

**Sudan University OF Sciences
and Technology**

College Of Graduate Studies

**Evaluation of ExtraAxial Brain
Hemorrhage Using Computed
Tomography**

تقييم نزيف المخ الخارجي باستخدام الاشعة المقطعية

المحوسبة

Thesis Submitted for Partial Fulfillment
of the Requirement of the Degree of
M.Sc.in Diagnostic Radiological
Technology

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

الآية

قال تعالى:

(قُلْ إِنَّ صَلَاتِي وَنُسُكِي وَمَحْيَايَ وَمَمَاتِي لِلَّهِ
رَبِّ الْعَالَمِينَ)

سورة الانعام الآية (162)

Dedication

This research study is dedicated to:

My father

My mother

My brothers

My sisters

Other people who assisted in this study.

Acknowledgment

First of all,I thank of Allah the almighty for helping me to complete this project.

I would like to thank my supervisor Dr: Mona Ahmed Mohammad , and Dr .Mohammad Alkhider the radiologist in the Ibrahim Malik Hospital.

My thank also to the staff of the radiology department in the kassala teaching hospital and Ibrahim malik hospital.

Finally ,Iwould like to thank everyone for this support and encouragement.

I could not have completed this effort without their assistance and enthusiasm.

Abstract

The extra axial brain hemorrhage causes mortality when not early diagnosed and treated.

The study aimed to evaluate the extra axial brain hemorrhage using computed tomography.

Collected all the patients from Ibrahim Malik Hospital from march to may 2016 .Non contrast computed tomography was done in all patients .

The result from 60 patients with different age and gender diagnosed as extra axial brain hemorrhage. In this study peak incidence was among the age between (41-50 year), (63.3%) of patients complain of headache as common clinical indication. Found the Right side was common in (51.7%) ,and the Subdural hemorrhage (48.4%) was common in final diagnosing . A percentages of male (80%) was greater than the female (20%), and the Road traffic accident was common causes of brain injury in (81.7%). Related to the nature of the hemorrhage (case) found the acute was common in (68.3 %) . The acute Epidural hemorrhage was common (91.3%) in correlation between nature and location of hemorrhage.

Using non contrast computed tomography as initial investigation for diagnosing extra axial brain hemorrhage after brain injury is necessary.

The level of significance (P) was 0.05 .

ملخص البحث

النزيف خارج المخ يسبب الوفاة اذ لم يشخص ويعالج مبكراً.

هدفت هذه الدراسة لتقييم النزيف خارج المخ باستخدام الاشعة المقطعية المحوسبة .

تم جمع المرضى من مستشفى ابراهيم مالك من مارس الي مايو 2016 .

استخدمت الاشعة المقطعية بدون الصبغة الملونة لجميع المرضى .

اخذت النتائج ل 06 مريض من مختلف الاعداد والجنسين تم تشخيصهم بنزيف خارج المخ

واظهرت النتائج ان اكثر الفئة العمرية تأثراً بين (41-50) سنة و 63.3% من المرضى يشكون

من الصداع كأكثر الاعراض السريرية . ووجد ان الجانب الايمن هو الاكثر بنسبة 51.7% وان

النزيف تحت الجافية هو الاكثر في التشخيص النهائي بنسبة 48.4%. نسبة الرجال

80% اكثر من النساء 20% والحوادث المرورية هي الاكثر سبباً لإصابات الدماغ بنسبة

81.7% وجد في طبيعة النزيف ان النزيف الحاد هو الاكثر شيوعاً في 68.3%.

وجد ان النزيف الحاد فوق الجافية هو الاكثر في العلاقة بين- طبيعة وموقع النزيف في

91.3%.

من الضروري استخدام الاشعة المقطعية بدون الصبغة الملونة كفحص ابتدائي لتشخيص
النزيف خارج المخ بعد اصابته.

ومستوي المعنوية (P) تساوي 0.05.

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Abbreviations

CT	Computed Tomography
CSF	Cerebro Spinal Fluid
MRI	Magnetic Resonance Imaging
RT	Right
LT	Left
CN	Cranial Nerve
LOC	Loss Of Consciousness
GIT	Gastro Intestinal Tract
ANS	Autonomic Nervous System
AVM	ArterioVenous Malformation
TBI	Traumatic brain injury
SDH	Subdural hemorrhage
SAH	Sub arachnoid haemorrhage
EDH	Epidural haemorrhage

Chapter One



Chapter One

1-1Introduction

brain injury (TBI) ,also known as acquired brain injury ,head injury,or brain injury.It occurs when asudden trauma damages the brain and Traumatic disrupt normal function .)Stephen et-al 2015.(

TBI may have profound physical,psychological,emotional, and social effects.TBI may be divided into primary and secondary injury.Primary injury is induced by mechanical force and occurs at the moment of injury .Secondary injury is not mechanically induced it may be delayed from the moment of impact.These forces can cause intra cranial hematoma ,diffuse vascular injury, to cranial nerve.(Stephen et-al 2015).

Intracranial hemorrhage is the most common cause of death and clinical deterioration after TBI.Hematoma are categorized as

Epidural hemorrhage -these are usually caused by fracture

And rupture of the middle meningeal artery,clotted blood collects between the bone and the dura matter .Because the source of bleeding is arterial this type of hematoma can grow quickly and create pressure against the brain tissue.

Subdural hemorrhage -these are usually caused by rupture of the bridging veins in the subdural space . They can grow large enough to act as mass lesions,and are associated with high morbidity and mortality rates.(Stephan et-al 2015).

Subarachnoid hemorrhage-these result from damage to blood vessels into subarachnoid space ,the area between the arachnoid membrane and pia matter surrounding the brain. (Stephan et-al 2015).

Atotal the Glasgow coma scale (GCS) score of 3-8 for the indicates severe TBI,ascore of 9-12 indicates

moderate TBI, and score of 13-15 indicates mild TBI. (Stephan et al 2015).

Imaging plays an important role in diagnosing and managing TBI. Non contrast computed tomography is the initial modality of choice for traumatic brain injury. (Kim and Gean 2011).

1.2 Problem of study

Large number of individuals suffer from traumatic brain injury due to road traffic accident, and less of modern diagnostic centers in the some places that teeming high percentage of road traffic accident. Lead to late diagnosed, treated and increased high risk of mortality.

In spite of using conventional skull radiography demonstrated fractures and foreign bodies in the patients with head trauma, the brain hemorrhage difficult to diagnose on radiography, therefore to investigate the patients with CT is necessary.

-1.3 The objectives

-1.3.1 General objective

To evaluate the extra-axial brain hemorrhage using computed tomography.

-1.3.2 Specific objectives:

To evaluate the findings by CT

To identify common site affected.

To correlate the finding with age, gender, location of hemorrhage.

-1.4 Important of study

Due to previous mentioned problems ,the use of computed tomography for early diagnosis of extra- axial brain hemorrhage appears justifiable.

-1.5 Over view of study

This study is concerned with study of extra axial brain hemorrhage using CT . It falls into five chapters.chapter one is an introduction and study objectives .chapter two will include literature review .chapter three dealwith methodology where it provides an outline of material and methods used to acquire the data in this study as well as the method of analysis approach .while the result were presented in chapter four and finally chapter five include discussion of result, conclusion,recommmendation followed by references and appendix .

Chapter two

Literatures review



Chapter Two

Literatures review

2.1anatomy

The brain is a delicate organ that is surrounded and protected by three membranes called meninges. The outermost membrane, the dura mater. Between the layers of dura mater are the meningeal arteries and the dural sinuses. The dural sinuses provide venous drainage from the brain. Fold of dura mater help to separate the structures of the brain. Two dural folds are the falx cerebri, which separates the cerebral hemispheres, and tentorium cerebelli forms a partition between the cerebrum and cerebellum. The middle membrane, known as the arachnoid that is separated from the dura mater by a potential space called the subdural space. The inner layer, or pia layer, is a highly vascular layer that adheres closely to the contours of the brain. The sub arachnoid space separates the pia matter from the arachnoid matter. This space contains cerebrospinal fluid, which circulates around the brain and spinal cord and provides further protection to the central nervous system. (Lorrie L et-al 1997).

