

A MEDICOLEGAL STUDY OF
CORNEAL INJURIES AT JORDAN UNIVERSITY HOSPITAL

T H E S I S

"Submitted to the University of Jordan
in partial fulfillment of the requirements for
MASTER DEGREE IN FORENSIC MEDICINE"
and Forensic Pathology

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UNIVERSITY OF JORDAN

1985

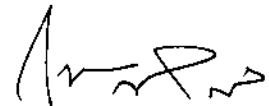
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This thesis has been approved by all members of the
examination committee.

Prof. Dr. M. Soliman, Chairman of committee

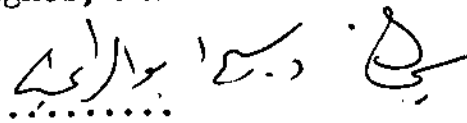


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Date of defence: 29 - 9 ,1985



A C K N O W L E D G E M E N T S

I wish to express my thankfulness and deep gratitude to Dr. M. Soleiman, Professor of Forensic Medicine, Medical College, University of Jordan, for his continuous supervision, guidance, stimulation, unlimited help and generous encouragement, without whom such a work would not have been presented.

I also wish to express my cordial gratitude to Dr . F. el - Sayegh, Professor of Ophthalmology, Medical College, University of Jordan, for allowing me to review the records of his clinic and for helping me in the clinical part of my research.

I am greatly indebted to Dr. Sameeh abul-Ragheb, Associate Professor of Forensic Medicine, Medical College , University of Jordan, who has offered valuable suggestions and continuous interest that were of great asset during the course of work.

I also wish to thank Miss Ikram Rida, Medical librarian, Jordan University Hospital, for her help in collecting the references from the literature . I also wish to thank Dr. Jawad el-Hammouri and Upjohon Company for supplying copies of papers, from outside Jordan; without which the illustrations of this thesis would not have been possible .

I wish to express my gratitude to Miss Seham el-Wohoush, Graphic Illustration, University of Jordan, for assisting me in preparing the tables and graphs. I am also grateful to Miss Ghada Hajjawi, and to everyone to whom the final form of this manuscript owes a great deal.

S U M M A R Y

A Medicolegal Study of

Corneal Injuries at Jordan University Hospital

Cases of eye and corneal injuries , that were given medicolegal reports, Forensic Clinic at Jordan University Hospital, in the period from 1978 to 1984, were subject to a statistical study to correlate their incidence with: age and sex, occupation and sex, geographical distribution, day, time and type of accident, sites of injuries, sick-leave needed, complications, sequela of vision, permanent disability resulted, and any associated injuries in the body apart from those of the eye.

At the same time, a number of cases of eye injuries seen in the Ophthalmic Department, during "one" year interval 1982 / 1983 at the same hospital, were subject to the same type of study.

There were "371" cases (424 eyes affected), including "106" cases of corneal injuries (122 eyes affected). 8.81% of all cases that had medicolegal reports during the period of study 1978-1984 were eye injuries.

In this study, it was found that 74.12% of cases were adults less than 30 years old, 74.93% were males, and 25.07% females.

The majority - 41.51% were students. 48.79% of the accidents occurred at areas surrounding the Jordan University Hospital. In general, 57.95% of eye injuries were associated with other injuries in the body, the percentage of these injuries decreases in corneal cases to 16.98% since corneal injuries are usually the result of direct injuries sustained to the eye.

50.67% of injuries were caused by traffic accidents, while 24.80% were the result of assault, most of which - 63.33% , were in the left eye. 84.60% of injuries were the result of blunt instruments while perforated injuries constitute 15.40% of cases. The incidence of perforated injuries increases in cases of corneal injuries as it constitutes 44.04% of injuries.

The adnexa is affected in 45.49% of cases, the anterior segment is affected in 46.01% of cases; the cornea is affected in 35.23% of the later cases, as this depends on the exposure of distance of the affected part from the surface of the eye. Diminution of vision results in 19.34% of cases, the percentage rises in cases of corneal injuries to 49.18% .

Only 24.53% of the affected eyes have developed some sort of complication, 64.84% of these complications were in the anterior segment. While in cases of corneal injuries 63.93% have developed complications; 83.67% of these comp-

lications were in the anterior segment. "165" cases had final report; 27.88% of these cases had permanent disabilities , whereas 6.67% were given sick-leaves exceeding twenty days. These figures rise in cases of corneal injuries; out of "51" cases who had final reports, 58.82% had permanent disabilities.

It is hoped that this study will stimulate further studies on this important field which has its bearing on social , economical, and medical aspects of human life.

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I . I N T R O D U C T I O N

Ocular injuries are common despite the anatomical and physiological protection afforded by the sturdy orbital walls, the elastic orbital pad of fat, the mobile lids and the lacrimal fluid (Roperhall, 1968) .

The particular importance of eye injuries in general, and corneal injuries in particular, is that the structural delicacy of the eye and its functional significance render such injuries of disastrous consequences, even though such trauma might be of a trivial magnitude as to cause little concern elsewhere.

This study is devoted to ocular injuries particularly those of the cornea in Jordan; their causes, types, effects, sick-leave needed, and sequelae in different age groups. Ocular injuries are not only of great impact on the individual's physical and psychological health, but also on the community, through the disability that results, the working days that are lost and the expenses of treatment and rehabilitation.

Many surveys about ocular trauma have been published, (Garrow, 1923. Lambah, 1968. Venger, 1978. Canavan et al, 1980 . Waddy, 1981. Huelke, 1982. And others). Most of these surveys were related to clinical and surgical practice. Only few considered the importance of medicolegal aspects (Adenis, 1978).

This study aims at giving general information published about physio-anatomical protection of the eye, causes of injuries, types of injuries, incidence of eye trauma, age and sex distribution of patients, as well as corneal anatomy, physiology and injuries. In addition, the incidence of ocular injuries in Jordan is discussed through analysing the data collected from two main sources: the first being patients attending the Ophthalmic clinic at the Jordan University Hospital during one year (from 1.8.1982 to 31.7.1983), the second being the medicolegal reports given by the Forensic clinic of the hospital during the years from 1978 to 1984.

This study gives an insight into the problem of corneal injury and its incidence among other eye injuries in Jordan.

II. REVIEW OF LITERATURE

A. Anatomy and Physiology of the Eye

The essential part of the eye is the retina (the nervous coat), which serves the primary purpose of photoreception. The retina is a thin nervous membrane, hemi-spherical in shape, and lines the posterior half of the eye-globe in order to receive images of the outside world to the greatest advantage. The cavity is filled with transparent matter, surrounded, and largely closed in, by opaque coats. All the intericate structures and appendages of the eye are subsidiary to this tissue. The retina is considered as an outlying island of the central nervous system, to which it is connected by a tract of nerve fibres - the Optic nerve.

The nervous structure of the retina, similar to the brain and the spinal cord, is encased within two coats serving the purposes of protection and nutrition. The exterior coat which corresponds to the dura matter is a layer composed essentially of dense fibrous tissue which serves as a protective envelope. The fibrous coat is represented by the sclera in the posterior five sixth and by the cornea in the anterior part of the eye. The cornea in contradistinction to the sclera, not only serves the purpose of protection of the globe for which purpose it retains its fibrous texture, but also serves as an optic entrance to the images of visual objects and thus it keeps its embryonic transparency.

Inside this layer, separating it from the retina, is the Uveochoroid ; which represents the pia-arachnoid of the brain, serves the purpose of nutrition of the eye. In front of the choroid, lies the ciliary body which, while retaining its nutritional function, is largely responsible for the formation of the intra-ocular fluid. Meanwhile, it is supplied with a number of muscles which support and adjust the lens. Still further inside, the uveochoroid layer separates itself from the outer tunic and is deflected into the interior of the eye to form the Iris; a diaphragm provided with a rounded opening of changeable width through which rays of light may enter the Pupil. While the iris is still primarily optical in function, it retains its nutritive role in as much as it also concerns itself with the fluid traffic of the eye.

Behind the iris, lies the Lens suspended from the ciliary body by the suspensory ligament. The space between the iris and cornea is termed the "Anterior chamber", and that between the iris and lens the "Posterior chamber". Both spaces are occupied by a clear fluid "Aqueous Humour" while the rest of the cavity behind the lens is filled with a transparent gel; the vitreous body.

The eyeball is surrounded by a number of structures which act singly or together in order to protect the globe from injurious agents. The deep position of the eye within the bony orbital cavity, and the presence of a thick pad of soft fatty tissue between the eye and orbital wall, provide protection against harmful factors. Furthermore, protection is also prov-

ided by a thick overhanging projection of bone " the orbital rim" and by the projecting nose. Objects that threaten the eye induce a rapid reflex closure of the eyelids and a reflex turning of the head. Intrusion of foreign bodies into the conjunctival cul-de-sac, or contact with the anterior surface of the eye, produce a copious flow of tears that washes away or dilutes the foreign body. The eye tears have in addition a bactericidal effect.

Despite this anatomical and physiological protection, ocular injuries are common. Even trivial injuries which are of little significance to other parts of the body can be potentially harmful to the delicate structure of the eye and its significant function.

The resultant disability, economic loss, and human misery, are strikingly disproportionate to the extent of the injury. Considered as a whole, the complex subject of injuries, especially corneal injuries, assumes a constantly growing importance in both the practice of Ophthalmology and Forensic Medicine.

B. Injuries to the Eye

In spite of the fact that it is well protected, both anatomically and physiologically, the eye is frequently injured.

The first recorded estimate of ocular injuries was published in Leipzig by Zander and Geissler in 1864, who found that ocular injuries constitute a considerable percentage; 1.8 - 9% of eye affection. In 1888, Weidmann reported that eye injuries occurred in Zürich at a rate of 10.41% among "30,000" Ophthalmic patients. "440" cases of injury representing 12% of Ophthalmic cases in Sweden were reported (Lindsted, 1966). Yuasa et al, 1967, at the Osaka University Hospital in Japan, reported "2484" ocular injuries representing 7.8% of all cases.

In a survey conducted in Northern Ireland comprising "2032" Ophthalmic patients reporting to Royal Victoria Hospital, Belfast, Y.M. Canavan found in 1980 that 8.7% of these patients were suffering from ocular injuries. In Jordan, Sayegh, Arafat, Ashouri, in a study of "5000" cases attending the Ophthalmic clinic during the years of 1983 and 1984 in Jordan University Hospital, showed that 10.8% of these cases were the result of injuries to the eyeballs.

1. Age Incidence

The occurrence of eye injuries varies according to age. A study of eye injuries in a group of "319" cases at Helsinki University Eye Hospital, Finland, revealed that ocular injuries in children constitute 34.5% of eye injuries in general (Niiranen M. et al, 1981). In a group of "2032" cases in Royal Victoria Hospital, Belfast, Northern Ireland, it was found that eye injuries in children form 38.4% of all eye injuries. It was also found that 51.2% of the patients were under 21 years of age, and more than three fourths of injuries, 77.4%, occur to those who are less than 36 years old (Canavan YM, et al, 1980).

2. Sex Incidence

Owing to the great exposure to injurious agents in industries, travel, sports, and play; and since the number of males exceeds that of females in these fields; statistics show that approximately 67 - 84% of such cases occur to males.

Among "500" cases of eye injuries seen in Alexandria University Hospital, 27% of cases females and 73% males (Korra A, et al, 1972). In Northern Ireland, during the period 1967 - 1976, studies of sex incidence by Canavan YM, et al, 1980, revealed that 16% of eye injuries were

suffered by females in a series of "2032" cases. Niiranen M, et al, 1981, found in a study of "319" cases in Finland that the figures were 18.2% and 81.8% females and males respectively.

Out of "252" consecutive cases of injury, Gordan YJ, et al, 1981, Southern Affrica, stated that 31.7% of ocular injuries were suffered by females. The figures of Mazza C et al, 1982, in the University of Modena, were 37% females out of "222" cases.

3. Aetiological Types

By aetiology we mean the different circumstances under which eye injuries occur; such as domestic accidents, industrial hazards, agricultural injuries, injuries during travel and sports.

a. Domestic Injuries (non-occupational injuries)

Ocular injuries at home are numerous and frequently severe. They excite little attention owing to their localized and personal significance, and many of them are trivial and are not recorded. In spite of this, the reported cases constitute about one fifth of ocular injuries (Gordan YJ, et al, 1981).

b. Industrial Hazards

The general incidence of ocular injuries varies greatly with the industrial development of the region involved; its occurrence, therefore, differs widely in different countries. Yet, relevant figures increase in time. In 1925, Elsching of Prague found out that 8.53% of all ocular conditions treated in his clinic from 1907 to 1924 were of industrial origin. In Northern Ireland, between 1967 and 1976, these cases constituted 15.4% of ocular trauma, as revealed by studies of Canavan YM, et al, 1980. The number of cases covered by these studies was "2032" .

In more highly industrialized cities, the later proportion is higher. Cridland reported in 1925 an incidence of 52 % of all eye cases in Sheffield, England.

In the United States of America, more than "300,000" ocular accidents necessitating cessation of work for one day or more were reported to occur annually. (Resnick, 1941 . Mattos, 1958).

In assessing these figures, it is to be remembered that by no means all industrial injuries find their way to hospitals. The greater majority of trivial injuries are being dealt with on spot by the medical and nursing staff in the factories.

c. Agricultural Injuries

In agricultural countries, agricultural injuries reach to a considerable high concurrence. The causes are many e.g. thorns and twigs, injuring a person sometimes during walking and frequently during hedge-trimming and brush-cutting (Blake, 1969), blow from an animal, dust, lime wash and chemical fertilizers, sharp instruments ... etc.

In Finland, during the years 1955 - 1957, 11.4 % of all ocular injuries occurred amongst agricultural workers. (Forsius and Nikupaava, 1964).

d. Travel Injuries

Injuries to the eyes and adnexa during travel are very common. The most common cause is motor car (the most common vehicle used). Such injuries are not usually localized to the eye-globe, but frequently accompanied with more serious injuries to the body. These traffic injuries constitute 5 - 20 % of all ocular injuries.

In Southern Africa, Gordon YJ, et al, 1981, found that 4.8 % of cases out of a total of "252" cases of traffic accidents occur to adults, sustained ocular injuries. On the other hand, Niiranen M, et al, 1981, in

Finland, reported an incidence of 5 % in his study on "319" children under the age of fifteen. For all age groups, an incidence of 19.3 % was found in "2032" cases studied by Canavan YM, et al, 1980, in Northern Ireland between 1967 - 1976.

e. Sport Injuries

Injuries sustained in sports, including boxing, football and other games, are usually in the nature of a severe contusion of the globe, caused by the impact of a ball, a club, a stick, or racquet, and by a fist or a foot. Injuries incurred by sporting guns and small arms fall in this category.

Sport injuries constitute 1.6 - 14 % of all injuries, according to prevalence of various sports, in different countries. Ocular injuries in sport constitute 1.6 % out of "252" cases in Southern Africa (Gordan YJ, et al, 1981). In Finland, Niiranen M, et al, in the same year, found that in a series of "319" cases the incidence was 14%.

f. War Injuries

Ever since man evolved, he quarrelled and fought during his struggle for survival. It follows that ocular injuries

must have been known throughout his long history. The injuries sustained in war are extremely varied in type and differ in succeeding wars as the techniques of combat change. The incidence of ocular casualties is high proportionately to other parts of the body, as in open warfare in trenches or tanks, the head is apt to be preferentially exposed.

4. Type of Accident

Ocular injuries may be inflicted by the same person either intentionally or accidentally, or by another person in the same methods. There is a large number of cases in which injury to the eye is the result of criminal violence. Considering all age groups, Korra A, et al, 1972, found that out of "500" cases studied in Egypt, almost one fourth of ocular cases were the result of assault. The incidence rises in adult cases; in Southern Africa, it was found that the incidence was 53.2% (Gordan YJ, et al 1981). On the other hand, the incidence in children decreases; Niiranen M, et al, found in 1981 that the incidence constituted only 1% of "319" cases.

The accidental causes constitute about three fourths of ocular injuries. Of both assault and accidental injuries, stone is responsible for about one sixth of the cases (Korra A, et al, 1972).

About one third to one half of ocular injuries in children are self-inflicted. The remainder cases are inflicted by another person (usually a child). 68% of these injuries occur during play (Niiranen M, et al, 1981). Practically speaking, all such injuries are due to over-exuberance or lack of controlling influences, the result of carelessness during playing, the use of dangerous articles ... etc.

