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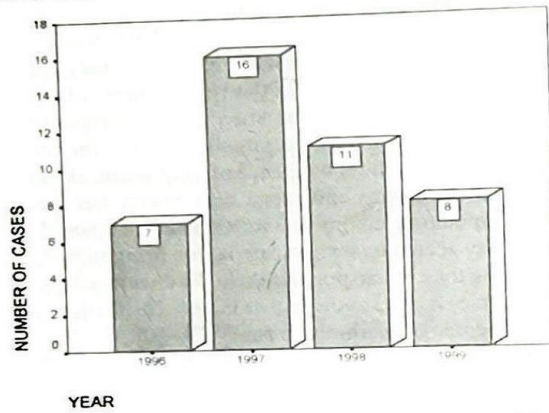


shown in Table 1.

**Table 1: Types of guns used to injure 42 patients reviewed**

Types of guns	Number of cases	%
Pistol	34	81.0
Airgun	4	9.5
Not stated	4	9.5
Total	42	100

The annual incidence of GSI seen in our hospital over the four year period is shown Fig. 1 The means annual admissions for GSI was  $10.5 \pm 4.04$  (range = 8-16 cases/annum)



**Fig. 1: Bar chart showing the annual incidence of gunshot injuries over a four year period.**

Wounds of entry and exit were present in 28 patients (66.7%) while 14 patients (33.3%) had no wounds of exit and the bullets were retained in various parts of the body. The distribution of the wounds of entry is shown in Table 2.

**Table 2: Distribution of the wound of entry in 42 patients who sustained GSI**

Locations of wounds Of entry	Frequency	Percent
Left lower limb	13	31.0
Right lower limb	6	14.3
Right upper limb	5	11.9
Left upper limb	4	9.5
Head	3	7.1
Left anterior chest wall	2	4.8
Anterior abdominal wall	1	2.4
Neck	1	2.4
Posterior abdominal wall	1	2.4
Right anterior chest wall	1	2.4
Right lateral chest wall	1	2.4
Both lower limbs	1	2.4
Right posterior chest wall	1	2.4
Left lateral chest wall	1	2.4
Not stated	1	2.4
Total	42	100

From the data, it is evident that the left lower limb was the predominant target (13/42, 31%). The two lower limbs were hit in 20 cases (47.2%). The regions of the body involved in GSI were as follows: lower limbs - 47%, upper limbs - 22%, chest -

13%, head-7%, abdomen-4%, and neck-2%. The area involved was not documented clearly in one case. In two cases each (2.4%), the bullet was lodged in the right

**Table 3: Types of gunshot injuries\* sustained in 42 patients**

Types of injuries	Frequency	Percent
Superficial wound	27	64.3
Fractures tibia/fibula	4	9.5
Nerve injury	4	9.5
Haemothorax	4	9.5
Haemotoma	3	7.1
Fractures femur	3	7.1
Spinal cord injury	2	4.8
Gut perforation	3	7.1
Haemopneumothorax	2	4.8
Fractured humerus/ulna	1	2.4
Fractured metatarsal	1	2.4
Fractured skull	1	2.4
Fractured styloid process	1	2.4
Quadriplegia	1	2.4
Facial injuries	1	2.4
Urethra injury	1	2.4
Vascular injuries	1	2.4
Fractured scapula	1	2.4
Head injury	1	2.4
Liver injury	1	2.4
Muscles damage	1	2.4
Cerebral oedema	1	2.4
Kidney injury	1	2.4
Oral cavity injury	1	2.4
Paraplegia	1	2.4

\*Some patients had multiple injuries

Most of the GSI sustained by the patients were superficial (64.3%) without injury to the internal organs. Eight of the patients (19%) had fractures of the limb bones. Haemothorax and haemopneumothorax were observed in 9.5% and 4.8% of the patients, respectively. One patient each (2.4%) developed paraplegia and quadriplegia, respectively, following GSI. Some of the patients had multiple injuries depending on the trajectory of the bullet.

The resting position of the bullet as evidenced on plain radiography is shown in Table 4.

