

Chapter One

Introduction to Psychopharmacology

1.1. Definition of Psychopharmacology

The branch of pharmacology that deals with the study of the actions, effects, and development of psychoactive drugs.

Psychopharmacology is the study of drug-induced changes in mood, thinking, and behavior. These drugs may originate from natural sources such as plants and animals, or from artificial sources such as chemical syntheses in the laboratory. These drugs interact with particular target sites or receptors found in the nervous system to induce widespread changes in physiological or psychological functions.

- ✓ The specific interaction between drugs and their target sites or receptors is referred to as drug action.
- ✓ The widespread changes in physiological or psychological function is referred to as drug effect.

Psychopharmacology is the study of drugs used for psychological treatments. These drugs can affect moods, sensations, consciousness, and behavioral patterns. These drugs are also called psychotropic medications.

Psychopharmacology is the study of the use of medications in treating mental disorders. The complexity of this field requires continuous study in order to keep current with new advances. Psychopharmacologists need to understand all the clinically relevant principles of pharmacokinetics (what the body does to medication) and pharmacodynamics (what the medications do to the body).

In a generic sense, any physician who treats clients with psychotropic medication is a psychopharmacologist. Physicians who have completed residency training after medical school have a high level of understanding and expertise in pharmacology, including psychopharmacology. Psychiatrists (who have completed four years of advanced training after medical school) have an even higher level of understanding and expertise in psychopharmacology.

1.2. Psychoactive drugs

- Psychoactive substances, more commonly known as psychoactive drugs, are substances, when taken, have the ability *to change an individual* consciousness, mood or thinking process.
- Psychoactive substances act in the brain on mechanism that exists normally to *regulate the functions* of mood, thoughts, and motivations.
- Substance use and dependence cause *a significant burden* to individuals and societies throughout the world.
- WHO (2002) report indicated that 8.9% of the total burden of disease comes from the use of psychoactive substances (to Tobacco 4.1% Alcohol 4% and illicit drugs 0.8%).
- Much of the burden attributable to substance use and dependences is the result of a wide *variety of health and social problems*, including HIV/AIDS, which is driven in many countries by injecting those substances.

Use of these substances is defined into three categories according to their sociological status.

- A. Many of them used as medications (most with prescription by medical doctor)
- B. A second category of use is illegal or illicit use these are substances which are banned by international conventions plus some prohibited by countries or local jurisdictions
Example, cocaine, heroin, cannabis, etc.
- C. The third category is legal or licit consumption, for whatever purpose the consumer chooses e.g. Alcohol, caffeine, nicotine (the most widely used psychoactive substances).
Alcohol & nicotine no less harmful than some drugs in group B.

The three major international drug control treaties are:

- Single convention on narcotic drugs, 1961
- Convention on psychotropic substances, 1971
- United Nations convention against illicit traffic in narcotic drugs and psychotropic substances, 1988.
- All the treaties are mutually supportive and complementary and ensure the availability of narcotic drugs and psychotropic substances for medical and scientific purposes and prevent their diversion to illicit channels.

- Conventions provide comprehensive measures against drug trafficking and provides for international cooperation
- Illicit drug use a predominantly male activity.
- In the majority of cases, people use psychoactive substances because they expect benefit from their use (either by the experience of pleasure or the avoidance of pain).
- In spite of the real or apparent benefits, the use of psychoactive substances also carries with it the potential for harm, whether in the short-term or long term.

The *main harmful effects* due to substance use can be divided into four categories.

1. Chronic health effects E.g. alcohol- liver cirrhosis/disease; nicotine – lung cancer, etc.
2. Acute or short-term biological health effects E.g. opioids and alcohol overdose
3. Acute social problems E.g. arrest, break in relationships
4. Chronic social problems E.g. difficulties in working, life, in family roles

1.3. Psychological Explanations for Drug Abuse

Psychology is a science devoted to understanding human behavior. Psychologists are concerned with improving the quality of people's lives and their life satisfaction. Psychologists consider behaviors that promote people's well-being and life satisfaction adaptive behaviors. Behaviors that serve to limit people's functioning and diminish life satisfaction are termed *maladaptive behaviors*. Since addiction is a harmful, maladaptive behavior, psychological models are very useful for understanding why people engage in this unhealthy behavior.

Psychologists propose several possible causes of drug abuse. First, people may engage in **harmful behaviors because of an abnormality**, or "psychopathology" that manifests itself as mental illness. Second, **people may learn unhealthy behavior** in response to their environment. Third, people's thoughts and beliefs create their feelings. This in turn determines their behavior. To the extent that someone's thoughts and beliefs are unrealistic or dysfunctional, their behavior will be similarly affected.

The psychopathological model sees mental disorders as the cause of drug abuse. These disorders might include cognitive difficulties, mood disturbances, and other mental illnesses. In fact, addiction and other mental health disorders commonly occur together (called co-morbidity).

Roughly, half of the people seeking addiction treatment will also have another significant mental disorder.

Related to psychopathology is the concept of an addictive personality. Certain personality characteristics might be the underlying factors in all addictive disorders. These may include the denial of obvious problems, problems with emotional regulation, and problems with impulse regulation. There isn't sufficient evidence to suggest an "addictive personality" per se. However, addiction does most frequently co-occur with a class of disorders called Personality Disorders.

Reasons Why People Use Drugs and Alcohol

1. People suffering from anxiety, bipolar disorder, depression or other mental illnesses use drugs and alcohol to ease their suffering.

