Discussion

Missile injuries are on the increase globally and have wide regional variations; they are a known cause of high morbidity and mortality and have become the leading external cause of non-natural deaths in some parts of the African continent. Firearm injuries are associated with substantial emotional, physical and financial burden causing an enormous human toll and imposing huge costs on the society despite outcomes that could be lethal. This is a result of the unpredictability of gunshot injuries with potentials for causing damages through wide mechanisms.

While fatal gunshot injuries can result in immediate death, non-fatal wounds can result in serious disability. The pathological effects of gun wounds do not merely depend on the caliber of weapons but on the quantity of energy transferred, the rate of such transfer and the energy flux which is influenced by the range at shot, impact velocity and body tissue resistance [(72)]. The pathological outcomes thus depend on the resultant tissue interactions and a 'high-energy' bullet may sometimes produce a low-energy transfer wound. Moreover, there have been no prior documentations on this subject in our immediate locality. This study is, therefore, had been undertaken to document our experience and the morbidities associated with gunshot injuries in order to advance ways of curbing the growing trends.

In the present study, among our patients, males had a higher incidence of missile injuries (97 %) than female patients (3%). The prevalence in the male gender is also higher in the general population in other studies: Pappas et al (1997) [(73)] estimating the prevalence of missile injuries in Department of Surgery UMDNJ-University Hospital, New Jersey, Between 1979 and 1994, reported that males were at a significantly higher risk for missile injuries than females, 75 were males of total 92 patients (82%).

Singh et al (2003) [(74)], reported that, during a period of one year, from Jan 99 to Dec 99, 60 cases of missile injuries were treated. males had a higher incidence of missile injuries (98 %) than female patients (2%).

Khan et al (1997) [(75)], In Pakistan, between 1993 and 1995, thirty-three patients having 39 fractures caused by missiles fired from a high velocity rifle were reviewed retrospectively, 31 were male and 2 female.

Lone et al (2009) [(76)], A retrospective study in India, reviewing 40 cases (30 males, 10 females) of missile cardiac injuries was conducted.

Oluyemi F. (2011) [77], In this study, Nigeria, there was a higher incidence of penetrating ocular injuries among males. Males were more frequently involved than females (ratio 4:1).

Wani et al (2011) [78], Missile cardiovascular injuries have taken an epidemic proportion in Kashmir valley since the eruption of militancy in 1990. 386 patients with missile cardiovascular injuries since Jan 1996 to Oct 2008 were studied retrospectively. They reported also that males were at a significantly higher risk for missile injuries 322(83.41%) than 64(16.58%) females.

Regarding age distribution of the current study we reported that the majority of missile injuries were young and below the age of thirty, this majority represents (72%) of all patients.

In this study, the incidence of missile injuries in the second decade was (20%) to reach the maximum in the third decade (52%) then there was a decreasing incidence starting from the age above thirty (16%) then gradual decrease in the fifth decade (9%).

The highest incidence of missile injuries was in the age range of 20-29 years. This could be explained by the fact that this age is the most active age.

This is in agreement with Odai et al (2011) [79] at the University of Benin Teaching Hospital between January 2001 and December 2005 who reported that the highest incidence was recorded among the 20-29 year age group (51.1%). In Turkey, Izci et al (2005) [80],a study carried out on 22 patients and reported that the majority of incidence were in age range <30 years.

A similar study done in Assiut Governorate reported that the highest incidence of firearm injuries and fatalities occurred in the age group 21–30 years (31.3%), followed by the age group 31–40 years (25.5%).[81] Our results are similar to those reported in ElMonofia Governorate, Egypt, during the year 2000, where the highest incidence occurred in the age group 20–30 years, and the majority of victims were male (88.6%).[82]

A retrospective study by Gamal et al (2008) [83] recorded all firearm fatalities in El-Fayoum Governorate during the 7 year period from 2000 to 2006. The study reported that the most commonly affected age group in the studied victims was the third decade (29.6%), followed by the fourth decade (25.4%). The least affected age group was above the sixth decade (1.4%). The results of the current study differ from Saleh (2008) [84] that of a study done in Qena Governorate that outlined the pattern of firearm injuries. There, the

rate of incidence was in the age group 30–40 years (49.5%), followed by the age group 40–50 years (25.2%). No victims were younger than 20 years, and most of the victims were male (94.2%).

