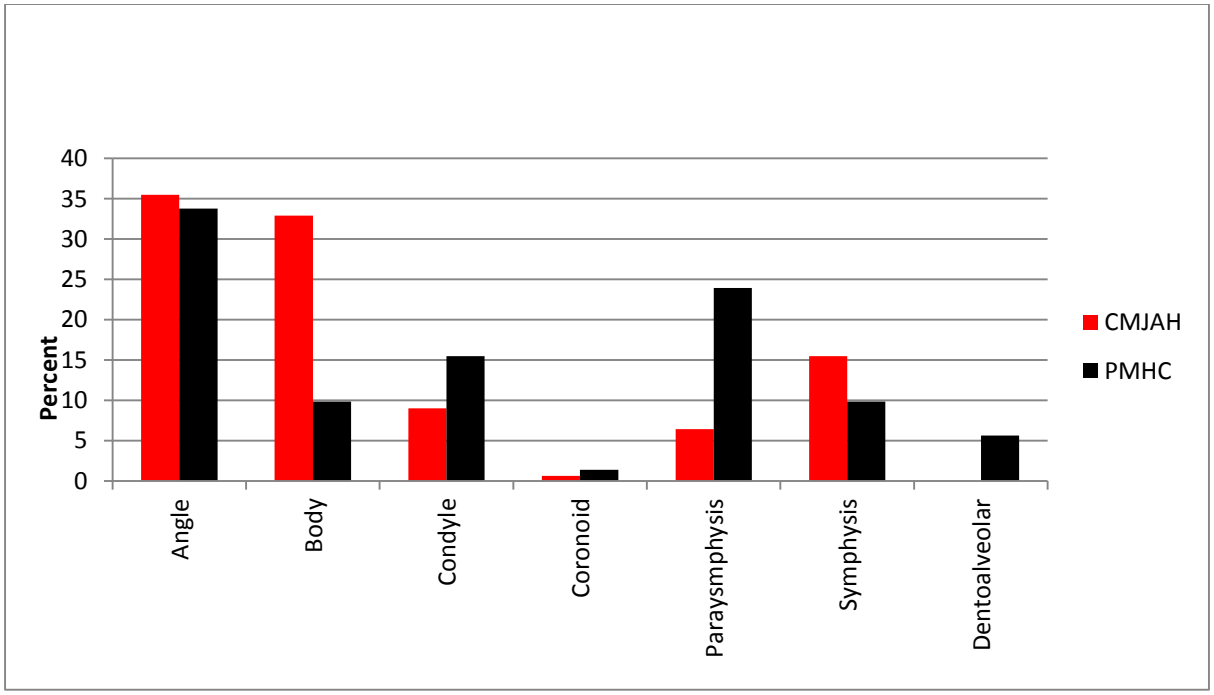

Figure 3.10.1 Comparison of fractures to different sites of the mandible by hospital

3.10.2 Comparison of side of mandibular fracture by hospital.

Angle

In overall, the 79 angle fractures sustained were nearly equal by side, 50.6% were on the right side and 49.4% were on the left side. In CMJAH, 41.8% fractures were on the right and 58.2% on the left side. It was interesting to note that in PMHC, most (70.8%) angle fractures were on the right and few (29.2%) on the left side.

Body

In overall, the 58 body fractures sustained were nearly equal by side, 51.7 % were on the right and 48.3% were on the left side. In CMJAH, 51.0% fractures were on the right and 49.0% on the left side. In PMHC, 57.1% were on the right and 42.9% were on the left.

Parasymphysis

Of the 27 parasymphysis fractures sustained in overall, 48.1% were on the right side and 51.9% on the left side. In CMJAH, 60.0% were on the right and 40.0% on the left side. In PMHC, 41.2% were on the right and 58.8% were on the left side.

Condyle

Of the 25 condyle fractures sustained in overall, 52% were on the right and 48.0% on the left side. In CMJAH, 42.9% were on the right and 57.1% on the left side. In PMHC, 63.6% were on the right and 36.4% were on the left side.

Dentoalveolar

All dentoalveolar fractures sustained in mandible were from PMHC. They were all from the right side.

Coronoid process

Of the overall coronoid process fractures, 50.0% recorded from CMJAH and the other 50.0% from PMHC. All on the right side of mandible.