Mental illness is such a burden for some people they will try just about anything to relieve the pain. Drugs or alcohol can temporarily make that person feel 'normal' again, like they remember feeling in the past. Mental illness is scary for the individual experiencing it, so they are afraid to go to a doctor or family member for help and instead turn to drugs or alcohol to try and solve the problem on their own.

2. People see family members, friends, role models or entertainers using drugs and rationalize that they can too.

As teenagers and young adults, it's very easy to think that drug and alcohol use can be handled and controlled, especially if they see others they know doing the same thing. It can become easy to rationalize like: 'hey my friend's been doing this for a couple years and he seems fine to me.' Entertainment and music is full of drug references and that can add to the rationalization that drug use is ok sometimes. Individuals with a family history of drug or alcohol abuse are far more likely to develop an addiction than an individual with no family background of addiction.

3. People become bored and think drugs will help.

Boredom is a big factor in drug abuse in teens and young adults. People in this age bracket generally don't have bills, jobs and all the stresses that go along with adulthood. So it's easier to become bored and want to try something new and exciting. Drug use is often thought of as a way to escape the mundane world and enter an altered reality.

4. People think drugs will help relieve stress.

Our modern world is full of new strains and stresses that humans have never experienced in the past. Although many things in life are now easier than ever, the burdens are also very high. Simply having a family, maintaining a household, and holding a job are huge stress factors. Some drugs are viewed as a means of relaxation – a way to calm the storm in your mind. Although drugs can be very effective at doing that, there can be serious side effects.

5. People figure if a drug is prescribed by a doctor, it must be ok.

It is easy for an individual to rationalize using a drug because it came from a doctor. The thinking goes like this ‘it was prescribed to someone I know for the same problem I am having, so it makes sense it should work for me too.’ The dangerous part about this rationalization is that this can lead to mixing of drugs, overdose, unintended side effects and/or dependency.

6. People use drugs to cover painful memories in their past.

Many people go through extremely traumatic events in their life, many times as children, and turn to drugs to cover the horrible memories. Children are extremely susceptible to trauma, whether physically or emotionally, and those feelings can haunt them into their adulthood. These people could benefit from working with psychologists to help repair their damaged mind. Drugs usually only deepen the issue.

7. People think drugs will help them fit in.

When hanging out with friends, it’s easy for people to want to fit in and seem like one of the crew. If others are drinking or doing drugs, it’s very likely for someone to fall into that trap. Peer pressure can be a tremendous force causing someone to try things they would normally not try on their own.

1.4. Drug addiction (Dependence), drug abuse, and drug misuse & drug tolerance

1.4.1. Drug Dependence

Dependence: a cluster of *cognitive, behavioral, and physiological symptoms* indicating that the individual continues the use of the substance despite significant substance related problems.

- A behavioral syndrome that implies *compulsive (habitual, uncontrollable)* use of a drug
- Physical dependence, or *change in brain function in tolerance and withdrawal, when a chronically administered drug is abruptly discontinued.*

Dependence- a state in which a *person functions normally only in the presence of a drug.*

It manifests as *physical disturbance when the drug is removed (withdrawal)*

Withdrawal symptoms are usually the opposite of the drug's effect

Drug dependence – is a syndrome in which an individual continues to take a drug for its pleasurable effect despite the adverse medical and social consequences

Drug Dependence: A state, psychic and sometimes physical characterized by behavioral and other responses that always include a compulsion to take the drug on a continuous or periodic basis in order to:

- experience its psychic effects and enhance pleasure
- sometimes to avoid the discomfort of its absence

Diagnostic Criteria for substance dependence in DSM-IV

According to the **DSM-IV**, substance dependence is a maladaptive pattern of substance use, leading to clinically significant impairment or distress, as manifested by three (or more) of the following, occurring at any time in the same *12- months* period.

Tolerance development

Withdrawal syndrome

The substance is often taken in *large amounts or over longer period than intended*

There is a *persistent desire or unsuccessful efforts to cut down or control* substance

A great deal of time is spent in activities necessary to obtain the substance.

Important *social, occupational, or recreational activities are given up or reduced* **because** of substance use.

The substance use is *continued despite knowledge of having* a persistent or recurrent *physical or psychological problem* likely to be caused by a substance.

Dependence can be *physical or psychological* dependence on psychoactive substances.

Physical dependence: is characterized by higher dependency of the physiological/biological systems on a drug.

It is a phenomenon in which abnormal behavioral and autonomic symptoms occur following the abrupt withdrawal of a drug of dependence or when the effect of the drug is terminated by means of a specific antagonist.

It occurs when the brain adapts to continuous high drug levels; appears to function "normally" (*due to functional tolerance*), **but** abruptly stopping drug causes an abstinence syndrome (*withdrawal reactions*).

Psychological dependence-Dysphoria (a state of feeling of hopelessness, uncontrollable, and unhappy) and **craving** which arise following the abrupt withdrawal of a drug of abuse.

Dysphoria (acute, transient changes in mood (e.g. feelings of sadness, sorrow, anguish or pain)

Craving (thirst/hunger) which arises following the abrupt withdrawal of a drug of abuse.

Psychological dependence refers to an **individuals' expectation** *that they want to get pleasure, satisfaction and avoiding dysphoric state from a drug or substance.*

Psychological dependence is **present** whenever significant harmful or pathological consequences **do not** stop the drug user.

Psychological dependence also occurs with drugs that are weaker reinforcers (e.g. ethanol, barbiturates, and nicotine) where factors like social influences, environment or genetics enhance abuse liability (as in alcoholism or smoking tobacco).

1.4.2. Drug Abuse or Substance abuse

Abuse- use of a legal or illicit substance or medication for non-medical or pleasurable purposes unconnected with medically approved indications.