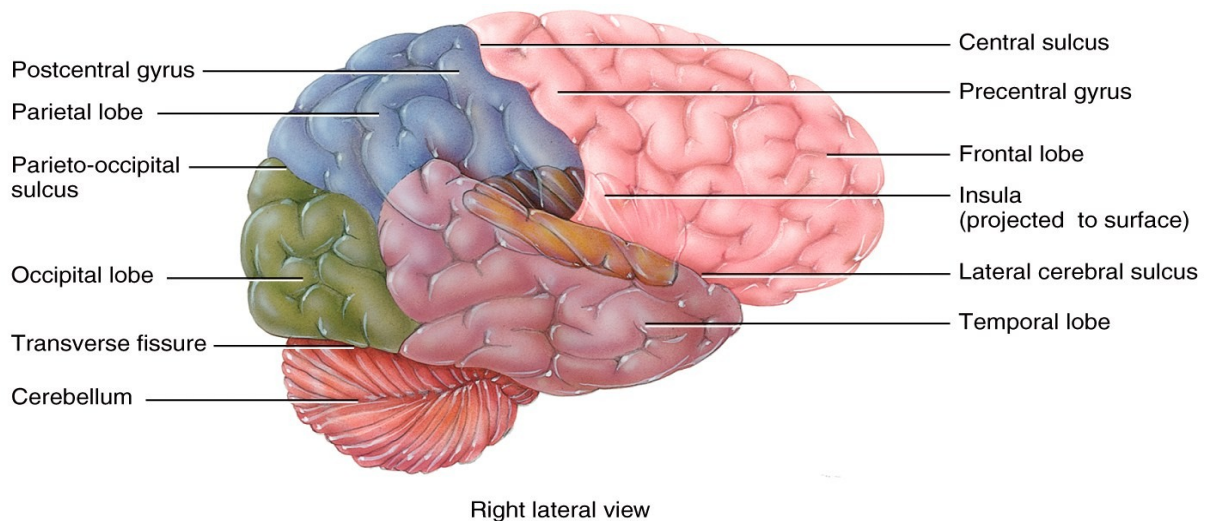
2.1.1 Cerebrum

The cerebrum is the major part and largest portion of the brain and is divided into right and left hemispheres. The cerebral cortex of each hemisphere is arranged in folds of gray matter called gyri. The gyri are separated by shallow grooves called sulci and by deeper grooves called fissures. The main sulcus that can be identified on (CT) and (MRI) images of the brain is central sulcus, which divides the precentral gyrus of the frontal lobe (motor strip), and postcentral gyrus (sensory strip), two main fissures are longitudinal fissure, divides the left and right

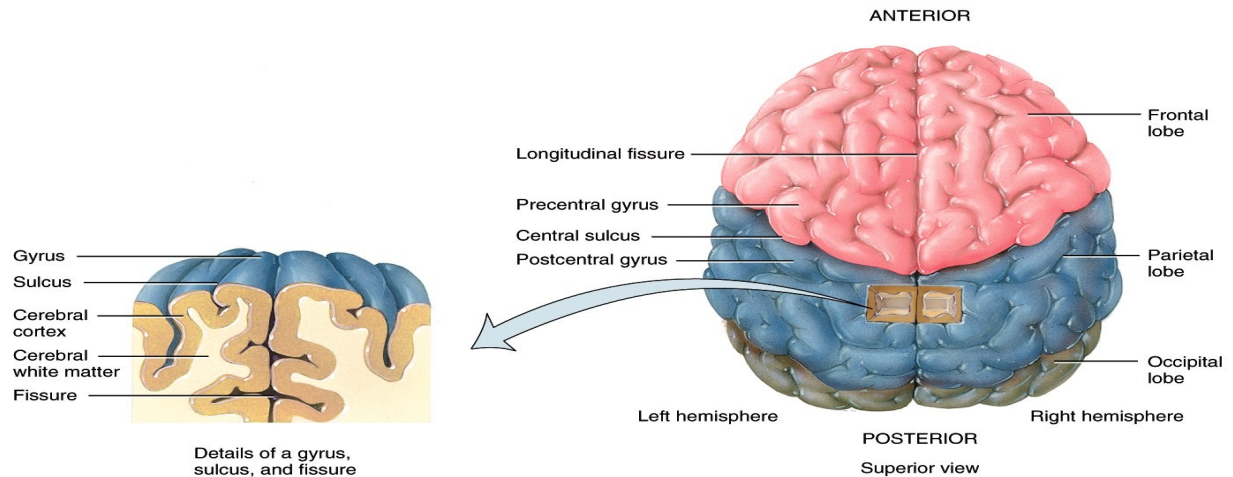
hemispheres, and sylvian fissure separates the frontal and parietal lobes from the temporal lobe. The largest and densest bundle of white matter fibers within the cerebrum is the corpus callosum. The four parts of it from anterior to posterior are the rostrum, genu, body, splenium. Form the roof of the lateral ventricles and connects the (RT) and (LT) cerebral hemispheres. Another bundle is the anterior commissure and posterior commissure (Lorrie L et-al 1997).

The Cerebral cortex can be divided into four individual lobes frontal, parietal, occipital, and temporal. Another area of cortical gray matter located under the lateral surface of the temporal lobe is the insula, frequently

referred to as fifth lobe. (Lorrie L et-al 1997).



**Figure2. (1) SHOW RT lateral view of cerebrum .
(John Wiley& Sons, Inc 2010).**



Copyright 2010, John Wiley & Sons, Inc.

Figure2. (2) superior view show gyrus,sulcus,and fissure.

(John Wiley & Sons,Inc 2010).

2.1.2 Cerebellum

Attaches posteriorly to the brain stem and occupies the posterior cranial fossa. The cerebellum consists of two cerebellar hemispheres. The vermis connects the two cerebellar hemispheres at the midline. On the inferior surface of the cerebellar hemispheres are cerebellar tonsils herniating down through the foramen magnum. Three pairs of nerve tracts, cerebellar peduncles, connect the cerebellum to the brain stem. The superior cerebellar peduncles connect the cerebellum to the mid brain. The middle cerebellar peduncles serve as attachments to the pons, and the inferior cerebellar peduncles attach to the medulla oblongata. (Lorrie L et-al 1997).

2.1.3 Brain stem

The brain stem connects the cerebral hemispheres with the spinal cord, and ten of the twelve cranial nerves originate

from the brain stem. Its major segments are the mid brain, pons, and medulla oblongata. (Lorrie L et-al 1997).

2.1.3.1 Midbrain

Located above the pons. Composed of bundles of nerve fibers and divided into two major segments, the colliculi and the cerebral peduncles. The mid brain surrounds the cerebral aqueduct, which contains (CSF) and connects the third and fourth ventricles. Posterior to the cerebral aqueduct is the tectum, which consists of four rounded protuberances termed colliculi. The upper pair, (superior colliculi), are associated with the optic system. The lower pair, (inferior colliculi), are relay stations associated with the auditory system. (Lorrie L et-al 1997).

The midbrain is the narrow part of the brain that passes through the tentorial notch and connects the forebrain to the hind brain. (Snell, S-R, 1995).

2.1.3.2 Pons

Is the large expansion of the brain stem located between the midbrain and medulla oblongata posterior to the clivus. It is called the pons because it connects the cerebrum and the cerebellum. (Lorrie L et-al 1997).

2.1.3.3 Medulla oblongata

Extends from the pons to the foramen magnum, where it continues as the spinal cord. It contains all fiber tracts between the brain and spinal cord, as well as vital centers that regulate internal activities of the body. The center of the

anterior and posterior surfaces of the medulla oblongata are marked by the anterior and posterior median fissures. The two fissures divide the medulla oblongata into two symmetric halves. Located on either side of the anterior median fissure are two bundles of nerve fibers called pyramids. The pyramids contain the nerve tracts that contribute to voluntary motor control. At the lower end of the pyramids, some of the nerve tracts cross or decussate; to the opposite side. (Lorrie L 1997).

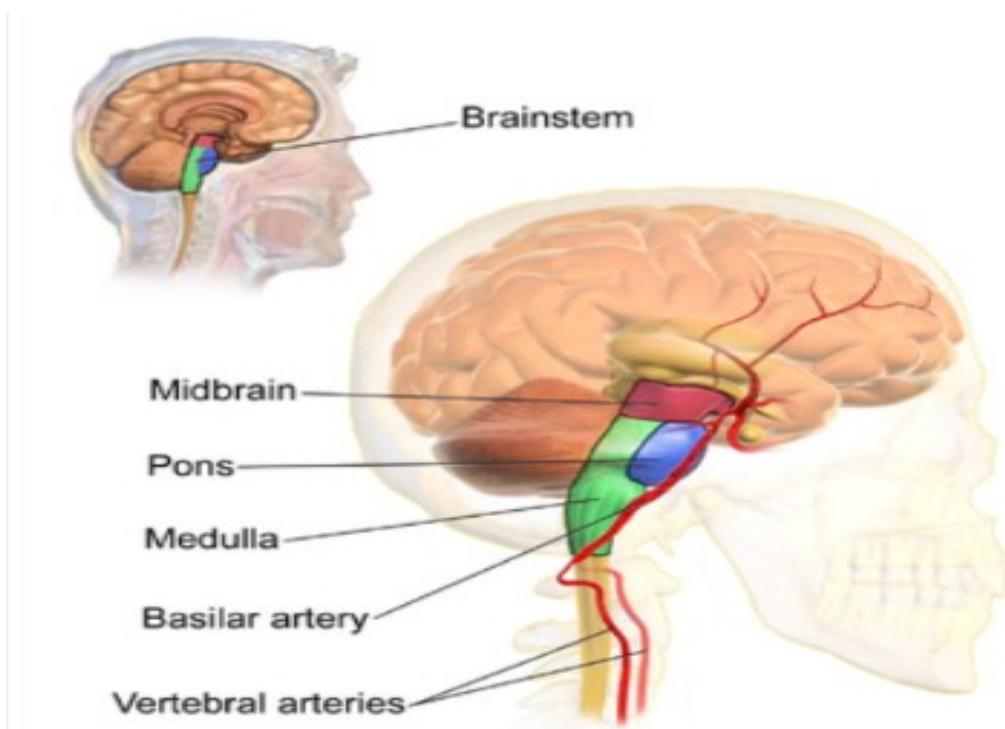


Figure (2) NO (3) Show the structure of the brain stem.