5. Type of Trauma

Eye injuries are extremely difficult to classify according to types of trauma, since the list of causal factors is almost endless. They can, however, be separated into mechanical and non-mechanical types.

The mechanical types may be caused by blunt objects (usually non-perforating) or by sharp objects or intraocular foreign bodies (perforating). The non-mechanical types may be physical or chemical injuries.

Injuries by blunt objects constitute about one to two thirds of ocular injuries. Korra A, et al, 1972, found them to be 38% in all age groups. Canavan YM, et al, 1980, stated that blunt injuries were 49.2% . The incidence also varies in children; in 1979, Krasny, et al, reported 36.5 - 38.2 % of ocular injuries inflicted by blunt objects.

Niiranen M , et al , in the year 1981 , have reported

65.2%

Perforating injuries constitute one third to one half of the injuries. In Northern Ireland, between 1967 and 1976 , Canavan M, et al, 1980, reported 48% in all age groups. Korra A, et al, 1972, found them to be 35.5% . In children, Krasny J, et al, 1978, found the perforating injuries constitute 59.6% of injuries, while the same author in 1979 found the ratio decreasing to 43 - 46% .

Intraocular foreign bodies were about one tenth of ocular trauma. Korra A, et al, in 1972, found that they constitute 14.2% , while Canavan M, et al, 1980, stated that 8.4% of cases were perforated injuries.

Extraocular foreign bodies were about one twentieth of the injuries. Niiranen M, et al, 1981, reported 6.3% in children..

The non-mechanical injuries may reach up to 12% of all injuries in some countries (Korra A, et al, 1972) .

C. Corneal Anatomy and Physiology

The cornea is an avascular, transparent structure, that represents the window of the eye, through which light rays pass to the retina for proper image formation. It is approximately "0.5"mm thick at its centre and "1"mm thick at its extreme periphery. It consists largely of connective tissue and forms the anterior one sixth of the outer coat of the eye globe.

The cornea is covered anteriorly by about five layers of stratified, non-keratinized epithelium, which regenerates rapidly without scar formation in cases of injury. In the living eye, the cornea is covered by a thin fluid film (tear film), composed of three layers : an external lipid layer - a middle aqueous layer, and an internal mucus layer . This fluid layer is continuously renewed from the lacrimal and conjunctival secretions. The primary function of the tear film is to provide a high-quality optical surface, as the most refractive power of eye originates at the air-corneal interface. Other important functions of the tear film are protective functions i.e. lubrication of the eyelids during blinking , and antibacterial action mediated by lysozyme and betalysin, also leukocytes gain access to corneal ulcerations via the tear film, which help in wound repair.

Beneath the epithelial layer of the cornea, comes a modified anterior layer of the stroma (Bowman's membrane) ,

which is not firmly attached to the epithelium. This layer (Bowman's membrane) has no power of regeneration in cases of injury, but any gap produced in it is filled with epithelium forming an opacity.

Approximately 90% of the thickness of the cornea is made up by the substantia propria, composed of transparent, modified connective tissue, arranged in lamellae running parallel to the corneal surface, with cells in between. The corneal stroma and epithelium contain abundant non-myelinated nerve fibers that are usually not visible in sections prepared using routine histologic stains.

The fourth layer of the cornea is the true basement membrane (Descemet's membrane), which can be reformed following injury by the corneal endothelium behind it.

The endothelium, is a single layer of flat cells continuous with that of the iris. These cells are fragile, very susceptible to injury, and have limited regenerative capacity. Normally the cornea tends to imbibe water and swell, keeping a fixed degree of hydration. Excess fluid in the stroma causes dispersion of light, thus diminishing the transparency of the cornea. The corneal endothelium is the responsible tissue for keeping control of the normal state of corneal hydration. Any injury to the corneal endothelium leads to excessive oedema of the corneal epithelium & stroma resulting in a decrease in transparency and a visual deficit.

D. Corneal Injuries

Injuries to the cornea could be also classified according to the type of trauma in the following categories :-

1. Mechanical Injuries

Mechanical injuries include a long list of objects which could be either blunt, sharp, or pointed. The extent and nature of the injury to the cornea, depend on the type of the causal instrument, on the method of application of force, and on the amount of the energy discharged during the impact which depends on the kinetic energy of the object. An important factor is the time during which the energy was discharged, the shorter the time, the more the injury. Injury also depends on corneal resistance to trauma i.e. its elasticity. Wounds occur if the limit of corneal elasticity is exceeded by traction forces.

a. Abrasion of the Cornea

A superficial wound of the cornea, termed a corneal abrasion, is essentially a traumatic scraping of the epithelial layer from the underlying Bowman's membrane, while this membrane and the remainder of the cornea are intact

and uninjured. Many types of minor traumata are capable of producing a corneal abrasion. These include injury by fingernails, edges of paper pieces, small foreign bodies under the upper eyelids ... etc.

The cornea has a very extensive sensory innervation, that counts for the extreme severity of clinical symptoms produced by a relatively minor injury. A corneal abrasion results in exposure of the sensory nerve endings, causing acute pain.

The epithelium regenerates rapidly, thus a corneal abrasion heals in 12 to 48 hours resulting in clinical comfort. The corneal epithelium acts as an effective barrier against invasion, thus, provides a ready portal of entry for microorganisms, that may be introduced by the traumatic agent, or that are already present in the conjunctival sac. Therefore, although the injury itself is relatively minor, it offers a great potential for secondary corneal infection.

A traumatic corneal abrasion may be followed by an entity called recurrent erosion of the cornea. This occurs spontaneously for indefinite period up to 20 years following a corneal abrasion.

b. Blunt Injury of the Cornea

This is a common type of corneal injury caused by instruments or objects which act through the application of their blunt surfaces to the cornea. The causal objects vary e.g. fist,

tennis ball, stick, stone . . . etc.

All corneal layers usually remain intact following blunt trauma, and no morphologic damage is evident. Nevertheless, oedematous changes are evident within the stroma, typically as a disc-shaped gray opacity. Though the cause has not been yet fully substantiated, the lesion appears to be due to a temporary disturbance of the corneal endothelial cells by the concussion and subsequent distortion of the cornea. In any event, the oedema generally clears without specific therapy in a few days, although its final disappearance may be delayed for some weeks.

If the blunt force causing the injury is of sufficient magnitude, it produces a more severe injury, manifested by the occurrence of tears in Descemet's membrane, and interruption in the continuity of the endothelial layer in the involved area. This, in turn, is associated with more extensive oedema of the corneal stroma, the lesion being larger and denser. Here again, the corneal opacity tends to clear without specific therapy. In the most severe injuries of this type, however, the degree of structural damage is beyond the reparative capability of the endothelium. Permanent oedema, scarring and opacification of the cornea ensue.

Multiple tiny, golden-brown deposits may be seen to lie on the endothelium after blunt trauma. These deposits , derived from the pigmented epithelium of the iris, generally produce no corneal injuries or visual loss and may diminish in time.

When a considerable blunt force is applied directly to the cornea itself, the indentation of the cornea may be so great as to cause laceration of the corneal tissue involving the stroma, Descemet's membrane, and the endothelium while the epithelium and Bowman's membrane usually remain intact. Although in rare instances complete rupture of the cornea may occur. In the later case, the causal force causes excessive rise in the intraocular pressure, resulting in prolapse of intraocular tissue through the laceration.

A most dramatic result of blunt ocular trauma is blood-staining of the cornea. This occurs when the contusion has produced bleeding into the anterior chamber (hyphema). The anterior chamber must be largely or wholly filled with blood, and concomitant elevation of the intraocular pressure seems to be a prerequisite. The metabolic breakdown products of hemoglobin appear to be driven through the corneal endothelium by the increased intraocular pressure. Over an extended period of time, minimally several months, but most often in the order of several years, it tends to resorb, often leaving a clear cornea.

Good visual acuity may eventually be recovered if the original injury has not produced intractable glaucoma or seriously damaged other parts of the eye. Poor vision for a period of years while the corneal opacity is clearing may produce strabismus, and if the injury occurs in a child before the age of five or six, it may cause irreversible amblyopia.

c. Sharp Injury to the Cornea

Incised wounds or stab wounds of the cornea are relatively rare and may result from the application of any sharp or pointed instruments such as knives, needles, pins, pieces of broken glass ... et cetera . Owing to the extreme thinness of the cornea, these injuries are usually perforating, that is to say, reaching the anterior chamber of the eye. Thus, resulting in the escape of the aqueous humour through the wound. The sudden gush of fluid in such a wound may also displace one or another of the ocular tissues into the open wound. Such wound is usually described as a " complicated corneal wound". However, less commonly the edges of the wound are so approximated to become apposed together, thus preventing the escape of the aqueous, such wound is usually described as a "simple wound".

The healing of the simple wound starts immediately by the imbibition of water into its edges, together with the

formation of a fibrinous exudate causing the edges to stick together in apposition, thus, keeping the normal formation of the anterior chamber. If the traumatic incident has not injured intraocular structures, the situation is compatible with a favorable visual outcome.

Such wounds, however, heal with the formation of a permanent scar, the effect of which upon vision will depend upon the density of the scar and upon its location. A relatively lucent scar in the center of the cornea may produce profound visual loss, while a much more dense scar in the corneal periphery may have no effect at all upon vision. Significant complications following this type of injury include infection and irregular astigmatism.

On the other hand, in cases of complicated corneal wounds the incarcerated tissue consolidates with the fibrovascular mass generated by the healing processes, to form a dense opaque mass "an adherent leukoma". This will produce mechanical closure of the wound but may lead to secondary glaucoma and chronic irritability of the injured eye.

Incarceration of the iris is most commonly encountered. less commonly encountered, portions of the crystalline lense may be incarcerated in the wound; an event that is invariably associated with prolapse of the iris. Similarly the vitreous humour may be incarcerated in the wound.

Finally, in the most extensive injuries, the ciliary body, the choroid, or even the retina, may become incarcerated in the wound or prolapse out of the globe.

Incarceration or prolapse of intraocular structure leads to further complications. When wound apposition or healing is delayed, corneal or conjunctival epithelium may proliferate through the wound into the anterior chamber, a condition called epithelialization of the anterior chamber. Uveitis and secondary glaucoma may result, thus resulting in irreparable damage. In an extensive wound with gaping edges, complicated by incarceration of uveal tissue, an ectatic scar may result. In time, the intraocular pressure causes such weak scar to protrude beyond the surface of the cornea, producing a "staphyloma".

d. Retained Foreign Bodies

Foreign bodies are of variable size and the catalogue of such foreign bodies is endless. Depending upon its velocity the foreign body may be lodged in the cornea (Extraocular foreign body), or pass into the inside of the eye (Intraocular foreign body).

Extraocular foreign bodies, are the most common accidents encountered in Ophthalmology. They adhere either to the surface or become embedded in the corneal tissue superficially or deeply.

In most instances, an adherent foreign body is removed by the patient himself by simple rubbing of the eye, or it may be washed out by the flow of tears. Superficially embedded foreign bodies, are more liable to cause irritation of the eye than the deeper ones. However, both may remain in situ causing little or no symptoms. If the foreign body is central, a considerable diminution of vision may result due to laceration, irregularity produced on the corneal surface, disturbing the image thrown on the retina. The important complication of extraocular foreign body is the introduction of infection at the time of injury, and the formation of corneal opacities later on.

Intraocular foreign bodies, penetrate the eye generally from before backwards, and the wound of entry is usually in the cornea, or the anterior part of the sclera. In the cornea, unless the wound of entry is extensive and complicated it usually heals rapidly. A corneal wound, however, always leaves a permanent track which, may eventually become invisible.

e. Explosive wounds

These wounds may be caused by projectiles of some size, travelling at a high velocity (bullets, shell fragments, bombs, mines .. etc). Many of their effects resemble those seen in the perforating injuries by other means, and often share in the complications associated with foreign bodies, but the injuries are more extensive. Most commonly the missile comes from in front, or from the side and rarely from behind, in fatal cases.

2. Non-Mechanical injuries of the cornea

Although initial emphasis has been given to mechanical trauma, yet there are many other types of physical and chemical agents that may injure the cornea.

a. Thermal Injuries

Thermal injuries can be due to direct flame, or to contact of the cornea with hot bodies or fluids. Flame burns commonly involve the face, but the eyes are rarely affected. Only when the flames spread with explosive force and rapidity, is the cornea damaged. Even then, the damage often is superficial and limited to the corneal epithelium. In such cases, regeneration of the epithelium occurs within 48 hours, leaving no residue.

Contact burns are encountered in industry, for instance, when flying fragments of glowing metal enter the fornix before the blink reflex can act to prevent it. The cornea may be involved and the burn may be severe enough to produce permanent scarring of both structures. Contact burns incurred at home are frequently caused by splashing of hot fluids onto the face.

These accidents, often involve young children whose inquisitiveness leads them to overturn boiling liquid from the kitchen range upon themselves. The same hazard may, however,

be encountered in industry as a result of a bursting boiler or steam pipe. The blink reflex often protects the eyes or at least decreases the severity of the injury.

Exposure to extreme cold, may produce lesions remarkably similar to those due to heat in both their clinical and their histologic characteristics. They occur more rarely, however, and invariably are encountered as the result of exposure in survivors of mountain climbing and high altitude flying.

b. Ultrasonic Injuries

High intensities of ultrasonic vibrations, will destroy the corneal epithelium and produce necrosis of the stroma. Fortunately, however, these effects have only been seen in experimental animals, and at present, are largely of theoretical interest only. This form of energy is not a common source of industrial or domestic injury.

c. Electrical Injuries

The anterior segment of the eye, may be damaged considerably as the result of lightning or a high-voltage electrical burn. Corneal stromal opacities, may be demonstrable beneath an intact epithelium. These often are largely a manifestation of oedema and they clear spontaneously. Alternatively, a more destructive electrical burn may cause the corneal epithelium

to become necrotic and slough. Corneal sensation is diminished and stromal ulceration and secondary infection may ensue.

d. Radiational Injuries

A wide range of wavelengths of the electromagnetic spectrum are capable of injuring ocular tissues. A latent period generally lapses between the absorption of the energy and the appearance of its biologic effects. This varies with the wavelength of the rays and the tissue affected; the longest wavelengths have the shortest latent period. Thus, the latent period following infrared radiation is negligible so that an "instantaneous" burn results while the latent period following ultraviolet irradiation is in the order of hours, while the period following exposure to ionizing radiation may be weeks or months. For any particular wavelength, the latent period varies with the intensity of the exposure. With increasing energy levels, the pathologic changes increase until a maximum level is reached, and thereafter, the changes are constant. The vulnerability of the tissue to radiational injuries, varies with its ability to repair itself.

The effects of radiation, can be divided into : thermal, abiotic and ionizing lesions. Thermal lesions are non -

specific in nature and are comparable to the effects of raising the temperature by other means. The abiotic effects are produced by the ultra-violet band of the energy spectrum, the lesion varies from granular appearance of the cornea to necrosis of it and even perforation, according to the dose. The ionizing lesions result from the liberation of ions, which causes cellular abnormalities or cellular death.

e. Chemical Injuries

Chemical injuries of the eye, including the cornea, are uncommon and constitute a markedly heterogeneous collection of accidents, varying in severity from complete loss of one or both eyes, to a trivial and transient irritation of little significance. Most of them are due to external contact with the chemical in the form of a solid, liquid, powder, dust or vapour. Chemical injuries may occur at home, but chemical laboratories and industry, however, are responsible for the vast majority of chemical hazards. Also the careless use of drugs is responsible for such injuries.

In general, chemical substances may be said to exert either an irritant or a precipitating effect. The irritant reaction in the cornea raises the epithelium from Bowman's

membrane. The precipitating effect results especially from the salts of heavy metals. Injuries of the cornea vary from sloughing of the corneal epithelium, oedema in the substantia propria with opacification, or necrosis and perforation of the cornea.

III. MATERIAL and METHODS

The data in this study are collected from two main sources:

1- The records of ocular injury seen in the medicolegal clinic of the Jordan University Hospital, during the period from January 1,1978 till December 31,1983.

The number of patients given medicolegal reports during this period is "306", including injuries to "349" eyes. These represent only a small percentage of cases attending the Ophthalmic clinic of Jordan University Hospital during this period, since most injured people don't care for medicolegal reports, unless the injuries become subject of trials at court. These medicolegal reports were sorted out from the records of the Jordan University Hospital and the data therein were subject to statistical analysis by the usual methods.