There are on-going debates as to the exact distinctions between substance abuse and substance dependence

Drug abuse – is the use of any drug in a manner which is at variance with the approved use in that culture.

- It is the use of substances in a manner deviate from the acceptable, *social, & legal pattern within a given society, resulting in long term physical, mental or social problems.*

➡ **Drug Abuse or Substance abuse:** persistent or sporadic use inconsistent or unrelated to acceptable medical practice.

- ➡ **Drug abuse** is related to an excessive or improper use of drugs, especially through self-administration for nonmedical purposes.
- ➡ **Drug Misuse:** is the taking of a drug which harms or threatens the physical or mental health or social well-being of an individual.
- ➡ In **DSM**, disorder characterized by a pattern of continued pathological use of a medication, non-medically indicated drug that results in repeated adverse social consequences related to drug use, such as failure to meet work, family, or school obligations, interpersonal conflicts, or legal problems.

1.4.3. Tolerance

Tolerance: the *decrease in pharmacological effect on repeated administration of the drug.*

Tolerance - A state in which a *person no longer responds to a drug (being not responsive enough to the effect of) even someone uses large amount.*

Decreasing response of the central nervous system to the effect of a substance.

- A higher dose is required to achieve the same effect. Thus, the effect of a given dose is diminished.
- Tolerance is **not** addiction
- Tolerance can develop to drugs that are **not** addictive
- Can be produced by several different mechanisms
- Metabolic tolerance takes place in the liver.
- **Tolerance** is *resistance or decreased responsiveness to expected actions of a drug.*

It can be subdivided into **two major categories:**

1. **Innate tolerance:** is *in-born, genetically determined resistance to drug.* It *does not depend* on any prior drug use.
2. **Acquired / Cross- tolerance:** this refers to *reduced sensitivity to a drug that develops due to one or more drug exposures.* Acquired tolerance can be due to metabolic, behavioral or functional mechanisms to one drug that extends to another.

1.4.4. Addiction

- It is a term that refers to a pattern of *compulsive drug use that includes dependence & tolerance.*
- It is a state of *chronic intoxication characterized by an overpowering desire, need or physical compulsion/pressure to continue taking more drugs.*

- *Compulsive, drug craving, seeking, and use that persists even in the face of negative consequences.*
- Here, there are 3 components i.e. *tolerance, dependence* whether physical or psychological, *& compulsive drug-seeking behavior making the cycle of abuse even more difficult to interrupt.*
- *Tolerance & dependence have a chemical basis; compulsive drug seeking may be a sociological phenomenon*

1.4.5. Withdrawal

Withdrawal is *maladaptive behavioral change, with physiological and cognitive concomitants, that occurs when blood or tissue concentrations of a substance decline in an individual* who had maintained prolonged heavy use of the substance.

The effects on the body and mind of a person who suddenly stops taking a drug, after becoming dependent on it

Occurs when a drug is abruptly removed, or dose is significantly decreased.

Cluster of symptoms often accompanied by directly overt physical signs.

Unpleasantness of withdrawal may be so severe that the individual fearing it may use drug again just to avoid or relieve symptoms.

Withdrawal symptoms observed due to stop taking or withdrawing from a drug/substance for certain time. E.g. hallucination and illusion are among symptoms.

Intoxication- is the temporary maladaptive experience of behavioral and psychological changes due to accumulation of a substance on the body.

Who are drug Abusers?

People who abuse drugs come from *all walks of life, although statistics show that some are more likely to take drugs than others. For instance,*

- men are more likely to abuse drugs than women
- Single more than married
- City dwellers more than rural residents
- younger more than older
- Homeless Youth & Adults
- Lesbian, gay youth and adults
- Aboriginal/native people

- Sex workers
- People in detention centers, jails & prisons
- People with mental illnesses, learning disabilities,...

1.5.Commonly Abused Drugs

The most commonly used drugs are:-

1. Tobacco/Nicotine – found in cigarettes, cigars, snuff, chew, etc. This can cause chronic lung disease, cancers of the mouth, cardiovascular disease, bladder problems and most importantly, addiction.

- Behavioral effects associated with nicotine include arousal, increased attention and concentration, enhancement of memory, reduction of anxiety and suppression of appetite.
- Withdrawal from smoking may be accompanied by symptoms such as irritability, hostility, anxiety and depressed mood, bradycardia and increased appetite.

2. Alcohol – found in liquor, beer and wine. Alcohol can cause loss of coordination, impaired memory, slurred speech, depression, liver and heart disease, fatal overdose, addiction and an array of other problems.

- Consumed for recreational and religious purposes
- Gender & genetic diversity accounts for differences in blood concentration
- At low doses → heightened activity and disinhibition
- At higher doses → impaired cognitive, perceptual & motor function
- Tolerance develops with chronic consumption → dependence
- A withdrawal syndrome that may be severe enough to be total characterizes ethanol withdrawal.
- Signs & symptoms of withdrawal: staking, sweating, weakness, agitation, headache, nausea & vomiting, tachycardia, seizures, delirium tremens

3. Cannabinoids – found in marijuana and hashish. Common names for the drug include dope, ganja, grass, herb, bud, Mary Jane, pot, reefer, green, trees, smoke, skunk and weed. Some of the risks are distorted sensory perception, impaired balance and coordination, impaired learning, and high anxiety.

4. Opioids (Strong Painkillers):– found in heroin and opium. Street names associated with opioids include smack, dope, H, white horse and China white.

