MEDICO-LEGAL ASPECTS OF TRAUMATIC EAR INJURIES AND THE RESULTING PERMANENT INFIRMITIES IN ASSIUT UNIVERSITY HOSPITALS

Doaa Almaz[1], Shimaa A. Elghazally[2], Maha Abdelgaber A. Aly[3], Asmaa H. M. Soliman[1]

[1] Department of Forensic Medicine and Clinical Toxicology, Faculty of Medicine, Assiut University, Egypt.

[2] Department of Occupational and Environmental Medicine, Assiut University, Egypt.

[3] Department of ENT, Faculty of Medicine, Assiut University, Egypt.

ABSTRACT

Background: Post traumatic hearing loss has a great impact on the quality of life of individuals. **Aim of the work:** This study was done to identify the clinical and forensic aspects of ear injuries and their sequelae. **Subjects and Methods:** This study included patients with ear injuries who attended in Audio vestibular Medicine unit, ENT (Ear, Nose and Throat) clinic and the Trauma Unit of Assiut University Hospitals during a one-year period. Demographic data and injury characteristics were collected. Investigations were done for the patients to assess hearing condition to detect any permanent infirmity. **Results**: The study included 103 patients with ear injuries. More than one third of injuries were in the age group <20 years old, and (47.6%) were in the age group of 20 to 40 years old. Majority of patients were males. Temporal bone fracture was found in (63.1%) of cases. Foreign body insertion and motor car accident were significantly higher as mode of injuries in age category<20 years old. Conductive hearing loss was the most common disorder. Facial nerve and speech affections were also observed among patients. More than half of the patients completely recovered. Permanent infirmity due to hearing loss was recorded in (25.5%) of the study patients. Permanent infirmity in the present study was due to sensorineural hearing loss in (50.0%) and conductive hearing loss in (29.2%) of cases. **Conclusion:** Post-traumatic conductive hearing loss showed good outcome in affected patients while post-traumatic sensorineural hearing loss showed bad prognosis with great impact on quality of life of affected patients.

Keywords: *Ear injury, Post traumatic hearing loss, Permanent Infirmity, Disability*

Corresponding author: *Dr. Asmaa H. M. Soliman*
Email: asmaahsoliman @gmail.com -asmaahasan@aun.edu.eg
ORCID: 0009-0003-7118-9701

INTRODUCTION

Trauma represents one of the main causes of morbidity, permanent infirmity and even mortality all over the world with a great impact on the community and individuals ***(Omran et al., 2019)***. Injuries to the ear can occur as an isolated injury or may be associated with multiple injuries to the head, chest, abdomen, spine, and extremities. The most prevalent causes of ear injuries are road traffic accidents, assaults, foreign body insertion, sports accidents, and falls from height, domestic violence and abuse ***(Selvaratnam et al., 2022)***. Ear injuries have a great impact on the health, and quality of life of individuals and can result in permanent infirmities. Long term follow-up following trauma is essential. Functional impacts including interference with speech, swallowing, breathing can occur following ear trauma in addition to loss of hearing and physical impact can also occur especially cosmetic disfigurement and this could be associated with psychological impact ***(Desai et al., 2022)***. The judge will have to resort to the Forensic Medicine specialist who proves the existence of harm to the patient and if it is linked to the cause ***(Miziara, 2024)***.

The magnitude of the problem in developing countries comes from the fact that morbidity and complications associated with ear injuries are usually neglected or missed and so it is essential to rise to the level of awareness of ear injuries and its complications that can be avoided with early and effective management.

THE AIM OF THE WORK

On this background, the aim of this work was to investigate cases of traumatic ear injuries to describe the clinical demographic features and the forensic aspects of these injuries regarding

mechanism, manner, and anatomical sites of ear trauma) to identify the sequalae of traumatic ear injuries and long-term complications and if permanent infirmities developed following trauma.

SUBJECTS AND METHODS

This descriptive cross-sectional study included the patients of ear trauma attending Audio vestibular Medicine unit, ENT (Ear, Nose and Throat) clinic and the Trauma Unit of Assiut University Hospitals, Assiut, Egypt over a period of one year from the 1st of May 2023 to the 1st of May 2024. The research was approved by the Faculty of Medicine's Local Ethical Committee, Assiut University, Egypt *(code number is 04-2024-300427).*

An informed consent was requested from all patients and the obtained information were kept confidential for the purpose of scientific research only and the participants were not identified by their names in any report or publications resulting from data collected in this study. Patients were identified by being given serial numbers with all information stored privately.

Inclusion criteria: All patients presented with ear injury during the study period were examined. Detailed medical history was taken through personal interviewing regarding demographic data (age, gender, and occupation), a detailed history of trauma (cause of trauma, manner, and anatomical sites of ear trauma), history of hearing loss, ear discharge and associated tinnitus or vertigo.

