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Assessment of Brain Stimulation Therapy Safety Measures

تقييم إجراءات السلامة في علاج التحفيز الدماغي

Thesis Submitted For Partial Fulfillment Of Requirement Of the Degree of M.Sc in Medical Physics

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MARCH 2016

الآيـة

قال تعالى :

(108)قُلْ لَوْ كَانَ الْبَحْرُ مِدَادًا لِكَلِمَاتِ رَبِّي لَنَفِدَالْ بَحْرُ قَبْلَ أَنْ تَنْفَدَ كَلِمَاتُ رَبِّي وَلَوْ جِئْنَا بِمِثْلِهِ مَدَدًا (109)قُلْ إِنَّمَا أَنَا بَشَرٌ مِثْلُكُمْ يُوحَى إِلَيَّ أَنَّمَا إِلَهُكُمْ إِلَهٌ وَاحِدٌ فَمَنْ كَانَ يَرْجُو لِقَاءَ رَبِّهِ فَلْيَعْمَلْ عَمَلًا صَالِحًا وَلَا يُشْرِكْ بِعِبَادَةِ رَبِّهِ أَحَدًا (110)

صدق الله العظيم

سورة الكهف

DEDICATION

This research is dedicated to my dear father who support me and encourage me to be in high levels

And to the great women who shaped my life mother and my small family ,my husband and my lovely kids.

Acknowledgement

Grateful thank and grace to Allah for guiding and helping me finishing this research.

My deep thanks to my supervisor Dr. Hussein Ahmed Hassan for the good treatment and available any time want him ,support by the idea of this research until finishing.

Also thanks to the department of (ECT) of Tgani Almahi hospital.

Abstract

This study was done to assess the safety measures in brain stimulation in Altigani Almahi Psychiatric Hospital in electroconvulsive therapy department.

Random sample from patients (15 male and 25 female) clinically diagnoses psychiatric problems with different ages and different symptoms and signs were underwent brain stimulation therapy.

the object of study to assessment of safety procedures in brain stimulation and comparing it with international stander and assessment of the protocols uses.

the study show the mistake of safety measure like amount of electricity and electrode position and the protocols lead to diseases like brain damage ,heart and pressure diseases .

these study ensures the treatment by brain stimulation is success method for diseases not response to conventional method by applying under conditions.

ملخص البحث

أجريت هذه الدراسة في مستشفى التجاني الماحي في الفترة من اكتوبر 2015 الى ديسمبر 2015 في قسم العلاج بالصعقات الكهربائية وتهدف هذه الدراسة الى تقييم إجراءات السلامة في التحفيز الدماغي ومقارنتها بالمعايير العالمية وتقييم البرتوكولات المتبعة

ولقد أخذت عينه عشوائية من اربعين مريض (25)من النساء و (15) من الرجال تم تشخيصها بأمراض نفسيه مختلفة من مختلف الأعمار وبأعراض مختلفة تم تحويلهم الى قسم العلاج الكهربائي ووضعوا تحت العلاج

وأوضحت الدراسة أن الأخطاء في قياسات السلامة اللازم إتباعها من حيث كمية الكهرباء المطلوبة أو وضعية الأقطاب الصحيحة أو عدم الالتزام بالبرتوكولات المتبعة عالميا يؤدي الى حدوث أمراض أخرى كتلف في خلايا الدماغ وأمراض القلب وأمراض ضغط الدم

وقد رصدت الدراسة ان العلاج بالتحفيز الدماغي من أنجع الطرق لعلاج الامراض النفسية والاكتئاب التي لا تستجيب للطرق الأخرى في العلاج في حال طبقت تحت الاجراءات والشروط المطلوبة لضمان سلامة المريض.

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List of Abbreviations

ECT	Electroconvulsive therapy.
EBS	Electrical brain stimulation.
TMS	Transcrnial magnetic stimulation.
FBS	Focal brain stimulation.
DBS	Deep brain stimulation.
VNS	Vagus nerve stimulation.
FES	Functional electrical stimulation.
CES	Cranial electro therapy stimulation.
RAS	Reticular activating system.
TDCS	Transcrainal direct current stimulation.
MPFC	Medial prefrontal cortex.
L-AA	L-α-amiomadipate.
MST	Magnetic seizure therapy.
ECG	Electro cardiograph.

CHAPTER ONE

CHAPTER ONE

1.1 Introduction :

Brain stimulation represents a new discipline in psychiatry focused on using magnetic or electrical energy to improve brain function. These techniques are used both for research and for treatment in major psychiatric disorders that do not always respond fully to conventional treatments, such as medication or psychotherapy. Stimulation with electrical or magnetic energy interacts with neurons, causing them to release chemicals called neurotransmitters, and possibly also helping form more healthy synapses, or connections, between nerve cells. Repeated stimulation can modulate or "reset" the activity of specific regions of the brain to exert significant changes. Brain stimulation therapy uses both traditional and brand new methods of applying energy, either alone or in concert with medications. As with other treatments, brain stimulation treatments have both risks and benefits that should be discussed thoroughly with your doctor (Joshua Berman 2009).

Stimulation treatments are designed for individuals who are either medication resistant or medication intolerant. While currently available medications and psychotherapies are effective for many people with depression, unfortunately a substantial number of people do not respond. When depression is resistant to medication, it can become chronic, lasting for long periods of time in some cases. Depression can also recur, making long-term maintenance strategies very important.. In addition, side effects of conventional psychotropic medications may limit the effectiveness of treatment(Joshua Berman 2011) .

In such instances, the use of Brain Stimulation treatments may allow treatment of a condition that otherwise could not be treated, by replacing medication or by allowing the use of lower doses of medications or medications that are more tolerable to the patient but less effective by themselves(Cheryl Corcoran 2011) .

Electroconvulsive Therapy (ECT) has been modernized substantially since it was first introduced over 70 years ago. ECT remains the most effective and rapidly acting treatment for severe treatment-resistant depression and other disorders. Modifications in ECT technique, electrode placement, and dosage can dramatically affect the side effects and tolerability of the treatment(Joan Prudic 2009).

New York-Presbyterian Hospital and the New York State Psychiatric Institute have long been recognized as leaders in the field of ECT research and clinical practice. We specialize in individualizing ECT dosage to each patient's needs, and in selecting treatment parameters that research has shown have the lowest risk of side effects(Joan Prudic 2009).

Transcranial Magnetic Stimulation (TMS) was approved by the United States Food and Drug Administration in October, 2008, for the treatment of major depression that has not responded to at least one adequate trial of an antidepressant medication in the current episode. Columbia was one of the main research sites that demonstrated the safety and efficacy of TMS prior to its approval, and is the first location in the New York area to offer it now for treatment(Stefan Rowny 2009).

TMS is a non-invasive form of brain stimulation that modulates brain activity using focused magnetic pulses. To treat depression, this stimulation is delivered to an area of the brain linked to depression in 30-60 minute sessions administered on an outpatient basis. Treatment typically occurs daily

(Monday - Friday for 4-6 weeks)

TMS is not a replacement for antidepressant medications, but may be added onto existing medications (Stefan Rowny 2009).

Vagus Nerve Stimulation (VNS) was approved by the FDA for the long-term treatment of chronic major depression that has not responded to antidepressant treatments(Joshua Berman 2009).

VNS is performed with an electrical device like a pacemaker that is implanted in the chest. Electrical leads are connected to the vagus nerve in the neck. The vagus nerve sends impulses to the brain. VNS is indicated for the adjunctive long-term treatment of chronic (more than 2 years) or recurrent depression for patients 18 years of age or older who are experiencing a major depressive episode and have not had an adequate response to four or more adequate antidepressant treatments(Joan Prudic 2009).