- Effects associated with usage may include drowsiness, impaired coordination, dizziness, confusion, nausea and sedation.
- Opioids have euphorogenic, analgesic or painkilling, sedative, and respiratory depressant effects.
- Tolerance develops with repeated use.
- Withdrawal is characterized by runny nose, yawning, sweating, restlessness, irritability, nausea, vomiting, diarrhea, tachycardia, increased blood pressure chills, cramps and muscle aches.

5. Stimulants – found in cocaine, amphetamines and methamphetamines. Side effects include increased heart rate, high blood pressure, increased body temperature, bursts of energy, mental alertness, reduced appetite, anxiety, violent behavior and more.

- Used to treat attention deficit hyperactivity disorder (ADHD), narcolepsy (a sleep disorder), and, in some cases, to improve symptoms of depression.

6. Depressants: - Depressants are used to treat anxiety and sleep disorders. Depressants slow normal brain function, and decrease blood pressure, heart rate, and breathing. They can cause confusion, drowsiness, fatigue, and impaired coordination. Long-term abuse can lead to addiction.

Here are commonly prescribed depressants.

- Benzodiazepines are used to treat anxiety, acute stress reactions, and panic attacks.
- Non-benzodiazepine sleep medications are also used to treat sleep problems, but typically with fewer side effects and less risk of addiction than benzodiazepines.
- Barbiturates are used to treat sleep disorders and seizures (epilepsy).

There is high co morbidity between any mental disorder and substance dependence. People with substance use disorders are about 4.5 times at higher risk of suffering at least one mental disorder as compared to people without substance use disorders. Higher percentages of people with mental illness are involved in substance abuse than the general population. Comorbidity indicates that many heavy users of psychoactive substances have active mental disorder that would greatly benefit from psychoactive or psychological services and treatments.

1.6. Routes of Drug Administration

- Intravenous (IV) injection – directly into a vein; fastest route
- Intramuscular (IM) injection – into a muscle
- Subcutaneous (SC) injection – into the space beneath the skin
- Oral administration – admin into the mouth, so that it is swallowed; most common with humans
- Most commonly used route may be due to its easiness for administration, cheaper, safer and pain less
- Sublingual admin – placing substance beneath tongue
- Inhalation – admin of a vaporous substance into lungs
- Topical admin – directly onto skin or mucous membrane
- Intracerebroventricular (ICV) admin – into one of the cerebral ventricles; to allow for widespread distribution in the brain
- **Oral-** taken into the mouth and swallowed.
 - Drug must be resistant to degradation by stomach acid and enzymes, and be absorbed across stomach/intestinal mucosa.
 - Diet high in fat slows down stomach clearance, so drug absorption can be hindered.
 - After absorption, blood passes through liver before going into general circ., so liver enzymes may degrade portion of drug before it has effect (first-pass effect).
 - Drugs taken orally are easiest to administer, but result in highly variable levels in the blood.
 - **Oral administration has the advantages of ease, convenience, economy, and safety.**
- **Intravenous (IV)** - a precise quantity of drug is injected directly into blood.
 - Very precise, accurate, and fast.
 - Also potentially dangerous (overdose, allergy, no easy method of removal).
 - Intravenous administration has several advantages: rapid onset, precise control
 - over the amount of drug entering the blood, suitability for use with large
 - Volumes of fluid, and suitability for irritant drugs.
 - Intravenous administration has several disadvantages: high cost; difficulty; Inconvenience; danger because of irreversibility; and the potential for fluid overload, infection, and embolism.

- **Intramuscular (IM)** - a precise quantity of drug is injected into a muscle.
 - Absorbed in 10 to 30 minutes
 - Can be irritating and cause muscle discomfort.
 - Intramuscular administration has two advantages: suitability for insoluble drugs and suitability for depot preparations.
 - Intramuscular administration has two disadvantages: inconvenience and the potential for discomfort.
- **Subcutaneous (SC)** - drug is injected just below the skin, into the SC fat layer.
 - Slow and steady rate of absorption
 - Subcutaneous administration has the same advantages and disadvantages as IM administration.
- **Inhalation**- drug absorbed into the blood across the alveolar capillary bed in the lung.
 - Rapid onset (blood goes straight to brain after returning from lung)
 - Can irritate nasal passages, throat, larynx, trachea, and damage lung.
- **Topical**- drug is smeared onto a mucus membrane of the body (eye, nasopharynx, vagina, colon, urethra)
 - Relatively fast, since mucosa is highly vascularized, but can damage mucosa as well.
- **Transdermal**- some lipid-soluble drugs can pass directly across the skin into the blood.
 - Controlled rate of delivery, with high conc. of drug imbedded in polymer matrix
 - Ex: Scopolamine for motion sickness, nicotine patch
- **Epidural**- blood-brain barrier prevents some drugs from crossing, so can inject directly into the CNS.
 - Extremely fast onset in CNS
 - Can observe effect in local areas of CNS/neuronal nuclei
 - Reasonably dangerous, not reversible, can cause neuronal damage

