

EVALUATION OF ZYGOMATIC FRACTURE IN RELATION TO TYPE OF VEHICLE IN CENTRAL INDIA

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ABSTRACT:

Background and Objectives : Road Traffic Injuries are the sixth leading cause of death in India. With the largest number of two wheeler in our city, there is corresponding upsurge in two wheeler accidents. In the developing world, there is scanty literature on zygomatic complex fractures. The purpose of this study was to evaluate characteristics of fracture and other facial fractures in patients with zygomatic complex fractures.

Materials and Methods : Total 350 patients reported to our department between July 2010 to August 2014 were suffering from maxillofacial injuries. Demographic data, type of injury & vehicle, pattern of fracture were recorded. Statistical analysis was performed to evaluate the epidemiology of zygomatic complex fracture.

Results : Motorcycle accidents were associated with a larger number of facial fractures and predominantly affect 20-30 year-old males. Mandibular fractures (50.8%) followed by zygomatic complex fractures (44%) were most frequent maxillofacial fracture. Right zygomatic complex fracture were more common in our study corresponding to right hand driving laws.

Conclusions : This study has shown that road traffic accidents are responsible for most zygomatic complex fractures in our city. Urgent enforcement of road traffic legislation is therefore necessary to minimize zygomatic complex fractures due to road traffic accidents.

Keywords: Road traffic accidents, two wheeler, maxillofacial fracture, side of fracture



INTRODUCTION:

Road Traffic Injuries are the sixth leading cause of death in India with a greater share of hospitalizations, deaths, disabilities and socioeconomic losses in young and middle-age populations [1]. There is abundant literature on the

pattern of maxillofacial injuries all over the world, but reports are scanty on zygomatic complex fractures (ZC) especially, in developing world. [2,3] The zygomatic bone is intimately associated with the maxilla, frontal and temporal bones and as they are usually involved

when a zygomatic bone fracture occurs it is more accurate to refer to such injuries as 'zygomatic complex fractures'^[4] They can occur isolated or in combination with other serious injuries, including cranial, spinal, upper and lower body injuries. The incidence of zygomatic complex fracture has a proportionate increase with rise in the facial bone fractures associated with the ever escalating hazards of modern transportation.^[5]

Various factors during injury affects the pattern and incidence of injury like age, sex, speed, side of direct hit, alcohol or drug abuse ^[6,7] , activity of the patient(driver, passenger, pedestrian)^[8], position of patient in the vehicle, & use of mobile during driving, type of vehicle,^[8,9] and use of safety measures like-seat belts^[8]& helmet^[10]. From a broader perspective, increasing individual modes of transport, heterogeneous traffic mix, rapid addition of high speed vehicles and less emphasis on the safety of vulnerable road users(VRUs) are some contributing factors^[11]. Increasing speeds, non-use of helmets drinking and driving, poor visibility, failure to implement safety laws and poor trauma care are some factors recognized in India.^[11]

The study aims to determine the incidence of zygomatic complex fractures in facial trauma taking into consideration various parameters like, type of vehicle, position of patient- driver or pillion rider, speed, use of safety measures like helmet, seatbelt, consumption of alcohol or drug.

The purpose of the study is to evaluate incidence of zygomatic complex fracture

based on mechanism of injury, thus providing a database based on which preventive measures can be formulated.

MATERIAL AND METHODS:

All the patients reported to our unit between the year July 2010 to August 2014, were evaluated for facial trauma involving zygomatic complex fractures.All the patients were evaluated clinically with detail case history and data were gathered. Imaging modalities like X-ray, CT scan were used to diagnose. Patient inability to follow instruction of the study protocol or unable to comprehend information about the study and give voluntary consent were excluded from study.

Data was segregated based on different variables like age groups, etiology of trauma, type of vehicle, type of maxillofacial fracture, zygomatic process involved, side of ZMC(zygomatic maxillary complex) fractured, driver or pillion, speed of vehicle and alcohol consumption at the time of injury. Etiology of trauma included RTA(road traffic accident), RTA due to collision with animal, fall at home(stumbling),fall from height, trauma at work and other miscellaneous cause. Maxillofacial fractures were divided into isolated ZMC, ZMC & associated fracture and other fracture (not associated with ZMC).