2- Cases in the Ophthalmic clinic of Jordan University Hosp. were seen during the period August 1,1982 to July 7,1983. Owing to the multiplicity of clinics in the Ophthalmic department, this study included only a small sample of the large number of cases attending this department. The study comprises "65" cases of eye injuries including injuries to "75" eyes.

A questionnaire was planned on the same line as any epidemiological study. The questionnaire sheet is shown on the following page.

EYE INJURIES AT JORDAN UNIVERSITY HOSPITAL

Hospital No. Case No. Name

Age Sex Occupation

Residence Time&date of accident

Day of accident.....Place of accident

Circumstance of accident

Mechanical injury

<u>Direct</u>	<u>Indirect</u>
Causative agent	Indirect effect from head injury:
Site
Effects	Affection due to other injuries:

Non-mechanical injury

Causative agent	Site
Effect	

Visual acuity

Before injury	at the time of injury
follow up, 1m	3 m
6m	ly

Post-traumatic complication

Sick-leave

Permanent disability

Remarks :

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The data of every case of eye injury reporting to the medicolegal clinic of J.U.H. from 1978 to 1984 were registered , including information about age, sex, occupation, residence, place of accident, time, date of accident, side affected, complications, sick-leave needed, sequelae of vision.

There were inefficient information regarding occupation of the injured patient, as it is unknown in many cases and isn't exactly given in others. It was also not known whether the accident had occurred at home or outside it. Many cases had not taken final medicolegal reports and so complications, sick-leave needed, sequela of vision and the permanent disability resulted for many patients was unknown. These medicolegal cases amounted to "306" eye injuries comprising "63" corneal injuries.

"65" cases of eye injuries reporting to Ophthalmic clinic comprising "43" corneal injuries, were taken and their data were put on the questionnaire sheet as far as possible, but the sick-leave needed, the permanent disability resulted, the complications and the sequelae of vision of most such cases was unknown, as the majority of them did not take medicolegal reports (only "4" patients had such reports). At the same time, the follow-up of these cases for more than one year after the last case of this study (1.8.1983) show that, most cases had no or had few visits to the Ophthalmic clinic after being discharged. So, both medicolegal and Ophthalmic patients were considered together.

IV. R E S U L T S

The total number of cases attending the forensic clinic in the Jordan University Hospital during the years of study were "3474". Only "306" cases of them were eye injuries, i.e. the percentage of eye injuries to the total number of injuries examined medicolegally was 8.81% .

Results were classified according to age and sex, occupation and sex, geographical distribution, day, time and type of accident for eye injuries in general. Further studies on both eye & corneal injuries were carried out concerning the site of injury, the eye which is subject more to trauma in accidents and fights, sick-leave needed, complications, sequelae of vision, permanent disability resulted, and any associated injuries to the body apart from those of the eye.

The statistical analyses of the results were tabulated, and graphs were drawn to represent these results.

A. Age & Sex

To find out the correlation between the incidence of eye injuries and the age of the patient, the span of life was subdivided into periods of "five" years each, starting from birth. After the age of "45" years, it was found of little value to classify the ages into five-year periods, owing to the small number of cases in each group, and thus the cases after "45" years of age were put in one group. The following table and graph show the distribution of eye injuries according to age and sex.

TABLE 1. EYE INJURIES ACCORDING TO AGE AND SEX

AGE IN YEARS	MALE		FEMALE		TOTAL	
	NO.	PERCENT	NO.	PERCENT	NO.	PERCENT
0 - 4	13	46.52	10	43.48	23	6.20
5 - 9	35	71.43	14	28.57	49	13.21
10 - 14	44	78.57	12	21.43	56	15.09
15 - 19	45	73.77	16	26.23	61	16.44
20 - 24	32	72.73	12	27.27	44	11.86
25 - 29	33	78.57	9	21.43	42	11.32
30 - 34	19	90.48	2	9.52	21	5.66
35 - 39	12	75	4	25	16	4.31
40 - 44	16	76.19	5	23.81	21	5.66
45 & ABOVE	29	76.39	9	23.68	38	10.24
TOTAL	278		93		371	

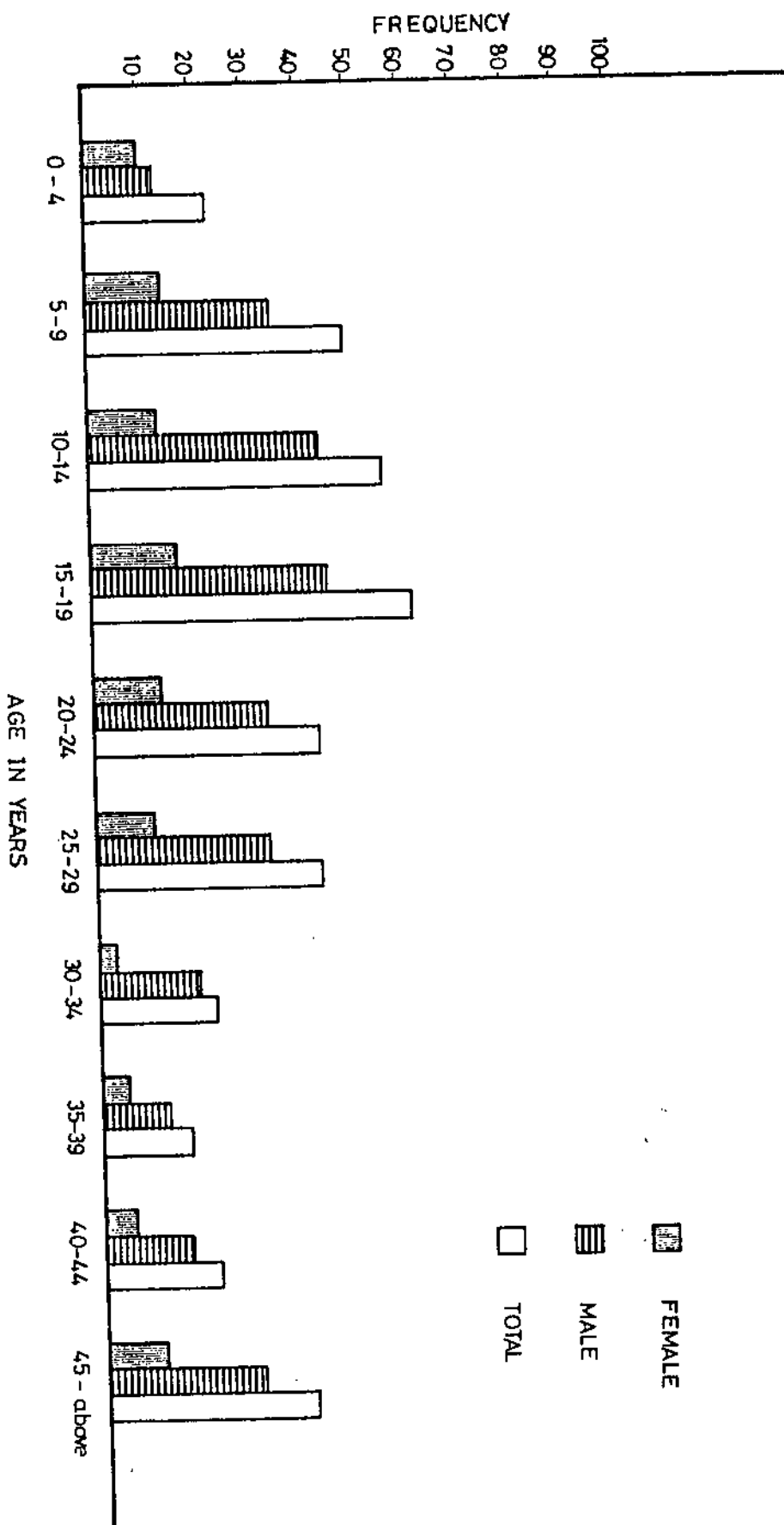


FIG. 1 : EYE INJURIES ACCORDING TO AGE & SEX .

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The most common incidence of eye injuries, as shown in table (1), fig. (1), is the group of patients under thirty years of age, who constitute about three fourths, 74.12 %, of cases; of which 60.36% were between five and twenty years. Children under fifteen years of age share, to a greater extent, slightly more than one third , 34.50%, of injuries occurred in them. No injuries below " $1\frac{6}{12}$ " years or above "80" years were present.

There is a clear difference in the incidence of ocular injury between the sexes, the male to female ration for ocular injury was 2.99 : 1 i.e. females constitute 25.07% of all cases - about one fourth. Females are particularly vulnerable in the first decade, for males; the greatest incidence of eye injury occurs in the second and in the third decades. For all age groups; males are almost more liable to injuries than females.

B. Occupation & Sex

To correlate the incidence of eye injuries to the occupation of the victims, the different occupations were classified into seven groups as follows :- students, employees, workers, housewives, drivers, unemployed and others.

By students it was meant all individuals between six and eighteen years of age, attending schools, and those above eighteen who attend the universities or institutes.

By employees we mean individuals under employment of the government. Drivers are individuals who are professionally classified and employed in the capacity of driver. Unemployed people are those who are above sixty years of age or under six years.

The following table and graph are designed to show the correlation of eye injuries to occupation and sex.

TABLE 2. EYE INJURIES ACCORDING TO OCCUPATION
& SEX

OCCUPATION	MALE		FEMALE		TOTAL	
	NO.	PERCENT	NO.	PERCENT	NO.	PERCENT
STUDENT	115	74.68	39	25.32	154	41.51
EMPLOYER	19	86.36	3	13.64	22	5.93
WORKER	26	100	-	0	26	7.00
HOUSEWIFE	0	0	27	100	27	7.28
DRIVER	16	100	-	0	16	4.31
OTHER OCCUP- ATIONS	11	100	-	0	11	2.96
UNEMPLOYED	31	65.96	16	34.04	47	12.67
UNKNOWN	61	89.71	7	10.29	68	18.33
TOTAL	279		92		371	

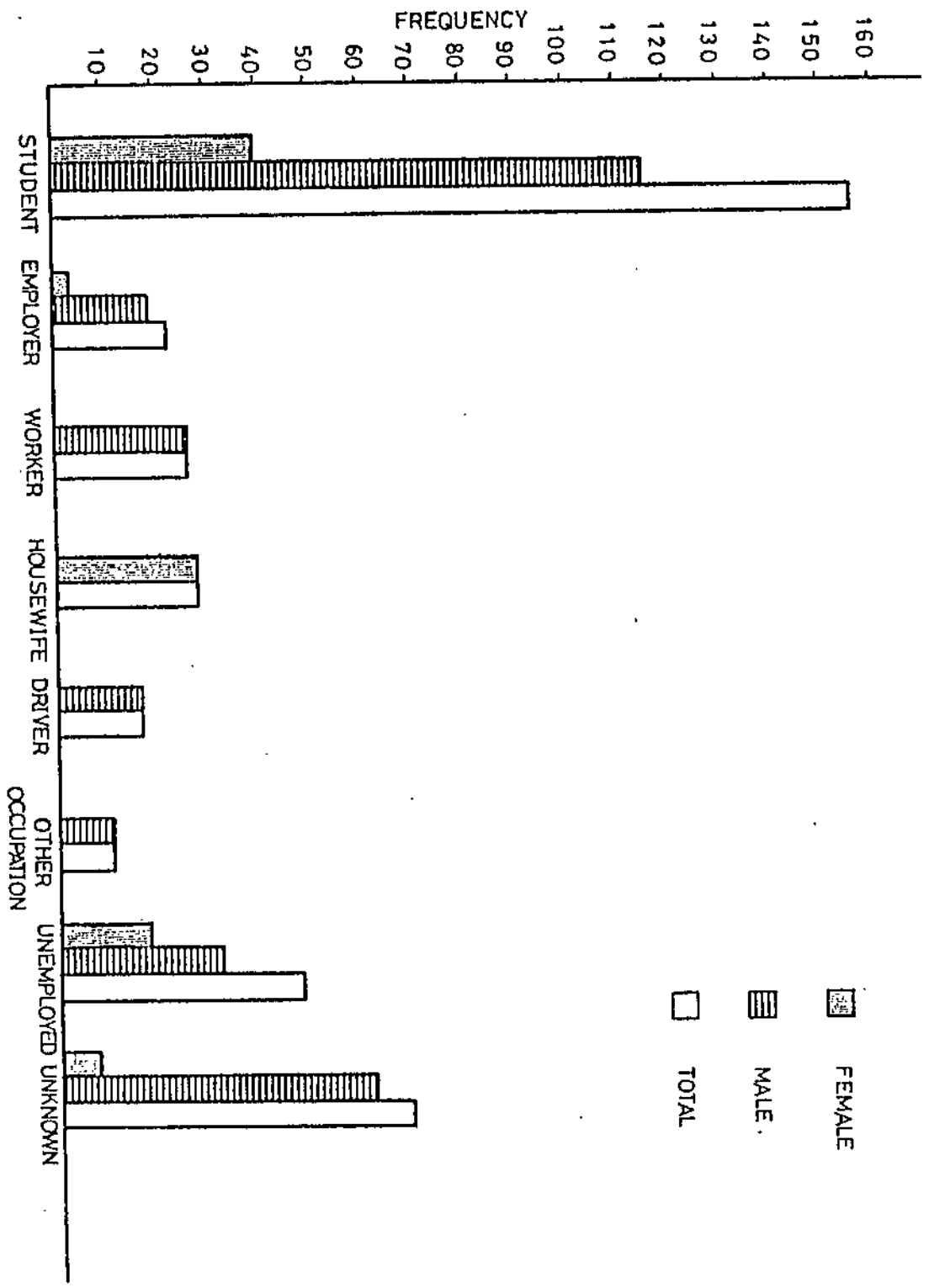


FIG. 2 : EYE INJURIES ACCORDING TO OCCUPATION & SEX .

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From the preceding data it could be clearly noted that there were certain occupations in which males and females were subject to trauma e.g. students, employees. And, of course, females are the only injured group in the capacity of a housewife. In working and driving only males were subject to injuries.

It could also be seen that students constitute the majority of cases - 41.51% , then the unemployed - 12.67% . The remainder is of no significance, as those with unknown jobs constitute 40% of them.

In cases of females, housewives constitute 29.03% of the affected females.

C. Place of Accident and Residence

Jordan is divided into five districts (or regions) namely Amman, el-Balka' , Irbid, el-Karak, and Maan. It was noticed that, during the study, the majority of eye injuries were restricted to the District of Amman; where the Jordan University Hospital is located. Eye injuries reporting to this hospital from other regions were varied according to the distance of those regions. So that in el-Balka' district, which is the nearest to Amman, a large number of cases was observed. While in the far region of el-Karak and the nearby region (to Karak) of Maan, only few cases were reported to the hospital. For this reason, the geographical distribution of eye injuries was considered , also considered was the

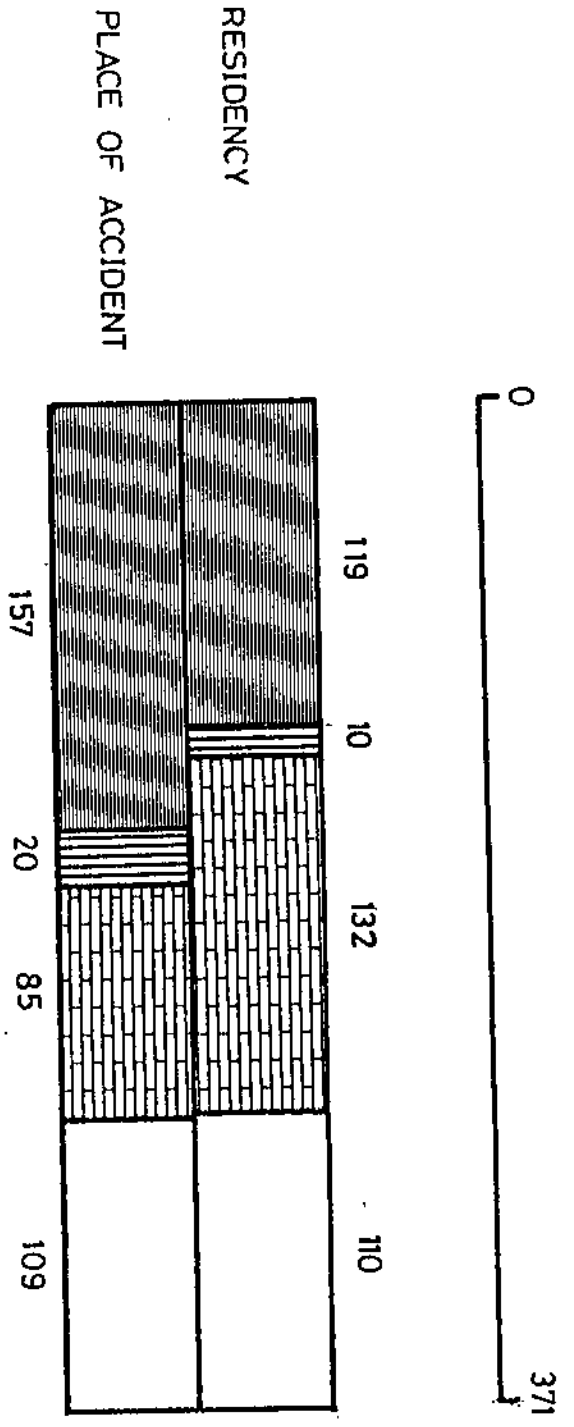
number of cases in the different places. Thus, Amman District was divided into six sub-areas, and el-Balkaa' district was divided into five sub-areas. Karak and Maan were considered as one region and termed "resting of Jordan".