Chapter Two

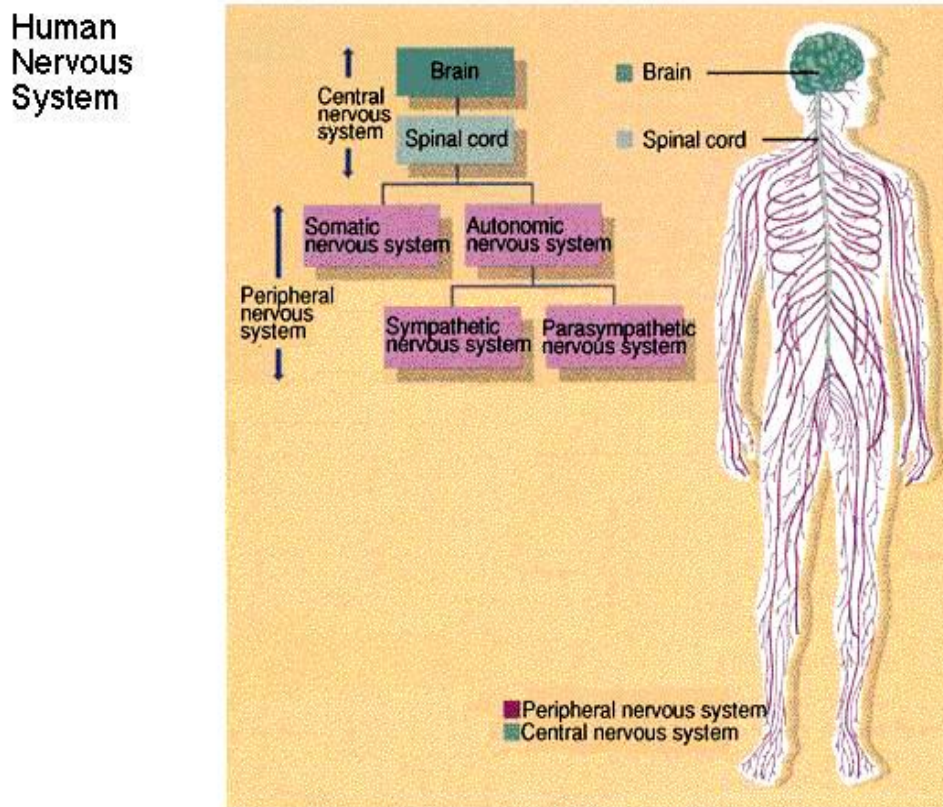
Psychoactive Drugs and the Brain

2.1. The Nervous System and Behavior

Human brain is an extremely complex organ. The brain is intricately (with many parts, complex and difficult) patterned of nerve cell bodies. Nervous system is the body's major communication system, and divided in to central and peripheral regions. The nervous system is the body's communication network, handling information just as the circulatory system handles blood. Almost all (most of) activities of the body are controlled by the nervous system. The basic components of the nervous system are living cells called neurons and glia. Glia are cells that provide structure and insulation for neurons. They are like neural "glue." Neurons are cells that receive, integrate, and transmit information, permitting communication in the nervous system.

1.1. Organization of the Nervous System

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Nervous system can be divided in to two. These are Central Nervous System (CNS) and Peripheral Nervous System (PNS). While the CNS is the high command of the body's information network, the PNS is what carries out the commands.

- **CNS**= Brain + Spinal Cord

Drugs are primary act on the CNS. **How?**

- **PNS** = Nerves outside these + ganglia

Ganglion- collections of neuronal cell bodies in PNS

- **PNS** connects the CNS with the muscles, glands, and sensory receptors

PNS subdivided into **SNS** and **ANS**.

Somatic nervous system (SNS) -Voluntary: Consists of sensory and motor neurons that bind together to create nerves to transmit messages to sensory receptors

- Senses and acts on the external world
- Relays to the brain information picked up through the sense organs
- Controls the functions of the body which are controlled by conscious mind.
- Transmits the brain's message to the skeletal muscles
- The actions are voluntary (E.g. Picking up a telephone)

Autonomic nervous system (ANS) - Involuntary: While the SNS activates the skeletal muscles, the ANS controls glands and smooth muscles and the internal organs.

Example, SNS- Crossing the street when the light turns green

ANS- Increased heart rate if we come close to being run over as we cross the street. The autonomic portion of the peripheral nervous system governs involuntary, visceral functions, such as heart and breathing rate, blood pressure, etc. The role of ANS is to adjust the internal workings of the body to the demands of the environment. The ANS can become over stimulated in response to extreme environmental demands (e.g. under conditions of chronic stress at work or severe anxiety). The ANS can be divided in to **sympathetic** nervous system and **parasympathetic** nervous system.

Sympathetic nervous system (Expend energy): arouses the body

- The Sympathetic division consisted of nerve fibers emanated from the middle of the spinal cord
- Mobilizes the body to meet emergencies (crossing the street)
- The heart beats faster and pumps out more blood with each beat
- The blood vessels near the skin and those that lead to the gastrointestinal tract constricts, increasing blood pressure and slowing digestion
- The sympathetic nervous system mobilizes the body's resources for emergencies and creates the fight-or-flight response.

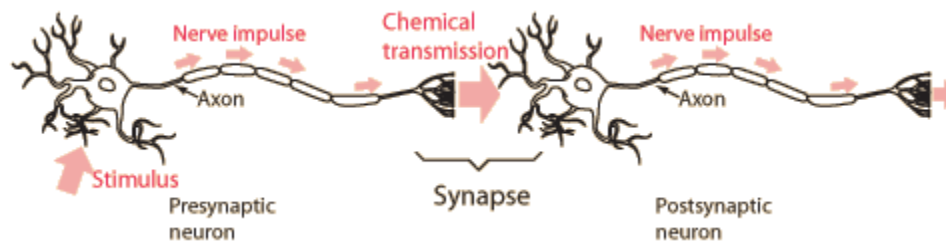
Parasympathetic nervous system (Conserves energy): slows down body processes

- The Parasympathetic division consisted of nerve fibers emerging from the top and bottom of the spinal cord
- Oppose the function of sympathetic division
- While the sympathetic division generally gears up the body to use its energy, the parasympathetic division slows down metabolism and regulates the organs in such a way that they can do the work of rebuilding their energy supply.
- The parasympathetic division, in contrast, activates processes that conserve bodily resources: slowing heart rate, reducing blood pressure, etc.