Exclusion criteria: Patients with history of previous ear surgery, ototoxic drug intake, history of chronic illness or neurological disorder were excluded.

Sample Size Calculation: Sample of this study included patients admitted into Audio vestibular Medicine unit, ENT (Ear, Nose and Throat) clinic and the Trauma Unit of Assiut University Hospital, Assiut, Egypt over a period of one year, and calculated using Epi info program and calculator net.

The clinical assessment and investigations for the patients with ear trauma participating in the study were done as follow:

- Otoscopic examination to detect any abnormality in the external auditory canal, and to observe the tympanic membrane.
- Basic audiological evaluation (immitan cemetry using Immitancemeter to evaluate middle ear function, pure tone audiometry to assess hearing loss (sensorineural or conductive) and Speech audiometry to assess speech reception threshold test and speech discrimination score for each ear separately).
- Auditory Brainstem Response measurement when reliable responses via conventional audiometry were not possible, or for medicolegal issue.
- Neurological examination and computed tomography (CT scan) were done.

All the participating patients were observed and treated in the ENT Department and Trauma unit and complications during hospitalization were recorded. Follow up of the participating patients was done to detect any permanent infirmity.

Statistical Analysis:

Data entry and analysis were carried out using SPSS version 20. Descriptive statistics were done in the form of frequencies. Bivariate analysis in the form of Chi-square (X2) test was done as the test of significance to compare the variations in the proportions. Significant p-value was set at 0.05 cutoff (IBM, SPSS).

RESULTS

The present study included 103 casualties with ear injuries who attended and managed in the ENT Department and the Trauma Unit of Assiut University Hospitals and met the inclusion criteria during one-year period. Regarding demographic characteristics of ear injuries of the studied cases it was fund that age ranged from 1 to 66 years and the median was 22 years old among the affected subjects. More than one third of the ear injury (38.8%) were in the age group <20 years old, nearly one half of the patients (47.6%) were in the age group of 20 to 40 years old and 13.6% of them aged more than 20 years old. Majority of the study participant were males (86.4%). More than half of the study patients (64.1%) were not working.

Cases with trauma involving other body parts in addition to ear injury represented nearly two thirds of the sample (66%). As regards the site of injury, temporal bone fracture was the most recorded physical injury (63.1%),

and majority of ear injuries were accidental (85.4%) **(Table 1)**.

Regarding mode of ear injuries of the studied cases; motor car accident was the most common mode of injuries (22.3%) followed by blunt injury (19.4%), foreign body insertion (18.4%), and falling from height (13.6%) and gunshots (12.6%).

On the other side, sharp injuries (7.8%) and animal bites (5.8%) were the least reported causes **(Figure 1)**.

There were statistically significant relationships between manner of injury exposure and mode of injury in the present study, where motor car accident (25%), foreign body insertion (21.6%) and falling from height (15.9%) found more frequent to occur accidentally, while higher percent of sharp injury (40%), gunshot (26.7%) and blunt injury (26.7%) were found to occur homicidally. Additionally, foreign body insertion (35%) and motor car accident (37.5%) were significantly higher as mode of injuries in younger age category <20 years old, blunt and sharp injuries were significantly higher among those aged 20-40 years old (28.6%), while falling from height (21.4%) and gunshots (21.4%) recorded in higher percent among older age >40 years old. Moreover, no statistically significant difference between males and females regarding mode of trauma among the studied cases **(Table 2)**.

Regarding clinical presentation, the common symptoms among study cases were bleeding (33%), otalgia (26.2%) and hearing loss (23.3%), while tinnitus was the least reported symptom (4.9%). It was found that (12.6 %) of cases were presented with disturbed conscious level. Sixty two percent patients were managed conservatively while (37.9%) were managed surgically. Hospital stays of patients enrolled in the study ranged from 1 to 22 days with a median of three days and more than one half (53.4%) spent ≥ 3 days in the hospital.

Regarding condition at discharge, (68%) of the study patients improved and discharged, (23.3%) were referred to private departments (orthopaedic, maxillofacial, and plastic surgery) according to the need of cases, (3.9%) escaped before any intervention, (3.9%) of study participants died due to brain laceration and (1%) died due to brain haemorrhage. Facial nerve and speech affections were observed among injured patients in (17.5%) and (15.5%) respectively **(Table 3)**.

According to ENT consultant examination during follow up visits, the clinical finding of ear injuries among patients (n=94) were recorded after exclusion of escaped and died cases. It was found that (34%; n=32) of cases showed no abnormal clinical finding while conductive hearing loss was the most common functional signs (42.6%; n=40) followed by sensorineural hearing loss (12.8%; n=12) and healed ear drum tear with normal hearing (10.6%; n=10) **(Figure 2)**.

Regarding fate of ear injures among patients attended the ENT clinic (n=94), it was found that more than half of attended patients (62.8%) completely recovered, permanent infirmity due to hearing loss recorded in one quarter of the study patients (25.5%) and 11.7% of injuries healed with disfigurement due to loss of pinna or auricle **(Figure 3)**.