3.11 Middle third fractures

Figure 3.11 below shows comparison of middle third fracture proportions between the two units. In overall, the zygoma was the most (28.1%) common affected site. When comparing the two units, a significant high proportion (42.4%) of middle third fracture was noted on the zygoma in CMJAH than 12.9% in PMHC (P= 0.0087). Dentoalveolar fracture (21.9%) followed as the second most in the middle third fractures in overall. In PMHC, 25.8% of middle third fractures were on the dentoalveolar region and 18.2% dentoalveolar fractures were recorded in CMJAH. There was no significant difference in comparing the proportions of these fractures between the two units

(P=0.462). In overall, orbital fracture accounted for 20.3% of the middle third. There was a significant difference (P=0.0010) when comparing number of orbital fractures recorded in CMJAH (12.1%) and PMHC (29.0%). In overall, Le Forte I and zygomatic arch fractures accounted 7.8% each in the middle third. The was no significant difference (P> 0.05) when comparing the fracture proportions of Le Forte I between CMJAH (12.1%) and PMHC (3.2%), and fracture proportions of zygoma between CMJAH (6.1%) and PMHC (9.7%). In overall, nasal bone fracture accounted for 11.0% in the middle third. There was no significant difference (P=0.0618) when comparing the proportions of nasal bone between CMJAH (9.1%) and PMHC (13.0%). In overall, the Le Forte II fractures accounted for 3.15% in the middle third. These fractures were all recorded from PMHC.

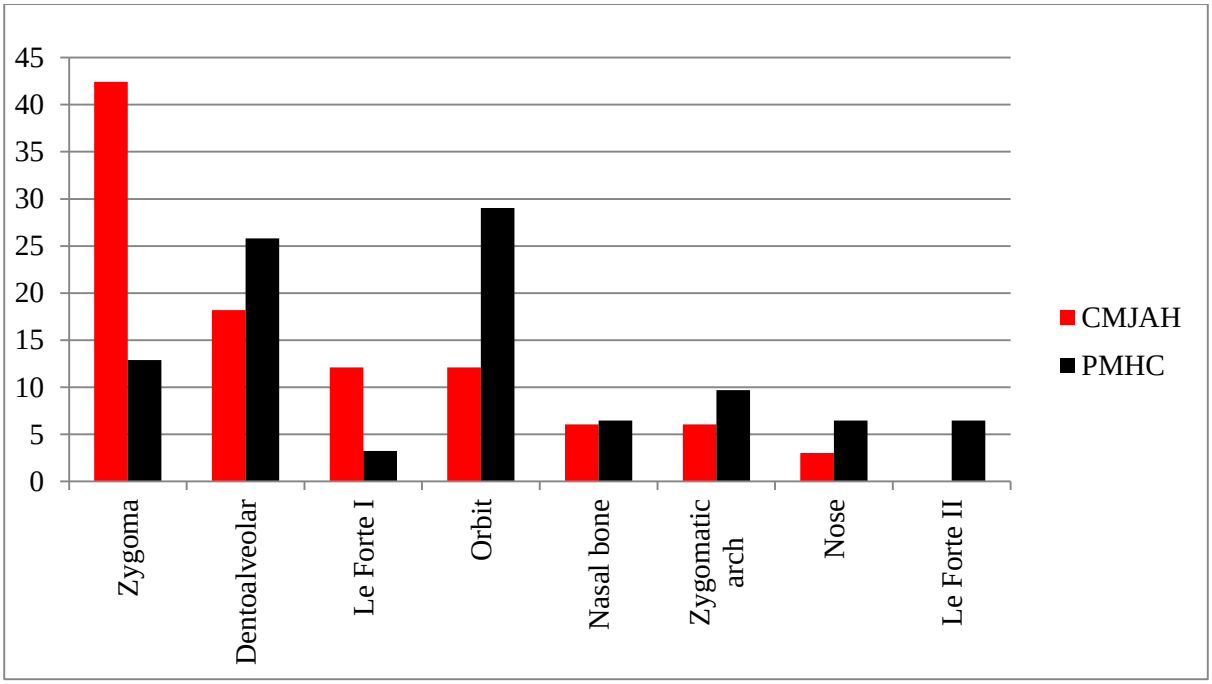

Figure 3.11 Comparison of middle third fracture proportions by hospital

3.12 Upper third fractures

In overall, the frontal fracture accounted for only 1.0% of the total fractures in both units. There was no significant difference (P= 0.088) in fracture proportions between CMJAH (1.6%) and PMHC (6.1%).