Statistical analyses were performed to study epidemiological information in case of zygomatic complex fracture and other associated maxillofacial fractures. Data was entered into an IBM compatible

computer and analysed using the software SPSS version 20 (SPSS Inc.). Simple frequency charts, mean and standard deviation, chi-squared statistics & Fisher's exact test were used as appropriate. Statistical significance was inferred at P-levels < 0.05.

RESULT AND DISCUSSION:

In this study, records of patients of maxillofacial trauma were evaluated. Total of 350 patients of maxillofacial trauma reported to our department. Zygomatic complex fracture occurred in 154 out of 350 (44%) cases of all maxillofacial injuries.

Age

Patient from 4-71 years were included in the study. Mean age was found to be 30.9 ± 11.78 years. Maximum maxillofacial injury occurred in third decade of life. (figure 1, table 2)

Sex

Among all the patient included in our study, there were 304 male (86.9%) and 46 female (13.1%). Male to female ratio was 6.6: 1. (table 1)

Etiology of trauma & ZMC fracture

On analyzing, etiology of trauma resulting in zygomatic complex fracture we found that road traffic accident involving vehicle (n=132, 85.7%) resulted in maximum fracture. (Figure 2)

Pattern of maxillofacial injury

Among all maxillofacial injury isolated ZMC fracture were present in 75 cases

(21.4%) of cases. & ZMC with other associated fracture 80 (22.9%) (figure 3)

Associated fracture with ZMC

Among the Associated fracture, mandible was most common (n=41). Least common was observed in maxilla (n=1). (Figure 4)

Maxillofacial fractures not associated with ZMC

Other fracture included maximum number of mandible fracture (178) out of which 169 were isolated mandible fracture. Least was observed in frontal bone (1), Lefort II (1) & Lefort III (1).

Type of vehicle & side of fracture

Among the road traffic accidents two wheeler involvement was most common (94.02%). (Table 3, figure 5)

On comparing the side involvement in two wheeler and four wheeler, we found that in two wheeler injury right side fracture were proportionately higher (62.7%). (table 4, figure 6)

Pattern of ZMC

On studying the pattern of ZMC in 154 cases, maximum number of times infraorbital rim (n=123) was fractured and frontal process of zygoma were fractured in least number of cases (n=41). (figure 7)

Zygomatic complex fracture based on patient position- driver or pillion

We found that among the isolated ZMC 87.6% were driver and rest were pillion.

Speed

Among the zygomatic complex fracture most of the trauma occurred at the speed of 40-60 km/hr. (table 5)

Alcohol

Among the patient who sustained zygomatic complex fracture 58.4% were under the influence of alcohol. (figure 8)

Protective gear

None of the two wheeler patients were wearing helmet during driving.

DISCUSSION

Road accidents have emerged as one of the major causes of death of youngsters in the city of Indore; no other disease claims as many young lives as does the road accidents. The GMMN (Global mobility monitor network) project is studying the present and future mobility patterns in BRIC (Brazil, Russia, India & China) nations, beside US and Germany. They found that among the six city study, in India, Indore has the highest registered two-wheeler- 429.2 vehicles for every 1,000 people.(march 2013).^[12] According to the statistics compiled by Save Life Cycle, an NGO, in the year 2012, 431 college youngsters and 71 school students have died in road accidents in that year. They found that 493 casualties were due to two wheelers. Ever increasing number of vehicles, not obeying traffic laws, poor traffic management and lack of traffic sense amongst the civilians, are claiming more and more young lives -mainly

college students---in avoidable road accidents in Indore.(Dec 2012)^[13]

On evaluation of etiology of trauma, in our study, maximum number of maxillofacial fracture was caused by road traffic accidents (74.6%). Worldwide literature advocates RTA as among the most common etiological factor for maxillofacial injury. Also in developing countries, the percentage of injury caused by RTA is comparatively greater as depicted in studies carried out by Ogunlewe et^[14] al (64.5%) and Udeaboretal^[15] (91.1%).