There were statistically significant relationships between mode of injury and clinical presentation following trauma. Bleeding was more frequent among sharp injuries (100%), otalgia was more frequent among cases with foreign body insertion (72.2%), higher percent of hearing loss was found among blunt injuries (47.4%), DCL were significantly higher among gunshots (27.3%), and tinnitus recorded in higher frequency among those who felt from height (15.4%). Also this table shows statistically significant relationships regarding mode of injury and clinical finding according to ENT consultant examination during follow up, where conductive deafness found more frequent among cases who received gun shots (54.5%) and who felt from height (53.8%), higher percent of healed ear drum tear (38.9%) were among those with foreign body insertion and motor car accidents recorded higher percent of sensorineural hearing loss (26.3%) while, higher percents of no abnormal findings were found among injuries from animal bites **(Table 4)**.

There was a statistically significant relationship between site of injury and clinical

finding during follow up according to ENT consultant examination. It was found that (36.8%) of auricle injury showed conductive hearing loss and (26.3%) showed sensorineural hearing loss. Nearly half (49.2%) of patients with temporal bone fracture presented with conductive hearing loss and (11.5%) showed sensorineural hearing loss. It was found that (71.4%) of patients with tympanic membrane perforation presented with healed ear drum tear with normal hearing while, (21.4%) presented with conductive hearing loss. Permanent infirmity following injuries in the present study were due to sensorineural hearing loss (50.0%), conductive hearing loss (29.2%) and healed ear drum (20.8%) while among patients who showed disfigurement following injury, (63.6%) of them showed no abnormal finding regarding hearing during follow up and (36.4%) were having conductive hearing loss. Nearly half (49.2%) of cases who ended with complete recovery were suffering from conductive hearing loss, (42.4%) showed no abnormality during follow up and (8.5%) of cases recovered with healed ear drum tear (p value=0.0001) **(Table 5)**.

Table (1): Characteristics of ear injuries of the studied cases attended the Audio vestibular Medicine unit, ENT Department and the Trauma Unit at Assiut University Hospitals from the 1st of May (2023) to the 1st of May (2024).

	No. (n=103)	%
Age (years)		
Median (IQR) (Range)	23 (22) (1-66)	
< 20 years	40	38.8
20-40 years	49	47.6
>40 years	14	13.6
Sex		
Male	89	86.4
Female	14	13.6
Occupation		
Working	37	35.9
Not-working	66	64.1
Type of trauma		
Isolated ear trauma	35	34.0
Poly trauma in other body parts	68	66.0
Site of ear injury		
Temporal bone fracture	65	63.1
Auricle injury	22	21.4
Tympanic membrane perforation	16	15.5
Manner of exposure		
Accidental	88	85.4
Homicidal	15	14.6

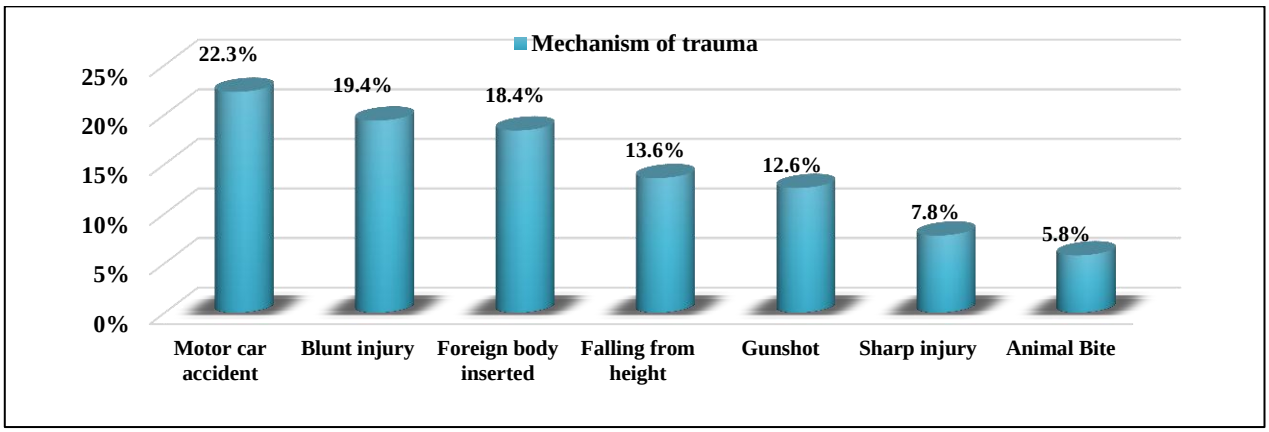

Figure (1): Mode of ear injuries of the studied cases attended the Audio vestibular Medicine unit, ENT Department and the Trauma Unit at Assiut University Hospitals from the 1st of May (2023) to the 1st of May (2024).