3.13 Multiple fractured sites

Multiple fractured sites accounted for 7.0% of the total 227 fractures. The difference of fracture proportions between CMJAH (5.5%) and PMHC (9.1%) was not statistically significant (P= 0.346).

3.14 Associated injuries

Some patients sustained associated injuries other than maxillofacial fractures (i.e. neurological; orthopaedic; ophthalmologic and other). There was no significant difference in proportions of these injuries between CMJAH and PMHC (P=0.878).

CHAPTER 4

DISCUSSION

In this study, more than 80.0% of the total study population were males and over 70.0% were between the ages of 20 to 39 years. These findings were in agreement with many other results from both local and international studies (Beaumont *et al* 1985; Singh *et al* 2009; Gupta *et al* 2006). The possible explanation for this finding is because these individuals are in active phase of life. They frequently take part in dangerous exercises and sports, drive motor vehicles carelessly and are more engaged in outdoor activities which are the leading cause of maxillofacial trauma (Oji 1999; Cheema & Amin 2006). The high proportion of patients (66.0%) reported at CMJAH compared with patients (34.0%) reported at PMHC during the same period of study was probably due to high density of population in Johannesburg region.

Assaults were by far the leading cause of maxillofacial fractures from our study accounting for 60.3% fractures of the total study population, followed by road traffic accidents accounting for 17.5%. This concurs with other South African studies, which reported assaults as the leading cause of maxillofacial fractures (Desai & Lownie 2010; Singh *et al* 2009). However, South African results including ours are in sharp contrast with several studies which reported that road traffic accidents are the leading cause of maxillofacial fractures in developing countries (Shayyab *et al* 2012; Ajike *et al* 2005; Adeyemo *et al* 2005; Udeabor *et al* 2014). Gupta *et al* 2009 maintain that prevailing socioeconomic, cultural and environmental factors, from one country to another and even within the same country, are the cause of variations in the aetiology of maxillofacial trauma.

When comparing the proportions of fractures by aetiology between the two units, we found that a slightly higher proportion (64.1%) of fractures due to assaults was reported at CMJAH. This finding

could be attributed to crowding and crime rate of that region, which contributes to interpersonal violence. It was interesting to note that road traffic accidents accounted for majority (22.7%) of maxillofacial fractures in PMHC, a rate higher than CMJAH (14.8%) and the overall rate (17.5%). It can be postulated that the high proportion of maxillofacial fractures due to road traffic accidents in Limpopo is attributed to poor quality roads and the common use of public transport, whereby when accident occur, many people sustain injuries. In contrast, the low percentage in Gauteng can be attributed to good quality roads and visible policing in that province. The possible reasons why assault is still the leading cause of maxillofacial fractures in South Africa could be attributed to the anecdotal evidence suggesting that poor socioeconomic factors such as poverty, unemployment and overcrowding are the major predisposing factors to interpersonal violence. Alcohol abuse appears to be the single largest contributor to violence in our country (Van de Spuy 2000). Another possible reasons why road traffic accidents still account for few maxillofacial fractures in our country could be the good quality of our roads and strict traffic law enforcement as opposed to in Nigeria, hence road traffic accidents are still the leading cause of maxillofacial trauma in that country (Adeyemo *et al* 2005; Fasola *et al* 2003).

Another interesting finding was that, there was statistically significant difference (P=.028) when comparing the proportions of patients sustained maxillofacial fractures due to sport injuries between the two units. With more patients (6.1%) reported at PMHC than patients (0.8%) reported at CMJAH. This could be attributed to inadequate recreational facilities and sporting codes in that province as opposed to in Gauteng. It is a general knowledge that soccer play and boxing are some of the risky sporting codes in terms of exposing patients to maxillofacial fractures. Unfortunately these are the most accessible sporting codes in Limpopo; hence individuals from this region have no alternative choice other than these.