The following tables and graphs display the distribution of eye injuries according to the place of accident, and the place of residence, and the percentage of cases in which the place of accident differs from that of residence.

TABLE 3. EYE INJURIES IN RELATION TO THE
PLACE OF ACCIDENT OF RESIDENCY

PLACE OF ACCIDENT & RESIDENCY	RESIDENCY		PLACE OF ACCIDENT	
	NO.	PERCENT	NO.	PERCENT
AMMAN GOVERNATE				
1 TELA-ELALI	7	1.89	8	2.16
2 SPORTING CITY	3	0.80	12	3.23
3 THE RESTING OF AMMAN CITY	132	35.58	85	22.91
4 SOWAILEH	22	5.93	37	9.97
5 EL-JOBAHA	17	4.58	34	9.16
6 THE RESTING OF AMMAN GOVERN	42	11.32	44	11.86
EL-BALKA GOVERN.				
7 SALT	20	5.39	23	6.20
8 BAKAH	41	11.05	43	11.59
9 AIN ELBASHA & SAFOOT	7	1.89	8	3.23
10 FOHAIS & MAHESS	12	3.23	12	3.23
11 EL-GOUR	14	3.77	8	2.16
IRBID GOVERN	47	12.66	40	10.78
RESTING OF JORDAN GOVERN	5	1.35	12	3.23
OUTSIDE JORDAN	2	2.54	1	0.27
TOTAL	371		371	

FIG. 3 : EYE INJURIES IN RELATION TO THE PLACE OF ACCIDENT & RESIENCY .



- 1 THE REST OF AREAS THAT SURROUND JORDAN UNIVERSITY HOSP.
- 2 TELA - ELALI & SPORTING CITY.
- 3 THE REST OF AMMAN.
- 4 THE REST OF JORDAN.

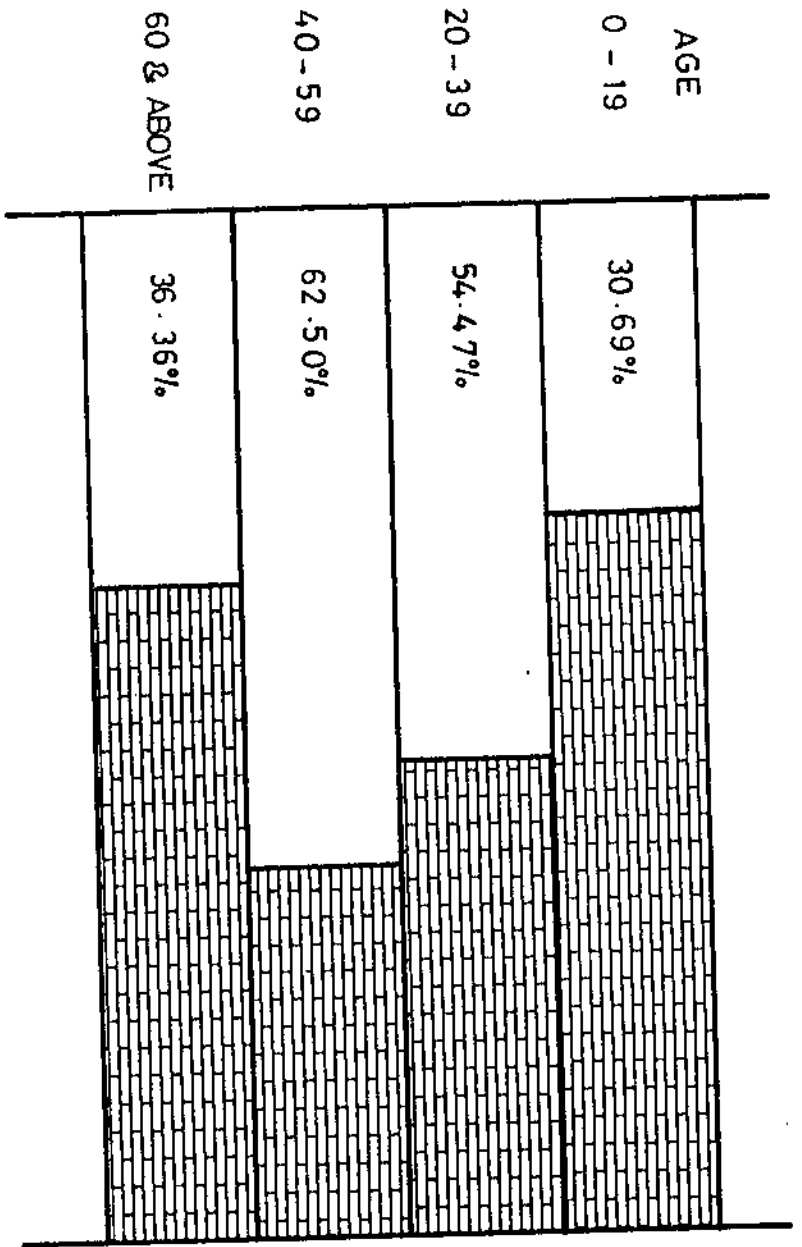
NOTE AREA NO. 1 + 2 = AREAS THAT SURROUNDS J.U.H.

2 + 3 = AMMAN CITY.

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TABLE (4) SHOWS THE PERCENTAGE OF CASES IN WHOME THE PLACE OF ACCIDENT DIFFERS FROM THAT OF RESIDENCY.

AGE IN YEARS	% OF PLACE OF ACCIDENT THAT DIFFERS FROM RESIDENCY
0 - 19	30.69
20 - 39	54.47
40 - 59	62.50
60 AND ABOVE	36.36



% OF PLACE OF ACCIDENT THAT DIFFERS FROM RESIDENCY
 % OF PLACE OF ACCIDENT THAT IS SIMILAR TO THAT OF RESIDENCY

FIG. 4 : SHOWS THE PERCENTAGE OF CASES IN WHOME THE PLACE OF ACCIDENT DIFFERS FROM THAT OF RESIDENCY .

It is obvious from the previous tables and figures, that the majority of individuals - 38.27% , reported to Jordan University Hospital, live in the city of Amman, the capital, (including areas 1,2,3), while those in areas surrounding this hospital (areas 1,2 ,4,5,7,8,9,10) constitute 34.77% of cases.

When considering the place of accident, the reverse occurs. More individuals - 48.79% of cases were coming from areas that surround Jordan University Hospital.

It is found, (table 4) that injuries to individuals between 20 and 60 years old happen more in places outside their residence.

D. Day of Accident

It was thought to check the correlation of the incidence of eye injuries against the day of the week, in order to find out whether work increases the incidence as expected, or the occupational accidents were the major cause of eye injuries, or whether traffic accidents were the major cause. In the later case, weekends would be the major percentage of eye injuries.

In Jordan, there is a habit of going on picnics during the weekend. Therefore, traffic accidents during the weekend are common. The following table and graph show eye injuries according to the day of accident.

TABLE 5. EYE INJURIES ACCORDING TO THE DAY OF ACCIDENT.

DAY OF ACCIDENT	NO. OF CASES	%
SATARDAY	46	12.40%
SUNDAY	33	8.89%
MONDAY	52	14.02%
TUSDAY	51	13.75%
WEDENSDAY	55	14.82
THIRSDAY	58	15.63
FRIDAY	70	18.87
UNKNOWN	6	1.62
TOTAL	371	

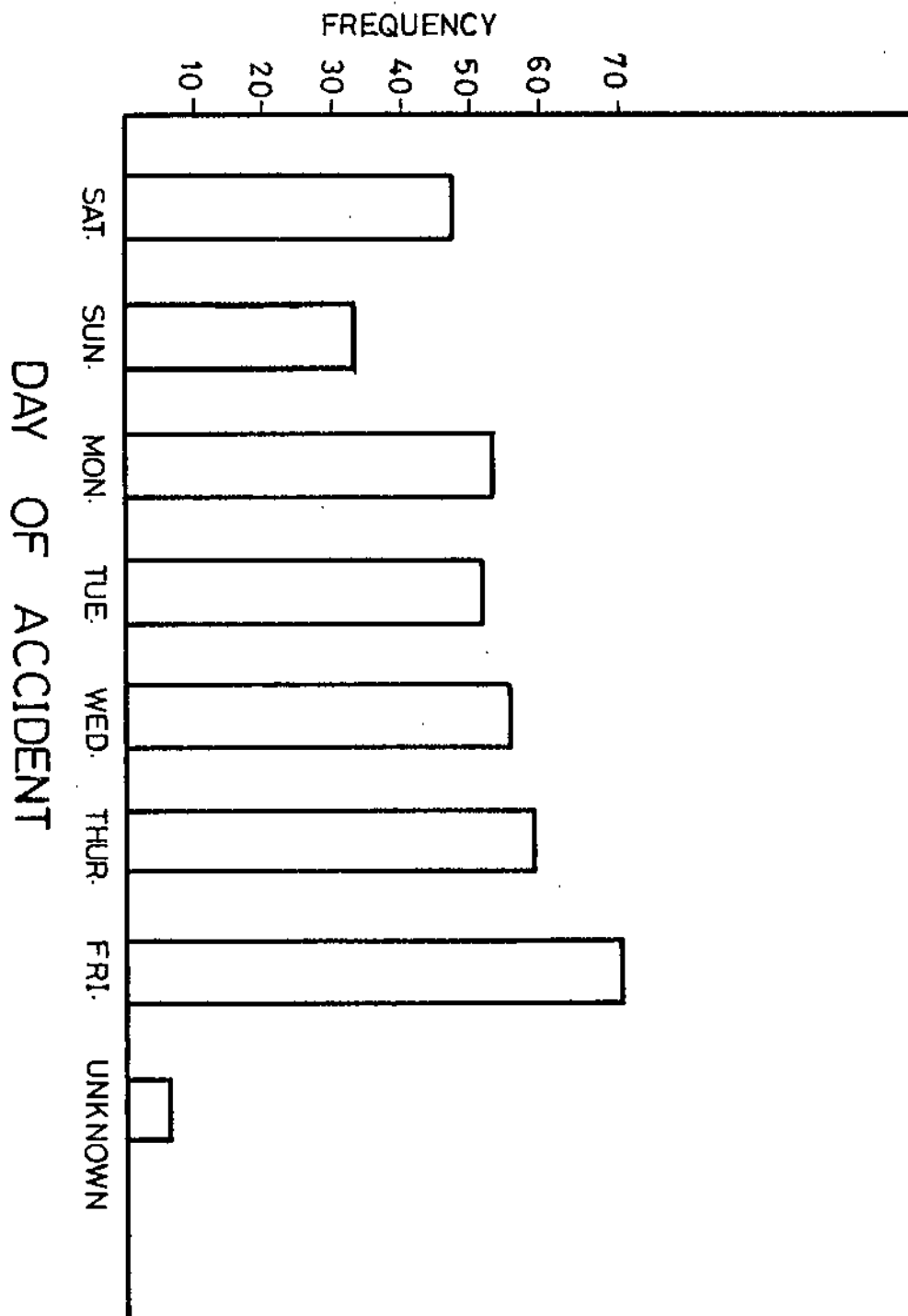


FIG. 5 : EYE INJURIES ACCORDING TO THE DAY OF ACCIDENT.

It could be noted that the smallest number of eye injuries occurred on Sunday, which is not a general day off in Jordan; while the number of cases reaches its maximum on Friday, 18.87% , which is the official weekend.

It could be said, with this respect, that most people go for picnics on Fridays. This may explain the rise in the number of accidents.

E. Time of Accident

The twenty-four hours of the day are divided into equal periods; each of three hours. Between five a.m. and just before eight p.m., while the night period was taken as a single period; between eight p.m. and five a.m.

The following table and graph show eye injuries according to time of accident.

TABLE 6. EYE INJURING ACCORDING TO THE TIME
OF ACCIDENT

TIME OF ACCIDENT	NO. OF CASES	PERCENT
5 AM - 7.59	25	6.74
8 - 10.59	66	17.79
11 - 1.59 PM	78	21.02
2 - 4.59	96	25.88
5 - 7.59	62	16.71
8 PM - 5 AM	34	9.16
UNKNOWM	10	2.70
TOTAL	371	

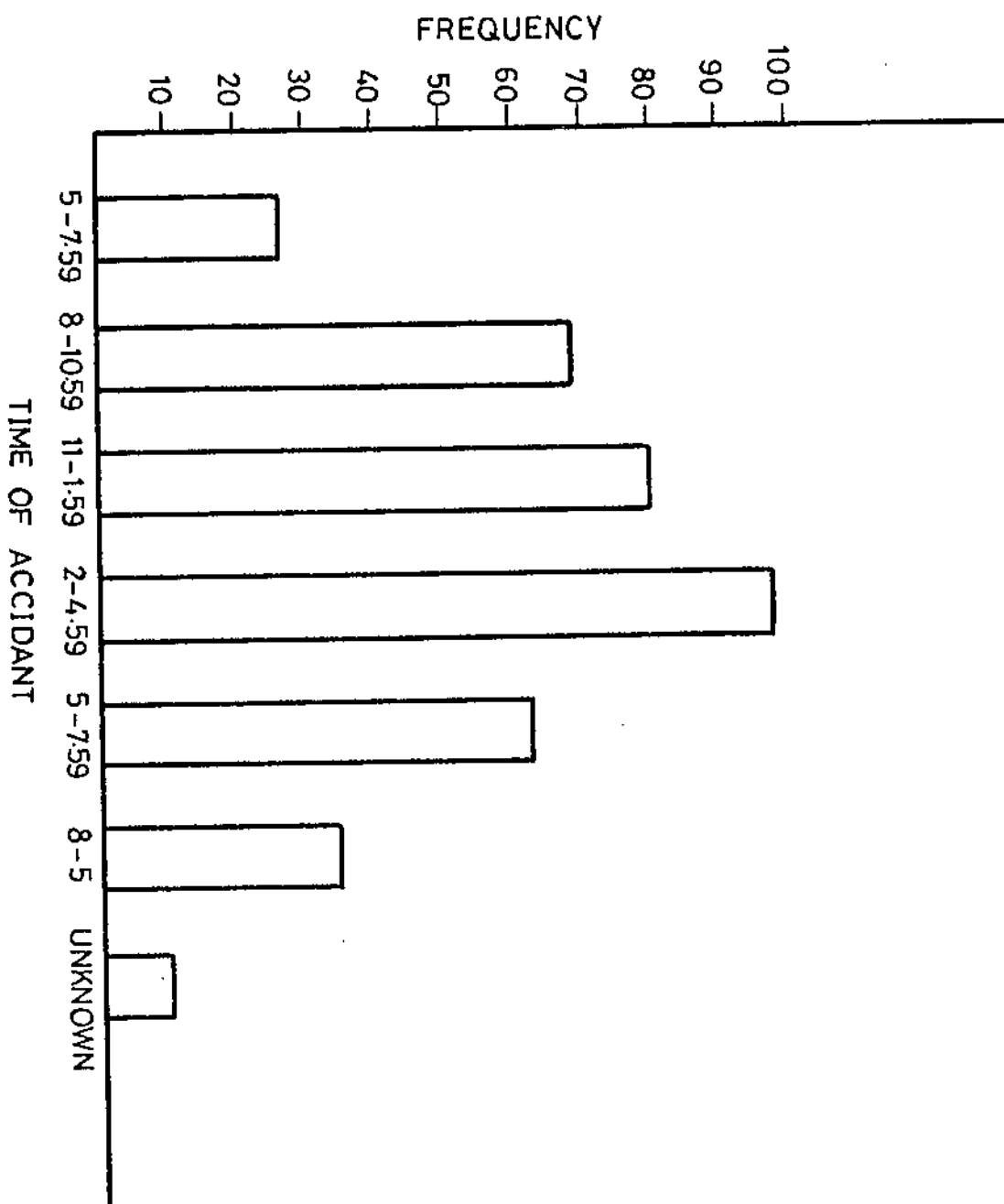


FIG. 6 : EYE INJURIES ACCORDING TO THE TIME OF ACCIDENT .