Table (2): Mode of ear injuries in relation to manner of exposure, age and sex of the studied cases attended the Audio vestibular Medicine unit, ENT Department and the Trauma Unit at Assiut University Hospitals from the 1st of May (2023) to the 1st of May (2024).

Manner of exposure	Mode of injury							
	Animal bite	Foreign body insertion	Falling from height	Gun shot	Motor car accident	Blunt injury	Sharp injury	P-value
Accidental	6 (6.8%)	19(21.6%)	14(15.9%)	9 (10.2%)	22(25.0%)	16(18.2%)	2 (2.3%)	**0.0001***
Homicidal	0 (0%)	0 (0%)	0 (0%)	4 (26.7%)	1 (6.7%)	4 (26.7%)	6 (40%)	
Age category								**0.0001***
<20 years	2 (5.0%)	14(35.0%)	5 (12.5%)	0 (0%)	15(37.5%)	3 (7.5%)	1 (2.5%)	
20-40 years	4 (8.2%)	4 (8.2%)	6 (12.2%)	10(20.4%)	5(10.2%)	14(28.6%)	6 (12.2%)	
>40years	0 (0%)	1 (7.1%)	3 (21.4%)	3 (21.4%)	3 (21.4%)	3 (21.4%)	1 (7.1%)	
Sex								0.676
Male	6 (6.7%)	16(18.0%)	12(13.5%)	12(13.5%)	18(20.2%)	17(19.1%)	8 (9.0%)	
Female	0 (0%)	3 (21.4%)	2 (14.3%)	1(7.1%)	5(35.7%)	3(21.4%)	0 (0%)	

*Chi-square test, *Significant (p value ≤ 0.05).*

Table (3): Clinical presentation, management and outcome of the studied cases with ear injuries attended the Audio vestibular Medicine unit, ENT Department and the Trauma Unit at Assiut University Hospitals from the 1st of May (2023) to the 1st of May (2024).

	No. (n=103)	%
Clinical presentation following trauma		
Bleeding	34	33.0
Otalgia	27	26.2
Hearing loss	24	23.3
DCL	13	12.6
Tinnitus	5	4.9
Management		
Conservative	64	62.1
Surgical	39	37.9
Hospital stays (days)		
< 3days	48	46.6
≥3 days	55	53.4
Condition at discharge		
Improved	70	68.0
Referred to Private Department	24	23.3
Escaped before Intervention	4	3.9
Death/ Brain laceration	4	3.9
Death/ Brain haemorrhage	1	1.0
Complications from associated injuries		
Facial nerve affection	18	17.5
Speech affection	16	15.5

*DCL: disturbed conscious level, *Significant (p value ≤ 0.05).*

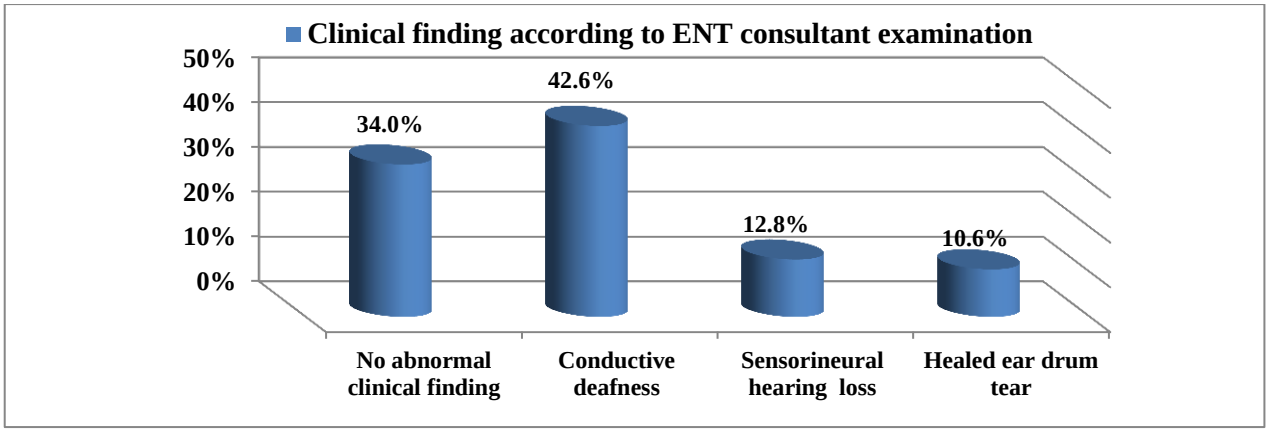

Figure (2): The clinical finding following ear injuries among patients (n=94) attended the Audio vestibular Medicine unit, ENT Department and the Trauma Unit at Assiut University Hospitals from the 1st of May (2023) to the 1st of May (2024) according to ENT consultant examination.