VNS is not a replacement for medications or electroconvulsive therapy (ECT), but it can be added onto other treatments for adjunctive therapy and long-term management. New York-Presbyterian Hospital and New York State Psychiatric Institute played a role in the initial clinical trials of VNS for depression(Joan Prudic 2009).

In-depth evaluations are conducted by a team of psychiatrists with expertise in brain stimulation techniques. They are assisted by consultants from our research faculty and other medical and neurological specialists as needed(Stefan Rowny 2009).

Integrating this information, we provide a comprehensive assessment, second opinion on prior treatment strategies, and recommendations regarding state-of-the-art clinical care. Where appropriate, FDA-approved brain stimulation treatments may be using prescribed and administered and referrals for research based treatments are also available(Joshua Berman 2009).

1.2 problem of study

The brain disorder un controlled disease coming at any time with Loss of consciousness and the patients me be Compromised him.(Ect) help patients to Discharge electric charge from body to Becomes quiet and comfortable.

1.3.1 General Objectives:

To assess of brain stimulation safety measure.

1.3.2 Specific Objectives:

1- To determine the main side effect of brain stimulation therapies.

2- To establish safety protocol for brain stimulation therapies in Sudan.

3- To assess quality assurance program implement in Sudan.

1.4 The study area:

The study area was done in Tigani ALmahi hospital and Khartoum center for Psychiatry.

1.5 Duration of study:

The duration of the study six month.

1.6 Overview of the study:

Chapter one include introduction.

Chapter two shows theoretical background and previous study.

Chapter three explains material and methods.

Chapter four shows the analysis and results.

Chapter five discussion, conclusion and recommendations.

CHAPTER TWO

CHAPTER TWO

LITRTURE REVIEW

2. Brain

2.1.1 the Brain

The human brain is not only one of the most important organs in the human body; it is also the most complex. In the following tour, you will learn about the basic structures that make up the brain as well as how the brain works. This is not an in-depth look at all of the **research** on the brain (such a resource would fill stacks of books). Instead, the goal of this brain tour is to familiarize you with major brain structures and their functions (Kendra cherry 2008).

The cerebral cortex is the part of the brain that functions to make human beings unique. Distinctly human traits including higher thought, language and human consciousness as well as the ability to think, reason and imagine all originate in the cerebral cortex (Kendra cherry 2008).

The brain is the portion of the central nervous system in vertebrates (animals with bones) that lies within the skull. In humans, the brain weighs about 3 pounds. Differences in weight and size do not correlate with differences in mental ability.

The brain is the control center for movement, sleep, hunger, thirst, and virtually every other vital activity necessary to survive

The brain is a pinkish-gray mass that is composed of about 10 billion nerve cells. The nerve cells are linked to each other and together are responsible for the control of all mental functions. Nerve fibers in the brain are covered in a near-white substance called myelin and form the white matter of the brain

Nerve cell bodies, which are not covered by myelin sheaths, form the gray matter (Kendra cherry 2008).

The entire brain is enveloped in three protective sheets known as the meninges, continuations of the membranes that wrap the spinal cord. The

two inner sheets enclose a shock-absorbing cushion of cerebrospinal fluid. Nerve fibers in the brain are covered in a near-white substance called myelin and form the white matter of the brain. Nerve cell bodies, which are not covered by myelin sheaths, form the gray matter (Richard 2000).

The brain is divided into three major parts, the hindbrain (including the cerebellum and the brain stem), the midbrain, and the forebrain (including the diencephalon and the cerebrum).

The brain is a delicate organ that must be protected. When participating in activities such as skiing or snowboarding , wear a helmet to help reduce brain injuries. Also, try to avoid heat stroke because the brain can only function in a very narrow temperature range. The cerebral cortex can be divided into four sections, which are known as lobes , The frontal lobe, parietal lobe, occipital lobe, and temporal lobe have been associated with different functions

ranging from reasoning to auditory perception (Richard 2000)

2.1.2 brain's major function?

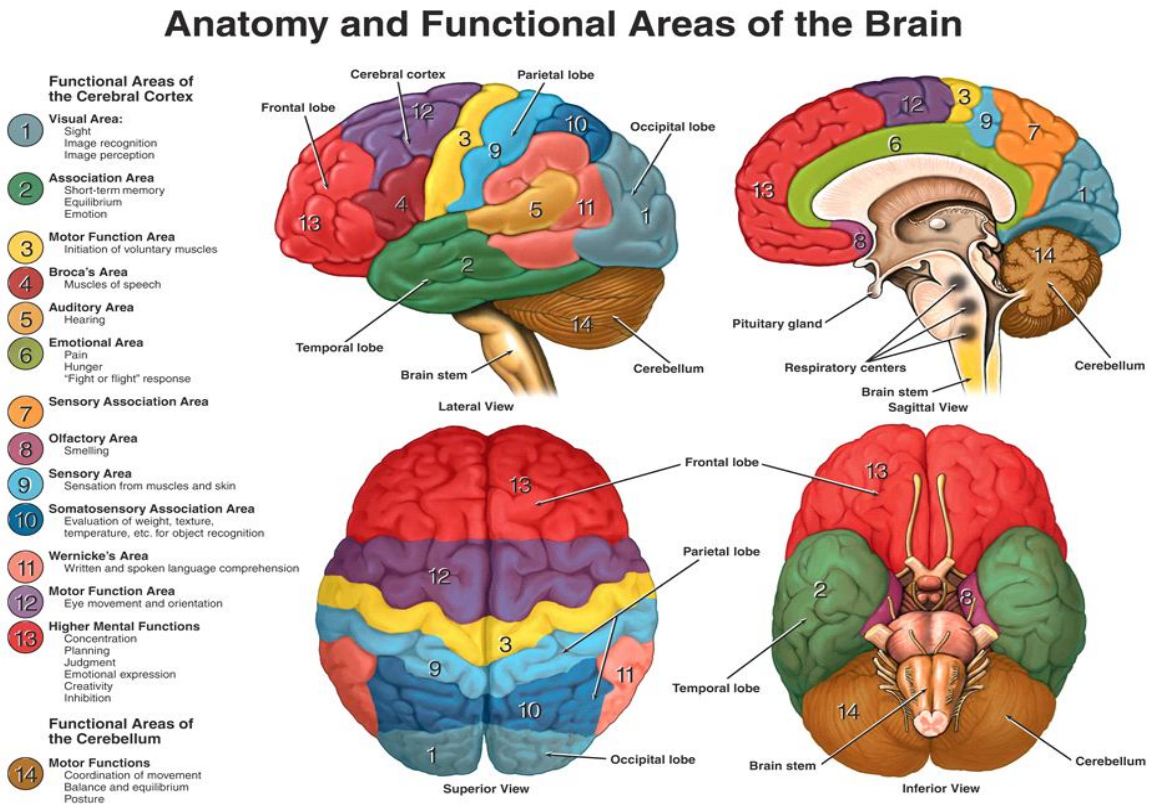


fig 2.1 Anatomy and functional area of the brain (WWW.Chop.edu).

Each area of the brain has an associated function, although many functions may involve a number of different areas.

The cerebellum is the hind part of the brain. It is made up of gray, unmyelinated cells on the exterior and white, myelinated cells in the interior. The cerebellum coordinates muscular movements and, along with the midbrain, monitors posture. It is essential to the control of movement of the human body in space. The brain stem, which incorporates the medulla and the Pons, monitors involuntary activities such as breathing and vomiting(Richard 2000).