The cause of the injury and more particularly the direction of the force, to a large extend will determine the site of the fracture on the mandible (Rosenberg 1976). Out of the total patients who sustained maxillofacial fractures due to assault, 65.0% of these patients were assaulted by assailants known to them but not related to them. This finding suggests that violence resulting in maxillofacial trauma mostly occur in individuals staying in the same area. This also correlate with the information during history taking that most assaults occurred during robbery, hence few patients sustained maxillofacial fractures due to assault by assailants known to them. Ten percent were assaulted by their partners; 16.7% were assaulted by their family members; 8.3% were assaulted by their friends.

We also found that a significantly higher proportion (P=0.0017) of the patients (65.8%) were injured during the night. This could be attributed to our finding that a high proportion of patients were young males between the ages of 20 to 39. It is a general observation that, these individuals tend to fill clubs and taverns during the night drinking alcohol, which appears to be the largest contributor to interpersonal violence in our society.

Another important finding in our study was that the mandible was the most affected site of the face accounting for 73.0% in the total study population, followed by zygoma. This concurs with results from many other results from both national and international studies (Singh *et al* 2009; Desai & Lownie 2010; Adeyemo *et al* 2005; Shayyab *et al* 2005). These results are however in contrast with those reported by Gupta *et al* in 2009 where zygoma was the most affected maxillofacial bone, followed by mandible. The reason for preponderance of mandible as the common affected bone in maxillofacial trauma is because of its prominence, mobility and its selection as a target of

intentional violence. In addition, the mandible is a strong bone but has several areas of weakness that are prone to fracture (Oji 1999; Hussain *et al* 1997).

It was interesting to note that, in general, majority of fractured body and angle of the mandible were recorded on the right side. This finding could probably be that patients were assaulted from behind running from imminent danger or were kicked. Our finding is the opposite of what is generally expected that most fractured body and angle of mandible due to assault are on the left side since majority of assailants are right handed, hence will aim blows to the left side of the opponent's face. This observation was noted in CMJAH where most left side angles and coronoid processes were recorded.

Zygomatic fractures mostly result from road traffic accidents (Covington *et al* 1994, Ungari *et al* 2012). As opposed to our expectation, we found that a statistically significant (P=0.0087) proportion of zygomatic fractures were recorded in CMJAH where road traffic accidents accounted for less maxillofacial fractures compared with PMHC. This could be that these fractures were sustained due to assault. The slightly higher proportion of dentoalveolar fractures in the middle third in PMHC could be readily explained by the finding that, sport injuries accounted for majority of maxillofacial fractures in that region compared with CMJAH. The low percentage of nasal bone fractures recorded in both units could be readily explained by the fact that most of the isolated nasal fractures are referred to and managed by other surgical departments.

Our study found that a significant high proportion (98.4%) of black patients reported at PMHC compared to CMJAH (87.5%), this is simply a reflection of the demographic profile of that province. Another finding from this study was a high unemployment percentage (60.0%) of patients reported at PMHC, this finding supported the general observation that Limpopo province is one of the poor without job opportunities. It can be postulated that, because these patients are not working , thus have all the time and consequently are exposed to factors that lead to maxillofacial trauma like alcohol and interpersonal violence. It was not surprising to found that the 3.6% whites patients of the total population was recorded at CMJAH, this because of mixed ethnicity and economic opportunities in that province.

CHAPTER 5

CONCLUSION

Most of our findings were consistent with many other results from various studies from South Africa. We found that maxillofacial fractures occurred most commonly in young adult males in the age group of 21 to 40 years, and male to female ratio was higher, a finding that concurs with many studies in our country. There is no apparent shift from assault as the leading cause of maxillofacial fractures in South Africa over a period of many years, unlike in most other developing countries where road traffic accidents have replaced assault as the major cause of maxillofacial fractures. This confirms our country's high crime rate and the violent nature of our society, this probably due to high unemployment rate amongst youth; crowding and poverty. The solutions for these problems should start with poverty eradication; enforcing stricter laws on alcohol usage; education and socioeconomic upliftment.

Road traffic accidents and sport injuries accounted for more maxillofacial fractures in PMHC than CMJAH. To reduce the high percentage of dentoalveolar fractures recorded at PMHC, sport authorities need to advocate the use of mouth guards amongst soccer players. Most patients sustained maxillofacial factures during the night due to assault by assailants known to them but not related to them.