In 1995, The World Health Organisation (WHO) has estimated that nearly 25% of all injury fatalities worldwide area result of road traffic crashes, with 90% of the fatalities occurring in developing countries^[16]. Therefore, there is an urgent need to enforce measures to the what the developed nations have done to reduce and/or prevent road traffic crashes.

We found that second most common cause was fall at home (8.6%),fall from height(8.0%) which was similar as found by Maximiana Cristiana de souzaMaliska et al(9.8%)^[17]. Assault, was found to be etiologic factor in only in 4.3% cases, which was found to be in contrast with studies published by D. Sakavicius et al (32.7%)^[18] where assaults and interpersonal violence have replaced RTA as the major cause of maxillofacial injuries.

In our study, there were certain cases which were caused due to stray animals, either they hit the patient(3 cases,0.85%)

or vehicle collided with them(1.1%) on the road. So formation of rules and regulation and its enforcement is needed to check stray animals on road.

We found most common cause of zygomatic complex fracture was road traffic accident (85.7%). Other studies which quoted road traffic accident as the most common cause of zygomatic fracture were Chowdhury and Menon^[19] 86.20%, Fasola et al 81.6%^[20] and Ugoboko et al(74.2%)^[21].

In the pediatric population (0-10 year group) only cause was found to be fall from height (figure 9). The lower incidence of facial fractures among children may be explained by the greater protection offered by the family, which leads to less exposure to injuries stemming from accidents. However, social habits change as a child grows, including school attendance and participation in sports and activities that involve bodily contact, thereby increasing the risk of trauma.

Maximum number of reported maxillofacial trauma patient were driving two wheeler (n=146,94.6%), that can be attributed to two facts - the increased number of registered two wheeler in the city and less number of four wheeler injury reported to our hospital due to socioeconomic factor.

Two wheeler injury included collision with other vehicle, slip of bike, fall from bike due to bad driving condition and bicycle injury were also included. The result was similar in distribution as shown by Trivellato et al^[10] who found 42.8% of

patient were driving motorcycle, 31.8% were driving bicycle automobile injury leading to ZMC were 7.2% which was comparable to our study 5.1% out of 154 cases of zygomatic complex fracture.

We found that RTA occurring due to two wheeler caused maximum number of right ZMC fracture (62.7%) which was supported by the findings of Punjabi et al^[22] (55%). Whereas, Trivellato et al^[10] in their study done in Brazil, found that left side ZMC was more commonly fractured. Reason can be attributed to the fact that Brazilians drive on the right side of the road, which is opposite to that of India where we drive on left side. This makes our right side of the body more vulnerable to injury.

When the pattern of maxillofacial fracture was evaluated in our study showed that, mandible fracture (178,50.9%) was the most common fracture & ZMC fractures(154,44%) was the second most common fracture, which was similar to studies done by Maliska et al(54.7%)^[17], whereas Claudio Maranhao Pereira et al^[23] found that zygomatic complex fracture (31%) was the most common facial fracture followed mandible(30%).

Zygomatic complex fracture, when evaluated based on involvement of zygomatic process in injury, we found that maximum incidence of infra orbital rim fracture (123) . It may be due to, its inability to withstand direct impact in central and medial areas of face, secondary to proximity of the underlying maxillary antrum and closely related infra-orbital canal.

Incidence of maxillofacial fractures based on the position of driver, we found that driver sustained maximum fractures (94.8%). This is supported by the study done by R. Bali et al^[24] (66.2%). This can be attributed to the fact that drivers are exposed to greater impact when compared to those who were riding pillion.