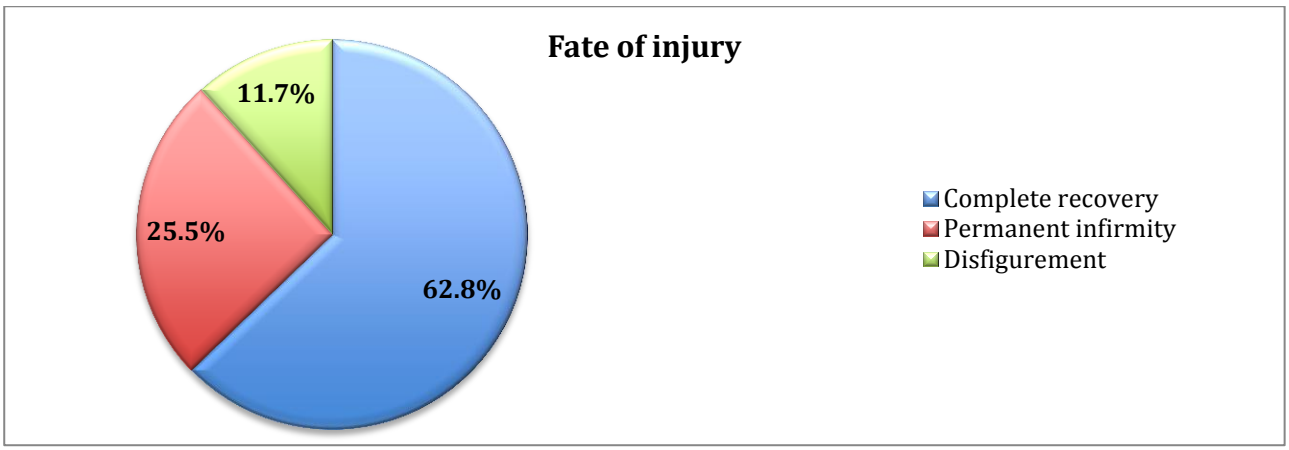

Figure (3): Fate of ear injures among the studied cases (n=94) attended the Audio vestibular Medicine unit, ENT Department and the Trauma Unit at Assiut University Hospitals from the 1st of May (2023) to the 1st of May (2024).

Table (4): Clinical presentation of the studied cases with ear injuries attended the Audio vestibular Medicine unit, ENT Department and the Trauma Unit at Assiut University Hospitals from the 1st of May (2023) to the 1st of May (2024) in relation to mode of injury.

Clinical presentation following trauma	Mode of injury							
	Animal bite N=6	F.B inserted N=18	FFH N=13	GUN shot N=11	MCA N=19	Blunt injury N=19	Sharp injury N=8	P- value
Bleeding	3 (50%)	2 (11.1%)	2(15.4%)	8(72.7%)	4(21.1%)	5(26.3%)	8(100%)	0.0001*
Otalgia	3 (50%)	14(73.7%)	5(35.7%)	0 (0%)	2 (10%)	3 (15%)	0 (0%)	
Hearing loss	0 (0%)	3 (16.7%)	4(30.8%)	0 (0%)	7(36.8%)	9(47.4%)	0 (0%)	
DCL	0 (0%)	0 (0%)	1(7.7%)	3 (27.3%)	4(21.1%)	1 (5.3%)	0 (0%)	
Tinnitus	0 (0%)	0 (0%)	2(15.4%)	0 (0%)	2(10.5%)	1 (5.3%)	0 (0%)	
Clinical findings with follow up	**Animal bite N=6**	**F.B inserted N=18**	**FFH N=13**	**GUN shot N=11**	**MCA N=19**	**Blunt injury N=19**	**Sharp injury N=8**	**P -value**
Conductive hearing loss	1 (16.7%)	6 (33.3%)	7(53.8%)	6 (54.5%)	9(47.4%)	7(36.8%)	4 (50%)	0.002*
Healed ear drum tear with normal hearing	0 (0%)	7 (38.9%)	0 (0%)	3 (27.3%)	0 (0%)	0 (0%)	0 (0%)	
Sensorineural hearing loss	0 (0%)	1 (5.6%)	2(15.4%)	1 (9.1%)	5(26.3%)	3(15.8%)	0 (0%)	
No abnormal finding	5(83.3%)	4 (22.2%)	4(30.8%)	1 (9.1%)	5(26.3%)	9(47.4%)	4 (50%)	

*F.B: foreign body, DCL: disturbed conscious level, FFH: fall from height, MCA: motor car accidents. Chi-square test *Significant (p value ≤ 0.05).*

Table (5): The clinical findings and functional disorders during follow up of the studied cases (n=94) attended the Audio vestibular Medicine unit, ENT Department and the Trauma Unit at Assiut University Hospitals from the 1st of May(2023) to the 1st of May(2024) in relation to the site and fate of ear injury.