As expected, the mandible was the most common affected maxillofacial bone and the angle was the most common site involved in both units. Although majority of patients reported at CMJAH, still there was generally no significant difference when comparing the sides of fracture between the two units. Looking at the proportions of maxillofacial and oral surgeons between the two provinces, we

therefore recommend allocation of more budget and maxillofacial and oral surgeons in Limpopo to manage these complex fractures.

CHAPTER 6

References

Adeyemo WL, Ladeinde AL, Ogunlewe MO and James O (2005). Trends and characteristics of oral and maxillofacial injuries in Nigeria: a review of the literature. *Head and Face Medicine***.1(7)**:15.

Ahmed AL, Jaber MA, AbuFanas SH and Karas M (2004). The pattern of maxillofacial fractures in Sharjah. United Arab Emirates: a review of 230 cases. *Oral Surg. Oral Med. Oral Path. Oral Radio*. *Endod*. **98 (2):**166-170

Ajike SO, Adebayo ET, Amanyiewe EU and Ononiwu CN (2005). An epidemiologic survey of maxillofacial fractures and concomitant injuries in Kaduna, Nigeria. *Nigerian Journal of Surgical Research***. 7(3-4):**251-255.

Al-Balbissi AH (2003). A role of gender in road accidents. Traffic inj. Prev. 4(1):64-73.

Bamjee Y (1996). Paediatric maxillofacial trauma . *Journal of the Dental Association of South Africa*. **51**:750-753.

Beaumont E, Lownie JF, Cleanton-Jones PE and Newton NPD (1985). An analysis of fractures of the facial skeleton in the three populations in the Johannesburg urban area. *Journal of the Dental Association of South Africa*. **40**:633-638.

Cheema SA and Amin F (2006). Incidence and causes of maxillofacial skeletal injuries at the Mayo Hospital in Lahore, Pakistan. *Br. J. Oral Maxillofac*. Surg. **44(3)**: 232-241.

Conforti PJ, Haung RH, Likavec M (1993). Management of closed head injury in the patient with maxillofacial trauma. *J Oral Maxilofac Surg*. **51**:298-303

Covington DS, Wainwright DJ, Teichgraeber JF and Parks DH (1994). Changing patterns in the epidemiology and treatment of zygoma fractures: 10 year review. *Journal of Trauma and Acute Care Surgery*.**37(2)**: 243-248

Desai J, Lownie JF and Cleanton-Jones PE (2010). Prospective audit of mandibular fractures at the Charlotte Maxeke Johannesburg Academic Hospital. *SAJS*. **48(4)**: 12-126.

Fasola AO, Nyako EA, Obiechman AE and Arotiba JT (2003b). Trends in the characteristics of Maxillofacial Fractures in Nigeria. *J. Oral. Maxillofac. Surg*. **61(10):**1140-1148.

Gassner R, Tuli T, Emshoff R and Waldhart E (1999). Mountainbiking- a dangerous sport comparison with bicycling on oral and maxillofacial trauma. *J. Oral Maxillofac. Surg*. **28 (3):**188-191.

Ghaffar A, Hydei AA and Masud TI (2004). The burden of road traffic injuries in developing countries, the 1st national injury survey of Pakistan. *Public Health*. 118 (3): 211-217.

Gupta AK, Garg R, Gupta A and Bajaj K (2009). A retrospective analysis of 189 patients of maxillofacial injuries presenting to a tertiary care hospital in Punjab, India. *J. Maxillofac. Oral Surg* **8 (3):**241-245.

Hofman K, Pilmack A, Keusch G and Hrynkow S (2005). Addressing the growing burden of trauma and injury in low and middle-income countries. *Am. J public Health*. **95 (1):** 13-17

Hohlrieder M, Hinterhoelz J, Ulmer H *et al* (1993). Traumatic intracranial haemorrhages in facial fracture patients: review of 2195 patients. *Intensive Care Med*. **29**: 1095-1100

Holmgren E P, Dierks E J and Holmer L D *et al (*2004). Facial computed tomography use in trauma patients who require a head computed tomogram. *J Oral Maxillofac Surg*. **62**:913-918.

King RE, Scianna JM and Petiuzzelli GJ (2004). Mandible fracture patterns, a suburban trauma center experience. *Am. J. Otolaryngol*. **25 (5):** 301-307.