<http://en.m.wikipedia.org>.

2.1.4 Limbic system

Structures of the limbic system include the hippocampus, amygdala, fornix, olfactory bulb and mamillary bodies.

The hippocampus is the inrolled medial border of the temporal and is concerned with olfactory reflexes. Is an

important for the transition from short term to long-term memory.(Lorrie L et-al 1997).

The limbic system is integrated with other structure that lie below the splenium of the corpus callosum .It serves specifically to integrate the hippocampus with other functional area of the brain.The olfactory tracts run underneath the frontal lobes and connect to the amygdala to bring information on the sense of smell to the limbic system. (Lorrie L et-al 1997).

The mamillary bodies can be found at the anterior end of the fornix.They receive direct input from the hippocampus and give rise to fibers that terminate in the periaqueductal gray matter of the midbrain.9(Lorrie L et-al 1997).

2.1.5 Basal ganglia

The basal ganglia are a collection of subcortical gray matter consisting of the caudate nucleus, and lentiform nucleus. The caudate nucleus parallels the lateral ventricle and consists of head, body, and tail. The head causes an indentation to the frontal horns of the lateral ventricle, and the tail terminates in the amygdala of the temporal lobe. The lentiform nucleus is a mass of gray matter located between the insula, caudate nucleus and the thalamus, divided into globus pallidus and putamen.(Lorrie L et-al 1997)

2.1.6 Thalamus

The thalamus is the large mass of gray matter that lies on either side of the third ventricle. It is a great relay station on the afferent sensory pathway to the cerebral cortex.(Snell).

2.1.7 Hypothalamus

The hypothalamus forms the lower part of the lateral wall and floor of the third ventricle. The following structures are found in the floor of the third ventricle from before back ward, the optic chiasma, the tuber cinereum and the infundibulum, the mammillary bodies, and the posterior perforated substance. (Snell).

2.1.8 The pituitary gland

Is an endocrine gland connected to the hypothalamus by the infundibulum. It is nestled in the sella turcica at the base of the brain. It is known as the master gland because it controls and regulates the function of many of the other glands through the action of its six major types of hormones. The pituitary gland can be broken down into an anterior lobe (adenohypophysis) and a posterior lobe (neurohypophysis). (Lorrie L et-al 1997).

2.1.9 Ventricular system

The ventricles of the brain consist of the two lateral ventricles, the third ventricle, and the fourth ventricle. The lateral ventricles are in communication with the third ventricle through the inter ventricular foramina. The third ventricle communicates with the fourth ventricle by the cerebral aqueduct. The ventricles are filled with cerebrospinal fluid, which is produced by the choroid plexuses of the two lateral ventricles, the third ventricle, and the fourth ventricles.

The cerebrospinal fluid escapes from the ventricular system through the three foramina in the roof of the fourth ventricle and enters the subarachnoid space. The circulation of the CSF in the subarachnoid space and the fluid's ultimate absorption into the blood stream. (Snell).

2.1.10 Arterial supply

There are two main pairs of arteries internal carotid arteries and vertebral arteries. Internal carotid arteries, these large arteries are the LT and RT branches of the common carotid arteries in the neck which enter the skull, as opposed to the external carotid branches which supply the facial tissues.

The internal carotid artery branches into the anterior cerebral artery and continues to form the middle cerebral artery. (Lorrie L 1997).

The Vertebral arteries smaller arteries branch from the subclavian arteries which primarily supply the shoulder, lateral chest and arms. Within the cranium the two vertebral arteries fuse into the basilar artery. (Lorrie L et-al 1997).

2.1.11 Venous drainage

The venous system of the brain and its coverings is comprised primarily by the dural sinuses, superficial cortical veins, and deep veins of the cerebrum.

The Dural sinuses are very large veins located within the dura mater of the brain. All the veins of the head drain into the dural sinuses and ultimately into the internal jugular veins of the neck. The major dural sinuses include superior and inferior sagittal, straight, transverse, sigmoid, cavernous, and petrosal.

The superficial cortical veins are located along the surface of the brain to drain the cortex and some of the white

matter .The veins drain into the dural sinuses with numerous anastomoses between the superficial and deep veins.(Lorrie L et-al 1997).

The deep veins of the cerebrum drain the white matter and include the thalamostriate, septal, internal cerebral, basal (vein of Rosenthal) and great cerebral vein (vein of Galen).

The Circle of Willis functions as a means of collateral blood flow from one cerebral hemisphere to another in the event of blockage. It is formed by the anterior and posterior cerebral, anterior and posterior communicating, and the internal carotid arteries. (Lorrie L et-al 1997)

2.1.11 Cranial nerves

There are 12 cranial nerves (CN) numbered from anterior to posterior according to their attachment to the brain.

The olfactory nerve (CN I) is the nerve of smell. Optic nerve (CN II) is the nerve of sight. Oculomotor nerve (CN III) moves the eye. Trochlear nerve (CN IV) innervates only the superior oblique muscle of the eye. Trigeminal Nerve (CN V) has three major divisions: ophthalmic, maxillary, and mandibular. Abducens Nerve (CN VI) supplies motor impulses to the lateral rectus muscle of the eye. Facial Nerve (CN VII) innervates the facial muscles. It provides taste sensation to the anterior two thirds of the tongue. Vestibulocochlear Nerve (CN VIII) the cochlear branch receives impulses from the cochlea and separates these impulses into high and low frequencies for the interpretation of sound.

Glossopharyngeal Nerve (CN IX) supplies motor impulses to the muscles involved in swallowing. Vagus Nerve (CN X) supply areas of the neck, thorax, and abdomen. Accessory Nerve (CN XI) supply the skeletal muscles of the pharynx and larynx.

Hypoglossal Nerve (CNX11) supply muscle of the tongue.
(Lorrie L et-al 1997).

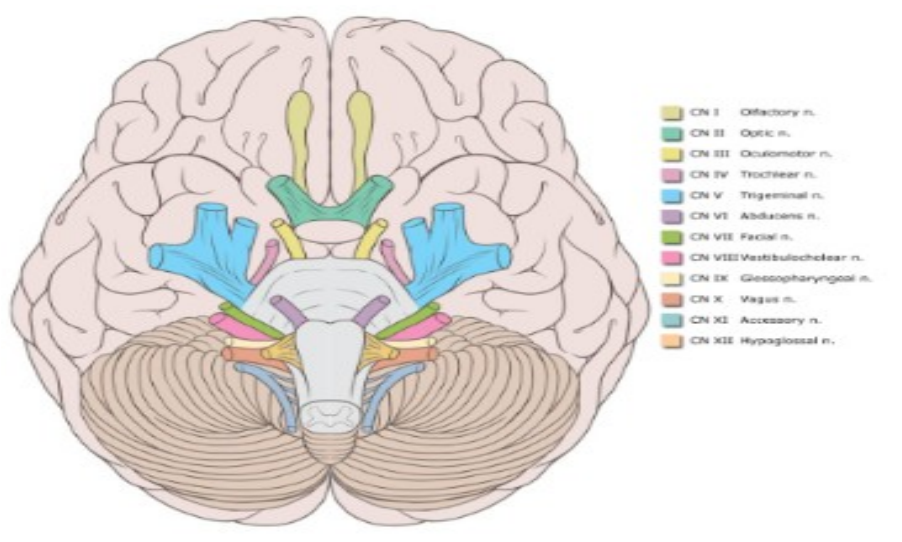


Figure (2) NO (4) Show the cranial nerves.

2.2 Physiology

The brain regulates and coordinates many critical functions from thought processes to bodily movements. (Lorrie L et-al 1997) .

2.2.1Cerebrum and its lobes.