The thalamus, which forms the major part of the diencephalon, receives incoming sensory impulses and routes them to the appropriate higher centers. The hypothalamus, occupying the rest of the diencephalon, regulates heartbeat, body temperature, and fluid balance. Above the thalamus extends the corpus callosum, a neuron-rich membrane connecting the two hemispheres of the cerebrum (Richard 2000) .

At of the brain. It makes up about 85% of the brain's weight. The cerebrum is split vertically into left and right hemispheres, it appears deeply fissured and grooved. Its upper surface, the cerebral cortex, contains most of the master controls of the body. In the cerebral cortex ultimate analysis of sensory data occurs, and motor impulses originate that initiate, reinforce, or inhibit the entire spectrum of muscle and gland activity. The left half of the cerebrum controls the right side of the body; the right half controls the left side (Richard 2000).

Other important parts of the brain are the pituitary gland, the basal ganglia, and the reticular activating system (RAS). The pituitary participates in growth regulation. The basal ganglia, located just above the diencephalon in each cerebral hemisphere, handle coordination and habitual but acquired skills like chewing and playing the piano. The RAS forms a special system of nerve cells linking the medulla, Pons, midbrain, and cerebral cortex. The RAS functions as a sentry. In a noisy crowd, for example, the RAS alerts a person when a friend speaks and enables that person to ignore other soundques (Richard 2000).

2.2 pathology (Psychiatry):

Disorders leading to unconsciousness or altered consciousness

Coma is defined as a state where the brain is no longer alert and the body does not respond to inner or external stimuli. Common causes of coma include brain injury, thrombosis, embolism, brain tumor, metabolic disease, nutritional deficiency, poisoning and brain infection caused by falciparum malaria, tuberculosis, or syphilis, for example. In some cases, loss of consciousness may be only partial and this is termed altered consciousness (Jerome 2007).

2.2.1-1 Epilepsy

This is caused by abnormal electrical activity in the brain.

2.2.1-2 Stroke

interruption of the blood supply to the brain can lead to paralysis and other complications. The risk factors for stroke include high blood pressure , diabetes, obesity, high blood **cholesterol**, smoking, excessive alcohol abuse, previous stroke, use of birth control pills and genetic predisposition.

2.2.1-3 Brain infection

Infections of the brain may affect the brain or the meninges. The brain is more prone to infection compared to other organs of the body such as the heart. Infections may be viral, bacterial or fungal.

2.2.1-4 Multiple sclerosis

Multiple sclerosis describes a condition where the protective myelin coating surrounding nerve fibers is damaged in the brain and spine causing problems with muscle movement, vision and balance.

2.2.1-5 Migraine, headaches and vertigo

Headache is a common symptom but may signify a deeper pathology in some individuals. Migraine is a common affliction affecting a substantial number of people worldwide.

2.2.1-6 Cerebral palsy

This is a severe disorder of the nervous system that affects two in every thousand children. The condition leads to loss of control over muscles and movement, leading to severe disability.

Some other diseases and disorders that may affect the brain include:

1- Brain trauma or concussion caused by head injury

Hormonal or metabolic encephalopathy

2- Congenital brain disorder

Movement disorders and disorders of balance such as chorea, dystonia, tics, and tremors

3- Degenerative diseases such as dementia, Parkinson's and Alzheimer's disease

4- Myelopathy and motorneurone diseases.

Interest in astroglial cells is rising due to recent findings supporting dynamic neuron–astrocyte interactions. There is increasing evidence of astrocytic dysfunction in several brain disorders such as depression, schizophrenia or bipolar disorder; importantly these pathologies are characterized by the involvement of the prefrontal cortex and by significant cognitive impairments. Here, to model astrocyte pathology, we injected animals with the astrocyte specific toxin L-α-aminoadipate (L-AA) in the medial prefrontal cortex (mPFC); a behavioral and structural characterization two and six days after the injection was performed. Behavioral data shows that the astrocyte pathology in the mPFC affects the attentional set-shifting, the working memory and the reversal learning functions. Histological analysis of brain sections of the L-AA-injected animals revealed a pronounced loss of astrocytes in the targeted region. Interestingly, analysis of neurons in the lesion sites

showed a progressive neuronal loss that was accompanied with dendritic atrophy in the surviving neurons. These results suggest that the L-AA-induced astrocytic loss in the mPFC triggers subsequent neuronal damage leading to cognitive impairment in tasks depending on the integrity of this brain region. These findings are of relevance to better understand the path physiological mechanisms underlying disorders that involve astrocytic There are several diseases and disorders that may affect the brain. Some of these include(Nima 2007).

2.3 brain stimulation therapies:

Brain stimulation therapies involve activating or touching the brain directly with electricity, magnets, or implants to treat depression and other disorders. Electroconvulsive therapy is the most researched stimulation therapy and has the longest history of use. Other stimulation therapies discussed here — vagus nerve stimulation, repetitive transcranial magnetic stimulation, magnetic seizure therapy, and deep brain stimulation—are newer, more experimental methods (Bernat 2006).

2.3.1 Electroconvulsive therapy (Ect)

fig 2.2 ECT Machine with electrode (WWW.Wikipdia.org)

First developed in 1938, electroconvulsive therapy (ECT) for years had a poor reputation with many negative depictions in popular culture. However, the procedure has improved significantly since its initial use and is safe and effective. People who undergo ECT do not feel any pain or discomfort during the procedure.

ECT is usually considered only after a patient's illness has not improved after other treatment options, such as antidepressant medication or psychotherapy, are tried. It is most often used to treat severe, treatment-resistant depression, but occasionally it is used to treat other mental disorders, such as bipolar disorder or schizophrenia. It also may be used in life-threatening circumstances, such as when a patient is unable to move or respond to the outside world (e.g., catatonia), is suicidal, or is

malnourished as a result of severe depression. One study, the Consortium for Research in ECT study, found an 86 percent remission rate for those with severe major depression. The same study found it to be effective in reducing chances of relapse when the patients underwent follow-up treatments(Ebmeier 2006).

2.3.2 the work

Before ECT is administered, a person is sedated with general anesthesia and given a medication called a muscle relaxant to prevent movement during the procedure. An anesthesiologist monitors breathing, heart rate and blood pressure during the entire procedure, which is conducted by a trained physician. Electrodes are placed at precise locations on the head. Through the electrodes, an electric current passes through the brain, causing a seizure that lasts generally less than one minute.

Scientists are unsure how the treatment works to relieve depression, but it appears to produce many changes in the chemistry and functioning of the brain. Because the patient is under anesthesia and has taken a muscle relaxant, the patient's body shows no signs of seizure, nor does he or she feel any pain, other than the discomfort associated with inserting an IV .

Five to ten minutes after the procedure ends, the patient awakens. He or she may feel groggy at first as the anesthesia wears off. But after about an hour, the patient usually is alert and can resume normal activities.

A typical course of ECT is administered about three times a week until the maintenance ECT treatment is sometimes needed to reduce the chance that symptoms will return. ECT maintenance treatment varies depending on the needs of the individual, and may range from one session per week to one session every few months. Frequently, a person who underwent ECT will take antidepressant medication or a mood stabilizing medication as well (Tharyan 2005).

Ect for sever depression

Bipolar disorder - manic phase - depressive phase – Schizophrenia - Psychiatric.

Early uses of Ect

schizophrenia –mania -psychiatric.

Now is effectively used to treat symptoms of major depression.

2.3.3 the side effects

The most common side effects associated with ECT are headache, upset stomach, and muscle aches. Some people may experience memory problems, especially of memories around the time of the treatment. People may also have trouble remembering information learned shortly after the procedure, but this difficulty usually disappears over the days and weeks following the end of an ECT course. It is possible that a person may have gaps in memory over the weeks during which he or she receives treatment.