In Teaching Hospital Sagamu (OOUTH), South Western Nigeria, Ayoade et al (2006) [85], 77 patient were reviewed. The age range was 3 years to 68 years, 32 patients (41.6%) were in 20-30 years age group. Ogwang (1999) [86], A prospective study of 15 consecutive patients admitted with high velocity missile injuries at Lacor hospital during 1 year, reported also that the incidence of injuries were in ages ranged from 2 to 33 years (mean 24.4 years). Singh et al (2003) [74], noted that the incidence of missile injuries were common for patient, their average age was 25 years.

Sajid et al (2013) [87], study was conducted at Allama Iqbal Memorial Teaching Hospital, from 2008 to 2012. study included 1240 injured, The most commonly affected age group was third decade of life, 498 cases (40.1%) followed by those in the fourth decade 272 cases.

Regarding the occupation of the patients with missile injuries included in the present study we found that the majority were unemplyed (44.1%), which can be attributed to increase of unemployment rate among our community at present time.

The second higher incidence (36.3%) was found in manual workers who represent a great sector of the community seek a better living conditions.

As regarding the hemodynamic stability of the current studied cases most of them (90%) were hemodynamically stable and only (10%) were hemodynamically unstable this may be due to fast arrival, good and rapid control of the bleeding. While fatal injuries from gunshot usually fatal on spot in some cases.

Such data are similar to those of Abrar et al (2011) [88] whose study was conducted both prospectively and retrospectively at Kashmir Institute of Medical Sciences, Srinagar, India over a period of 8 years, reported that 88 % of missile injuried parient were hemodynamically stable and only (12%) were hemodynamically unstable.

In this study, there were 484 patients (95.46 %) were admitted to our institution with a GCS score of 13-15, 9 patients (1.78%) had a GCS score of 9-12, 4 (0.78%) had GCS scores of 6-8 and 10 (1.97%) had GCS scores less than 5.

Almost all other studies agree with our results. In Aga Khan University Hospital between 1998 and 2011, Khan et al (2013) [89] carried out a retrospective review for 51

missile injured patients. The majority of 23 patients out of 51 had a Glasgow Coma Scale (GCS) score of 13–15, 6 patients had a GCS score of 9–12, and 22 patients had a GCS score of 3–8 on admission.

This is also similar to experiences in Tae-Won et al (2007) [90], whose study was conducted over a period of 22 years. There were (53.8%) patients with a GCS score of 13-15, (15.4%) patients had a GCS score of 9-12, (23.1%) had GCS scores of 6-8 and (7.7%) had GCS scores less than 5.Harjinder (2004) [91], reported that the majority of missile injuried patient (65.2 %) had a Glasgow Coma Scale (GCS) score of 12–15. Anglin et al (1998) [92], concluded that (11.1%) patient had a GCS < 15, and (88.9%) had a GCS = 15.

Regarding the injured sites of body, in this study the majority were the extrimities of which the lower and upper limb (22.58%) and (21.35%) respectively, and the second order were in head (15.38%), then shows descending order in abdomen (11.51%), then slightly descending order in chest, eye, and neck (10.54, 9.49, and 5.18 %) respectively. The lowest incidence was seen in back, gluteal region, spinal cord, inguinal region, and scrotum.

This finding agrees with Ojo et al (2007) [19], whose study was conducted on patients with gunshot injuries in Tertiary Nigerian hospital. They reported that, the parts of the body commonly involved were the lower limbs in 45(37.8%) patients, upper limbs in 21 (17.6%) patients and then abdomen in 13 (10.9%) patients while the least involved locations were the gluteal region, perineum, and other body regions (11.7%) patients.

A similar situation was also described in Southwest Nigeria by Aigoro and Abass (2013) [93] where the lower limb was the most common anatomic region affected (39.1%). The other body regions affected were upper limb (30.4%), Head & Neck (15.2%), Abdomen (6.5%), Chest (2.2%), Trunk(back) (2.2%). 4.4% of patients had multiple sites of GSI. Which agrees also with findings from kano and calabar studies in Nigeria [94, 95], but differs from findings from Durban, South Africa [96], where abdominal injuries predominated. This implies that The common sites of GSW injury were abdomen (26.6%), upper/lower limbs (25.3%) and chest (8.8%). .