The vast majority of ocular accidents, occur between two and five p.m. then from eleven a.m. and till two p.m. together they constitute 46.90% of accidents. This can be explained by the fact that in this period most activities occur i.e. students go out and in their schools, employees finish their jobs and many vehicles are in use.

F. Type of Accident

When the correlation of the incidence of eye injuries to the type of accident was studied, it was found necessary to group the common types of accidents that could cause eye injuries, into a number of groups which have got something in common. Thus, accidents were classified into seven types :-

1. Traffic Accidents:

These include all accidents occurring to pedestrians hit by vehicles, or to people accompanying the drivers in the cars or motorcycles .. etc.

2. Occupational Accidents:

These affect the people during their work.

3. Quarrel or Fights

Which result in injuries incurred by people to cause intentional harm.

4. Sports and Playing

Such injuries occur accidentally; a person might hurt himself, or get hurt by someone else in the process of playing. Children often hurt each other during play.

5. Foreign Bodies

Such as flying fragments of stones, metals, bombs, missiles ... etc.

6. Falling from a high distance.

7. Miscellaneous causes.

The following table and graph display the types of accidents.

TABLE 7. SHOWS THE TYPE OF ACCIDENTS

TYPE OF ACCIDENT	NO.	NO.
1) <u>TRAFFIC ACCIDENTS</u>		188
OCCUPANTS	116	
PEDIASRIAN	72	
2) <u>QUARREL</u>		92
INJ. BY BLUNT OBJECTS	88	
INJ. BY SHARP OBJECTS	4	
3) <u>OCCUPATIONAL</u>	35	35
4) <u>PLAY INJURIES</u>	26	26
5) <u>FLYING FOREIGN BODIES</u>	18	18
6) <u>FALLING FROM A HEIGHT</u>	10	10
7) <u>OTHER INJURIES</u>	2	2
TOTAL	371	371

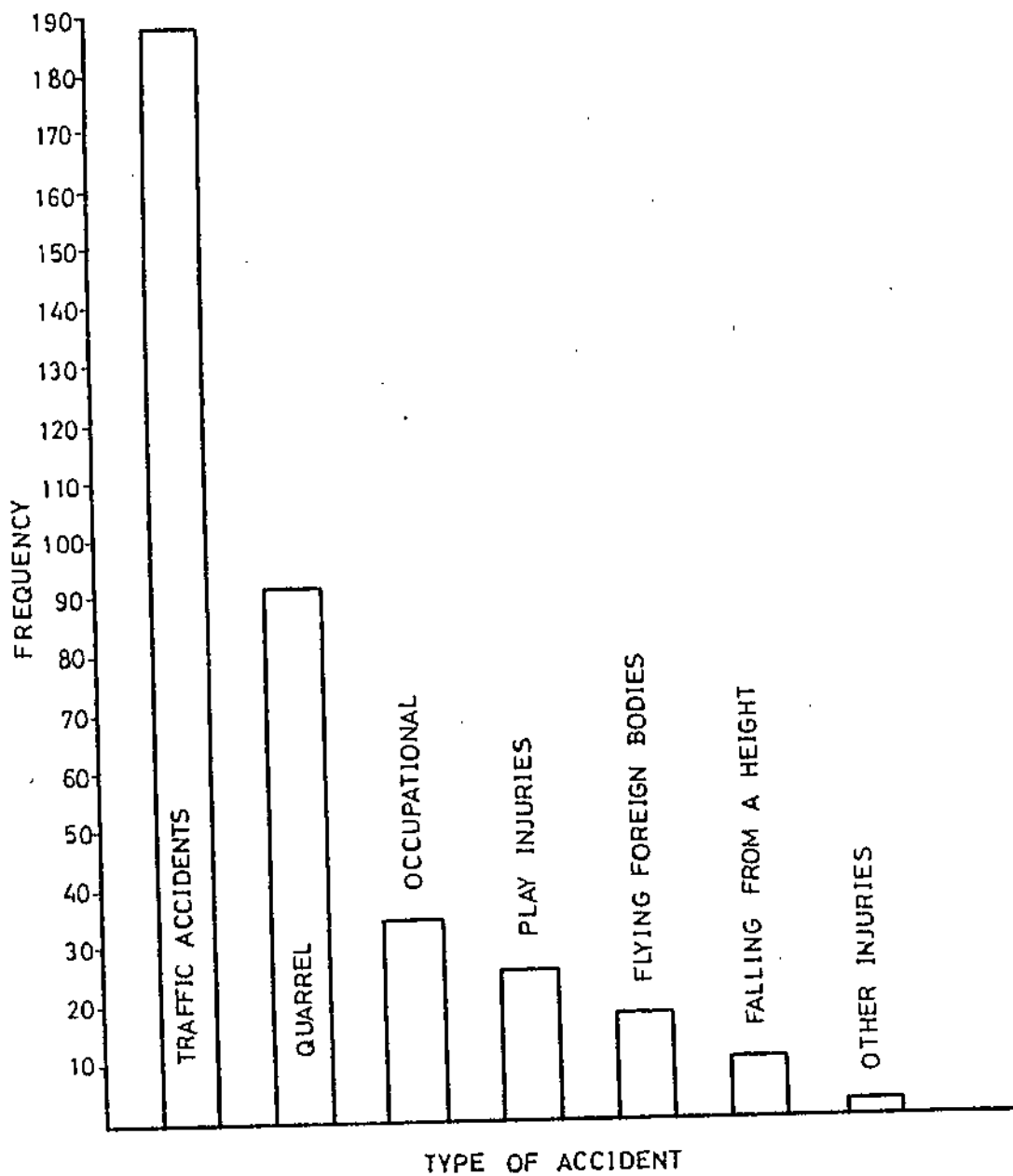


FIG. 7 : SHOWS THE TYPE OF ACCIDENTS.

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The most common injuries affecting the eye were accidental in nature, these include all what is mentioned in table "7" except cases due to fights. These constitute 75.20% of cases while about one fourth - 24.80% of injuries were the result of fights.

The majority of accidental injuries - 67.38% were the result of traffic accidents, 38.80% of which were incurred on pedestrians. Occupational injuries constitute only 9.43% of cases, while flying foreign bodies were 4.85%.

In assault, the majority of injuries were caused by blunt objects i.e. 95.65% of cases.

G. Side Affected: Accidents & Assaults

The following table and graph are designed to show the side affected and whether it is accidental or due to assault.

TABLE 8. SHOWS THE SIDE AFFECTED & IF IT IS DUE TO ASSAULT OR NOT.

EYE AFFECTED	ACCIDENTAL CASES		INJURY DUE TO ASSAULT		TOTAL	
	NO.	%	NO.	%	NO.	%
RIGHT EYE	116	41.28	24	26.67	140	37.74
LEFT EYE	121	43.06	57	63.33	178	47.98
BOTH EYES	44	51.66	9	10	53	14.29
TOTAL	281		90		371	

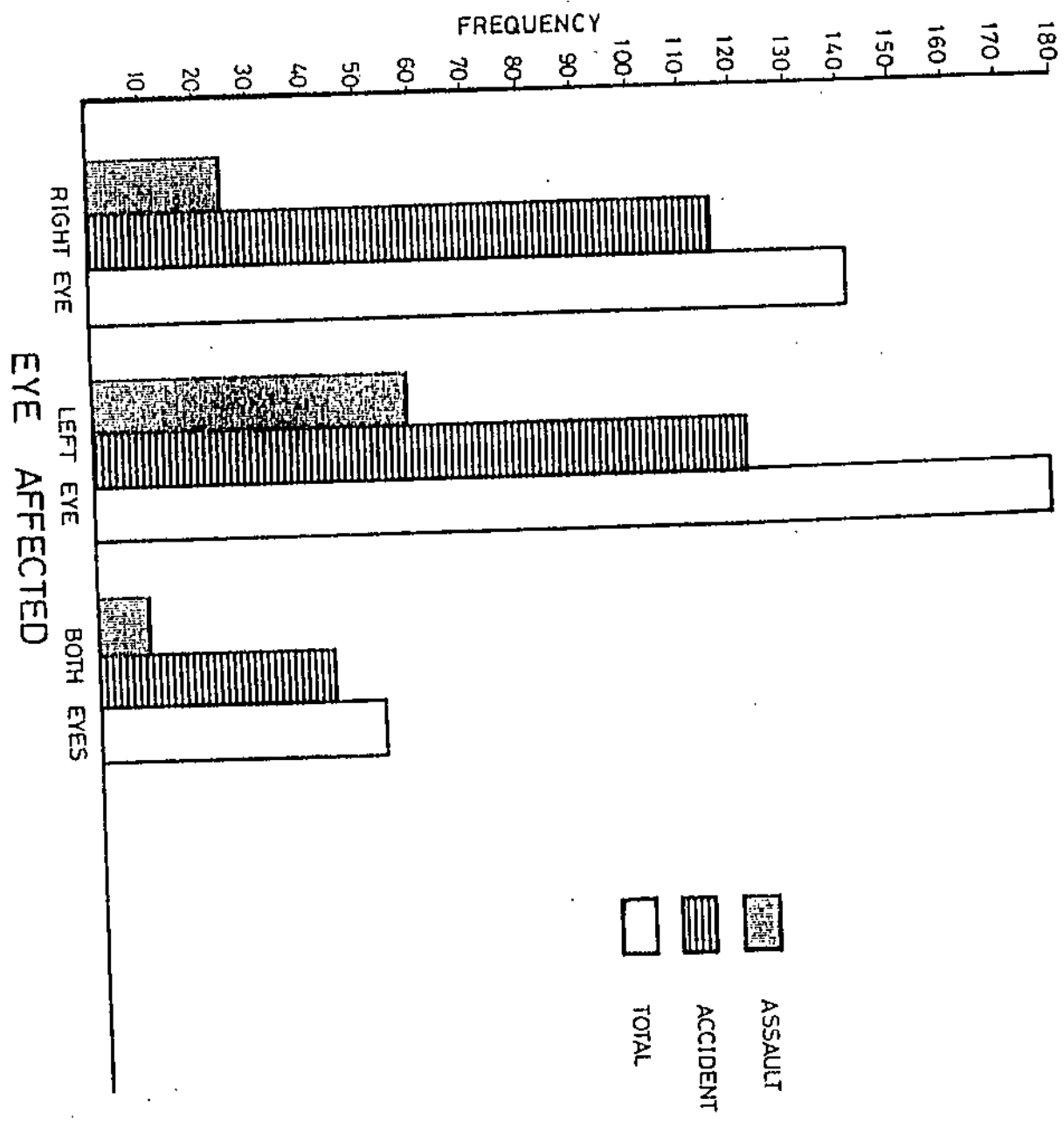


FIG. 8 : SHOWS THE SIDE EFFECTED & IF IT'S DUE TO ASSAULT OR NOT

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It is noted that the left eye is affected more than the right eye; as it is affected alone in 47.98% of cases. But in accidents, both show nearly the same incidence of eye injuries i.e. the left eye is more exposed to injuries in cases of assault (63.33% of injuries in cases of assault were affecting the left eye). This is due to the fact that most people are right-handed.

H. Type of Trauma

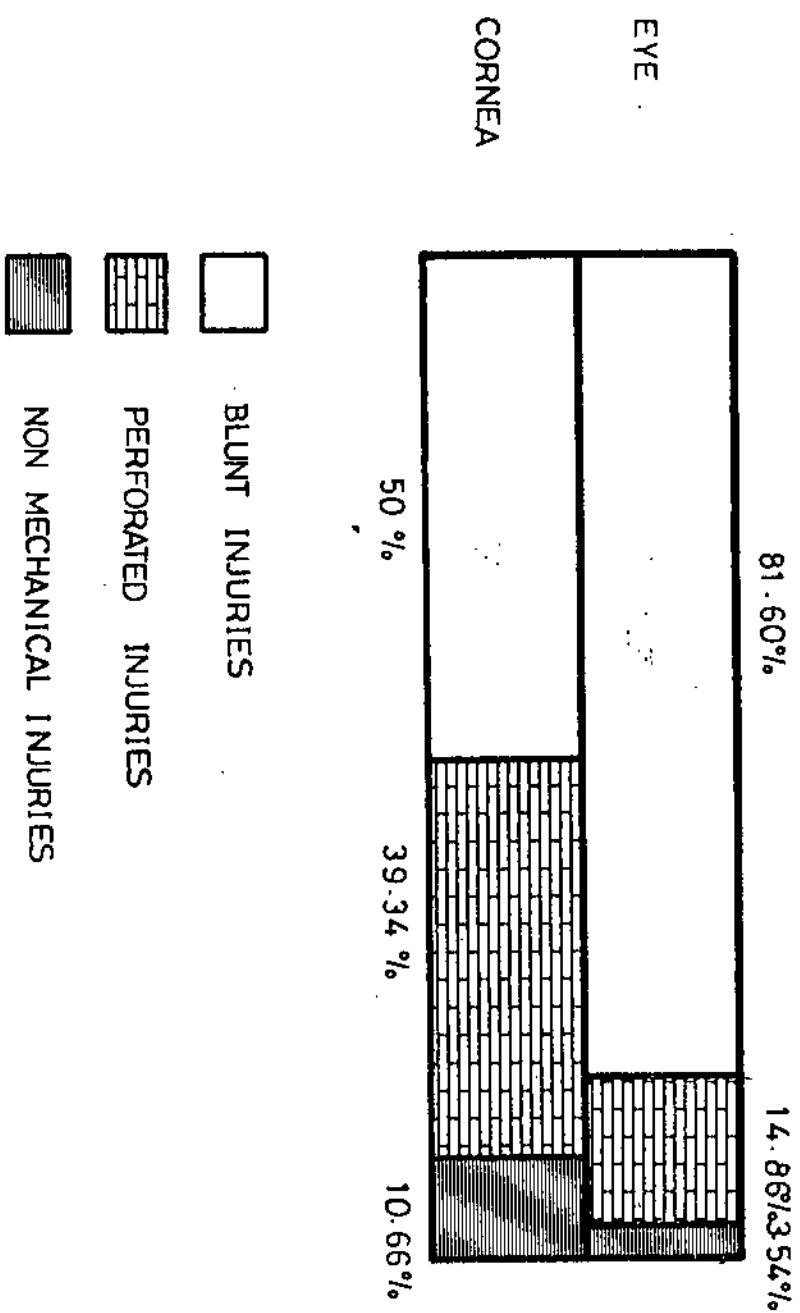
The causal trauma of the eye and cornea were classified as mechanical and non-mechanical injuries. Mechanical injuries are divided into direct injuries comprising contusions and perforating injuries, and indirect injuries where the primary injury is located outside the eye but the eye also is affected.

Non-mechanical injuries were subdivided into chemical, ultraviolet, and thermal injuries. The following table and graph show the type of trauma.

TABLE 9. EYE & CORNEAL INJURIES ACCORDING TO
THE TYPE OF TRAUMA.

TYPE OF INJURY	EYE INJURIES		CORNEAL INJURIES	
	NO.	%	NO.	%
* <u>MECHANICAL INJURY</u>				
DIRECT MECHANICAL INJ				
CONTUSION OF THE GLOBE	116	27.36	61	50
CONTUSION OF ADNEXA	197	46.46		
PERFORATION OF THE GLOBE	63	14.86	48	39.34
INDIRECT MECHANICAL INJ.	33	7.78		
* <u>NON-MECHANICAL INJURY</u>				
CHEMICAL	7	1.65	7	5.74
ULTRAVIOLET	4	0.94	4	3.28
THERMAL	4	0.94	2	1.64
TOTAL	424		122	

FIG. 9 : EYE & CORNEAL INJURIES ACCORDING TO THE TYPE OF TRAUMA



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The majority of cases - 96.46% , as shown in the above table, were the result of mechanical trauma, while the minority is non-mechanical injury i.e. 3.54% of cases. Most cases - 84.60% of the mechanical injuries were caused by blunt objects, while injuries caused by sharp objects constitute 15.40% of cases.