Research has found that memory problems seem to be more associated with the traditional type of ECT called bilateral ECT, in which the electrodes are placed on both sides of the head. Unilateral ECT, in which the electrodes are placed on just one side of the head—typically the right side because it is opposite the brain's learning and memory areas—appears less likely to cause memory problems and therefore is preferred by many doctors. In the past, a "sine wave" was used to administer electricity in a constant, high dose. However, studies have found that a "brief pulse" of electricity administered in several short bursts is less likely to cause memory loss, and therefore is most commonly used today (Tharyan 2005).

2.4 Procedure :

2.4.1 Reasons for Procedure

ECT is commonly used to treat:

Severe depression that does not respond to medicine or that causes serious symptoms, like **psychosis** and suicidal thoughts

Schizophrenia.

Severe mania that does not respond to medicine

In some cases, ECT may also be used for other mental or neurological conditions (kellner 2004).

2.4.2 Possible Complications

Common complications include:

Short-term changes in blood pressure and heart rate

Short-term abnormal heart rate

Headache – Nausea - Muscle aches or soreness

Cognitive impairment (e.g., problems with thinking and memory)—These usually go away after a couple of weeks. In some cases, memory problems may last for several months.

Rare complications may also occur, such as:

Heart attack - Long-lasting seizure - Death

Factors that may increase the risk of complications include:

Having a history of heart problems, stroke , or high blood pressure.

Being pregnant—While ECT is used in pregnant women with severe depression, this form of therapy may increase the risk of complications in the fetus.

Not responding well to medicine or being elderly—These factors may increase the chance of relapse (Linda Andre 1991).

2.4.3 Prior to Procedure

Prior to the procedure, your doctor will:

1- Do a physical exam

2- Do a complete medical and psychological history

Asking about any medicines

Having tests done, which may include blood tests and an electrocardiogram

Having meet with an anesthesiologist

Giving instructions about not eating or drinking before the procedure.

2.4.4 Technical procedure

1- Strict supervision.

2- High skilled staff.

3- Closely monitored contain with (ECG) and anesthesia ,pressure measuring before treatment.

2.4.5 Anesthesia

General anesthesia will be used. asleep during the treatment and will not feel any pain.

2.4.6 Description of Procedure

connected to a machine that will monitor your vital signs and brain activity. Next, receiving general anesthesia, as well as a medicine to keep muscles relaxed during the procedure.

Once are a sleeping, will receiving oxygen through a mask on face. A mouth guard may also be placed to protecting tongue and teeth from injury. Next, the doctor will position electrodes on head. These electrodes will be connected to a machine that will deliver an electric current to brain. This will cause seizure activity. Once the shock is given, the muscles that have not been affected by the medicine will contract for a few seconds. Next, body will twitch, which can last up to a minute (Ebmeier 2006).

2.4.7 After Procedure

will be taken to a recovery room where the nurses will monitor vital signs. will wake up in 10-15 minutes. may feel confused. This confusion can last minutes, hours, or sometimes longer.

About 30 minutes (plus time to recover after the procedure)

will not feel any pain during the procedure. After ECT, may have a headache and muscle aches or soreness.

Two methods uses.

Once are fully awake, the nurses will give you something to eat and drink. In most cases, will be able to go home the day of the procedure.

will need to schedule an appointment for another ECT treatment. In most cases, will need to have three treatments per week for one month. will need to take medicine (e.g. antidepressants) and continue with therapy to prevent a relapse.

may also need maintenance ECT to further prevent a relapse. doctor will help to determine the right plan . This will depend on how are progressing.

Electrical brain stimulation (EBS), also referred to as focal brain stimulation (FBS), is a form of electrotherapy and technique used in research and clinical neurobiology to stimulate a neuron or neural network in the brain through the direct or indirect excitation of its cell membrane by using an electric current. It is used for research or for therapeutically purposes(Tharyan 2005).

2.4.8-1 Contents

history – process- effect - therapeutic application .

2.4.8-2 History

Electrical brain stimulation was first used in the first half of the 19th century by pioneering researchers such as luigi Rolando (1773–1831) pierre flourens (1794–1867), to study the brain localization of function following the discovery by Italian Physician luigi galvani (1737–1798) that nerves and muscles were electrically excitable. The stimulation of the surface of the cerebral cortex by using brain stimulation was used to investigate the motor cortex in animals by researchers such as Eduard hi(1838–1907),Gustav Fritch (1838–1927), David ferrier (1842–1928) and Friedrich Goetz (1834–1902).

The human cortex was also stimulated electrically by neurosurgeons and neurologists such as Robert Bartholow (1831–1904) and (1857–1937).

In the following century, the technique was improved by the invention of the stereotactic method by British neurosurgeon pioneer Victor tlorsley (1857–1916), and by the development of chronic electrode implants by Swiss neurophysiologist Walter Rudolf Hess (1881–1973), Jose Delgado (1915-2011) and others, by using electrodes manufactured by straight insulated wire that could be inserted deep into the brain of freely-behaving animals, such as cats and monkeys . This approach was used by Dr. James olds (1922–1976) and colleagues to discover brain stimulation reward the pleasure center. American-Canadian neurosurgeon wilder Penfield (1891–1976) and colleagues at the Montreal Neurological institute used extensively electrical stimulation of the brain cortex in awake neurosurgical patients to investigate the motor and sensory homunculus (the representation of the body in the brain cortex according to the distribution of motor and sensory territories).

EBS remains inextricably entwined with the work of Dr. Robert Galbraith Heath Dr. Jose Delgado and Dr. Wilder Penfield. It's of interest that during cerebral localization studies, neurosurgeon Penfield could not elicit emotional reactions in humans, either by observing spontaneous epilepsy or by electrically stimulating the surface of the cerebral cortex. Neurophysiologist Dr. Jose Delgado noted a few exceptions to this rule. In contrast, EBS, via deeply implanted electrodes in localized areas of the brain (Deep brain stimulation DBS), elicited both pleasurable and aversive responses in laboratory animals and man as previously described.

EBS could elicit the ritualistic, motor responses of sham rage in cats by stimulation of the anterior hypothalamus, as well as more complex emotional and behavioral components of "true rage" in both experimental animals by stimulation of the lateral hypothalamus, and in human subjects by stimulating various deep areas of the brain. EBS in human patients with epilepsy could trigger seizures in the surface of the brain and pathologic aggression and rage with stimulation of the amygdala.

2.4.8-3 Process

Two photon excitation microscopy shown that micro stimulation activates neurons sparsely around the electrode even at low currents (as low as 10 μA) up to distances as far as four millimeters away. This happens without particularly selecting other neurons much nearer the electrode's tip. This is due to activation of neurons being determined by whether they do or do not have axons or dendrites that pass within a radius of 15 μm near the tip of the electrode. As the current is increased the volume around the tip that activates neuron axons and dendrites increases and with this the number of neurons activated. Activation is most likely to be due to direct depolarization rather than Synaptic activation (Ebmeier 2006).

2.4.8-5 Effects

A comprehensive review of EBS research compiled a list of many different acute impacts of stimulation depending on the brain region targeted. Following are some examples of the effects documented:

1- Sensory : Feelings of body tingling, swaying, movement, suffocation burning, shock, warmth, Parenthesis, feeling of falling, oscillopsia ,dysesthesia , levitation, sounds, phosphenes hallucinations, micropsia, diplopic etc.

2- Motor : Eye movements, locomotion, speech arrest, automatisms, laughter, palilalia, chewing, urge to move, crying without feeling sad, etc.