The cerebrum has many critically important functions including the thought,judgment,memory,and discrimination.The frontal lobe ,which is generally concerned with personality and voluntary motor activities.the parietal lobe is concerned with peripheral sensations ,and the occipital lobe is concerned with vision.The temporal lobe deals with sensations of smell,taste,and hearing.the insula ,frequently referred to as the fifth lobe,mediates motor and sensory functions.(Lorrie L et-al 1997) .

2.2.2 The cerebellum has two primary functions;

Controls postural reflexes of muscles in body. produces skilled movements- .(Syamal K,et-al(2008,The cerebellum can determine the relative position of various body parts and intended movements with the actual position of the body part (legs,arms). In this way ,it can perform any adjustments needed to changes the direction or make the movement action, smooth and coordinated.(syamal k,et-al 2008) .

2.2.3 Mid brain

The mid brain receive visual input, auditory input from the medulla oblongata and are involved in cranial reflexes. (Rodney, et-al 2009) .

2.2.4Pons

The pons is not responsible Plays a role in the regulation of the respiratory system. Contains two, pontine, respiratory centers.

for the rhythm of breathing, (the medulla oblongata is).

The pons also prevents over inflation of the lungs (Rodney et -al 2009).

2.2.5 med ulla oblongata

It houses some very important vital centers; the cardiac center adjusts the heartbeat. The vasomotor center regulates the diameter of blood vessels and therefore systemic blood pressure(constriction increases and dilation decrease blood pressure) and the respiratory Centre for control of the basic rhythm and rate of breathing .Additional centers regulate sneezing, coughing, swallowing and vomiting.(Rodney et - al 2009).

2.2.6 The limbic system

2009). Is the emotional brain participating in the creation of emotional states such as fear, hunger, pleasure, and processing vivid memories associated with those states. for example ,the amygdala is central for processing fear and stimulates asympathetic response.(syamalk, et-al 2008).

2.2.7 Epithalamus, thalamus and hypothalamus.

The epitheliums contains the pineal gland, under the influence of the hypothalamus, its secretes the hormone melatonin, which aids in the regulation of day night cycles. The thalamus makes up for the various sensory and motor functions. (Rodney et-al 2009).

The hypothalamus controls and regulates many important functions of the body including Centers in the brain that regulate heart rate,blood pressure,bronchiole diameter,sweat glands,gi.tract activity.It does this via the parasympathetic and sympathetic divisions of the A.N.S. (Rodney et- al 2009)

Control of emotional responses-in association with the limbic system.Regulation of body temperature.

The hypo thalamus contains the feeding and thirst centers to regulation of hunger and thirst sensations.

Control the endocrine system-controls the relase of pituitary hormones.Also,it makes the 2 hormones;oxytocin and antidiuretic hormone that are stored in the posterior pituitary and relased when signalled.(Rodney et-aL

2-3 Pathology

2.3.1 Epidural hematoma

Is a mass of blood frequently formed as a result of a trauma to the head strongly associated with a linear skull fracture. Usually caused as a result of blunt trauma to the head with a tearing of the middle meningeal artery and blood then hemorrhaging into the epidural space.

Patients may present with loss of consciousness, headache, dilated pupils, increased intracranial pressure, nausea, and vomiting, convulsion and dizziness. (Michael L et al 2012). CT finding underlying fracture, acute stage hemorrhage will appear hyperdense, subacute stage hemorrhage will appear isodense, and chronic stage appear as hypodense. (Michael L et al 2012).

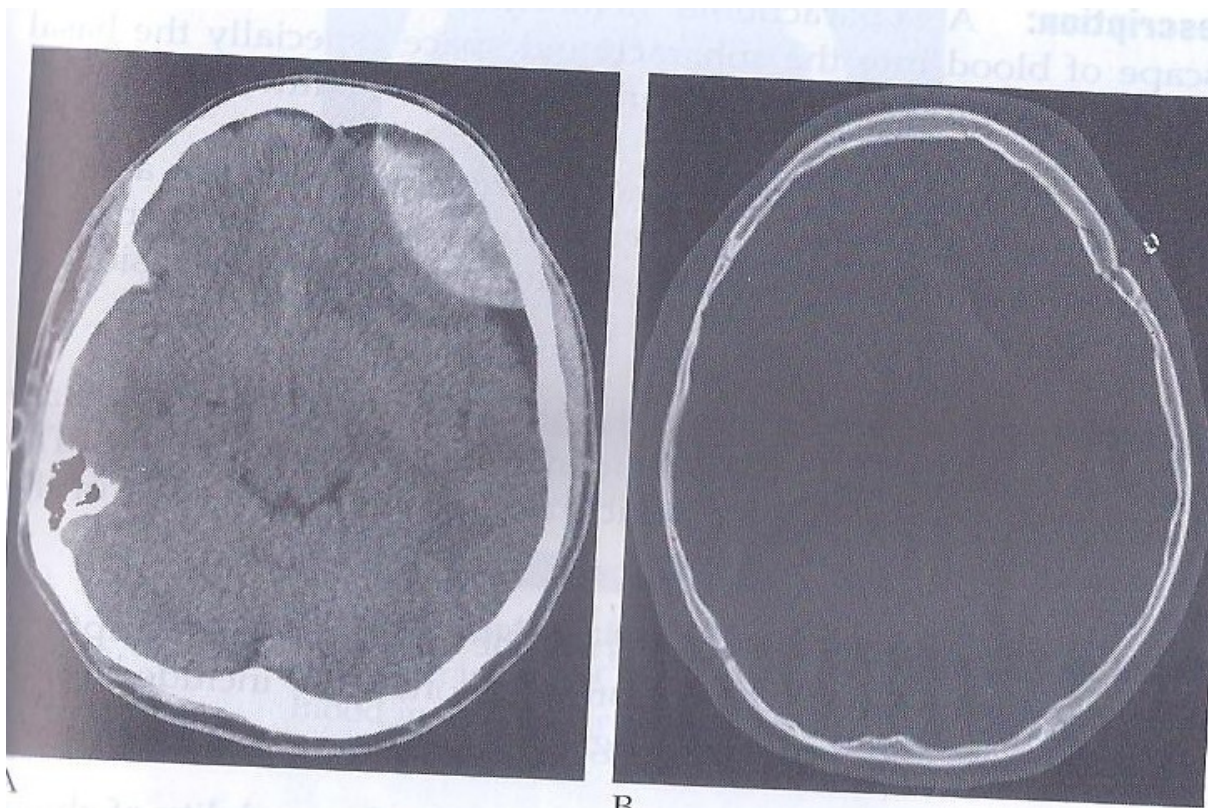


Figure 2. No(5) shows Epidural hematoma .NECT (A) shows the typical biconvex hyperdense acute It frontal EDH.NECT (B) For the same patient on bone windows shows It frontal bone fracture.

(Michael L 2012).

2.3.2 Subarachnoid hemorrhage

Involves the escape of blood into the subarachnoid space especially the basal cisterns and into

the CSF pathways. Occur most often as a result of a ruptured saccular berry aneurysm. Other causes may include intracranial AVM, hypertension or traumatic injury to the head. Headaches are the most common symptoms associated with SAH. Other complications may include loss of consciousness and focal neurologic deficits. (Michael L et-al 2012).

Noncontrast examination reveals high-density acute blood present in the subarachnoid spaces e.g. basilar cisterns and sylvian fissures. (Michael L et-al 2012).



Figure 2 No 2(6) axial plane shows the SAH. (Michael L 2012).

2.3.3 Subdural hemorrhage

Is a collection of venous blood located between the dura mater and the arachnoid membrane(subdural space).occur as a result of trauma,seldom are associated with skull fracture.patients may present with headaches,change in mental status,motor and sensory deficits.Michael L et-al 2012.

CT finding acute stage appears hyperdense,subacute stage appears isodense,and chronic stage appears hypodense.

A subdural hematoma may be drained through a burr hole or require a craniotomy to drain the accumulated blood.(Michael L et-al 2012).



Figure 2.(7) shows LT subdural hemorrhage . (kushner D 1998).

2.4.Computed tomogram (CT)

CT is a medical imaging method employing tomography and digital geometry processing ,it use constant three-dimensional image of the inside of an object from ,a large series of two -dimensional x-ray images taken around a single axis of rotation . (Serum 2001).

2.4.1 Physical principal of CT scanning

The physical principal of the CT includes the three processes referred to as :data acquisition,data processing and image display.seeram 2001 .

2.4.1.1 Data acquisition

Refer to the systemic collection of information from the patient to produce the ct image. The two methods of data acquisition are slice –by slice data acquisition and volume data acquisition. Seeram 2001.

In conventional slice-by-slice data acquisition, data are collected through different beam geometries to scan the patient .essentially, the x-ray tube rotates around the patient and collects data from the first slice .the tube stops and the patient moves into position to scan the next slice .This process continues until all slices have been individually scanned. Seeram 2001.