Clinical findings and functional disorders	Site of injury			
	Auricle injury N=19	Temporal bone fracture N=61	tympanic membrane perforation N=14	P- value
Conductive hearing loss	7 (36.8%)	30 (49.2%)	3 (21.4%)	0.0001*
Healed ear drum tear (with normal hearing)	0 (0%)	0 (0%)	10 (71.4%)	
Sensorineural hearing loss	5 (26.3%)	7 (11.5%)	0 (0%)	
No abnormal clinical finding	7 (36.8%)	24 (39.3%)	1 (7.1%)	
Clinical findings and functional disorders	**Fate of injury**			
	Complete recovery N=59	**Disfigurement N=11**	**Permanent infirmity N=24**	**P- value**
Conductive hearing loss	29(49.2%)	4 (36.4%)	7 (29.2%)	0.0001*
Sensorineural hearing loss	0 (0%)	0 (0%)	12 (50.0%)	
Healed ear drum tear (with normal hearing)	5 (8.5%)	0 (0%)	5 (20.8%)	
No abnormal finding	25(42.4%)	7 (63.6%)	0 (0%)	

*Chi-square test *Significant (p value ≤ 0.05).*

DISCUSSION

Forensic practitioners may be requested by the court to give a detailed a medicolegal opinion in certain ENT injuries regarding the causal link between these injuries and the medical outcome especially the presence of permanent infirmity ***(Miziara, 2024)***. Ear injuries may be undiagnosed or missed during assessment of poly trauma patients in Emergency Department. The aim of the current study was to identify traumatic ear injuries and its sequalae especially permanent infirmities. The present work emphasized that nearly one half of the participating patients (47.6%) were in the age group of 20 to 40 years old. This age group is the most active to be involved in assaults and trauma in many communities and this agrees with other studies conducted by ***Omran et al. (2019)*** in Egypt and elsewhere as mentioned by ***Selvaratnam et al. (2022)***.

On the contrary, the study of ***Adegbiji et al. (2018a)*** mentioned high prevalence of ear injuries in age group from 1-10 years old.

Majority of this study participants were males (86.4%). This high vulnerability of males to ear injuries and trauma in general could be associated with their activities outside home, so they are more vulnerable to assaults and accidents in agreement with ***Hafez et al., (2020)*** and ***Al-Hajj et al.(2021)***. On the other hand, females may be exposed to domestic violence and injuries may be reported in them as males or even more and this opinion is supported by studies in certain communities according to ***Singhai et al. (2018)***.

Isolated ear trauma in this study represented 34% of cases while cases with trauma involving other body parts in addition to ear injury represented nearly two thirds of the sample (66%). According to ***Patil et al. (2018)***, ear and face trauma is commonly associated with injuries of other body parts mainly in head and neck because of the prominence of the face especially in high energy trauma like road traffic accidents and falls from height and this could be associated with further complications in affected subjects. On the contrary, the studies of ***Omran et al. (2019)*** and ***Sreekanth et al. (2022)*** reported high occurrence of ENT injuries with trauma in other body parts.

Temporal bone fracture was recorded in 63.1% of cases. This finding can be attributed to the higher incidence of road traffic accident and falling from height in agreement with the results of ***Sakthignanavel et al. (2022)***. Auricle injury and tympanic membrane perforation were found in (21.4% and 15.5%) respectively and these findings are similar to the study done by ***Adegbiji et al. (2018a)*** and ***Desai et al. (2022)***. On the contrary, the study of ***Omran et al. (2019)*** reported minimal auricle injury.

The most common mode of injuries among the participating patients were motor car accidents followed by blunt injury. Other causes were also reported but less frequent as foreign body insertion, fall from height, gunshots, sharp injuries and animal bites. These patterns of trauma were not different from that observed by other studies in developing countries as mentioned by ***Adegbiji et al. (2018a); Adegbiji et al. (2018b)*** and ***Omran et al. (2019)***. Road traffic injuries or disability are a worldwide public health concern. Road traffic accidents are responsible for more than two thirds of trauma admissions in emergencies especially in low- and middle-income countries ***(Gobyshanger et al., 2020)***.

Majority of ear injuries in the present study (85.4%) were accidental in nature while (14.6%) of injuries were homicidal. This could be explained according to the cause of trauma. There were statistically significant relationships between manner of injury exposure and mode of injury in the present study, where motor car accident, foreign body insertion and falling from height found more frequent to occur accidentally, while sharp injury, gunshots and blunt injury were found to occur homicidally.

The mechanism of ENT injuries usually vary with age and different age groups of people could be exposed to different risk according to ***Adegbiji et al. (2018b)***. In the current study, motor car accident and foreign body insertion were significantly higher as mode of injuries in younger age category <20 years old. The study of ***Shankar et al. (2020)*** found similar results regarding frequent exposure of adolescents and young adults to traffic accidents. Moreover, ***Adegbiji et al. (2020)***

and ***Ngatomela et al. (2022)*** reported high rates of foreign body impaction in the head and neck orifices among children.