3- Autonomic : Blushing, mydriasis, change in blood pressure and breathing, apnea, nausea, tachycardia , sweating, etc.

4- Emotional : Anxiety, mirth, feeling of unreality, fear, happiness, anger, sadness, transient acute depression ,hypomania , etc.

5- Cognitive : A calculi ,par aphasia, anomic aphasia , recalling memories, "going into a trance", out of this world conduction aphasia, hemi spatial neglect, alexia reliving past experiences, agraphia, a praxia, etc.

EBS in face-sensitive regions of the fusiform gyrus caused a patient to report that the faces of the people in the room with him had "metamorphosed" and became distorted (Ebmeier 2006).

2.4. Therapeutic applications

Examples of therapeutic EBS are:

1- Cranial electro therapy stimulation (CES)

2- Deep brain stimulation (DBS)

3- Transcranial direct current stimulation (tDCS)

4- Electroconvulsive therapy (ECT)

5- Functional electrical stimulation (FES)

6- Magnetic seizure therapy (MST)

7- Vagus nerve stimulation (VNS)

8- Deep transcranial magnetic stimulation (Deep TMS)

Strong electric currents may cause a localized lesion in the nervous tissue, instead of a functional reversible stimulation. This property has been used for , focal epilepsy and psychosurgery. Sometimes the same electrode is used to probe the brain for finding defective functions, before passing the lessoning current electro coagulation (Ebmeier 2006).

2.5 Safety measuring

Any medical procedure involving anesthesia carries some risk. The potential risks include cardiac or respiratory or arrest. The risk of them resulting in death during ECT is negligible (less than 1 in 10,000 cases). this risk is typically regarded as being similar to the risk having an outpatient surgical procedure under anesthesia .ECT treatment are extremely safe and severe medical complication are rare.

Dr. John Breeding gives testimony to the New York State Assembly hearings on electroshock, May 2001. Dr. Breeding says ECT *always* causes brain damage.

Writing in Nature, Dr. Peter Sterling says: ECT damage is easy to find if you look for it, and says that ECT practitioners don't find any memory loss because they don't test for it.

In public, psychiatrists say that ECT is safe.
This MD says yes, in an article on ECT and EEGs.

ECT permanently harm the brain This article says it has, and can, cause permanent **brain pathology** (APA 2001).

2.5.1 Safety of ECT, or Shock Therapy, Used on Elderly

the treatment is inherently unsafe for the elderly.

"It causes them to have memory problems when they've already got memory problems to start with. It causes increased cardiovascular risks. It causes falls which can lead to death when they break their hips," says Dr. Peter Breggin, a psychiatrist and author, speaking on the phone from his office in Bethesda, Md.

"It is ridiculous to give a brain-damaging treatment to people who are already having cognitive difficulties due to an aging brain."

The topic has also provoked a great deal of debate in New York State over the past year. In March, a standing committee of the New York Assembly released the results of a yearlong review that concluded elderly people were more likely to receive ECT(CPA 2001).

2.6 Previous studies:

Dr. John Friedberg, writing in the American Journal of Psychiatry, takes an in-depth look at the effects of ECT on the brain .

A lengthy chronology on epilepsy and ECT, something denied by the ECT industry. Yet there are many documented cases of ECT-induced epilepsy.

Psychopathology of Frontal Lobe Syndrome
This article from Seminars in Neurology details frontal lobe syndrome, which many neurologists believe is one of the side effects of ECT. The researcher explains how this injury is often difficult to measure clinically, but how damaging the results are to the person who has it.

Neuroscientist testimony on ECT brain effects
From Dr. Peter Sterling, a neuroscientist at the University of Pennsylvania School of Medicine, this remarkable testimony and review of the available studies on the effects of electroconvulsive therapy on the human brain. Analyzing years of data, including private communications with one of the leading researchers of our time on memory loss from ECT (Janis), Sterling strongly concludes that ECT does, in fact, cause organic brain damage, similar to that seen from the results of trauma or toxicity in the brain.

Neuropsychological assessment
This journal article from Dr. Alan E. Brooker, clinical neuropsychologist with the USAF, details the complexities of evaluating the function of the brain. What this shows is how extensive the measurements are when truly understanding how one's brain is working on a day-to-day basis.

ECT as head injury
In a report for the National Head Injury Foundation, the case is made that ECT works by inducing the effects of head injury. This well-researched report highlights the work of many neurologists and psychiatrists who believe this is the mechanism of action of ECT, as well as case reports of patients. Included are some great tips on recovery.

Electroshock: Scientific, ethical and political issues
From Dr. Peter Breggin, this comprehensive article explains how ECT works as head trauma, and goes into the scientific, ethical and political ramifications of the controversial treatment. A Must Read!

Dr. Charles Kellner (Hall of Shame winner) says "There are now important carefully controlled studies with MRI brain scans before and after ECT showing conclusively that there is absolutely no structural brain damage.

Quite a bit more on the issue of brain damage in the news section.

A new article about how ECT induces PTSD and what can be done to aid recovery, from David Armstrong. I strongly believe this is an effect of ECT that is almost always overlooked (Linda Andre 2000)

CHAPTER THREE

CHAPTER THREE

MATERIAL AND Methods

The study was analytical descriptive study performed in the department of neurotherapy of Tgani Almahi hospital.

3.1 Material

3.1.1 Patients

The study was carried out for (40) adult patient whose undergone brain stimulation with Ect unit (20 males,5 females) with ages range between (18 to 35) years with different pathology from these year on Tigani Almhi hospital.

3.1.2 Machine used

Electric shock Apparatus called electroconvulsive system (Ect) give electrical shock by tow electrode with input (220voltage-110) (100)voltage output connecting with power supply to closing system content of electrocardiograph (Ecg)

3.2 Methods

3.2.1 Techniques used

The goal of ECT is to produce a generalized cerebral seizure under general anesthesia. The technique affects the rate of remission with ECT, in research studies using different which varies from 20 to 80 percent However, response and remission rates in clinical practice, . procedures using standard techniques, are at the higher end of that range.

The technique for performing ECT is reviewed here. An overview of ECT, the indications for treating unipolar major depression with ECT, the efficacy of ECT for treating unipolar depression, and medical consultation for ECT are discussed separately- patient should be sleeping and in straight way,

Air place. Patient must be in between Two person hold patient from hand and leg And rise the neck - Closing patient mouth - Put the electrode in both side of head in time not more than two second- put the patient in right side after finish from treatment.

3.2.2 Data collection

For all 40 patients male and female with deferent symptoms By observation the research collected data can use patient safety before the procedure ,during and after procedure ,life face if they any complication .

CHAPTER FOUR

CHAPTER FOUR

RESULT

4- Result

The following tables and figures presented the data obtained from 40 patients who were examined under (Ect) unit with psychiatric problem. safety measure for every gender , symptoms of every pathology , the shocks with the time take and number of shocks to every gender until finished ,measure response rate of the shocks.

Table 4.1

The patient gender distribution of 40 patients in Tgani Almahi hospital electroconvulsive department.