While it is not in agreement with Gamal et al (2008) [83] in El-Fayoum Governorate, the most common site of injury was chest 29.6% followed by abdomen the hand and buttock. In another study the most common site of entrance was in chest 32% of total GSI. Also in a similar study by Saleh (2008) [84] whose study carried out in Qena Governorate in Egypt, which reported that most common site of entrance wounds were chest and abdomen representing 23.3% and 23.4% respectively.

Regarding the second order of injured sites of body, in our study were in head (15.38%) this is not in agreement with Mohammed et al (2005) [94] study. A retrospective analysis of patients with gunshot injuries seen at five major government hospitals in Kano metropolis over a four year period (1999-2002). The most commonly injured body regions were the lower limbs (31.6%), but the second order were in chest (15.6%), then upper limbs (9.4%) and head (9.0%).

In our study, As for the lower limbs injured mostly, the thighs mainly were the most frequent affected part this agrees with finding by Mohammed et al (2005) [94] study.

Regarding the treatment of injuried patients, the highest incidence was sterile dressing (32.87%), then repair of rupture glope (17.30%), then arterial exploration and Cold and hot dry compesses on eye were equally (9.00%), then stitching & dressing (8.65%), then abdominal exploration (7.96%), , and summation of other surgical interference equal (15.24%). This means that the majority of patients were treated surgically.

Such data are similar to those of Petkov et al (2008) [97] who reported that, the majority of patients (85.7%) were treated surgically. Wound exploration and debridement were the mode of treatment in the majority of cases.

On the contrary in Nigerian, Ogunlusi et al (2006) [98], reported that the majority of gunshot injured patients treated by wound dressing (92.2 %)

Regarding the outcome of the victims of high missile injuries, we noticed that 425 (84 %) patients of total 507 patients were discharged with morbidity, 13% discharged cured and the mortality was 3%. this concluded that morbidity and mortality rates were high where high-velocity weapons causing more complicated injuries that task the experience of the attending surgeon. Low-velocity bullets result in low morbidity and mortality, as compared with injuries from high-velocity missiles [99].

Almost all other studies agree with our results. In Istanbul, Turkey by Kalemoglu et al (2006) [99], studied the pattern of gunshot injury in the Gulhane Military Medicine Academy Haydarpasa Training Hospital between March 2001 and March 2004. They concluded that the gunshot injuries constitute the group of trauma, which are the high morbidity and mortality rates. It is also reported that the mortality rate were 8.4%, which is slightly higher than the rate quoted by Katchy et al [100] and our results.

Ojo et al (2007) [19], whose study was conducted on patients with gunshot injuries in Tertiary Nigerian hospital. They reported that, Morbidity from gunshot injury is substantial leading to admissions in 73.9% of the patients and a mortality of 3.36%.

Chinnery et al (2011) [101], conducted their study on patients with gunshot wounds of the pancreas treated from 1976 to 2009 in Cape Town, South Africa. They reported that morbidity and mortality rates were high after gunshot injuries to the pancreas.

Izci et al (2005) [102] using a retrospective clinical study about the outcomes of penetrating craniocerebral gunshot wounds (PCGW) with respect to the trajectory of penetration in the axial plane. They also noted high mortality and morbidity rates among gunshot injured patients.

In Sofia, Bulgaria, Petkov et al (2008) [97] their study included the management of diffuse brain edema after craniocerebral gunshot injury and other types of brain injuries represents a frustrating endeavor for the neurosurgeons and intensivists. They reported that mortality and morbidity rates were high.

In Tanzania, Chalya et al (2011) [103] concluded that gunshot injuries (GSIs) are a unique form of trauma that are on increase all over the world and contribute significantly to high morbidity and mortality, where the mortality rate was 8.3%.

Nathoo et al (2002) [104], conducted a retrospective analysis of 1069 patients with gunshot wounds (GSW), admitted over a 14-year period (1986-2000). Five of 26 patients died (19.2%). Severe morbidity was noted in 9 of 21 surviving patients (42.8%).