Blunt and sharp injuries were significantly higher among those aged 20-40 years old. This can be explained by the fact this age group could be more active and aggressive to be involved in quarrels and receive blows during arguments from sharp or blunt instruments. These methods of assaults could be gender based as mentioned by ***Tafo et al. (2022)***. However, the current results showed no statistically significant difference between males and females regarding mode of trauma.

Regarding the clinical presentation among study cases following trauma, the common symptoms were bleeding from ear (33%), otalgia (26.2%) and hearing loss (23.3%). These symptoms are similar to what was observed by ***Adegbiji et al. (2018b)*** and ***Sakthignanavel et al. (2022)***. Additionally, it was found that (12.6 %) of cases were presented with disturbed conscious level. An explanation to this finding is that ENT injuries are commonly associated with head injuries as that observed by ***Rai et al. (2021)***. Tinnitus was the least reported symptom (4.9%) in the present study, and this also observed by ***Sakthignanavel et al. (2022)***.

Ear injuries did not have significant impact on the outcome of injuries and duration of hospital stay of the patients following trauma as reported by ***Rai et al. (2021)***. In the current study, more than one half (53.4%) of the study cases spent ≥ 3 days in the hospital and this could be related to severity of trauma in other body parts. Also, it was found death among the study cases was due to brain laceration and brain haemorrhage.

Additionally, facial nerve and speech affections were observed among injured patients. This comes in line with ***Sarafraz et al. (2015)*** and ***Sakthignanavel et al. (2022)*** who reported facial nerve palsy in their studies as an ignored associated injury with head and face trauma. **Silva et al. (2016)**, found high percentage of speech disorders as a complication of head and face trauma.

During follow up of patients to assess functional disorders and hearing affection, it was found that conductive hearing loss was the most common among cases followed by sensorineural hearing loss while (34%) of cases showed no abnormal clinical finding regarding hearing. Healed ear drum tear with normal hearing was observed in (10.6%) of cases. Similar findings were observed by ***Shankar et al. (2020); Rai et al. (2021)*** and ***Tafo et al. (2022)***.

During assessment of fate of ear injures with follow up of cases in the present study, it was found that more than half of attended patients were completely recovered, permanent infirmity due to hearing loss recorded in (25.5%) of the study patients and (11.7%) of injuries healed with disfigurement due to loss of pinna or auricle.

The clinical presentation following trauma was significantly related to the mode of ear injury in this study. It was found that bleeding was more frequent among sharp injuries (100%), otalgia was more frequent among cases with foreign body insertion (73.7%), higher percent of hearing loss was found following blunt injuries (45%), DCL were significantly higher among gunshots (27.3%), and tinnitus recorded in higher frequency among those who felt from height (14.3%). These associations have not been previously reported except for the study of ***Ngatomela et al. (2022)*** regarding association of pain with foreign body insertion especially with delayed presentation.

Functional disorders during follow up were also significantly related to mode of injury, where conductive deafness found more frequent among cases who received gun shots and felt from height. Higher percent of healed ear drum tear were among those who came with foreign body inserted in the ear. Motor car accidents recorded higher percent of sensorineural hearing loss, and this may be explained with possibility of fracture skull base and temporal bone affection according to ***Verbruggen and Halewyck (2016)***. These results means that most cases that ended with permanent infirmity occurred accidently, and this was opposite to that observed by ***El-Hady et al. (2013)*** where homicidal cases were responsible for most of infirmity cases. Moreover, this means that blunt trauma was responsible for most infirmity cases.

The clinical finding during follow up were significantly related to the site of ear injury.

Nearly half (49.2%) of temporal bone fracture presented with conductive deafness and (11.5%) showed sensorineural hearing loss while (71.4%) of patients with tympanic membrane perforation presented with healed ear drum tear with normal hearing and 21.4% presented with conductive hearing loss. From these finding, it was found that ear injuries could be associated with hearing loss that may be related to underlying hidden cause or injuries in skull bones especially temporal bone fracture or inner ear and auditory nerve involvement especially sensorineural hearing loss and this opinion was also supported by ***Diaz et al. (2016)*** and ***Šarkić et al. (2019)***. ***Rahul Singh et al. (2016)*** and ***Rasool et al. (2016)*** mentioned that most of the patients with tympanic membrane perforation usually recover with conservative measures and return to normal hearing, however conductive hearing loss can occur if perforation is not properly treated or complicated by infection in middle ear especially with late presentation, and this comes in line with current study results.

Permanent infirmity in the present study was due to sensorineural hearing loss (50.0%), conductive deafness (29.2%) and healed ear drum (20.8%). Nearly half (49.2%) of cases who ended with complete recovery were suffering from conductive hearing loss.