In cases of corneal affection, more injuries - 44.04% were caused by sharp objects, and less injuries caused by blunt objects i.e. 45.96%. There are also no indirect mechanical injuries to the cornea.

I. The Site of Eye Injury

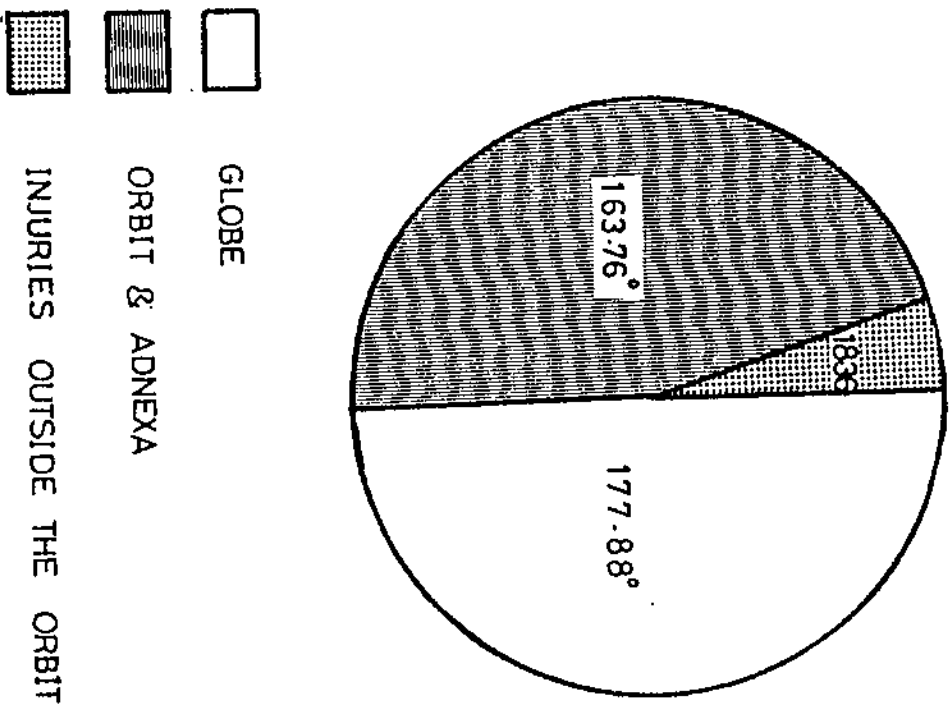
In trying to study the site of the injury and its relative incidence to other sites, it has been decided to differentiate between injuries affecting the eye-globe itself; injuries affecting the orbit and its contents, and injuries affecting other sites in the body but affecting the eye secondarily , such as those affecting the facial nerve which may affect the eye through causing paralysis of the lids.

Furthermore, globe injuries were divided into two main groups: The first affecting the anterior segment of the eye which is composed of conjunctiva, cornea, sclera, anterior chamber, iris and lens. While the second comprises the posterior segment which is composed of vitreous, retina, optic nerve. The following table and graph display the site of eye injury.

TABLE 10. SHOWING INJURIES ACCORDING TO THEIR SITES.

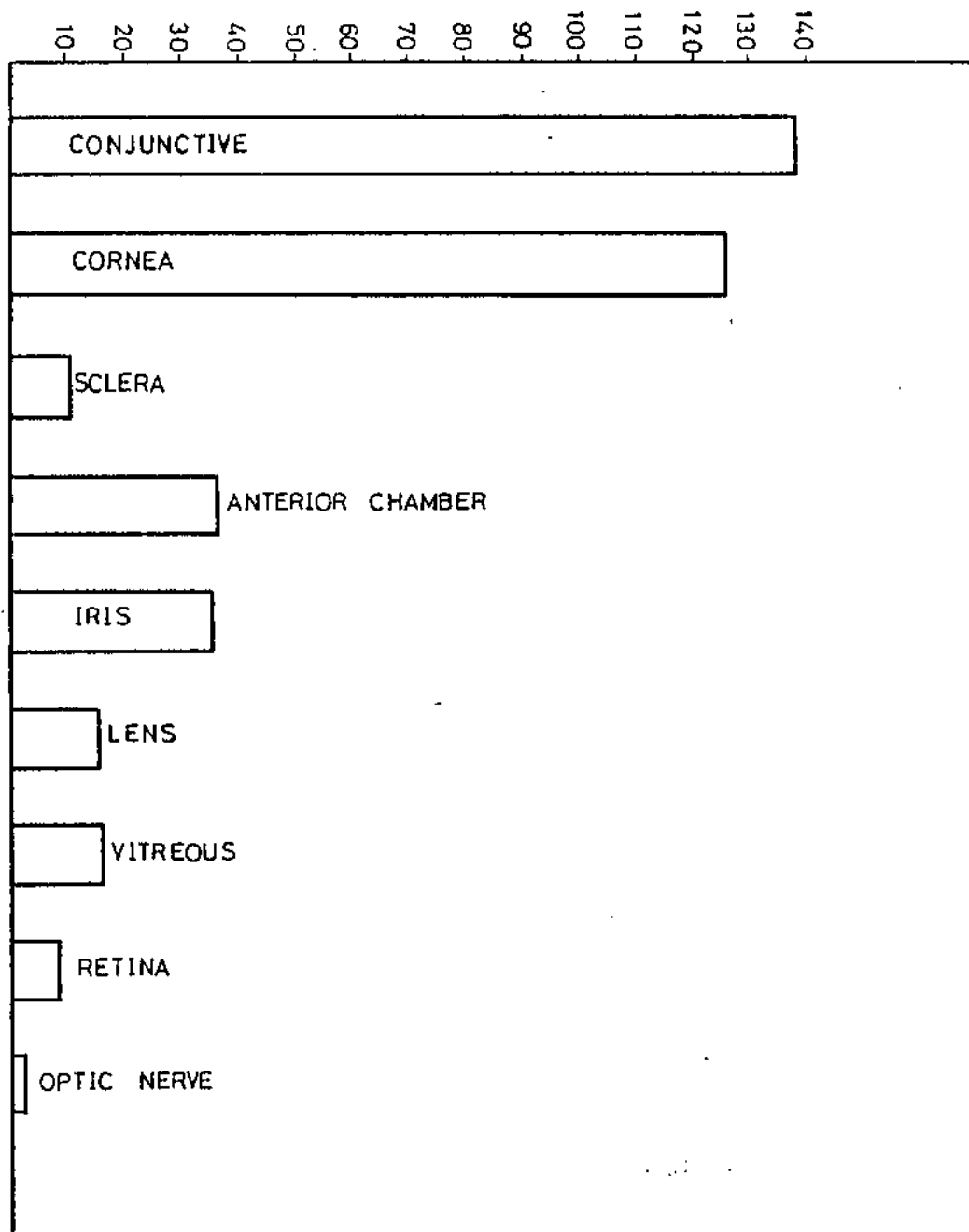
SITE OF EYE INJURIES	NO.	%
<u>GLOBE</u>		
ANTERIOR SEGMENT	352	46.01%
1) CONJUNCTIVA	137	
2) CORNEA	124	
3) SCLERA	10	
4) ANTERIOR CHAMBER	36	
5) IRIS	30	
6) LENS	15	
POSTERIOR SEGMENT	26	3.40
7) VITREOUS	16	
8) RETINA	8	
9) OPTIC NERVE	2	
<u>ORBIT & SOFT ADNEXA</u>	348	45.49
<u>INJURIES OUTSIDE THE ORBIT</u>	39	5.10
TOTAL	765	

FIG. 10 :(A) SHOWING INJURIES ACCORDING TO THEIR SITE.



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FIG. 10 : (B) SHOWING INJURIES OF THE GLOBE ACCORDING TO THEIR SITE.



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Seham El-Mahmoud

In the previous table, note that the majority of injuries has been occurred in the anterior segment which is affected in 46.01% of injuries. Nearly to the same extent, the orbit and adnexa were affected i.e. in 45.49% of injuries. A small percentage only affecting the posterior segment i.e. 3.4% of injuries only.

Note also that the majority of injuries resulted in the anterior segment were in the conjunctiva and 35.23% in the cornea then the iris, sclera, lens. Also in cases of the posterior segment, the vitreous is mostly affected then the retina and lastly the optic nerve.

Regarding the orbit and soft adnexa, the majority of injuries, 97.13%, usually affecting the soft adnexa. This can be explained by the higher exposure of the adnexa and anterior segment to the outside.

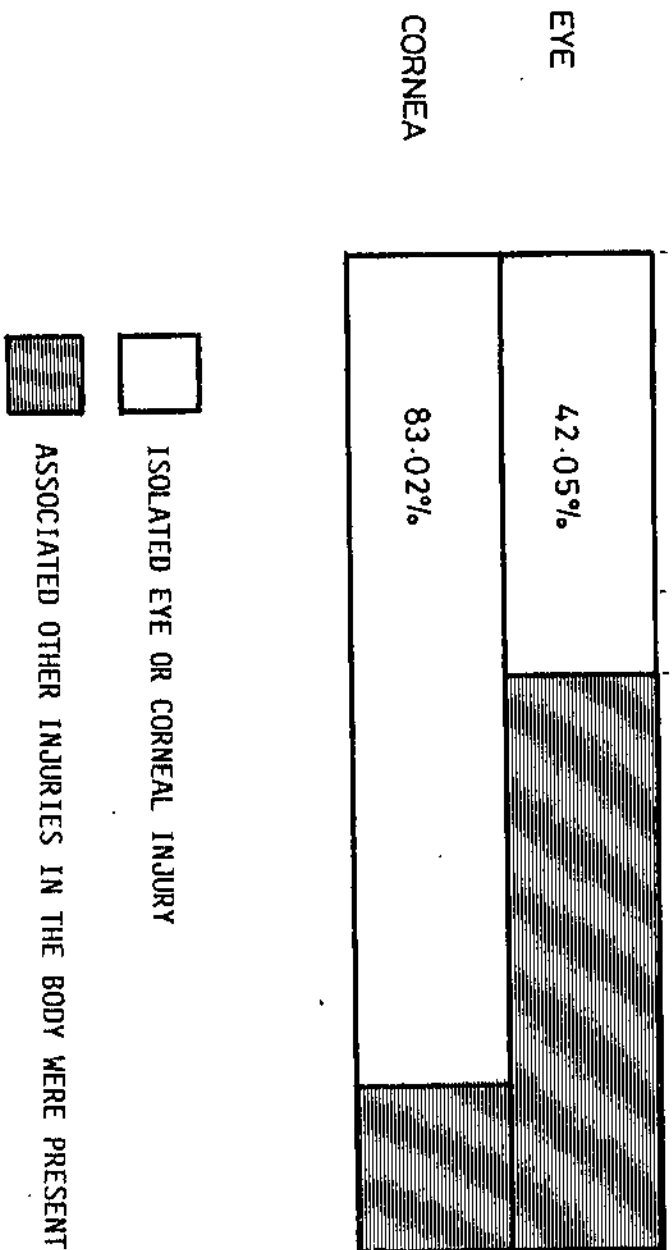
J. The Associated Injuries in the Body

Eyes form a part of the body as a whole, they may or may not be associated with other injuries of the body. These other injuries, apart from the eyes, may be of little significance in comparison with that of the eyes. Or they are major injuries and more important than that of the eyes. The following table and graph show the associated injuries in the body.

TABLE 11. ASSOCIATED OTHER INJURIES IN THE BODY APART FROM
THAT OF EYES.

ASSOCIATED OTHER INJURIES IN THE BODY	EYE INJURIES		CORNEAL INJ.	
	NO.	%	NO.	%
IT IS THE MAJOR INJURY AFFECTING THE PERSON	126	33.96	5	4.72
IT IS A MINOR INJURY	89	23.99	13	12.26
ISOLATED EYE INJURY	156	42.05	88	83.02
TOTAL	371		106	

FIG. 11 : ASSOCIATED OTHER INJURIES IN THE BODY APART FROM THAT OF EYES.



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Table (11) figure (11) show that in the majority of cases of eye injuries, there is another injury in the body i.e. in 57.95% of cases. While in corneal injuries, due to the fact that the injury is usually a direct one, the associated injuries constitute a small percentage of cases i.e. 16.98% .

K. Complications of Eye & Corneal Injuries

It was found that injuries to the eye or cornea may heal completely leaving no damage to the eye. Sometimes, however, the eye sustains one form of damage or another, and this was termed "complication". This complication may occur in any part of the eye. According to their sites, complications were classified into complications affecting the anterior segment, namely, the cornea, anterior chamber, iris, lens . The second site for complication is the posterior segment e.g. vitreous, retina, optic nerve. The complication may also affect the whole eye. Apart from the globe, the adnexa may be the site for complications. The following tables and graphs show complication of eye and corneal injuries and their distribution.

TABLE 12. EYE & CORNEAL INJURIES ACCORDING TO
THEIR COMPLICATIONS

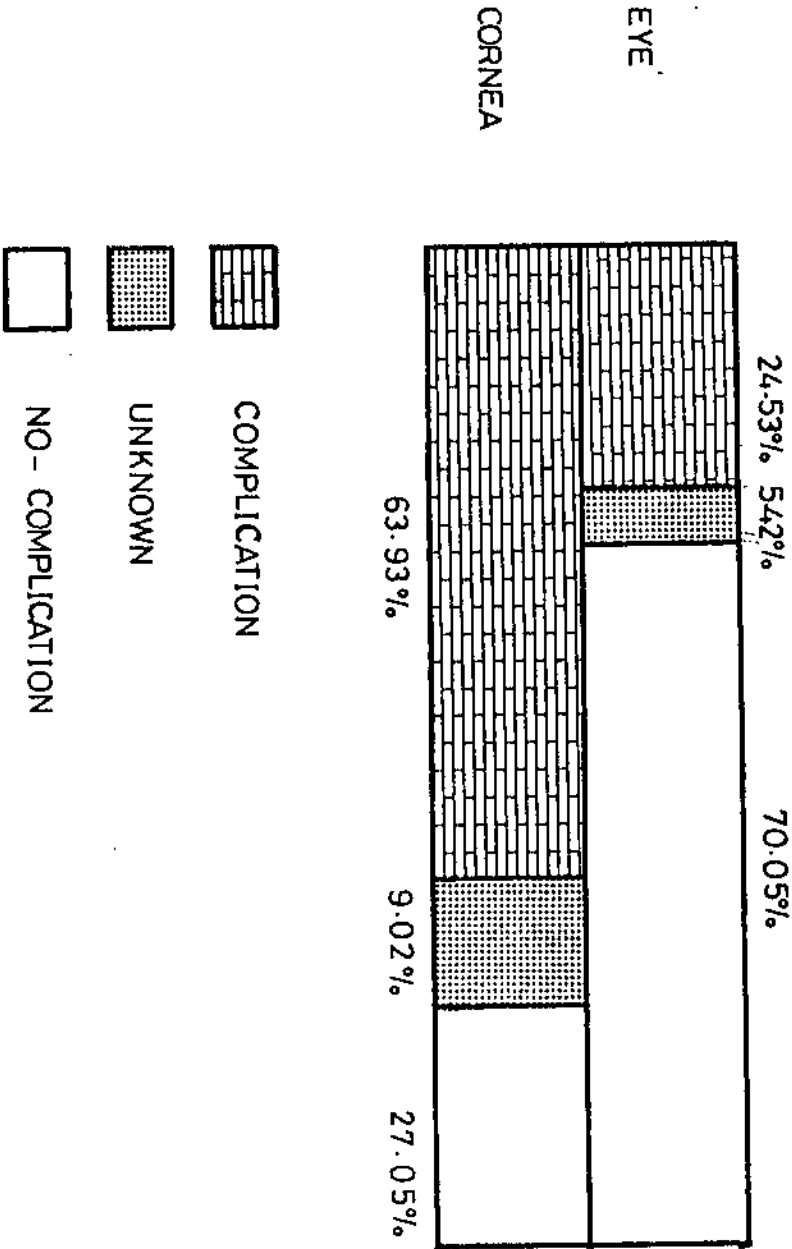
TABLE (12) A. WHETHER OR NOT A COMPLICATION HAD RESULTED

COMPLICATION	EYE		CORNEA	
	NO.	%	NO.	%
COMPLICATION PRESENT	104	24.53	78	63.93
NO COMPLIC	297	70.05	33	27.05
UNKNOWN	23	5.42	11	9.02
TOTAL	424		122	

TABLE (12) B. THE SITE OF COMPLICATION

SITE OF COMPLICATION	EYE		CORNEA	
	NO.	%	NO.	%
<u>CLOBE</u>				
<u>ANTERIOR SEGMENT</u>	83	64.84%	82	83.67
CORNEA	54	42.19%	54	55.10
ANTERIOR CHAMBER	1		1	
IRIS	3		2	
SYNACCHIA	4		4	
LENS	21		21	
<u>POSTERIOR SEGMENT</u>	12	9.38%	6	6.12
VITREOUS	4		2	
RETINA	6		4	
OPTIC NERVE	2			
<u>WHOLE EYE (ANT. & POST. SEG.)</u>	10	7.81	10	10.20
<u>ADNEXA</u>	11	8.59		
<u>OTHER COMPLICATION</u>	12	9.38		
TOTAL	128		98	

TABLE 12 : WHETHER OR NOT A COMPLICATION HAD RESULTED..