Regarding the relation between age group and patients outcome, patient aged (20 - < 30) years are the highest group who were cured (67.2%), then the second order were age group (30 - < 40) years (17.9%), and disapeared for group > 50 years. Inadition, patient aged (20 - < 30) years are also the highest group who were discharged with morbidity (48.7%), then the second order were age group (10 - < 20) years (21.6%), then groups aged (50 - <60) and (> 60) were the lowest.

As regards to mortality, patient aged (20 - < 30) years are also the highest group (66.7%), then the second order were age group (10 - < 20) years (20%), and disapeared for groups (30 - < 40) and > 50 years.

Regarding the relation between hemodynamic stability and outcome, highest incidence of patient who were cured or discharged with morbidity were hemodynamically stable

(70.1%) and (96.7%) respectively. As regerds to mortality all patients are hemodynamically unstable.

Regarding the relation between the GCS and outcome of missile injured patients, all patients with GCS score 6 - 8 discharged with morbidity, for GCS score 9 - 12 all patient cured. In patients with a GCS score 13–15 there was a 13 % cured rate and 87 % morbidity rate.

Such data are similar to those of Abrar et al (2011) [88] whose study was conducted both prospectively and retrospectively at Kashmir Institute of Medical Sciences, Srinagar, India over a period of 8 years, reported that In patients with a score of 3–7 there was a 66.7% mortality rate, and none of the patients had a good outcome. In patients with a GCS score of 8–12 there was a 15.0% mortality rate, and 71% of the patients had minimal or no deficits. There were no deaths in the group with GCS scores of 13–15, with all patients having a normal outcome.

This is also similar to experiences in Tae-Won et al (2007) [90], whose study was conducted over a period of 22 years. The admission GCS score was the most valuable prognostic factor. The best results were found to be in patients admitted with an initial GCS higher than 13. There were no favorable outcomes in patients admitted with a GCS of 8 or lower. patients with GCS score <5, they were arrived dead.

This is in agreement with Petkov et al (2008) [98] in Military Medical Academy, Department of Neurosurgery, Sofia, Bulgaria, who reported that low GCS scoring (3-6) corresponds to higher morbidity and mortality rates .Among other seven patients with primary GCS scoring 7-10 with 5 had good outcome and 2 with moderate disability. Four patients died in early postoperative period, all of them were between 3 and 5 GCS scores.

Izci et al (2005) [102] using a retrospective clinical study for patients with PCGW 1993 and 2003 at the Department of Neurosurgery, Maresal Cakmak Military Hospital. All of the patients with GCS score <5 on arrival died.

Grahm et al (1990) [105] reported also that no patient with a GCS score of 3 to 5 had a satisfactory outcome; however, outcome progressively improved as the GCS score increased. They conclude that all patient's with GCS score 3 to 5 and no operable hematomas are present, then no further therapy should be offered. All patients with a GCS score greater than 5 should receive aggressive surgical therapy.

SUMMARY

Gunshot injuries (GSIs) are a special form of trauma that are on increase all over the world and contribute significantly to high morbidity and mortality. Gunshot wounds impose a continuous burden on community and hospital resources around the world. Missile that travels in a speed exceeding 2,500 feet per second considered as high velocity missiles. This study was retrospective study to describe and analyze the pattern of morbidity & mortality of missile injury victims, management of the cases and the clinical evaluation of the cases of missile injury admitted to the emergency department in Alexandria Main University Hospital through a period of six months starting from the 25th of January to 25th of July 2011. During this period the study of 507 victims who constituted our study cases.

The data was extracted, including patient demographic data, hemodynamic stability, clinical examination, site of injury, investigations, management, and outcome. The data was entered and analyzed in Microsoft Excel®.

A group of 507 injured patients who sustained GSI, 491 were males and 16 were females and the most frequent age group was third decade of life. 90% of patients were hemodynamically stable. Limbs were the most common site (43%) to be affected by missile injuries and thigh were the most frequent site showed positive finding in the plain x-ray. 425 (84 %) patients were discharged with morbidity, 13% discharged cured and the mortality was 3%.

GSI victims discharged with disability weather major disability with loss of function or minor disability with preservation of function. Therefore, there is need for educational effort and community, societal curriculum to reduce GSI which is not possible without addressing root causes and bringing such changes which may minimize mortality, disability and cost to community.