In our study, none of our patients were using helmet when driving a two wheeler or riding pillion. Moreover, seat belt was not used by any of our patients on four wheeler. This finding was similar to the study done by R. Bali et al.^[24] and highlights the negligence of traffic rules and regulation by the civilians in our city. We found that 58.4% of patients were under the effect of alcohol at the time of injury which was quite a large proportion as compared to other studies like Trivellato et al^[10] (24.3%). The association of alcohol to interpersonal violence and reckless driving is well recognized & avoiding driving under the influence of alcohol can reduce the severity of maxillofacial trauma. We found that maximum maxillofacial fracture, occurred at the speed of 40-60 km/hr in city which was within speed limit (40-60 km/hr). At higher speed, we observed greater incidence of ZMC and associated fracture

compared to isolated ZMC fracture, which shows that impact of injury increases with increase in speed.

We found that increase in incidence of maxillofacial fracture can be explained by the increase of vehicles, insufficient stress on the use of helmets and seat belts, recklessness on the highways, badly maintained roads, and lack of enforcement of traffic rules and regulations which was similarly concluded in the studies done by Ugboke et al^[21]; Fasola et al.^[20], 2003; Kobusingye, 2004^[16].

CONCLUSION:

Maxillofacial injury cause physical as well as psychological impact. This study of ours reflects various factors influencing the maxillofacial trauma and zygomatic complex fracture in particular.

In conclusion, Reducing the burden of RTA is a challenge due to its multifactorial causes, multi-partner involvement and absence of appropriate safety policies and programmes. The lessons learnt, experience gained and emerging principles needs to be applied in India. Apart from the efforts needed from Government, we should educate our young population regarding traffic rules and regulations & importance of wearing a helmet.

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FIGURES:

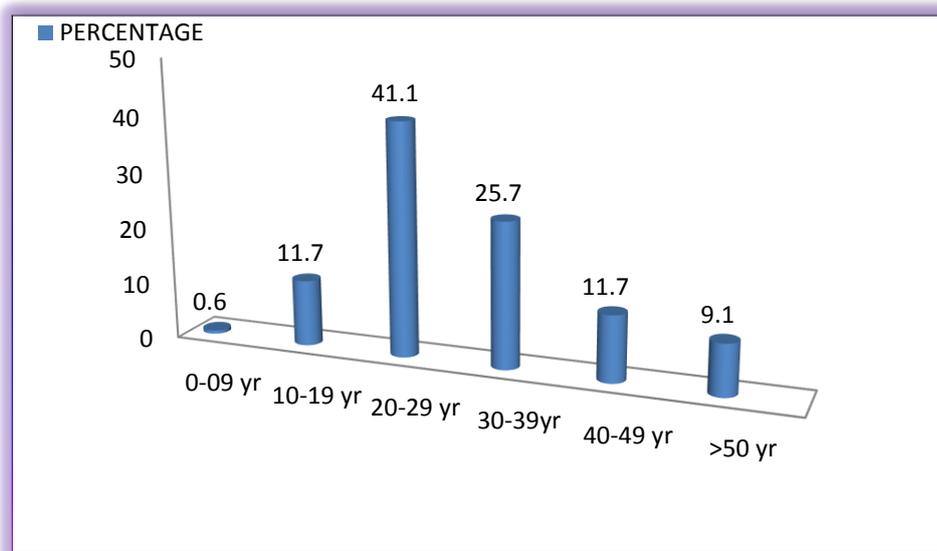


Figure 1. Age distribution in maxillofacial fractures

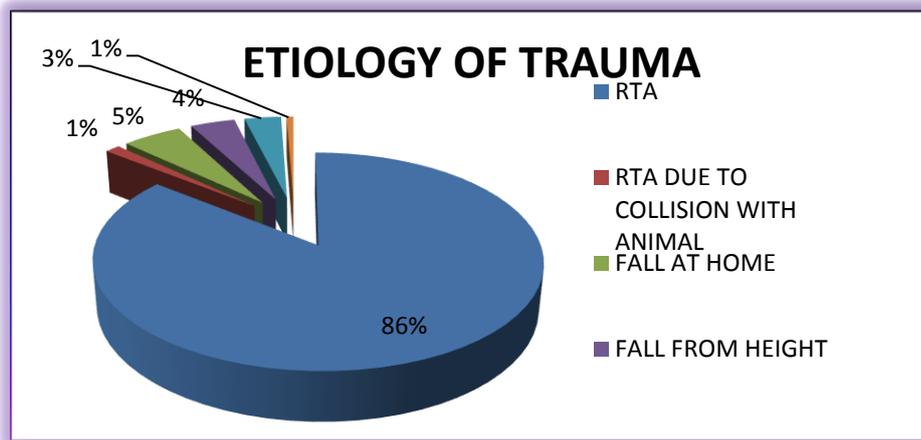


Figure.2. Etiology of trauma & zmc fractures

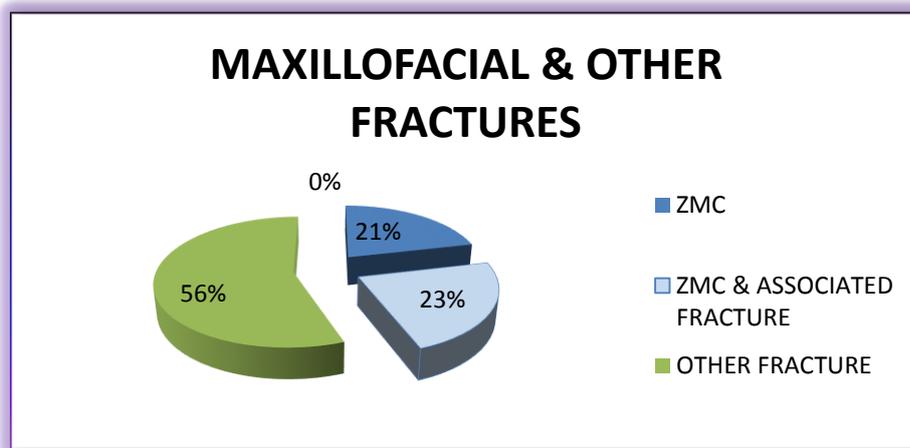