In volume data acquisition, special beam geometry referred to as spiral or helical geometry is used to scan avolume rather than one slice at a time. In spiral or helical ct, the x-ray tube rotates around the patient and traces aspiral ;helical path to scan an entire volume of tissue while the patient holds asingle breath .this method generates asingle slice per .one revolution of the x-ray tube.more recently , multi-slice spiral ;helical CT has become available for faster imaging patients.it generates multiple slices per one revolution of the x-ray tube .seeram 2001.

2.4.1.2 Data processing

Essentially constitutes the mathematical principles involved in ct.datd processing is a three –step process.first ,the raw data undergo some form of preprocessing in which correction s are made and some reformatting of data occurs .this is necessary to facilitate the next step in data processing

,image reconstruction .in this step ,the scan data ,which represent attenuation readings converted into a digital image characterized by ct numbers the final step is image storage of the reconstructed digital image .this image is held in a disk memory is a short -term storage. Seeram 2001.

2.4.1.3 Image display

It is the final process .after the ct image has been reconstructed,it exits the computer in digital form .this must be converted to a form that is suitable for viewing and meaningful to the observer.in ct the digital reconstructed image is converted into a gray scale image for interpretation by the radiologist.Because a diagnosis is made from this image,it is an important to present this image in a way that facilitates diagnosis. seeram2001.

2.4.2 Display device

The gray scale image is displayed on a cathode ray tube crt ,or television monitor ,which is an essential component of the control or viewing console .in some scanner there are two monitors ,one for text information and one for images. seeram2001.

The instrumentation of a modern ct facility consists of ;
A scanning gantry that includes the collimated x-ray source ,the detectors,the computer for data acquisition ,the image reconstruction system,motorized patient -handling table,the ct viewing console.

The major technical difference between various commercial scanners lies in the gantry design and the number and type of x-ray detectors used. seeram 2001.

2.4.3 The advantages of CT

CT has capacity to image material ranging from air to metal, ct is used as a guide in taking biopsy of the lesions demonstrated by other imaging technique ,.cct image has high contrast resolution which can easily demonstrate the brain tissue and the ventricular system and any other brain lesions seeram 2001.

2.4.4 The disadvantages of CT

The x-ray has serious effects in early pregnancy.

Ionizing radiation.

2.5 Previous studies

Ezecu, Abonyil C, et-al 2013 a sample of 500 patients with head trauma who has diagnostic cranial CT scans was detected in Lagos ,Nigeria.

Most of the study subjects(68%) were men,and (58%) of the head trauma resulted in intracranial bleeding.Among the hemorrhages found,

(37%) were intra cerebral ,(25%) were subdural,(16%) were intraventricular,(15%) were sub arachnoid,(7%) were epidural.

An intra cranial hemorrhage was acommon consequence of acute head trauma and the traffic accidents accounted for (44%) of all the head traumas found in the study and conciders the main cause of acute head trauma in Lagos Nigeria.

Brown CV et-al 2004 Blunt traumatic patients with an abnormal head CT admitted to an urban,level 1 trauma center over the 9 months period,There were100 patients admitted with an abnormal head CT after trauma.Abnormal head CT findings were SAH (47%),SDH(28%) ,EDH (11%), and diffuse axonal injury (2%).

CT of the head is the current standard for diagnosing intracranial pathology following blunt head trauma and it is common practice to repeat the head CT to evaluate any progression of injury.

Samuel C et-al 2011 done this is study of all the head injury patients who presented for CT scan at Memfys Hospital for Neurosurgery, Enugu, Nigeria . 204 including (33) follow up cases were done for trauma .The male to female ratio 3.5: 1 .In this study (33.9%)of the patients were in the third and fourth decades of life.The major causes of head injury were Road traffic accidents (RTAs 59%). In this series (19.9%) of patients had anormal CT finding,while9(80.1%)had abnormal CT finding . The most common CT findings due to head injury were Cerebral contusion and edema in(30.7%),SDH in (27%) ,skull fractures in(23.4%) and extradural hematoma in99(8%) .Samuel C et-al 2011.

Chapter Three

Material and Methods



CHAPTER THREE

3.1 Material and methods

3.1.1 Study design,area and duration.

This study was a descriptive study designed to assess the ability of CT to diagnose extra axial hemorrhage in emergency department .

The study was collected from radiology department of IBRAHIM MALIK HOSPITAL. The study was carried out within 3 months.

3.1.2 Machine used

The machine used is CT scan 64 slice (Toshiba)

3.1.3 Study population

The study includes Sudanese group of patients with extra axial hemorrhage.

3.1.4 Inclusion criteria

Study includes 60 traumatic patients visiting the emergency department.

3.1.5 Exclusion criteria

Exclusion criteria patients whom have non traumatic hemorrhage and normal patients.

3.1.6 Data collection

Data collection according to work sheet include ;the patient age,gender,clinical indication,final diagnosis,type of head trauma,and appearance of hemorrhage.

3.1.7 Data analytical methods

The use of descriptive analytical method using the spss statistical program based descriptive statistics and Data illustrative charts.

3.1.8 CT Brain Protocol

Patient position: Supine Head first .Arms along the side of the body and head immobilized in the head holder.

Scout : Lateral

Start location and end : From foramen magnum to vertex.

Slice plane :Axial

KVP,MAS,SLICE THICK ness

60 patients were diagnosed as extra axial hemorrhage with 120 KVP and 150 MAS ,5 mm in slice thick ness.

Filming: Soft tissue window and bone window.

Breath hold : None

I.V Contrast : None

3.1.9 Image Interpretation

The radiologist interpret radiology examinations ,was analyzed the images and send report to physician.

3.1.10 Ethical consideration

NO disclose any information concerning the patients identification.

Chapter Four

Result



CHAPTER FOUR

Results

Table (1): Patients distribution with Respect to Gender:

	Frequency	Percent
Male	48	80.0
Female	12	20.0
Total	60	100.0

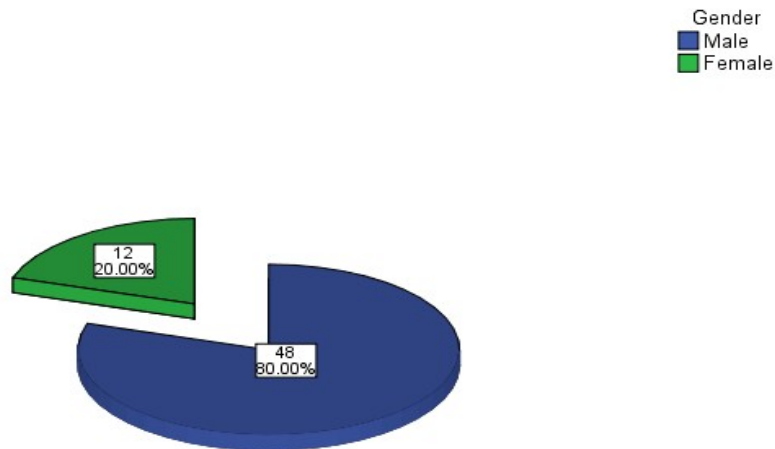


Figure (1): Patients distribution with Respect to Gender

Table (2): Patients distribution with Respect to Age:

	Frequency	Percent
less than 21 years	4	6.7
21-30 years	10	16.7
31-40 years	9	15.0
41-50 years	23	38.3
51-60 years	8	13.3
more than 60 years	6	10.0
Total	60	100.0