The outcome of post-traumatic conductive deafness is good as most cases result from the presence of blood clots in the external auditory canal, tympanic membrane perforation, or ossicular damage. However, the prognosis of post-traumatic sensorineural hearing loss is usually bad and most probably related to inner ear involvement or temporal bone and brain trauma ***(Diaz et al., 2016; Shankar et al., 2020)***. Sensorineural hearing loss was also observed by ***Omran et al. (2019)*** as a frequent persistent complication of otorhinolaryngeal injuries.

CONCLUSION

The otological injuries were variable in this study following blunt and sharp trauma especially among those aged 20-40 years old. Temporal bone fracture and auricle injury were the most recorded sites followed by tympanic membrane perforation. The clinical finding during follow up were significantly related to the site of ear injury. More than half of attended patients were completely recovered following early intervention. Patients who presented with post-traumatic conductive hearing loss showed good outcome with medical care while post-traumatic sensorineural hearing loss showed bad prognosis with great impact on quality of life of affected patients.

RECOMMENDATIONS

- Permanent infirmity following trauma is a medical and legal concept and the ENT physician must be aware that ear injuries could end with disability of the patients.
- Early careful diagnoses, intervention and proper treatment of ear injuries can prevent possible deformity and permanent infirmity.
- Careful examination and investigations for all ear trauma cases even if they do not complain from hearing problem can prevent complication following ear injuries.
- Long-term follow-up of patients following ear trauma is essential to assess the hearing condition.
- Complete and thorough physical examinations should be conducted for patients with multiple traumas after they are stabilized to assess injuries that could be missed.

Limitations of the study:

- The sample size was small to identify the true prevalence of ear injuries and its sequalae.
- Some files were excluded because of death and escape of the patients.

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الجوانب الطبية الشرعية لاصابات الاذن والعاهات المستديمة الناتجه عنها بمستشفيات جامعة اسيوط , مصر

دعاء محمد جمعه المظ[١]،شيماء عبد السميع الغزالي[٢] مها عبد الجابر علي[٣]، أسماء حسن محمد[١]

[١]قسم الطب الشرعي والسموم الاكلينيكية ،كلية الطب ، جامعة أسيوط، مصر
[٢]قسم الصحة العامة وطب المجتمع ،كلية الطب ، جامعة أسيوط، مصر
[٣]قسم الانف والاذن والحنجره ،كلية الطب ، جامعة أسيوط، مصر

الملخص العربى

المقدمة: فقدان السمع بعد التعرض لاصابه له تاثير كبير علي خياة الافراد وقد يحدث منه عاهه مستديمة.

الهدف من الدراسة: تقييم الجانب الطبي القانوني لإصابات الاذن وماقد ينتج عنها من حدوث عاهه مستديمة

طريقة الدراسة: دراسة مقطعية شملت مرضى إصابات الأذن الذين حضروا إلي وحدة السمعيات وعيادة الأنف والأذن والحنجرة ووحدة الطواري بمستشفيات جامعة أسيوط وذلك خلال عام واحد بداية من شهر مايو ٢٠٢٣ حتي شهر مايو ٢٠٢٤. تم جمع جميع بيانات المرضى المتعلقة بالبيانات الديموغرافية (العمر والجنس)، ووصف الإصابة (السبب، والأليه المحدثه، وهل الاصابه عرضيه ام جنائيه ام انتحارية واماكن الاصابه بالاذن)، تم إجراء الفحوصات للمرضى لتقييم حالة السمع للكشف عن أي عجز دائم .

النتائج: شملت الدراسة ١٠٣ شخصًا تعرضوا لإصابات في الاذن واماكن اخرى بالجسم وكان ما يقرب من الثلث أعمارهم أقل من ٢٠ سنه و(٤٧.٦%) تتراوح أعمارهم بين ٢٠-٤٠ عامًا و كان غالبية الحالات من الذكور. كان هناك كسر في العظم الصدغي في (٦٣.١%) من الحالات. أظهرت النتائج أن اكثر الاصابات كانت ناتجه عن حوادث السيارات. اكثر من نصف المرضي تعافي تماما بعد الاصابة وتم تسجيل عجز دائم نتيجه فقدان السمع في (٢٥.٥ %) من الحالات وكان بسبب فقد السمع الحسي العصبي في (٥٠%) من المرضي.

التوصيات: في ضوء هذه النتائج نوصي بأنه يجب أن يكون طبيب الأنف والأذن والحنجرة على علم بأن إصابات الأذن يمكن أن تنتهي بإعاقة المرضى وان التشخيص الدقيق المبكر والتدخل بالعلاج المناسب لإصابات الأذن يمكن أن يمنع حدوث هذه الاعاقة حتى لو لم يشتكى المصاب من مشكلة في السمع. كما نوصي ايضا بالمتابعة طويلة الأمد للمرضى بعد إصابة الأذن لتقييم حالة السمع.