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In the majority of cases of eye injuries, 70.05%, no complications could occur. While in cases of corneal injuries, only in 27.05% of cases complications were absent.

As said before, corneal injuries usually affecting the visual system directly and thus usually followed by some form of complication.

Only "104" eyes had developed "128" types of complication in cases of eye injuries and "78" eyes had developed "98" types of complication in corneal injuries.

When complications had occurred, either in cases of eye or corneal injuries, most commonly they affect the anterior segment then the posterior one. In cases of eye injuries, the anterior segment was affected in 64.84% of cases, and the posterior one in 9.38% . The same thing has been obtained in cases of corneal injuries. i.e. the anterior segment was affected in 83.67% while the posterior one in 6.12% of cases.

In both eyes and corneal injuries, the cornea itself was the most common site for complications, as complications occur in 42.19% in cases of eye injuries and 55.10% in corneal ones, followed by the lens.

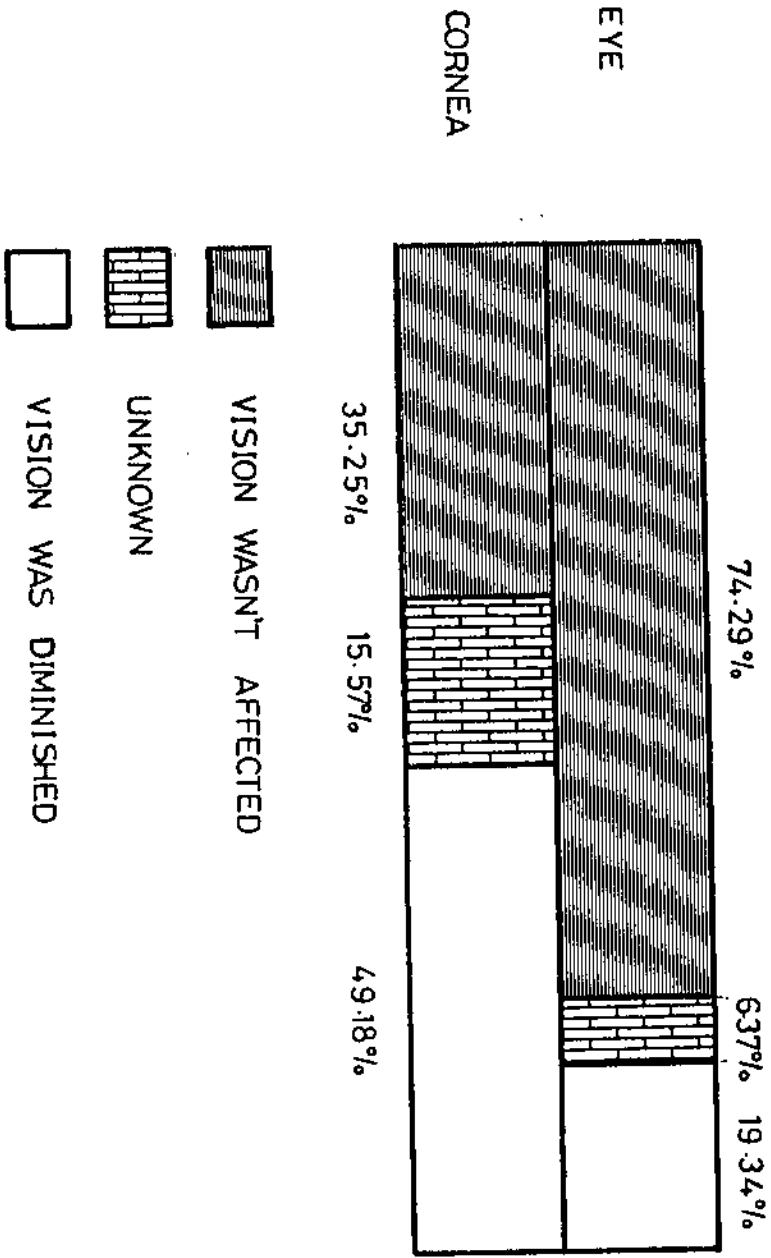
I. Sequela of Vision

Following eye or corneal injuries, the vision is either not affected at all, or diminished. In the later case, it may be improved, becomes worse or remains as it is with the progression of time. The following table and graph display the correlation of eye and corneal injuries to the degree of vision following the trauma to the eye.

TABLE 13. SHOWING SEQUALE OF VISION

VISUAL ACUITY	EYE		CORNEA	
	NO.	%	NO.	%
NOT AFFECTED	315	74.29	43	35.25
DIMINISHED				
IMPROVED WITH TIME	22	5.19	12	9.84
NOT IMPROVED	20	4.72	16	13.11
BECOMES WORSE	2	0.47	2	1.64
NOT KNOWN IF IMPROVED OR NOT	38	8.96	30	24.59
UNKNOWN	27	6.37	19	15.57
TOTAL	424		122	

FIG. 13 : SHOWING SEQUELA OF VISION .



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It could be seen that in the majority of cases, 74.29% of eye injuries studied, vision was not affected to an apparent degree and only in 19.34% vision was diminished. While in cases of corneal injuries the results were different, in 35.25% of cases the vision wasn't affected and in 49.18% of cases it was diminished.

This is due to the fact that when considering eye injuries in general, there was a high percentage of injuries that affected the adnexa only. And in this case, vision was not affected. This is not the situation in cases of corneal injuries that affect the visual system directly.

When diminution of vision occurs, it is not always improved in time as noted in table (13). It may not improve at all, or it may become even worse. In both eye and corneal injuries, the percentage is nearly the same.

In eye injuries, 26.83% of cases in which diminution of vision has occurred, the vision was improved in time. In about 24.39% of cases i.e. one fourth, no improvement took place. And in 2.44% of cases the vision became worse.

In corneal injuries, the corresponding figures were, in 20% of cases the vision was improved, in 26.67% of cases it did not improve and in 3.33% of cases it became worse.

M. Permanent Disabilities

The major function of the eye is vision (seeing objects) , so any disability resulted usually reflects itself on the eye's function in the form of diminution of visual acuity. We follow the international classification of the visual acuity in discussing the type of permanent disability resulted in cases of eye and corneal injuries.

The visual acuity according to that classification, were low vision or blinded. By low vision it was meant that the visual acuity is between 6/18 and 3/60 . By blind it was meant that the acuity is between 3/60 and no light perception.

To this, we add a category termed good vision, which is a diminution of vision of an acuity better than 6/18.

There were also other disabilities following eye injuries, e.g. diminution of visual field and diplopia that were considered separately. The following tables and graph show the permanent disability resulted and their distribution.

TABLE 14. EYE & CORNEAL INJURIES ACCORDING TO THE
TYPE OF PERMANENT DISABILITY RESULTED.

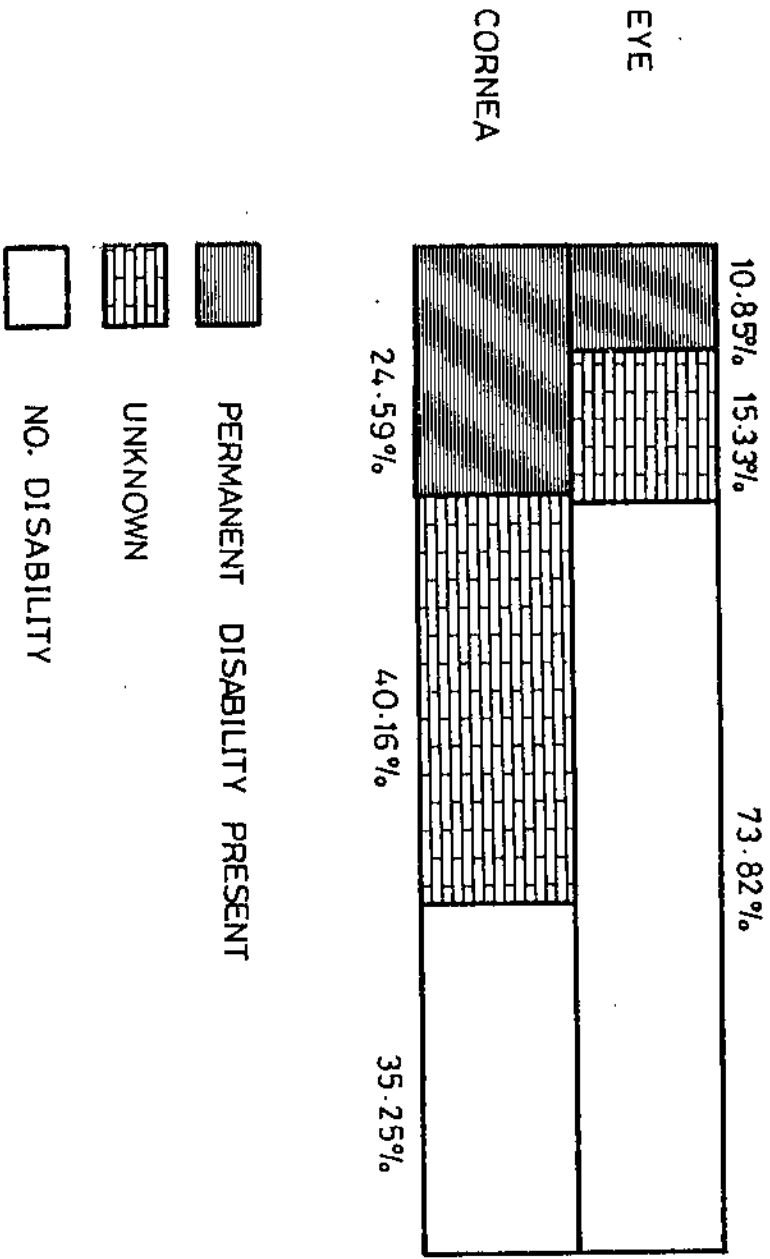
TABLE (14) A. IF A PERMANENT DISABILITY HAD RESULTED OR NOT.




PERMANENT DISABILITY	EYE		CORNEA	
	NO.	%	NO.	%
PERMANENT DISABILITY PRESENT	46	10.85	30	24.59
NO DISABILITY	313	73.82	43	35.25
UNKNOWN	65	15.33	49	40.16
TOTAL	424		122	

TABLE (14) B. THE TYPE OF PERMANENT DISABILITY

PERMANENT DISABILITY	EYE		CORNEA	
	NO.	%	NO.	%
GOOD VISION $\frac{6}{9} - \frac{6}{18}$ INCLUIDD	6	13.04	4	13.33
LOW VISION $\frac{6}{18} - \frac{3}{60}$	5	10.87	4	13.33
BLINDNESS ($\frac{3}{60}$ - NO LIGHT PERCEPTION)		67.39		73.33
C.F	13		9	
PL, H.M	4		2	
NO PL.	14		11	
↓ OF VISUAL FEILD	2	4.35		
OTHERS	2	4.35		
TOTAL	46		30	

FIG. 14 : SHOWING IF A PERMANENT DISABILITY HAD RESULTED OR NOT.



 PERMANENT DISABILITY PRESENT
 UNKNOWN
 NO. DISABILITY

It is obvious as shown in table (14 a) figure (14) that, in the majority of eyes affected in cases of eye injuries, no disabilities occur in 73.82% of cases, which becomes much less in corneal ones, as it constitutes 35.24% of injuries.

Only 10.85% of eye injuries had developed a permanent disability which becomes much higher in cases of corneal injuries i.e. 24.59% of cases. The permanent disability resulted in nearly all cases of eye and corneal injuries, were in the form of diminution of vision, which is the main function of the eye. In the majority of them, the vision were counting finger or less i.e. 67.39% in eye injuries and 73.33% in corneal ones. And according to international classification, those were considered blinded persons.

It could be also noted that, where a permanent disability had resulted, its distribution was nearly the same in both eye and corneal injuries i.e. the percentage of those with good, low vision or blind was nearly the same in both cases .

N. Sick - leave

Any medicolegal case in general, that includes eye and corneal injuries. It is important to note the sick-leave needed for such cases. In Jordan, from the legal aspect, it is important to differentiate this into the following intervals:

10 days or less. 11-20 days. More than 20 days.

It is also important to note whether a permanent disability has resulted or not.

The first period of less than ten days is only treated in the courts of law if the victim raises a complaint. Otherwise, there is no legal procedure for such a case.

Injuries which need periods such as eleven to twenty days are transferred to criminal courts unless the victim testifies in front of the court that he/she forgives the assailant and asks for no compensation. In this case, the public right (or case) is dropped.

While if the period of the sick-leave exceeds twenty days, or if a permanent disability resulted, the case shall be executively dealt with by the court in which case the court decides whether the victim would ask for compensation or not.

The sick-leave is also of importance for compensation on the part of the victim. The following table and graph are designed to show the sick-leave needed.

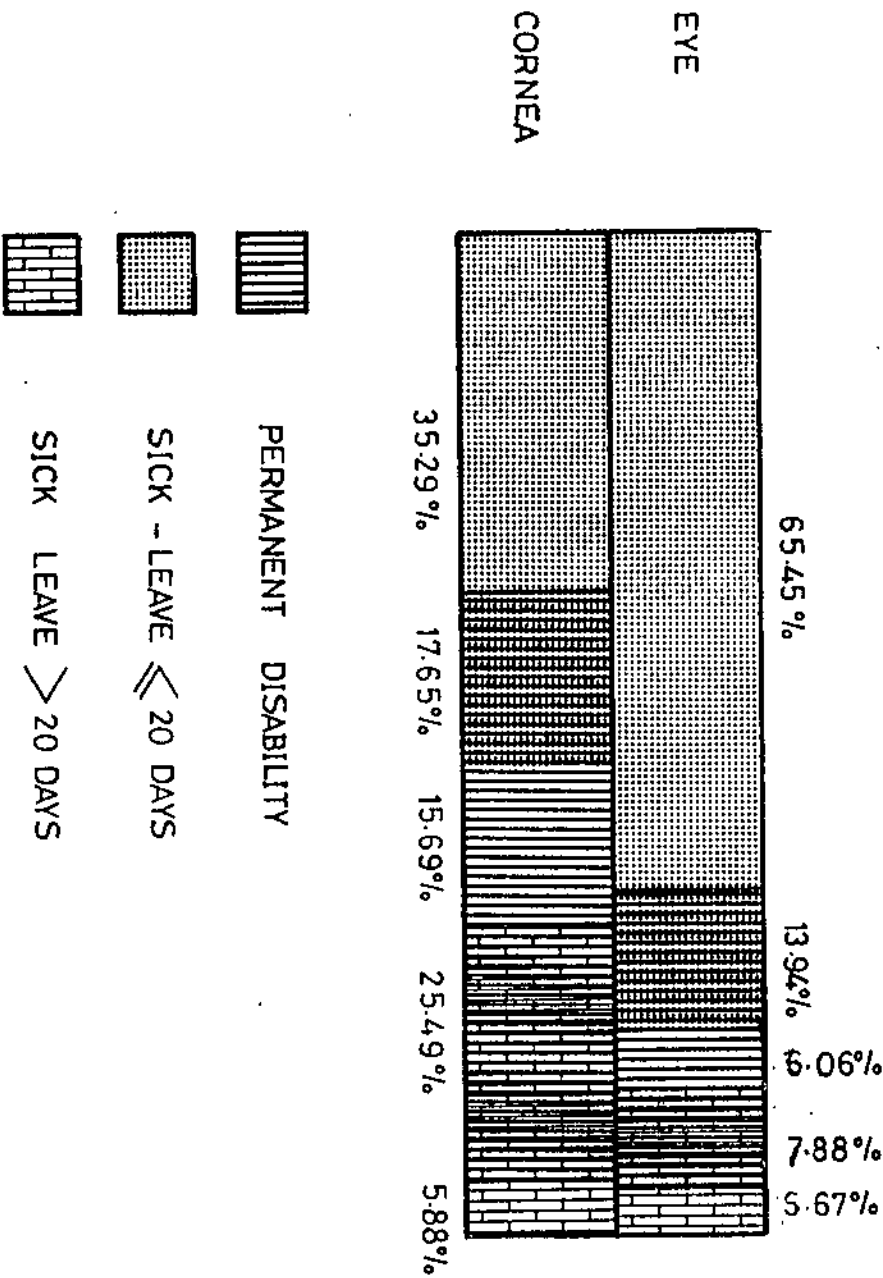
TABLE 15.¹ EYE & CORNEAL INJURIES ACCORDING TO THE SICK-LEAVE NEEDED.