**Table 4: Resting positions of the bullet in patients with GSI**

Resting position of bullet	Frequency	Percent
Bullet exited	28	66.7
Not stated	3	7.1
Intra abdominal	2	4.8
Left lower limb	2	4.8
Right anterior chest wall	2	4.8
Head	1	2.4
Left anterior chest wall	1	2.4
Pelvis	1	2.4
Right lower limb	1	2.4
Right upper limb	1	2.4
Total	42	100



# Gunshot injuries in adults in the Abha region of Saudi Arabia

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## Summary

In the four-year period from 1996 to 1999, 42 adult patients (age 12 years and above) were admitted to the Assir Central Hospital, Abha, Saudi Arabia, following gunshot injuries. The mean annual admissions for gunshot injuries was  $10.5 \pm 4.04$  (range = 8-16 cases/annum). All the patients were males. The distribution of the patients' nationalities were: Saudis-66.7%, Yemenis 11.9%, Ethiopians 11.9%, Eritreans 7.1% and Sudanis 2.4%. In 38 cases, others shot the patient, while only one patient (2.4%) admitted to shooting himself accidentally. A pistol was used in 81% of cases while an air gun was used in 9.5% of the cases. Wound of entry analysis showed that gunshots were to the lower limbs in 20 cases (47.2%), the upper limbs in 22% and the chest in 13% of cases. Gunshots to the head and neck occurred in 7% and 2% of cases, respectively, while the abdomen was hit in 4% of cases. The injuries sustained included: superficial wounds (64.3%), haemothorax (9.5%), nerve injury (9.5%), lower limb fractures (9.5%), haematoma (7.1%), liver and kidney injuries (2.4%, respectively). Management included wound debridement and suturing (76.2%), thoracostomy tube drainage (14.3%), bullet removal (11.9%), internal fixation of fractures of long bones (9.5%), laparotomy and repair of gut (7.1%), nerve repair (4.8%), ulnar nerve graft (2.4%), and external fixation compound fracture of the tibia (2.4%). All the patients survived. The mean hospital stay was  $15.45 \pm 23.06$  days (range = 1-150 days). Although gunshot injuries are increasingly being reported from Saudi Arabia, the injuries are accidental and the morbidity appears to be low.

**Keywords:** Gunshot injuries, wound of entry, wound of exit, low velocity missile, air gun injuries.

## Résumé

De 1996 à 1999, 42 adultes (âges de 12 ans et plus) ont été admis au centre Hospitalier d'Assir, Abha, Arabie Saoudite après des blessures par balles. La moyenne annuelle d'hospitalisation due aux blessures par balles était de  $10,5 \pm 4,04$  (intervalle 8-16 cas/an). Tous les patients étaient du sexe masculin. Les nationalités étaient comme suit. Arabes 66,7% et Soudanais 2,4%. Dans 38 cas, les patients ont été tirés dessus alors qu'un seul patient s'est tiré dessus (2,4%) & accidentellement. Le pistolet était utilisé dans 81% des cas alors qu'un fusil était utilisé dans 9,5% des cas. L'analyse des entrées de balles montre que les tirs arrivaient sur les membres inférieurs dans 20 cas (47,2%), membres supérieurs 22%. Poitrine 13%, tête et cou 7% et 2% respectivement, ventre 4%. Les blessures subies comprenaient. Plaies superficielles (64,3%), hémotorax (9,5%), blessure du nerf (9,5%), fracture des membres inférieurs (9,5%) hématome (7,1%), fore et reins (2,4%) respectivement. La gestion comprenait le débridage et la suture des blessures (76,2%), thoracostomie du tube de drainage (14,3%) enlèvement des balles (11,9%) fixation interne des os longs (9,5%), laparotomie et réparation des intestins (7,1%), réparation de nerfs (4,8%) greffe du nerf ulnaire (2,4%), fixation externe des fractures graves du tibia (2,4%). Tous les malades ont survécu. La

durée moyenne d'hospitalisation était de  $15,45 \pm 23,06$  jours (intervalle 1-150 jours) bien que les blessures par balles augmentent et sont rapportées en Arabie Saoudite, les blessures sont accidentelles et la morbidité paraît être basse.