Gender	Frequency	Percent
Female	25	62.5%
Male	15	37.5%
Total	40	100%

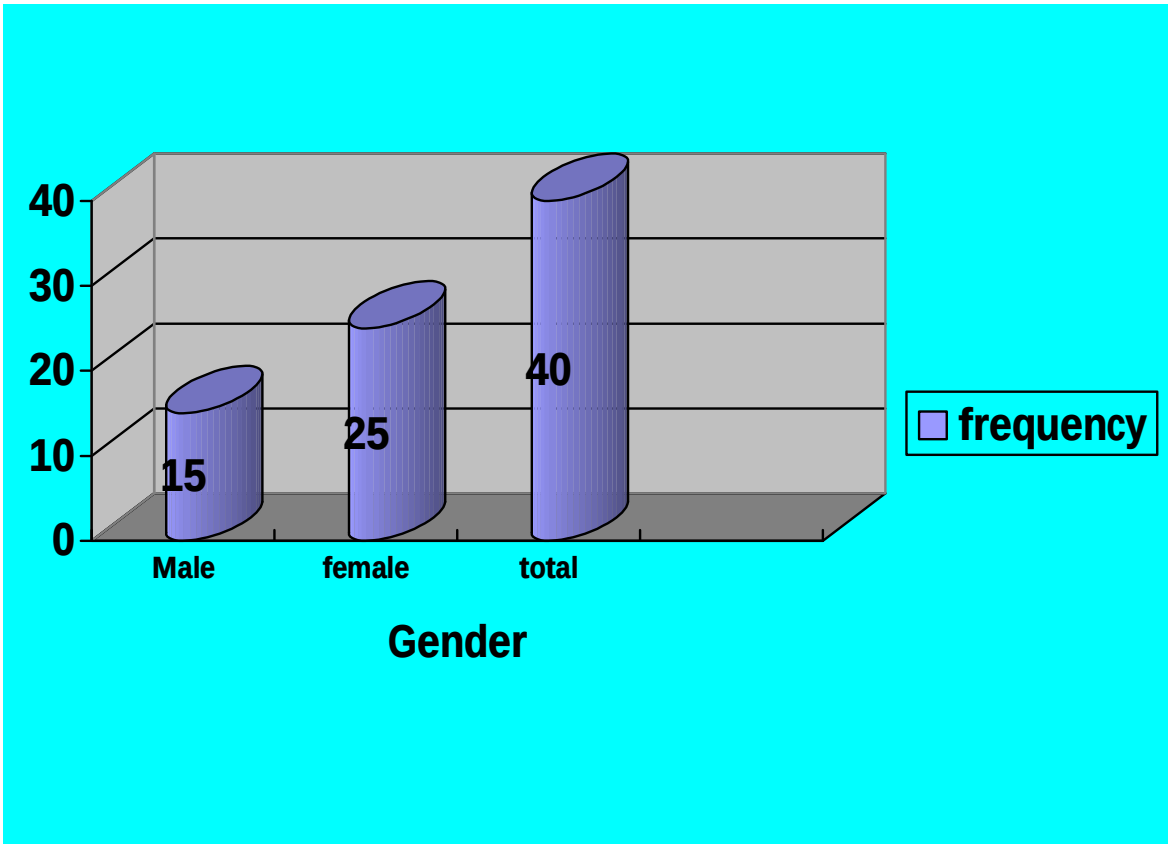


Figure 4.1 illustrated study group according to gender.

Table 4.2 The age classes and frequency

Age classes	Frequency	Percentages
18-23	6	15%
24-29	10	25%
30-35	15	37.5%
36-41	7	17.5%
42-47	2	5%

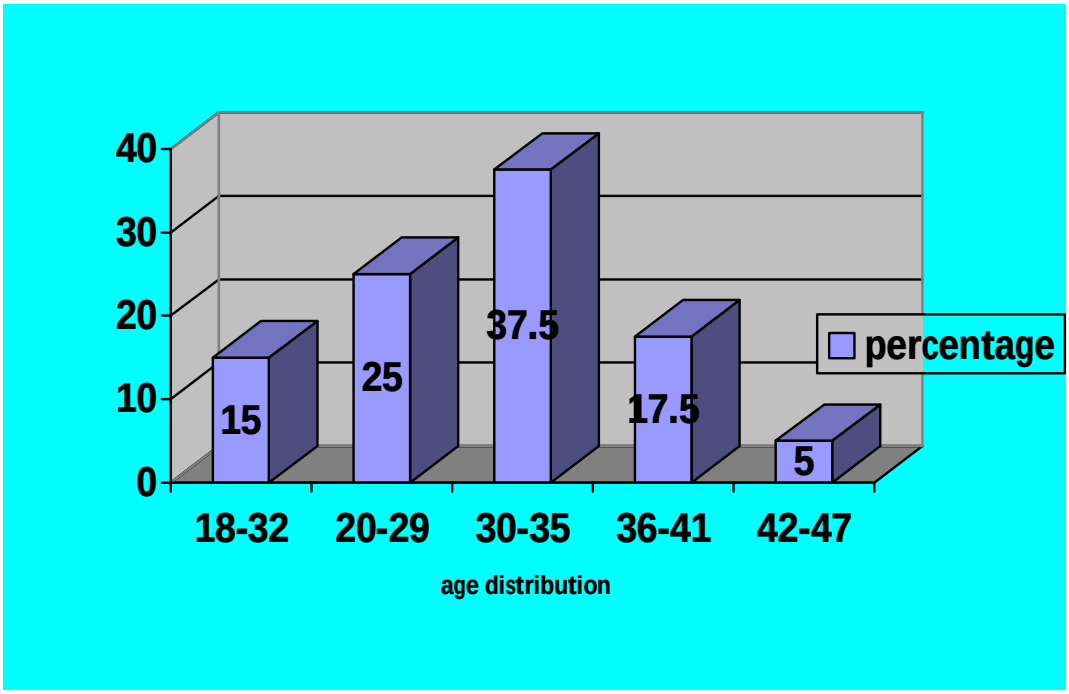


Figure 4.2 illustrate the age class frequency and percentage.

Table4.3

The measures of safety shocks per time for male and female for 40 patient under Ect treatment.

Gender	Frequency	Shock/Time
Male	15	100volt/2second
Female	25	100volt/1second

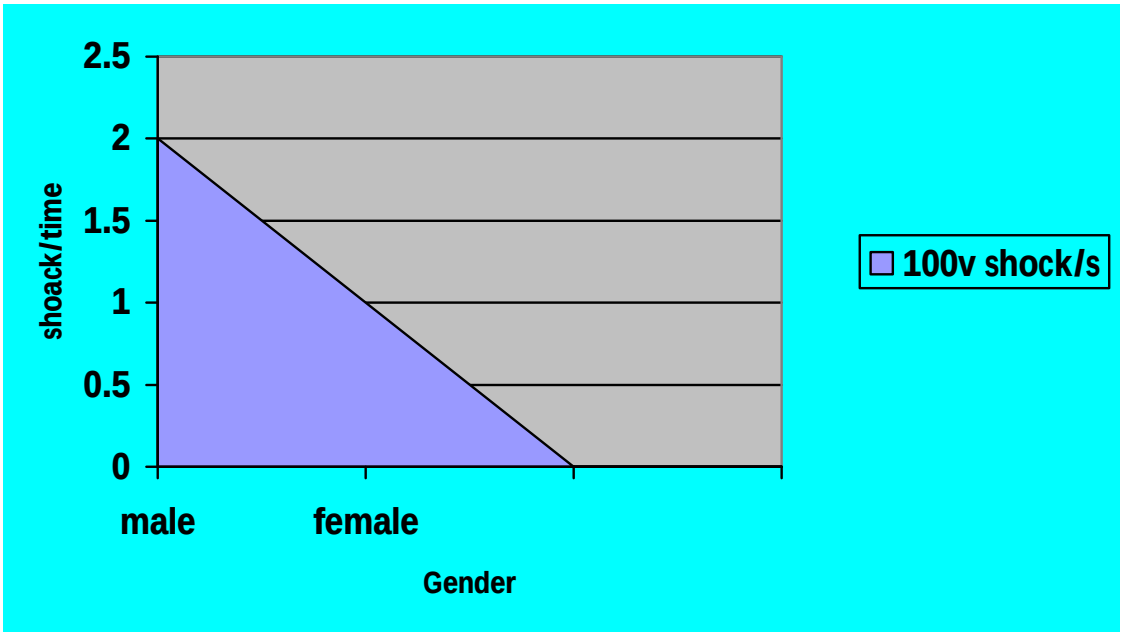


Figure 4.3 illustrate the safety shock.