Figure.3: Pattern of maxillofacial injury

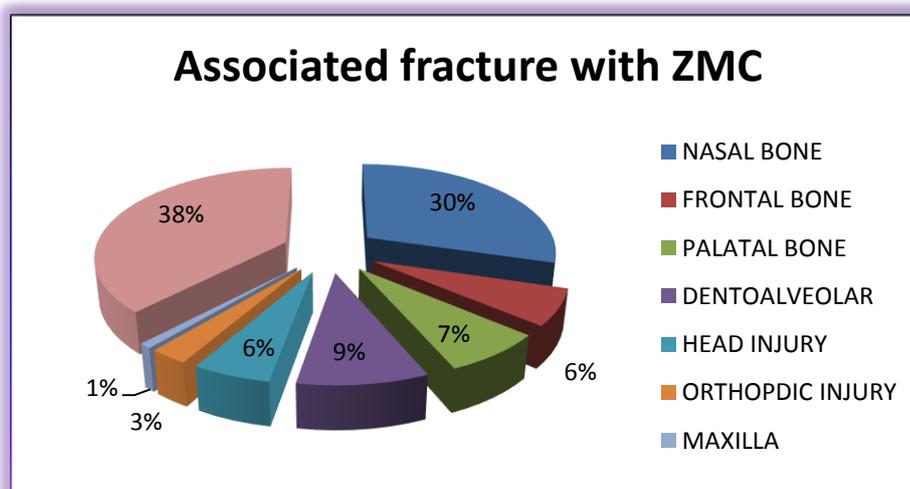
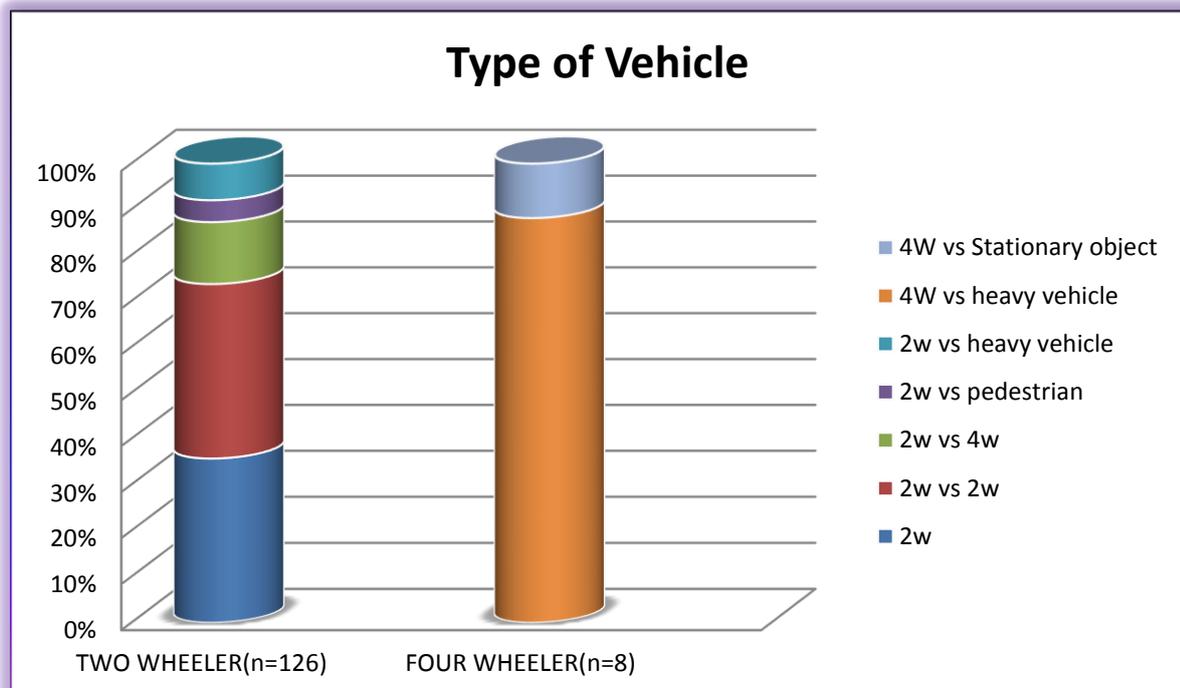


Figure 4. Associated fracture with ZMC



(2w- Two Wheeler, 4w- Four Wheeler)