## Introduction

There is an increase in firearms injuries reported from developed countries with associated high morbidity and mortality [1-4,10]. In many cases, the gunshot injuries (GSI) are due to homicides[2], suicides[2], assaults[3], while in a few cases they are non-intentionally self-inflicted[3]. In the United States of America, the constitutional right to bear arms and the relatively easy availability of firearms are responsible partly for the high incidence of GSI. The high incidence of drug abuse, alcoholism, stress-related conditions and racial disharmony has created a high-risk population among whom GSI are rampant[5]. The relatively easy access to sophisticated guns firing high velocity bullets among the civilian population in the developed countries such as America has led to the higher incidence of lethal injuries and a high degree of morbidity from GSI[6-10].

In Saudi Arabia, there are no gun shops, but the law requires licensing of all firearms regardless of the mode of acquisition. There is a paucity of reports on firearms-related injuries from Saudi Arabia which is a relatively peaceful Islamic nation which is guided by the Islamic Sharia legal system [11-13].

The aim of this retrospective study is to examine the incidence of GSI in adults (age = 12 years and above) seen in the Assir Central Hospital, Abha, Saudi Arabia, over a 4-year period; to assess the age distribution, nationality, type of guns used, the nature and positions of the wounds of entry, injuries sustained, treatment modalities offered and outcome.

## Clinical materials and methods

This is a retrospective study. All the consecutive adult patients (age = 12 years and above) admitted into the Assir Central Hospital, Abha, Saudi Arabia, during the four-year period from 1996 to 1999 with gunshot injuries were included in the study. The data extracted from the medical records of the patients included: age, sex, nationality, aetiology of the gunshot, type of gun used, locations of the wounds of entry and exit, types of injuries sustained, management offered and its outcome, and the duration of hospital stay.

The data obtained was subjected to statistical analysis (frequencies/%) using SPSS (Statistical Package for the Social Sciences).

## Results

A total of 42 patients were admitted with GSI during the 4-year period under study. All the patients were males. The ages ranged from 14 to 70 years (mean =  $27.14 \pm 10.81$ ). The distribution of the patients by nationalities showed a preponderance of Saudi nationals - 28 (66.7%), Yemenis - 5 (11.9%), Ethiopians - 5 (11.9%), Eritreans - 3 (7.1%), and Sudanis - 1 (2.4%). The GSI were inflicted by others in 38 cases (96.1%) and accidentally self-inflicted in one case (2.4%). Information about the assailant could not be obtained in 3 cases (7.1%). The type of guns used could be ascertained in 39 cases. Pistols predominated (81%) as



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anterior chest wall, the left anterior chest wall, or the left lower limb. The management of the patients with GSI in this study is shown in table 5.

Table 5: Management instituted in 42 patients with GSI

Management	Frequency	Percent
Wound debridement and suturing	32	76.2
Thoracostomy tube drainage	6	14.3
Bullet removal	5	11.9
Internal fracture fixation	4	9.5
Laparotomy/Gut repair	3	7.1
Nerve repair	2	4.8
Not stated	1	2.4
Vascular repair	1	2.4
Fasciotomy	1	2.4
Nerve graft	1	2.4
Bone graft	1	2.4
External fracture fixation	1	2.4
Suprapubic catheter drainage	1	2.4

In 32 cases (76.2%) the patients had wound debridement and suturing. Six patients (14.3%) required thoracostomy tube drainage, while bullets were extracted in 5 patients (11.9%). The management of long bone fractures included internal fixation (9.5%), external fixation (2.4%), and bone grafting (2.4%). Laparotomy was required in three patients (7.1%) in whom gut perforations were repaired. In the three patients who had nerve injuries, one had ulnar nerve graft and the other two had nerve repairs.

All the patients survived. The mean hospital stay was  $15.45 \pm 23.06$  days (range = 1 - 150 days).