Table 4.4

Show the symptoms of 40 patient and the sings aftershock in fifteen minute.

Symptoms	Frequency	Percentage
Depressed mood, low energy, concentration, sleep disorder	17	42.5%
Refuse medication, decreased activity, fatigue, poor appetite	13	32.5%
Guilty feelings ,crying alone, taking,	10	25%

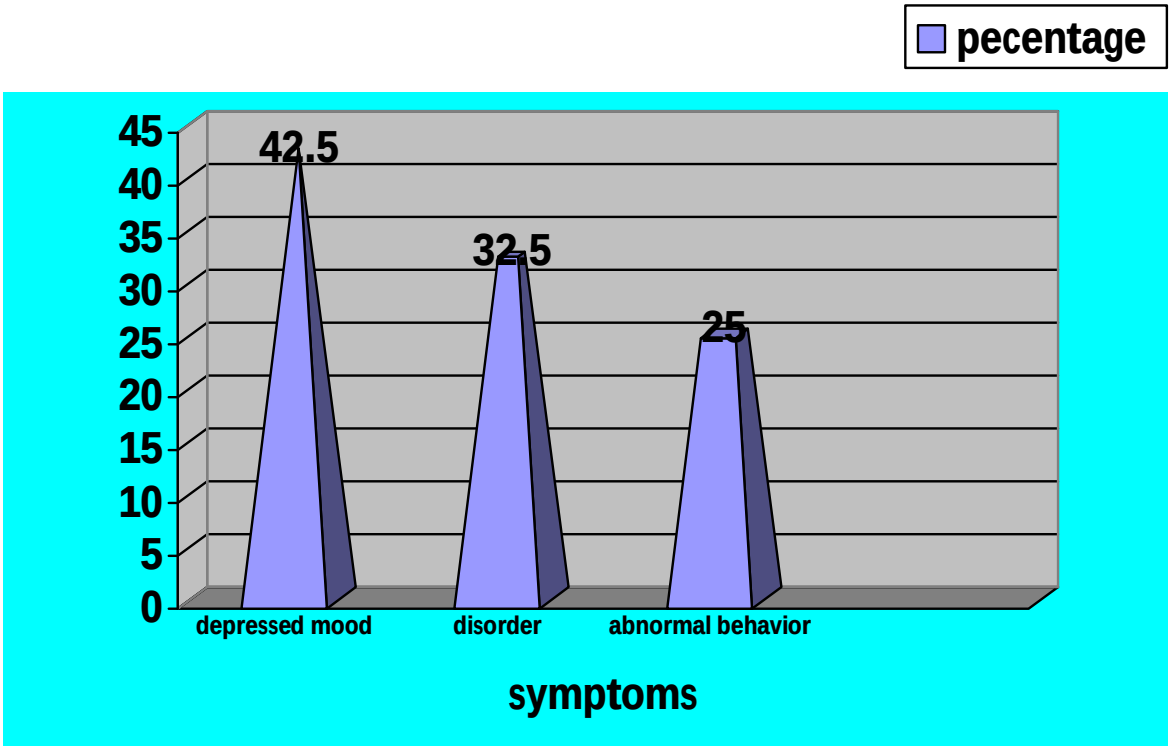


Figure 4.4 illustrate study group according to symptoms and signs.

Table 4.5

the sings during and after make the electrical treatment for both male and female.

Sings during treatment	frequency	Sings after treatment	frequency
Convulsion	30	Loss of memory every things before treatment	35
Loss of consciousness	20	Sleeping	33
Urination	10	Relaxation	39
Puffing	25	Good appetite	38