2.2.Neurons

Neuron (Nerve cell) is the structural unit of the brain system. Neurons, also known as nerve cells, are the basic building blocks of the brain since communication in the brain takes place between neurons. The communications are carried by neurotransmitters that act as the chemical messengers of the brain. Neurons regulate the function of tissues by neurotransmitters (chemical substances) by which information is transferred from one neuron to another. Neurons are cells that rapidly change membrane voltage to convey (communicate something) electrical and chemical message. These cells transmit important information via electro-chemical impulses that travel throughout the brain and nervous system.

Neurons are able to communicate through contact points called synapses. These synapses exist as small gaps/space found between neurons. A synapse is the junction point between two neurons. Neurons are highly specialized cells that exist in many shapes, sizes and varieties. They share the following basic regions: cell body or soma, dendrite, axon and terminal buttons.



This diagram highlights the key parts of a neuron, including specialized receptor areas (dendrites), the cell body (soma), the axon, and the terminal buttons. Neurons vary considerably in size and shape and are usually densely interconnected. Nerve cells have the following characteristics.

The cell body

- Contain the nucleus and the genetic information determining cell function
- The chemical reactions that take place in the cell body provide the energy and chemicals needed for the transmission of impulses

The Dendrites

- Are structures specialized to receive information
- Are highly branched processes extending from Short fibers branching out from the cell body of the neuron that receive chemical messages or impulses from other neurons.

The Axon

- A long, thin fiber in which impulses are transmitted
- It transmits signals or impulses away from the soma to other neurons, or to muscles or glands.
- Carries information from the cell body to the terminal buttons.
- Conducts electrical impulses

- The long fiber stretching outward from the cell body

The Axon Terminals (Terminal Buttons)

- Are highly specialized to release information (message) to the synapse.
- Release chemical messengers that carry signals to other neurons.
- The axon's branchlike endings each with a button like structure at its tip.
- At terminal buttons chemical signaling molecules are stored.
- The impulse is transmitted to the next neuron through these buttons

The Myelin sheath

- Made up of fatty cells wrapped around the axon in segments
- Speed up transmission of signals that move along axons.
- Speeds neural transmission by insulating the axon from other cells, just as traffic on an interstate is sped along by limiting the access of other road ways.

Glial cells: provide metabolic support, insulation and protection to neurons.

The Typical pathway is: The basic flow of information is as follows: the dendrite receives a signal; the signal passes through the soma and down the axon to the dendrites of another neuron.

- Through its dendrites, a neuron receives an impulse from a neighboring neuron (the neighboring neuron may range from one to several thousands)
- The neuron then passes the impulse along its axon to axon terminals
- At the terminal the impulse must leap a small gap, called the **synapse**, between the terminal button and the dendrite of the neuron that is to receive the impulse.
- The leap is accomplished by a chemical known as a neurotransmitter.

Neurons don't actually touch at a synapse; instead they are separated by a microscopic gap between the terminal button of one neuron and the cell membrane of another neuron - the synaptic cleft. Electrical signals can't jump this gap. Instead, the neuron that is sending the message across the gap (the presynaptic neuron) releases neurotransmitters into the synaptic cleft. This occurs when the *action potential* gets to the terminal button and causes the synaptic vesicles (storage sacs for the neurotransmitter) to fuse with the membrane at the end of the axon and spill its contents into the synaptic cleft.

2.3.Types of Neurons

Three types of Neurons

Sensory (Afferent) Neurons- carry, conduct or transmit information/impulse or message to the CNS. Carry input messages from the sense organs to the spinal cord and brain

Motor (Efferent) Neurons- Transmit impulses from the brain and spinal cord to the muscles and organs

Inter Neurons- Perform connective or associative functions in the nervous system.

Basic Functions of Neurons

Neurons are the communication links of the nervous system. Information in the form of NTs (chemical substances) released from presynaptic neuron interact with receptors in postsynaptic neuron; it can affect postsynaptic neuron. Communication between neurons by means of chemical substances from presynaptic neuron to postsynaptic neuron.

2.4.Neurotransmitters and Their Types

Neurotransmitters

Neurons communicate with each other through the release of NTs.

- s Presynaptic cells – deliver message
- s Postsynaptic cells – receive message
- **Neurotransmitters** are released from one neuron to attach to another. Many different types of neurotransmitters exist, and they vary depending on the type of receptor site.
- NTs are chemical substances that are released from one neuron and interact with receptors on another neuron to affect a change in that neuron.
- **NTs** are the brain chemicals that communicate information throughout our brain and body.
- **Neurotransmitters** are the chemicals which allow the transmission of signals from one neuron to the next across synapses.
- A neurotransmitter's agonist is a molecule that has the same effect on the postsynaptic neuron as the neurotransmitter itself does.
- An antagonist is a molecule that blocks the effect that the neurotransmitter normally has on the post-synaptic neuron.

Types of Neurotransmitters

There are two kinds of neurotransmitters that can be classified by function – **inhibitory** and **excitatory**.

1. **Excitatory Neurotransmitters:** stimulate the brain which means that it does not stimulate the brain. These types of neurotransmitters have excitatory effects on the neuron; they increase the likelihood that the neuron will fire an action potential.
2. **Inhibitory neurotransmitters:** These types of neurotransmitters have inhibitory effects on the neuron; they decrease the likelihood that the neuron will fire an action potential. Those that calm the brain and help create balance are called inhibitory. Inhibitory neurotransmitters balance mood and are easily depleted/tired/useless when the excitatory neurotransmitters are overactive. Some of the major inhibitory neurotransmitters include serotonin and GABA

Common NTs and some of their Functions

Some of Chemical transmitters known to be involved in mental processes are the following.