## Discussion

The annual incidence of GSI of  $10.5 \pm 4.04$  cases at the Assir Central Hospital, Abha, a level 1 trauma and referral centre, reflects the low incidence of GSI in Saudi Arabia. This low incidence contrasts sharply with the reports from the more advanced countries[6,10]. The distribution of the patients according to their nationalities merely reflects the population demographics in Saudi Arabia. The absence of racial tensions means that no particular ethnic group stands a higher risk of sustaining GSI. In the urban areas of America, racial tensions and disharmony have been identified as factors compounding the risk of GSI[5]

A report from Hunburg, Germany[2], showed that about 30 fatalities due to GSI occurred yearly of which 33.3% were homicides, 63.6% were suicides and 3% were accidental. In our series, there were no homicidal or suicidal attempts. Elfawal and Awad[12] reported an incidence of 0.35 per 100,000 populations for firearm fatalities in Eastern Saudi Arabia of which 48% were homicides, 28% were suicides and 24% accidental. Suicide by firearm was found to be 9% of 221 cases reported over a 10-year period from the Medico-Legal Centre in Damam, Saudi Arabia[11]. Foreigners comprised 70% of all reported suicide cases[11]. In a population-based study from Connecticut in America[3], the authors reported a 6% incidence of accidental shootings among children and youths up to 19 years of age. The other major causes of fatal GSI included homicide (68%) and suicides (25%). The reported hospitalization rate was 16 per 100,000 of the population while 80% of deaths occurred in the

15 to 19-year age group in the study encompassing patients 19 years and under[3]. In the state of Connecticut in the USA, it was found by Zavoski et al[3] that GSI was a major cause of death among those aged 1 to 19 years - second only to motor vehicle accidents. These very high morbidity and mortality rates reflect the social state of some of the industrialized nations. The low morbidity and absence of mortality observed in our study reflects the contrasting state of social stability and peaceful coexistence in Saudi Arabia.

In this study, 76.2% of the patients with GSI required only wound debridement and suturing while thoracostomy tube drainage was performed drainage of haemo- or haemopneumothorax in 14.3% of cases. Laparotomy and repair of gut perforation was required in 7.1% of cases. This contrasts with the severe injuries such as aortic injuries[4,7], trans-axial injuries[8], pancreatic injuries[14], severe head injuries[15] and vascular injuries[16] reported from the industrialized nations where civilian violence has become an increasing problem[3,5,9].

Very sophisticated handguns firing high velocity bullets are available in the advanced countries and this result in more deadly injuries culminating in a higher morbidity and mortality. In our study, 81% of the patients were shot with pistols but these fired mostly low velocity missiles. Whereas more severe injuries are being reported from airguns in the industrialized countries[17], the 9.5% of our patients shot with air guns sustained only minor injuries. This is so because airguns in the developed countries are now being made with deadlier firing mechanisms that put them in the high velocity range (1,200 feet/sec) resulting in deeper tissue penetration and destruction[17]. The United States of America records 30,000 airgun injuries per annum[17], but airguns are not designated as firearms and thus require no licensing[17]. In the United Kingdom, there is an average of one death per year from air powered weapon injury[18]. There is also considerable morbidity from airgun injuries[13,18].

There were no deaths recorded among the 42 patients in this study. This contrasts sharply with the high mortality from GSI reported from the industrialized nations[1-5]. The difference, we believe, is due to the types of guns used and the social structure of the society. In a developing country such as Turkey where there is a degree of insurgency and easy availability of high-velocity guns an increasing number of civilians are presenting with GSI with a mortality rate of 8.95%[19].

The use of plastic bullets was introduced into Northern Ireland for riot control purposes in 1973 with some fatalities although the morbidity appeared to be lower than that recorded when conventional bullets were used<sup>20</sup>. In Saudi Arabia, riots are very rare and the need to use of plastic bullets for crowd dispersion has been virtually nonexistent.

It has been suggested that intervention strategies must be developed and implemented to reduce unintentional shootings and assaults associated with firearms and airguns[3,6,12]. Physicians and other members of the society have a role to play in instituting firearm injury prevention counseling as a routine part of anticipatory guidance[3]. It is hoped that such measures would help in reducing the incidence of GSI in the Saudi Arabian society although it is still very low compared to the incidence found in the industrialized nations.

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