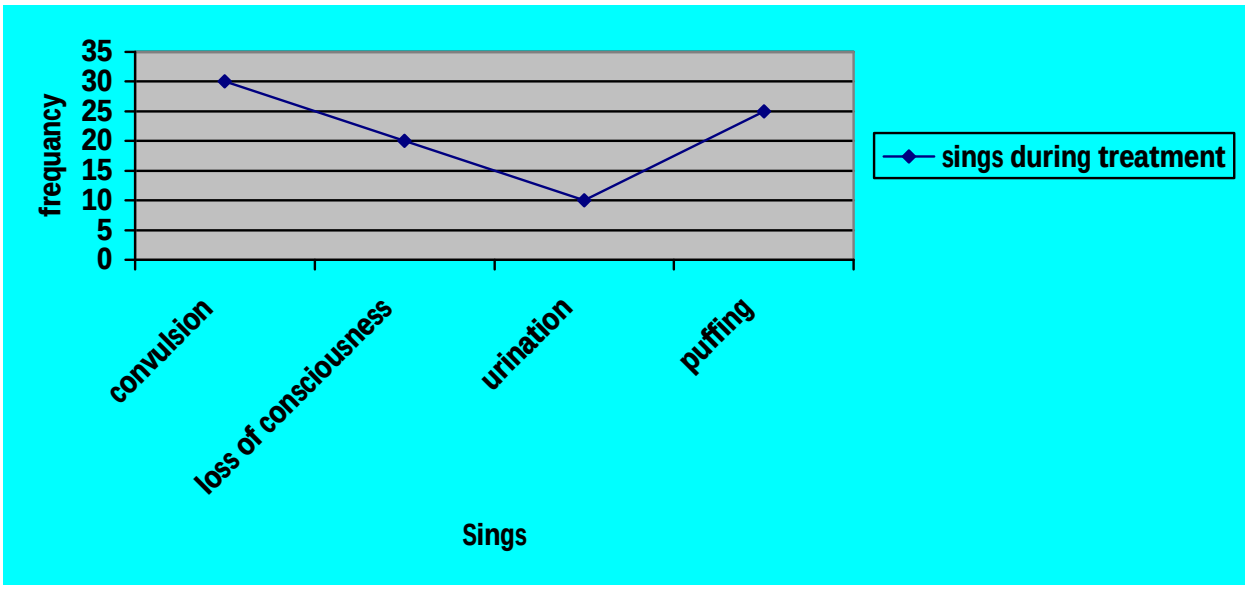


Figure 4.5.1 illusrate most sings and frequency during treatment

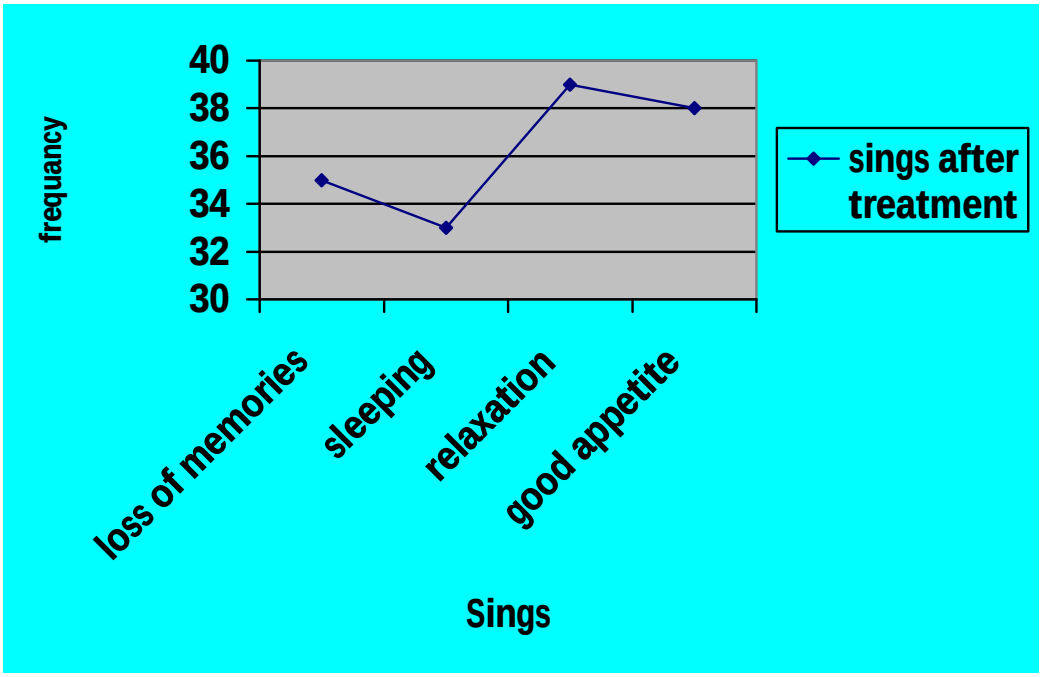


Figure 4.5.2 showing most sings and frequency after treatment.

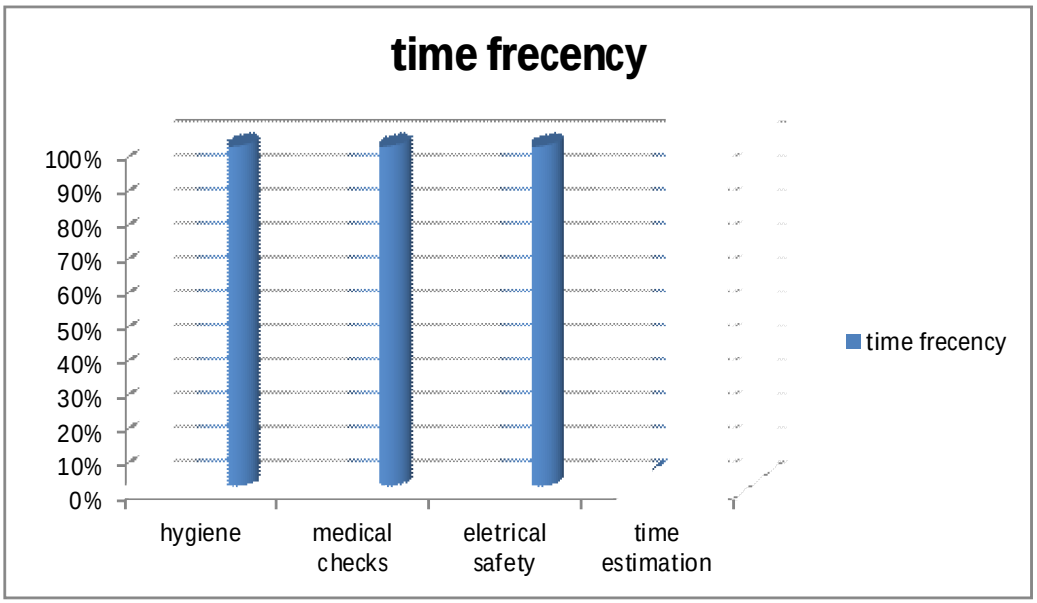
Table 4.6 shows the safety of procedures must check during treatment for machine and patients and doctors .

Pre care

Items	Frequency time
Hygiene	One time to patient and machine
Medical checks	One time before treatment
Patients safety procedures	Six hours fasting
Electrical safety	One time before treatment
Time estimation	One time during treatment
Sterilization	One time before use machine

After care

Items	Frequency time
Medical checks	One time after treatment
Surrounding Environment	Two time before and after treatmen
Sterilization	One time after use machine
Time for wake up	Maximum 24 hours



Pre care safety procedure

After care safety procedures

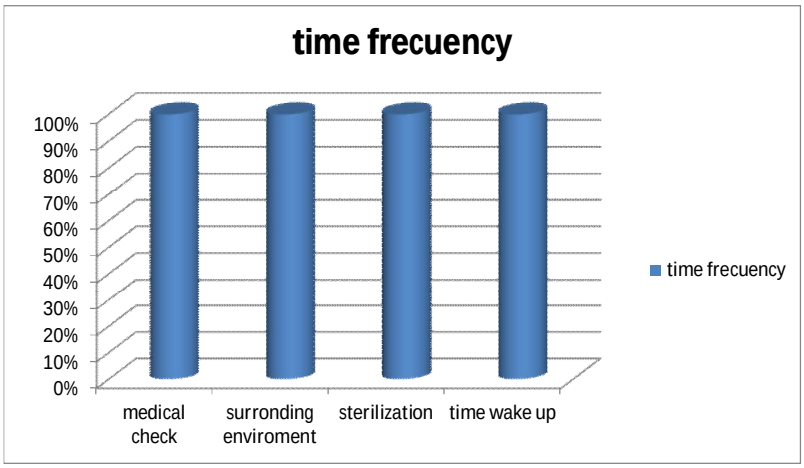


Figure 4.6 shows the safety procedure for patients and machine before and after treatment.

CHAPTER FIVE

CHAPTER FIVE

Discussion, conclusion and recommendation

5.1 Discussion

This study was carried out to evaluate the safely measures for psychiatric cases that have a complicated symptom not response to medical treatment ,but was response to physical electrical wave brain stimulation nerves to discharge body electric.

Random sample of forty psychiatric patients , male and female and make to him Ect treatment after doctor decide every patient according to his case two treatment or three or more and must note this following

Must take agreement form co-patient for treatment and make all medical check and sure fasting patients more than six hours.

Must take ansysia and put patients in suitable position and ensure of a good condition.

Ensure of safe the machine after check and sterling.(table 4.4)

Start treatment by put the electrode on the two side of head and accurate the time estimation for male two second and female one second for 100volt (table 4.3)

Convulsion case happen for male and female result of body discharge of increase electric .(table 4.5)

They are some symptoms happen after treatment, the partial loss of memory.(table 4.5)

The patients after treatment became in good case and hidden all symptom before treatment(table 4.6).

5.2 conclusion:

A 40 cases of psychiatric patients were studied in order to evaluate the range of response and the effective of treatment and the conclusion of results are This study showed that Ect is best modality in cases of psychiatric, ensure are have improve the patients cases and its hidden all symptoms before treatment which hazard for patients and co-patients surrounding.

The electrical treatment are sufficiently and effectively uses

And its conceder safety and does not have side effects and improve patients treatment.

5.3 RECOMMENDATION:

- Psychiatric patients with neurological symptoms should be visit psychiatric doctors to ensure that they wanted electrical treatment.

- All governmental psychiatric hospital should be provided by ECT machine and should be done free or less cost.

- The staff of the neurosurgery department should be well trained.

- The government should build new other centers with super

possibilities

- the psychiatric patient considering with special needs and must treating carefully specially if they go outside lonely because my happen to them epileptic fit with dangers position.

- the facilities for the treatment of patient should be available in the emergency departments , and these patient should be adequately card for.

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APPENDICE

APPENDICES

DATA COLLECTION SHEET:

NO	Age	GENDER	Diagnose	Symptoms	Number of treatment	Procedure of safety measures	
						pre care	after care