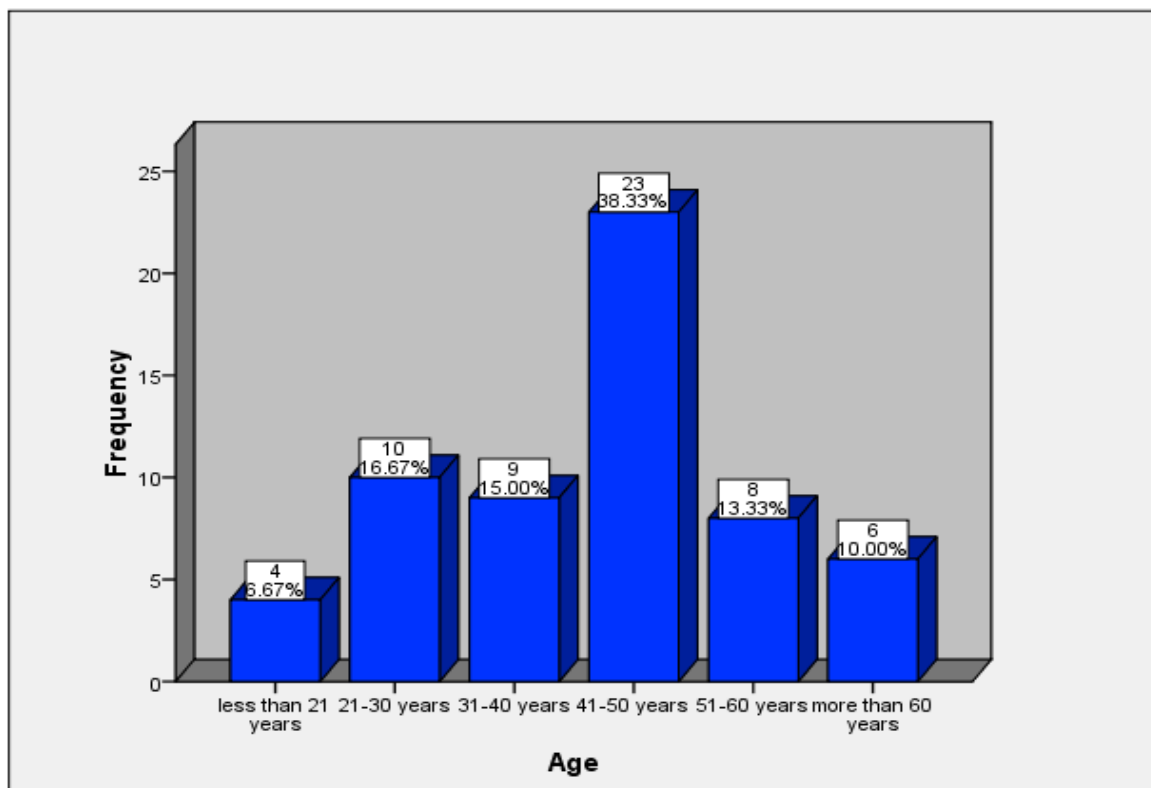


Figure (2): Patients distribution with Respect to Age

Table (3): Patients distribution with Respect to Clinical Indication:

	Frequency	Percent
Bleeding	2	3.3
Convulsion	2	3.3
Headache	38	63.3
LOC	12	20.0
LOC, Headache	2	3.3
LOC, Vomiting	1	1.7
Vomiting	3	5.0
Total	60	100.0

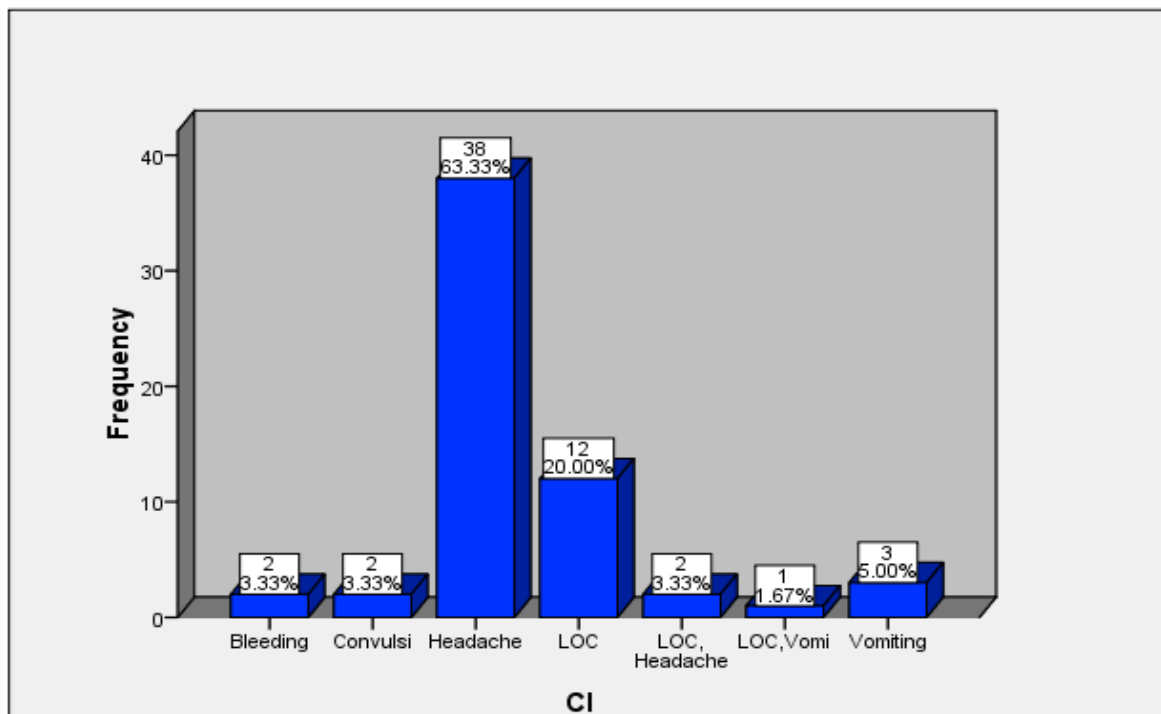


Figure (3): Patients distribution with Respect to Clinical indication

Table (4): Patients distribution with Respect to type of Head trauma :

	Frequency	Percent
FALL	5	8.3
FIGHTING	2	3.3
HIT BY STICK	3	5.0
RTA	49	81.7
Missed	1	1.7
Total	60	100.0

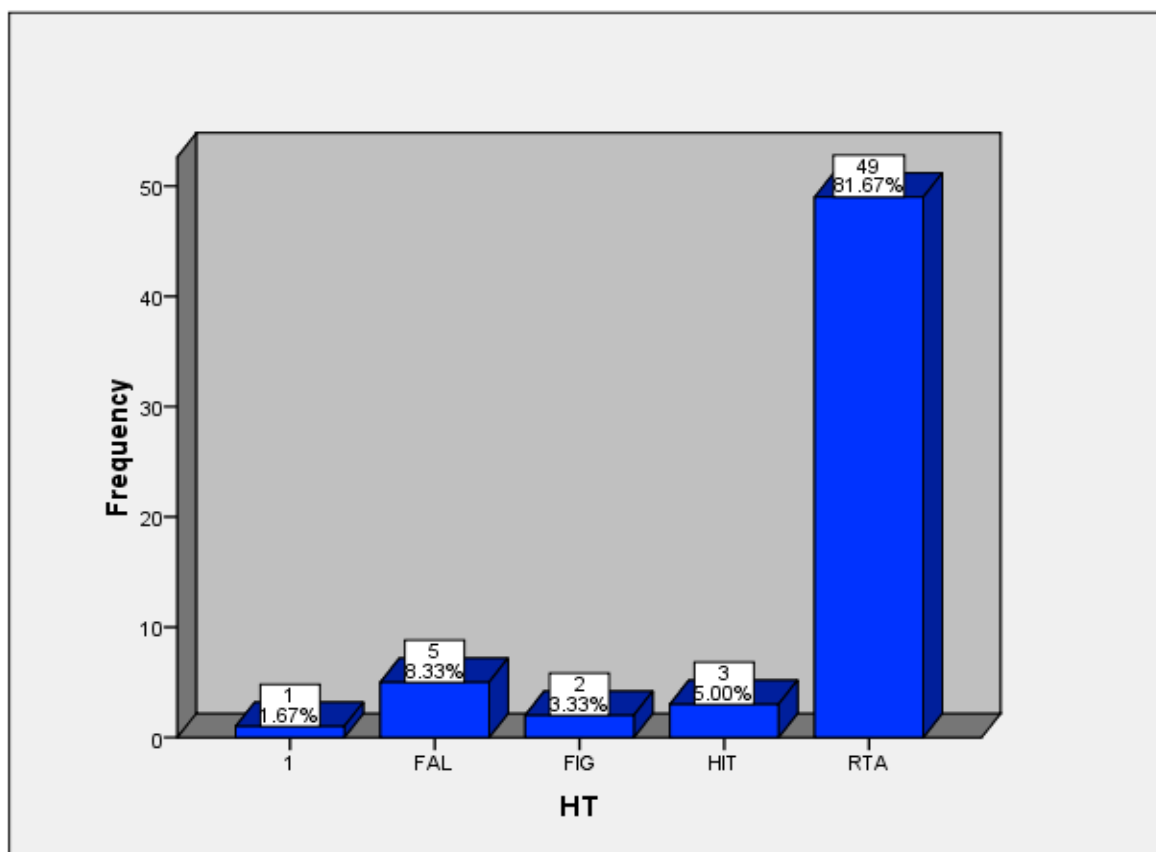


Figure (4): Patients distribution with Respect to type of Head injury.