Acetylcholine (Ach) - Excitatory/inhibitory

Functions

- Involved in transmitting nerve impulses to the muscles throughout the body.
- Also functions related to cognition, skeletal muscle movement, memory (attentional process), consciousness

Related condition

- Parkinson's disease, sleep disorder and in Alzheimer's disease.

Dopamine (DA) - Both Inhibitory and Excitatory

Functions

- Crucially involved in the regulation of motor behavior or skeletal muscle movement, behavior, emesis (vomiting), hormone release
- Certain frequently abused drugs, such as stimulants, act on the dopamine system.

- Stimulants such as medications for ADD/ADHD and caffeine cause dopamine to be pushed into the synapse so that focus is improved. Unfortunately, stimulating dopamine consistently can cause a depletion of dopamine over time.
- High levels of dopamine activity are associated with Schizophrenia and Parkinson's diseases
- Low level of dopamine activity is associated with Depression.

Related condition

- Parkinson's disease, inhibition of hormone release, aberrant or unusual behavior

GABA (Gama-amino-butyric acid) - Inhibitory

Functions

- Works on motor control, memory, consciousness
- When GABA is out of range (high or low excretion values), it is likely that an excitatory neurotransmitter is firing too often in the brain. GABA will be sent out to attempt to balance this stimulating over-firing.
- Tranquilizing drugs (benzodiazepines) that inhibit anxiety work by increasing the activity of GABA.

Related condition

- Aberrant behavior, insomnia, anxiety

Norepinephrine (NE) - Excitatory

- Its basic function is responsible for stimulatory processes in the body.

Related condition

- Involved in mood and anxiety disorders
- This neurotransmitter can cause anxiety at elevated excretion levels as well as some "mood dampening" effects.
- Low levels of norepinephrine are associated with low energy, decreased focus ability and sleep cycle problems.

Serotonin (S-HT) - Excitatory (S-HT_{2and 3}) and S-HT₁ (Inhibitory)

Functions

- Arousal, sleep, appetite, hormone release, body temperature
- Thought to be involved moderating mood
- Adequate amounts of serotonin are necessary for a stable mood and to balance any excessive excitatory (stimulating) neurotransmitter firing in the brain.
- If you use stimulant medications or caffeine in your daily regimen – it can cause a depletion of serotonin over time. Serotonin also regulates many other processes such as carbohydrate cravings, sleep cycle, pain control and appropriate digestion.

Related condition

- Eating disorder, depression, insomnia
- With low levels leading to conditions including depression, obsessive-compulsive disorder (OCD) and decreased immune system function.

Epinephrine -Excitatory

Functions

- Is an excitatory neurotransmitter that is reflective of stress?
- This neurotransmitter will often be elevated when ADHD like symptoms are present.
- Long term stress or insomnia can cause epinephrine levels to be depleted (low).
- It also regulates heart rate and blood pressure.

Inactivation or Termination of Neurotransmitters

The chemical message needs a means of termination, and this occurs by several mechanisms: Enzymatic degradation, Diffusion and Reuptake.

- A. Diffusion: the neurotransmitter drifts away, out of the synaptic cleft where it can no longer act on a receptor.
- B. Enzymatic degradation (deactivation): a specific enzyme changes the structure of the neurotransmitter so it is not recognized by the receptor. For example, acetylcholinesterase is the enzyme that breaks acetylcholine into choline and acetate.

- C. Reuptake: the whole neurotransmitter molecule is taken back into the axon terminal that released it. This is a common way the action of norepinephrine, dopamine and serotonin is stopped...these neurotransmitters are removed from the synaptic cleft so they cannot bind to receptors.

IMPLICATION OF THE LESSON

- Imbalances in NTs → brain disturbances → difficulty in normal functioning psychopharmacology → reintegration of affected individuals into the community.
- Psychoactive drugs exert their effects almost entirely via action of NTs, and modifying one or more aspects of synaptic transmission.
- Psychoactive drugs can also alter the secretion of many hormones.
- Not all drugs have effect by act on CNS.

Possible Mechanisms in which Drugs interact with receptors and produce Effect

Drugs may act by:

1. Alter NTs
2. Either blocking or stimulating autoreceptors (receptors locate in the presynaptic neuron that interact with the release of NT and inhibit further release of NTs)
3. Making NT not to release/produce, work/function or breakdown
4. Increase the synthesis of NTs
5. Making not quickly released
6. Blocking the released NTs
7. Modifying receptors effect which is receptors mediating effect
8. Inhibiting NT synthesis
9. Preventing storage
10. Stimulating or blocking postsynaptic receptors
11. Blocking NT reuptake by the presynaptic neuron

Chapter Three

Psychoactive Drugs and Human Behavior

3.1. The nature of Psychoactive Drugs

Psychoactive drugs are chemical substances that affect the brain functioning, causing changes in behavior, mood and consciousness. A **psychoactive** or **psychotropic drug** is a chemical substance that crosses the blood–brain barrier and acts primarily upon the central nervous system where it affects brain function, resulting in alterations in perception, mood, consciousness, cognition, and behavior. While these drugs can be used medically (therapeutically) to treat both physical and psychological disorders, they are also used recreationally to purposefully alter mood, perceptions and consciousness. Many psychoactive drugs have therapeutic utility, e.g., as anesthetics, analgesics, or for the treatment of psychiatric disorders. These substances may be used for ritual (ceremonial), spiritual, and/or shamanic purposes, and as a tool for studying or augmenting the mind.