Kobusingye OC (2004). Why poor countries cannot afford to ignore road safety. *Afr. J. Trauma*. **26**

Kruger E, Smith K and Tennant M (2006). Jaw fractures in the indigenous and nonindegenous populations of Western Australia 1999-2003. *Int. J Oral Maxillofac. Surg*. **35 (7):** 658-662.

Lindqvist C, Sorsa S, Hyikas T and Santaytha S (1986). Maxillofacial fractures sustained in bicycle accidents. *Int. J Oral Surg*. **15 (1):**12-18.

Majumder B, Karmakar R, Bose T, Dasguptas S and Basu R (1996). Some host factors and seasonal variations in the fatal road accidents occurring in Eastern Suburban Calcutta. *Indian J Public Health*. **40**:46-49.

Malara P, Malara B and Drugacz J (2006). Characteristics of maxillofacial injuries resulting from road traffic accidents- a 5 year review of the case records from Department of Maxillofacial Surgery in Katowice, Poland. *Head and face Medicine*. **2**: 27.

McDade AM, McNicol RD, Ward-Booth P, Chesworth J and Moos KF (1982). The aetiology of maxillofacial injuries with special reference to the abuse of alcohol. *Int. J. Oral Surg*. **11 (3):**152-155

Nwoku AL and Oluyadi BA (2004). Retrospective analysis of 1206 maxillofacial fractures in an urban Saudin hospital: 8 year review. *Pakistan Oral Dent*.**24**:13-16.

Oji C (1999). Jaw fractures in Enugu, Nigeria.1985-1995. *Br. J. Oral Maxillofac. Surg*. **37 (2):**106-109.

Peden M, Holmgren E P, Dierks E J and Holmer L D *et al (*2004). Facial computed tomography use in trauma patients who require a head computed tomogram. *J Oral Maxillofac Surg*. **62**:913-918.

Rikhotso E and Ferreti C (2008). A retrospective audit over a six months period of condylar fractures. *South African Dental Journal*. **63**: 222-229.

Roode GJ, van Wyk PJ and Botha SJ (2007). Mandibular fractures: an epidemiological survey at the Oral and Dental Hospital, Pretoria. *J Dent Ass S Afr*. **62:** 270-2274.

Rosenberg I, Smith I. (1976). A survey of fractures of the mandible. *J. Dent. Ass. S. Afri.* **31(11**): 555-567.

Shayyab M, Alsoleihat F, Ryalat S and Khraisat A (2012). Trends in the Pattern of Facial Fractures in Different Countries of the World. *Int. J. Morphol*. **30(2):** 745-756

Singh AS, Altini M and Bouckaert MM (2009). An audit of Maxillofacial Fractures in Patients attending the Medunsa Oral Health Centre, University of Limpopo, Medunsa Campus. Unpublished Msc thesis.

Snijman PC (1963). Fractures of the Bantu facial skeleton: a statistical analysis. *J Dent Ass S Afr*. **18**:555-567.

Sojat AJ, Meisame T, Sandar GKB and Clokie CML (2001). The epidemiology of mandibular fractures treated at the Toronto General Hospital: A review of 246 cases. *J Can Dent Ass*. **67**:640-645.

Thom JJ, Mogeltoft M and Hansen PK (1986). Incidence and aetiology pattern of jaw fractures in Greenland. *Int. J. Oral Maxillofac. Surg*. **15 (4):**372-379.

Udeabor SE, Akinbami BO, Yarhere KS and Obiechina AE (2014). Maxillofacial fractures: Pattern of Presentation, and treatment in University of Poet Harcourt teaching hospital, Port Harcourt, Nigeria. *Journal of Dental Surgery* .

Ungari C, Filiaci F, Riccardi E, Rinna C, Iannetti G (2012). Etiology and incidence of zygomatic fracture: a retrospective study related to a series of 642 patinets. *Eur Rev Med Pharmacol Sci*. **16**: 1559-1562

van As AB, van Loghem AJ, Biermans BFJ, Douglas TS, Wieselthaler N and Naidoo S (2006). Causes and distribution of facial fractures in a group of South African children and the value of computed tomography in their assessment. *International Journal of Oral and Maxillofacial Surgery*. **35**: 903-906