Table (5): Patients distribution with Respect to side of Hemorrhage :

	Frequency	Percent
RT	31	51.7
LT	21	35.0
Bilateral	7	11.7
Midline	1	1.7
Total	60	100.0

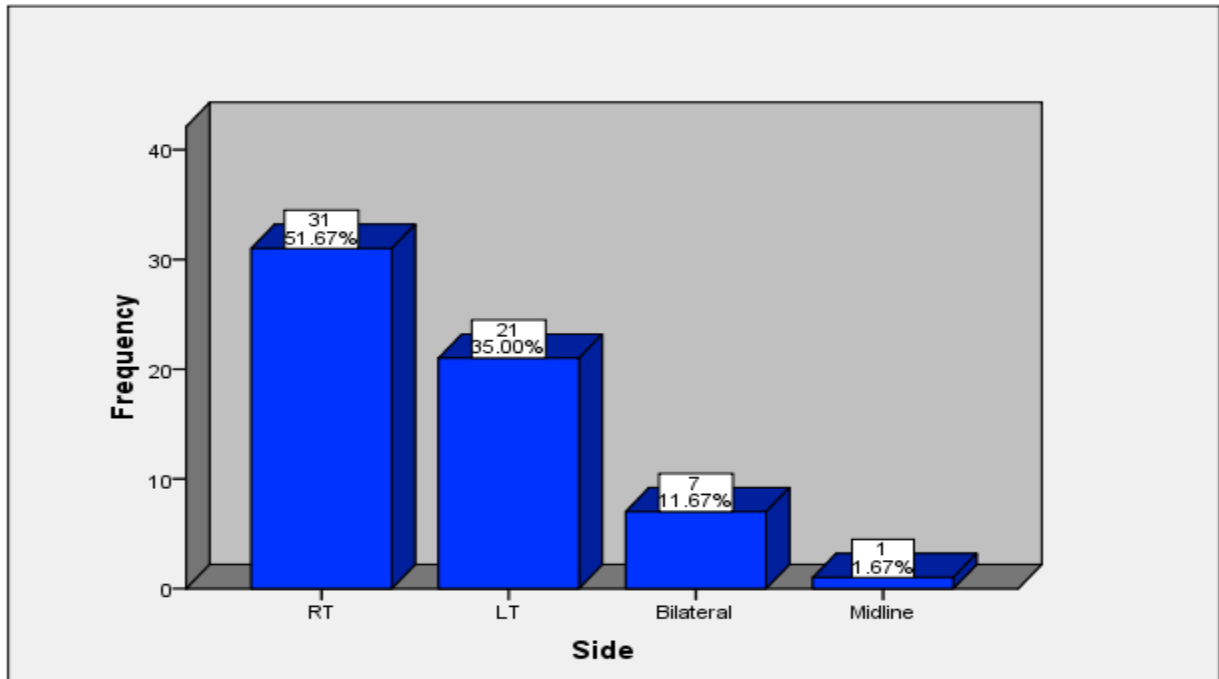


Figure (5): Patients distribution with Respect to side of hemorrhage :

Table (6): Patients distribution with Respect to diagnosis:

	Frequency	Percent
EDH	23	38.3
SAH	8	13.3
SDH	29	48.4
Total	60	100.0

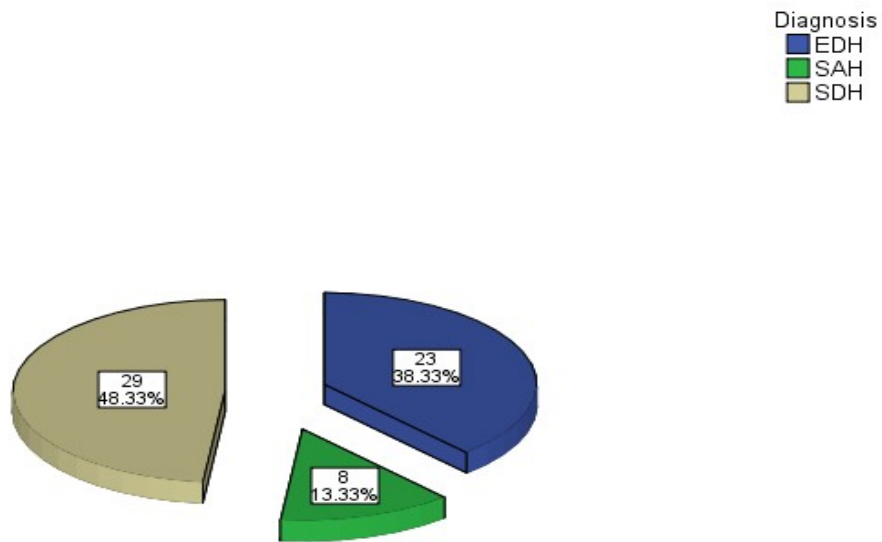


Figure6: Patients distribution with Respect to diagnosis.

Table (7): Patients distribution with Respect to CI situation (case):

	Frequency	Percent
Acute	41	68.3
sub-acute	9	15.0
Chronic	10	16.7
Total	60	100.0

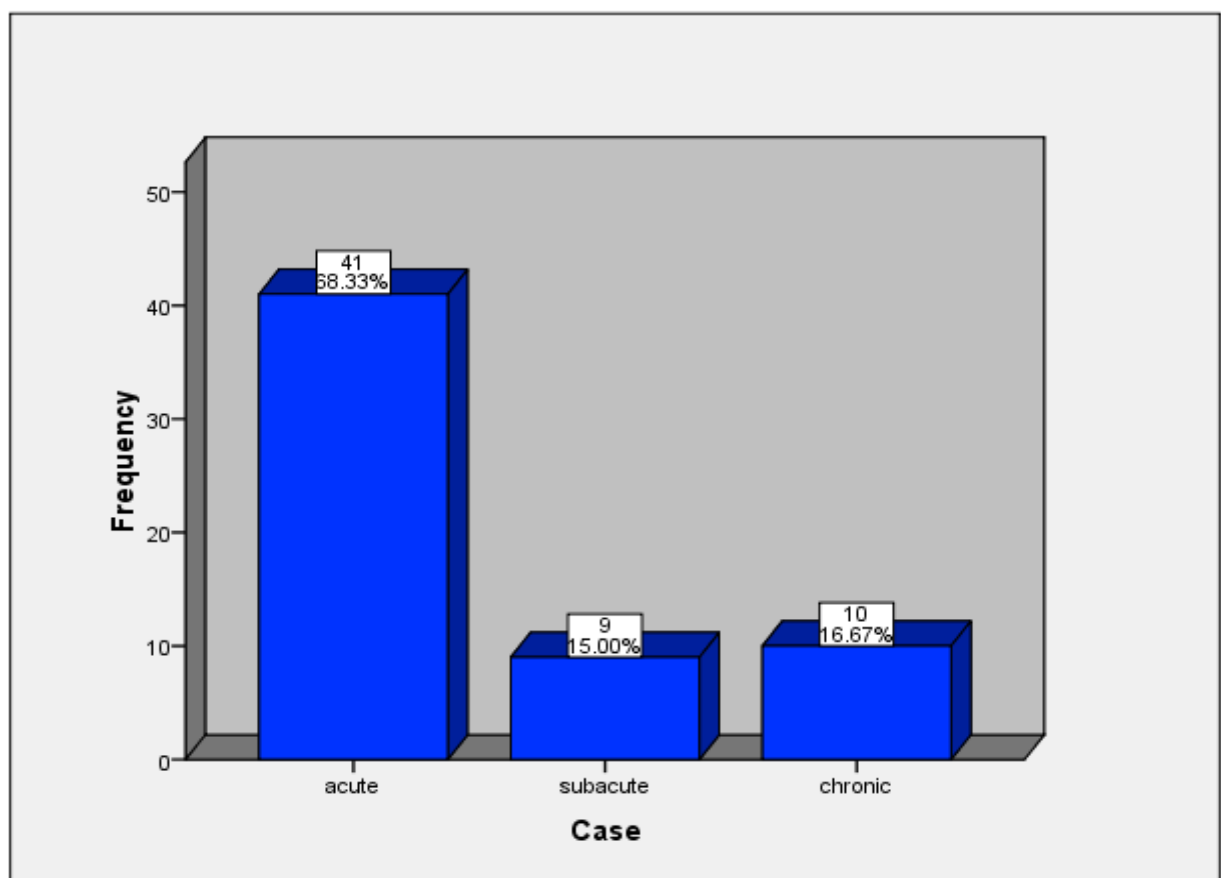


Figure7: Patients distribution with Respect to diagnosis situation case.