SICK-LEAVE	EYE		CORNEA	
	NO.	%	NO.	%
10 DAYS OR LESS	101 ^{.2}	61.21	16 ^{.4}	31.37
11 - 20 DAYS	30	18.81	11	21.27
> 20 DAYS (21 DAYS OR MORE)	24 ^{.3}	14.55	16 ^{.5}	31.37
REPORTS WITH A PERMINANT DISABILITY & WITHOUT A SICK-LEAVE	10	6.06	8	15.69
TOTAL	165		51	

NOTE

1. THOSE, WHO WASN'T TAKEN ANY MEDICOLEGEL REPORT, OR IN WHOME, THE ASSOCIATED INJURY IN THE BODY IS THE MAJOR ONE WERE EXCLUDED.
2. OF THEM (23) CASES HAD ALSO A PERMANENT DISABILITY.
3. OF THEM (13) CASES HAD ALSO A PERMANENT DISABILITY.
4. OF THEM (9) CASES HAD ALSO A PERMANENT DISABILITY.
5. OF THEM (13) CASES HAD ALSO A PERMANENT DISABILITY.

FIG. 15 : EYE & CORNEAL INJURIES ACCORDING TO THE SICK-LEAVE NEEDED.



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It is noted that some cases of eye and corneal injuries had ended with a sick-leave only in their final reports, others ended with a permanent disability and the remainder ended with both.

Table (15) figure (15) show the sick-leave needed for patients whose eye injuries are the major affecting factor for obtaining the sick-leave i.e. those with trivial injuries to the eye and with a sick-leave needed for other injuries affecting the body were excluded.

"165" cases of eye injuries including "51" corneal injuries had taken final reports. In about two thirds i.e 61.21% of cases, the sick-leave was ten days or less. While in corneal injuries, it was much less as it constitutes 31.37% of cases only. The sick-leave between ten and twenty days was 18.18% in eye injuries with slight increase in cases of corneal ones.

Those with a sick-leave more than twenty days, constitute 14.55% of eye injuries, which becomes much more in cases of corneal ones i.e. 31.37% of cases.

In eye injuries there were "46" cases with permanent disability, which constituted 27.88% of all cases. While this becomes much higher in cases of corneal injuries i.e. 58.82% of all corneal cases, "30" cases.

In treating such cases in courts, a special consideration was taken in cases of permanent disability or a sick-leave exceeding twenty days. In eye injuries, those with a permanent disability and sick-leave for more than twenty days, constitute 34.55% of all cases, that approximately doubled in cases of corneal injuries i.e. 64.71% of all corneal injuries.

V. D I S C U S S I O N.

Most cases, 48.79 %, of eye injuries, referred to Jordan University Hospital, came from areas that surround the hospital, although they constitute a small percentage of the population in general. This is because of the short distance to the hospital . The population of this area is a mixture of highly and low socioeconomic people, there are little industries, but the area is a busy one, especially in construction, with relatively heavy traffic. These circumstances affect the aetiology and course of ocular injuries when compared to other studies.

Another aspect regarding the place of accident and residence, is that more cases become affected outside their residence between the ages of twenty and sixty. This is the age of working, travelling, and enjoying other activities.

About one third, 34.50%, of patients were children under fifteen years of age and about three fourths, 74.12% were under thirty. This high incidence in children and young adults is similar to results reported by Niiranen M, et al, and by Canavan YM, et al. They found the incidence in children 34.5% and 38.4% respectively. An incidence of 77.4% in those younger than 36 was reported by Canavan.

This young age preponderance together with the fact that a fairly high percentage was due to traffic accidents, assault and occupation, give evidence to their occurrence during play of children and youngsters or during travel or work.

The high incidence of injury in males is illustrated by the male : female ratio of 2.99 : 1 i.e. females constitute about one fourth , 25.07%, of cases in the present study, which is similar to results presented by others, who found the incidence in females to vary from 16 - 33 % of cases (27% by Korra A, et al. 31.7% by Gordan YJ, et al. 16% by Canavan YM, et al. 18.2% by Niiranen M, et al. And 37% by Mazza C, et al). Male preponderance is due to the more exposure of males in outdoors life.

About three fourths , 75.20%, of cases in this study were accidental in nature while 24.80% were the result of quarrel. This is similar to the results found by Korra A, et al who found them to be 76.6% and 23.4% respectively. This is due to the fact that most cases were the result of road traffic accidents and occupational. It is found in this study that, about one half, 50.67%, of ocular injuries, were the result of traffic accidents. This differs from studies done by others, who found road traffic accidents to constitute 5 - 20% only of the causes of

eye injuries (Gordan YJ et al, Niiranen M et al, Canavan YM, et al who found the incidence to be 4.8% 5% and 19.3% respectively). This can be explained by the fact that studies carried out by others usually consider patients in Ophthalmic department only (i.e. those who are referred to eye clinic only). While this study, considers all patients who had any sort of eye injuries in whatever department (i.e. those who had a minor eye trauma and gross other injury that is managed in other clinics than that of the eye). Taking into consideration that the majority of our cases were from the forensic clinic. There is another important point that may help to explain this difference; inspite of the fact that all types of ocular injuries are medicolegal in nature and need some form of a report, yet not all of them do so, why? to answer this question, we can say that there is a common characteristic of such cases that had medicolegal reports , which is, the presence of some kind of a problem in them, and its resolution needs such a report. In other words, another participant is present in each type of accident e.g. in traffic accidents (another person, insurance ..), assault (another person), also in sport injuries (those cases that are caused by another person only had a report). One thing else that in cases of occupational injuries, compensation and sick-leave are needed.

The incidence of injuries by blunt objects in this study in cases of eye injuries in general was 84.60% and perforating injuries were 15.40% and the non-mechanical injuries were 3.54%. While in corneal injuries the figures were 44.04%, 45.96% & 10.66% respectively. These figures were similar to the results done by others in cases of corneal injuries, but differ in cases of eye injuries in general. It is found by Korra A, et al, Canavan YM, et al, Krasny J, et al and Niiranen that injuries by blunt objects were 38%, 49.2%, 36.5 - 38.2% and 65.2% respectively and perforating injuries to be 35.5%, 48%, 43 - 46% and the non-mechanical injury by Korra A, et al to be 12%). This can be explained by the fact that, a good proportion of our cases had a minor eye injury (33.96% of cases) and these patients usually were not received in Ophthalmic clinic and due to the fact that most cases were the result of traffic accidents (blunt trauma usually), this explains the higher incidence of this type of trauma in eye injuries. While in corneal injuries the patients usually managed in Ophthalmic department, that is why the results were similar to other studies which consider cases in Ophthalmic department only.

The anterior segment of the eye was much more affected than the posterior one. Figures were 46.01% & 3.4% respectively. Also we found that the conjunctiva was the commonest site of injury, then the cornea, iris, sclera, lense, vitreous, retina respectively. From this, we can

say that, the important factors that govern this distribution of ocular injuries is the exposure of the affected part to outside and its distance from the surface of the eye and also its surface area. The more exposure of the part and the nearer to the surface of the eye, the more affection occurs e.g. the conjunctiva is mostly affected Then the cornea, iris etc.

Regarding the site of ocular trauma, it is noted that the adnexa is affected in 45.49% of cases. This confirms its protective function to the eye.

The seriousness of corneal injuries were seen clearly when considering the complications resulted, the sequelae of vision, the resultant permanent disability and the sick-leave needed in cases of corneal trauma and compared to that of eye-trauma in general.

About three fourths , 70.05%, of eye injuries were not accompanied by any complication. This was much less in cases of corneal injuries, 27.05% of cases only. The rest were developed complications. Most of the complications in both eye and corneal injuries lie in the anterior segment, next to it is the posterior one. This is because as seen when considering the site of injury, that most injuries were in the anterior segment then the posterior one.

Another point is noted that, although the incidence of injuries affecting the adnexa is high, yet the complications in it are much less than those of the globe, for a minor scar and trauma that is considered as complications in the cornea, aren't so in case of adnexa.

In approximately three fourths , 74.29%, of those patients, for whom the final visual acuity was known, the vision is not affected. This becomes much less in corneal trauma, about one third , 35.25% . However, about one fifth - 19.34% of cases had suffered permanent diminution of vision, the vision was improved in 26.83% of them, in 24.39% no improvement occurs and in 2.44% the vision became worse. In corneal injuries, diminution of vision occurs in 49.18%, the vision was improved in 20%, no improvement in 26.67% and the vision becomes worse in 3.33% of them. The sequelae of vision in corneal injuries are thus more serious than the case of eye injuries in general. The prognosis of eye and corneal injuries regarding its primary function (vision) is guarded. So in giving a medicolegal report, sometimes we have to wait until the vision becomes established and stable, for many cases in whom diminution of vision occurs, the vision improved in time, others become worse, and the rest were stable with no change in time. Also as an expert, to give an opinion about the course and prognosis of such cases from the beginning, especially if diminution of vision occurs, is very difficult and must be with caution.

10.85% of eye injuries in general had developed a permanent disability in the form of diminution of vision, which is much higher in corneal injuries i.e. 24.59% . This also reflects the seriousness of corneal injuries.

Approximately one third , 34.55%, of ocular injuries , had a sick-leave for less than twenty days or a permanent disability. This is much more in case of corneal injuries i.e. nearly two thirds , 64.71% . This also determines the seriousness of eye and especially corneal injuries when treated in criminal or civil courts. As the case always goes to criminal courts for decision, according to the Jordanian laws, whether the victim asks for compensation or not.

Those who had a report with a permanent disability were 27.88% in eye injuries and 58.82% in corneal ones. This also reflects the seriousness of corneal injuries. Thus , in cases an expert opinion is needed... in such cases. It must be guarded and with caution.

In conclusion, the difference between the results of this study and other studies done by others, were present when we consider eye injuries in general and not when corneal trauma were considered. This is due to the fact that in this study any case with an eye injury in whatever department is considered, so this study presents many injuries which are not seen in Ophthalmic clinic e.g. many adne-

xal injuries, which are not accompanied with global ones, indeirect mechanical injuries ... etc. While other studies usually consider patients referred to Ophthalmic clinic only and also corneal injuries in this study, follow the same line.

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دراسة طبية قضائية.

لاصابات القرنية في مستشفى الجامعة الاردنية

رسالة مقدمة من الطبيب

حسن أحمد عبدالرحمن

لاستكمال متطلبات الحصول على درجة الماجستير

في الطب الشرعي السريري والمرضي

المشرفون

الاستاذ الدكتور نؤاد الصايغ

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المُلخَص

دراسة طبية قضائية

لاصابات القرنية في مستشفى الجامعة الاردنية

هذه رسالة عن دراسة احصائية على اصابات العيون . مع التركيز على اصابات القرنية التي راجعت عيادة الطب الشرعي في مستشفى الجامعة الاردنية في العدة بـسنتين ١٩٧٨ - ١٩٨٤ . استهدفت بيان العلاقة بين شيع الاصابات وعمر المصاب وجنسه وعمله ومكان الاصابة ويوم الحوادث ووقته ونسبته . وكذلك الاجزاء المعابة من العين وما تحتاجه من مدة تعطيل وما تخلف عنها من عاهات وتأثير الاصابات على ابصار العين بعد الشفا وفيما اذا كانت هذه الاصابات محوبة باصابات في مناطق أخرى من الجسم .

في نفس الوقت ، تمت دراسة عدد من اصابات العين والقرنية التي راجعت قسم العيون في مستشفى الجامعة الاردنية في مدة عام واحد (عام ١٩٨٢ / ١٩٨٣) بنفس الطريقة التي تمت بها دراسة اصابات العيون التي راجعت عيادة الطب الشرعي في المستشفى المذكور .

وقد بلغ مجموع الحالات التي درست في الجزئين السابقين " ٢٧١ " حالة شملت اصابة " ٤٢٤ " عين منها " ١٠٦ " حالات اصابة قرنية في " ١٢٢ " عين ، أي أن اصابة القرنية في " ١٦ " حالة كانت في كلتا العينين في المصاب نفسه .

وقد بلغت اصابات العيون التي راجعت عيادة الطب الشرعي ما نسبته (٨٨١ / ٠) من مجموع الحالات الطبية القضائية التي حصلت على تقارير من عيادة الطب الشرعي في نفس مدة الدراسة ١٩٧٨ - ١٩٨٤ .

ففي هذه الدراسة وجد أن ٢٤١٢/٠ من الحالات كانت في الأشخاص الذين تقل أعمارهم عن ثلاثين سنة ، وان نسبة الذكور بلغت ٢٤١٢/٠ بينما نسبة الاناث بلغت ٢٥٠٧/٠ . ولقد كانت الغالبية العظمى من الاصابات في الطلبة حيث بلغت النسبة ٤١٥١/٠ من بين المهن المختلفة ٤٨٧٦/٠ من الحوادث وقعت في المناطق المحيطة بالجامعة الأردنية ، ٥٧١٥/٠ من اصابات الغيون كانت مصحوبة باصابات اخرى في انحاء متفرقة من الجسم بينما في اصابات قرنية العين وجد أن ١٦٩٨/٠ فقط من الاصابات كان مصحوبا باصابات اخرى ، ذلك ان اصابات القرنية تكون ناتجة عادة عن اصابة مباشرة للعين .

لقد وجد ان ٥٠١٧/٠ من الحالات نتجت عن حوادث السيارات و ٢٤٨٠/٠ من الحالات نتجت عن حوادث المشاجرة ومعظم الاصابات التي نتجت عن حوادث المشاجرة اصاب العين اليسرى حيث بلغت النسبة ٦٢٣٢/٠ .

ولقد بلغت نسبة الاصابة بالاجسام الرافضة ٨٤٦٠/٠ بينما بلغت نسبة الاصابات النافذة ١٥٤٠/٠ من اصابات العين . وبلغت نسبة الاصابات النافذة فسي القرنية ٤٤٠٤/٠ من حالات اصابات القرنية .

أكثر مناطق العين تعرضا للاصابات كانت الجفون والجزء الامامي من كرة العين حيث بلغت النسبة في الاولى ٤٥٤٩/٠ وفي الثانية ٤٦٠١/٠ وقد اصبحت القرنية في ٣٥٢٢/٠ من الحالات . اصابة اجزاء العين المختلفة يعتمد على تعرض العين وقرب أو بعد الجزء المصاب عن السطح الخارجي للعين .

وجد ان نسبة الحالات التي نتج عنها ضعف في البصر كانت أعلى في اصابات القرنية المضعفات ٤٩١٨/٠ منها في حالات اصابة العين " ١٩٣٤/٠ " وبلغت نسبة المضلعات ٢٤٥٣/٠ من الحالات وكان أكثرها في الجزء الامامي من كرة العين " ٦٤٨٤/٠ "

ووجد ان ٦٣١٣ر٠/٠ من اصابات القرنية حصل بها مضاعفات ، نسبة المضاعفات التي حصلت في الجزء الامامي من كرة العين ٨٣٦٧ر٠/٠ من مجموع الحالات التي حصل بها مضاعفات .

بلغ عدد الحالات التي اعطيت تقارير طبية نهائية " ١٦٥ " حالة كان منها ٢٧٨٨ر٠/٠ عاهة دائمة ، ٦٦٧ر٠/٠ تعطيل عن العمل لاكثر من عشرين يوما . أما في حالات اصابات القرنية، فقد بلغ عدد الحالات التي اعطيت تقارير طبية نهائية " ٥١ " حالة كان من بينها ٥٨٨٢ر٠/٠ عاهة دائمة .

ونأمل ان تكون هذه الدراسة حافزا لدراسات اخرى في المستقبل ، في هذا المجال الحيوى والهام اقتصاديا واجتماعيا وطبييا .