Figure 5 . Road Traffic Accident And ZMC Fracture

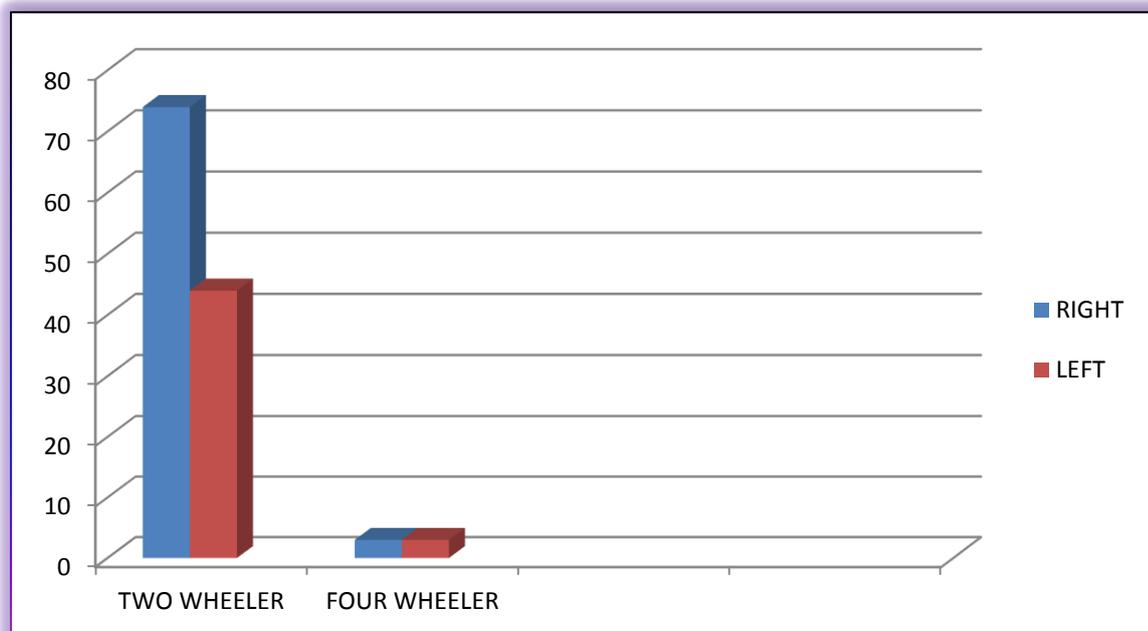


Figure 6. Two wheeler vs four wheeler: right or left side fracture

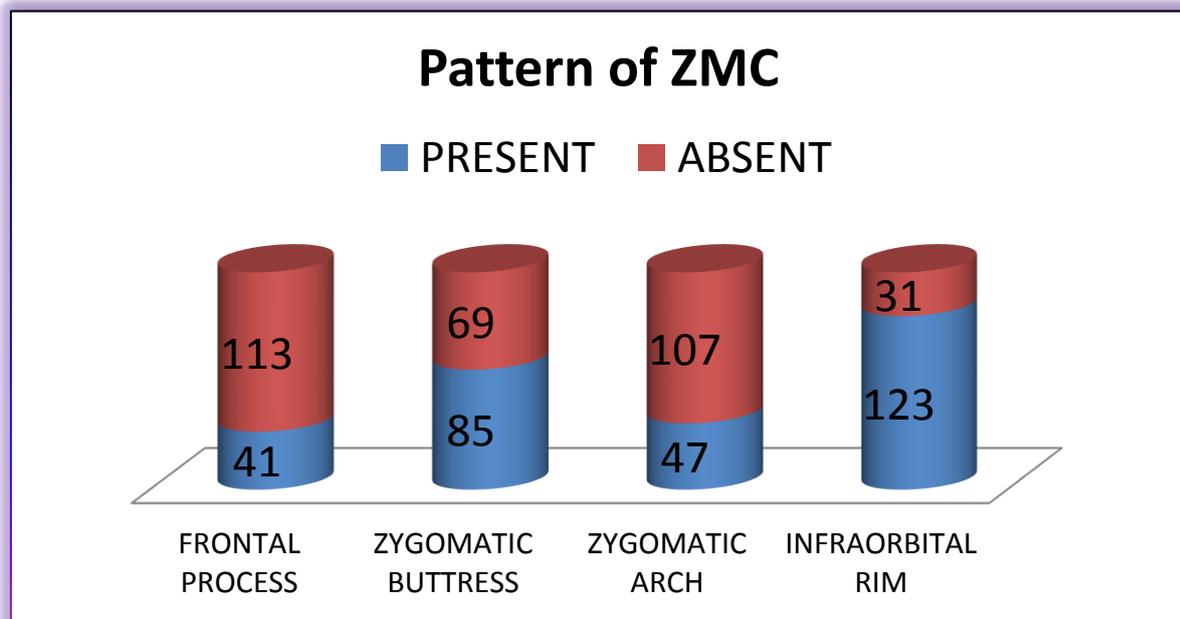


Figure.7: Pattern of ZMC

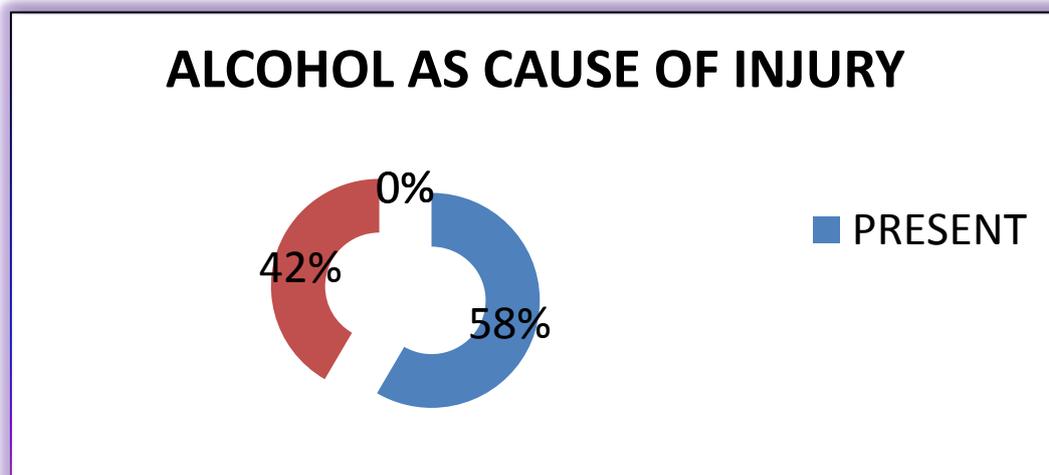
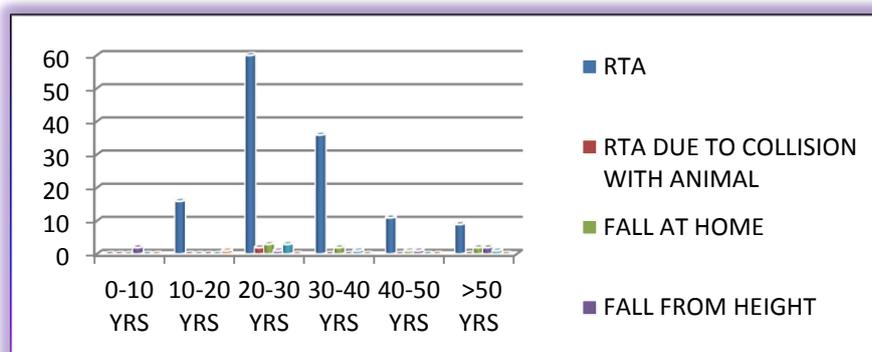


Figure 8. Alcohol &ZMC Fracture



Statistically highly significant (chi square 0.000)

Figure 9. Etiology of trauma & age distribution

TABLES:

TABLE 1. SEX DISTRIBUTION IN MAXILLOFACIAL FRACTURES & ZMC FRACTURE

SEX	TOTAL MAXILOFACIAL INJURY(%)	ZMC FRACTURES(%)
MALE	304(86.9%)	135(87.7%)
FEMALE	46(13.1%)	19(12.3%)

TABLE 2. AGE DISTRIBUTION IN MAXILLOFACIAL FRACTURES

AGE GROUPS(YEARS)	TOTAL MAXILOFACIAL INJURY(%)
0-09	0.6
10-19	11.7
20-29	41.1
30-39	25.7
40-49	11.7
MORE THAN OR EQUAL TO 50	9.1

TABLE 3. TYPE OF VEHICLE INVOLVEMENT IN RTA

Type of vehicle	RTA (%) 134(8)
Two wheeler	126(94.02%)
Four wheeler	8(5.98%)

TABLE 4. TWO WHEELER VS FOUR WHEELER: RIGHT OR LEFT SIDE FRACTURE

Type of vehicle	Right(%)	Left(%)
Two wheeler	74(62.7%)	44(37.3%)
Four wheeler	3(50%)	3(50%)

TABLE 5. SPEED & MAXILLOFACIAL FRACTURES

	10-20 KM/HR	20-40 KM/HR	40-60 KM/HR	60-80 KM/HR
ZMC	2	18	32	7
ZMC& ASSOCIATED FRACTURE	4	9	29	26
OTHER FRACTURE	7	30	78	11

Statistically significant chi square p=0.000