Table (8): Shows Case,Diagnosis Crosstabulation

			Diagnosis	Total		
				EDH	SAH	SDH
Case	Acute	Count % within Diagnosis	21 91.3%	6 75.0%	14 48.3%	41 68.3%
	Subacute	Count % within Diagnosis	2 8.7%	0 .0%	7 24.1%	9 15.0%
	Chronic	Count % within Diagnosis	0 .0%	2 25.0%	8 27.6%	10 16.7%
Total	Count % within Diagnosis	23 100.0%	8 100.0%	29 100.0%	60 100.0%	
	Value	Df	Asymp. Sig. (2-sided)			
Pearson Chi-Square	13.201	4	.010			

Table (9): show case ,Gender Crosstabulation:

				Gender		Total
				Male	Female	
Case	Acute	Count	33	8	41	
		% within Case	80.5%	19.5%	100.0%	
	Subacute	Count	7	2	9	
		% within Case	77.8%	22.2%	100.0%	
	Chronic	Count	8	2	10	
		% within Case	80.0%	20.0%	100.0%	
Total	Count	48	12	60		
	% within Case	80.0%	20.0%	100.0%		
	Value	Df	Asymp. Sig. (2-sided)			
Pearson Chi-Square	.034	2	.983			

Table (10): Shows Case, Age Crosstabulation:

		Age	Total					
			less than 21 years	21-30 years	31-40 years	41-50 years	51-60 years	more than 60 years
Case	acute	Count	4	8	8	15	6	0
	% within Case		9.8%	19.5%	19.5%	36.6%	14.6%	.0%
	subacute	Count	0	2	0	5	0	2
	% within Case		.0%	22.2%	.0%	55.6%	.0%	22.2%
	chronic	Count	0	0	1	3	2	4
	% within Case		.0%	.0%	10.0%	30.0%	20.0%	40.0%
Total	Count	4	10	9	23	8	6	60
	% within Case	6.7%	16.7%	15.0%	38.3%	13.3%	10.0%	100.0%

Chapter Five

Discussion, Conclusion and Recommendations



CHAPTRE FIVE

Discussion, Conclusion and Recommendations

5.1Discussion:

This study was conducted on Ibrahim Malik Hospital for 60 patients with extra -axial hemorrhage .48 of them were males which was 80.1%,12 patients were female which was 20%. Table NO (1) This result was consiend with the previous study showed that most of the study were men in the study of (Eezcu ,2013) , and (Samuel C 2011).

According to age found that the most common group affected were (41-50 year) which was 38% then comes (21-30) which was 16% ,then (31-40)was 15% then(51-60) was 13%,more than 60 year were 10% and less than 21 year which was 6%.Table NO (2) .This result similar to the previous study of (Samuel C 2011).

Road traffic accident accounted for 49 patient (81.7%) of all the head trauma found in the study and other causes as fall down,fighting,hit by stick in other patients. Table NO(4).This result similar to the stuydies showed that the Road traffic accident accounted (RTA) were common in the study of (Ezecu,2013) and study of (Samuel C 2011) .

On diagnosing of hemorrhage related to the location found that the apercentage of subdural hemorrhage was 48.4%,the subarachnoid hemorrhage was 13.3%,and Epidural hemorrhage 38.3%,table NO (6) ,we found that the subdural

hemorrhage was the most location of hemorrhage this result same as (Ezecu ,2013) and (Samuel C 2011).

Table and Figure (7) show that (68.3%) of hemorrhage acute cases(15%) subacute,while(16.7%) chronic.Therefore the most of the nature of the hemorrhage were acute.

Crosstabulation in Table (8) show the correlation between hemorrhage cases and location of hemorrhage ,show that (91.3%) acute epidural hemorrhage,(8.7%) subacute epidural hemorrhage.

Compare these with subarachnoid hemorrhage found (75.0%) of acute subarachnoid ,(25.0%) chronic subarachnoid hemorrhage.And with subdural hemorrhage found (48.3%) of acute subdural hemorrhage , (24.1%)subacute subdural hemorrhage ,and (27.6%) chronic subdural hemorrhage.Therefore the most acute cases in Epidural hemorrhage and subacute and chronic cases in Subdural hemorrhage and the value of P equal 0.05.The level of significance was 0.05 and the P less than 0.05 was considered significance.

Table (9) of hemorrhage cases and gender crosstabulation show that (80.5%) of acute cases were Male and (19. 5) were Female .Related to the subacute cases found (77.8%) in male and (22.2%) in female.Chronic in male found (80.0%),and (20.0%) in female .The value of P equal .983 and no considered significance.

Table (10) of hemorrhage case, Age crosstabulation show that (9.8%) was acute in less than 21 year ,(19.5%) acute in age between (21-31) year ,(19.5%) acute in (31-40) year (14.6%) acute in age between (51-60)year .When compare with subacute cases show (22.2%) in age between (21-31) , (55.6%) in age between (41-50) ,(22.2%) in age more than 60 year.Related to Chronic found that (10.0%) chronic in age

between (31-40) ,(30.0%) in age (41-50) ,(20.0%) in age (51-60) and (40.0%) in age more than 60 year. Value of P equal .011 and this is considered significance .

5.2 Conclusion

For diagnosis of Traumatic brain injury , non contrast CT is the initial modality of choice as it quickly and accurately identifies of extra-axial brain haemorrhage.

CT allows rapid assessment of the extent and type of brain hemorrhage.

The CT scan has higher resolution to differentiate between the tissue of the brain.

CT scan is the best modality in cases of head injury.

Most of head injuries were caused by RTA.

5.3 Recommendation

More research should be done using a large sample of patients for further assessment .

Traumatic patients with neurological symptoms should be directed to do CT scan examination firstly, and it should be done as quickly as possible.

All the governmental hospitals should be provided by CT scanning machine.

Building up hospitals and modern diagnostic centers along the main traffic road.

The CT scan for the head injured patients should be done free, or with less cost.

The facilities for the treatment of the patients should be available in the emergency departments.

Due to large number of individuals that suffer from TBI ,it is imperative that high quality images are produced to provided the best possible treatment for patients .There fore

both CT and MRI are used in the prognosis and management of TBI and advancements are continually made to increase the quality of the images.

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Appendex NO 1:



Figure 5.1 : CT of an 87 year-old female showing a large LT subdural hematoma with significant midline shift and effacement of the left lateral ventricle.



Figure 5.2: show Axial Soft tissue window for 55 year old man diagnosed as subarachnoid hemorrhage.

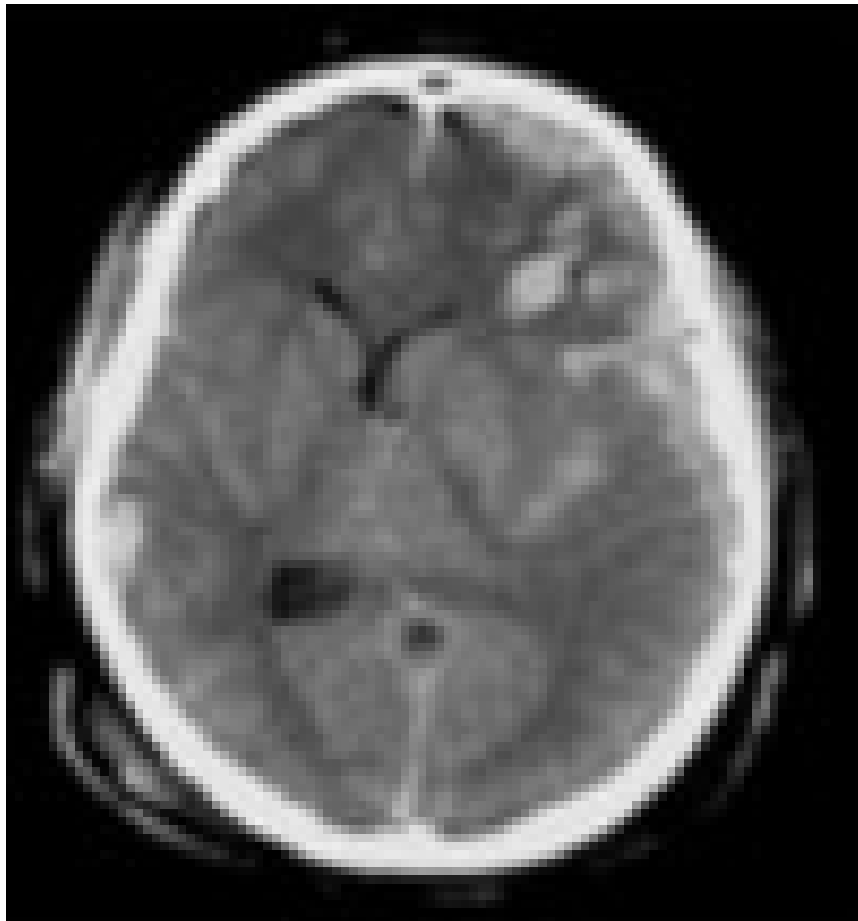


Figure 5.3: Axial CT for soft tissue window showing progressive epidural hematoma in 55year -old.



Figure 5.4: Show CT Toshiba Machine.

Appendix NO 2:

Data Sheet Collection

[illegible]