Psychoactive drugs can reduce or eliminate the suffering caused by psychological conditions such as anxiety, insomnia, depression, psychosis, bipolar affective disorder, etc. Many psychoactive substances are used for their mood and perception altering effects, including those with accepted uses in medicine and psychiatry. Examples include caffeine, alcohol, cocaine, LSD, and cannabis.

Psychoactive substances often bring about subjective changes in consciousness and mood that the user may find pleasant (e.g. euphoria) or advantageous (e.g. increased alertness) and are thus reinforcing. Thus, many psychoactive substances are abused, that is, used excessively, despite health risks or negative consequences. With sustained use of some substances, psychological and physical dependence ("*addiction*") may develop, making the cycle of abuse even more difficult to interrupt. **Physical dependence-** phenomenon in which abnormal behavioral and autonomic symptoms occur following the abrupt withdrawal of a drug of dependence or when the effect of the drug is terminated by means of a specific antagonist. **Psychological dependence-** dysphoria (acute, transient changes in mood (e.g. feelings of

sadness, sorrow, anguish or pain) and craving (thirst/hunger) which arise following the abrupt withdrawal of a drug of abuse.

Drug rehabilitation aims to break this cycle of dependency, through a combination of psychotherapy, support groups, maintenance and even other psychoactive substances. **However**, the reverse is also true in some cases, that certain experiences on drugs may be so unfriendly and uncomfortable that the user may never want to try the substance again. This is especially true of the deliriant (e.g. *Jimson weed*) and powerful dissociatives (e.g. *Salvia divinorum*). Most purely **psychedelic drugs** are considered to be **non-addictive** (LSD, psilocybin, mescaline etc.); "**Amphetamines**" or empathogen-entactogens (such as MDA, MDMA (Methylenedioxymethamphetamine, etc.) may produce an additional stimulant and/or euphoriant effect, and thus have an addiction potential.

3.2. Categories of Psychoactive Drugs and their Mechanism of Action

Psychoactive drugs can be **legal or illegal** and the labeling depends on the social context. Here below there are classes of psychoactive drugs. The classes are depressants, stimulants, narcotics and hallucinogens.

3.1 Depressants

Depressants are drugs that inhibit the function of the central nervous system and are among the most widely used drugs in the world. Drugs that are classed as depressants include alcohol, barbiturates and benzodiazepines. Depressants, are used as hypnotics (induce sleep), sedatives (increase calmness), and anesthetics (reversible loss of sensation), depending upon dosage. Depressants slow down the functions of the nervous system and producing sedation used to relieve anxiety, irritability, tension, pain and sleep disorders.

Examples, Barbiturates—used to overcome insomnia and treat epilepsy. - Injected, oral

Benzodiazepines and sleeping pills - injected, oral

Alcohol - is a clear drink that is made from corn, barley, grain, rye, or a beverage containing *ethyl*.

Effects of Depressants

- Small amounts cause calmness and relaxed muscles

- Larger amounts cause slurred speech, impaired judgment, loss of motor coordination
- Very large doses may cause respiratory depression, coma or loss of consciousness and death

3.2.Stimulants

Stimulants are a class of psychoactive drug that tend to increase activity in the brain. These drugs can **temporarily** elevate alertness, mood and awareness. Stimulants activate the central nervous system. These are used recreationally for their euphoric effects. While some stimulant drugs are legal and widely used, **all** can be addicting. **Examples** of drugs that are classed as stimulants include caffeine, nicotine, cocaine, amphetamines and some prescription drugs.

- **Caffeine**—found in tea, coffee, and cola drinks
- **Cocaine** – white powder from coca trees. Can be injected, smoked & sniffed
- **Nicotine** – substance found in tobacco products. Smoked, sniffed & oral
- **Amphetamines** – known as “pep pills”. It is injected, smoked, & Sniffed

Stimulants also used to treat disorders such as attention deficit disorder and narcolepsy (conditions with uncontrollable sleeping) and to suppress the appetite. Hence, stimulants are: substances that stimulate or speed up the functions of the nervous system drugs used to increase alertness, relieve fatigue, and feel stronger and more decisive as well as used for euphoric effects

Effects of stimulants

- Produce psychomotor arousal
- Increased heart and respiratory rates
- Elevated blood pressure
- Decreased appetite
- High doses may cause rapid or irregular heartbeat
- Loss of coordination
- A feeling of restlessness, anxiety and delusions

3.3.Narcotics or Narcotic-analgesia

Narcotics are substances that induce sleep & relieve pain. **Examples,**

Opium— derived from the juice of poppy pods. Oral, smoked

Morphine—produced from opium poppy. Injected, oral, smoked

Heroin—produced from opium. The *most* abused of these group. Injected, oral, sniffed

Effects of Narcotics

- Euphoria
- Shallow breathing
- Watery eyes
- Loss of appetite, nausea, tremors (shakes), panic (fear/fright), chills (anxieties) and sweating

3.4.Hallucinogens (Psychoedelics)

Hallucinogens are substances that cause hallucinations, illusions and distorted images. Psychedelic drugs, or hallucinogens, are psychoactive drugs that affect thinking, alter moods and distort perceptions. Hallucinogens (psychedelics, dissociatives and delirants), which induce perceptual and cognitive distortions. **Examples** of drugs that are classed as psychedelics include marijuana (made from the shredded leaves and stems of the hemp plant called *Cannabis sativa* that can be *orally administered or smoked*), LSD, psilocybin (derived from a type of mushroom) and mescaline (found in the peyote cactus).

Effects of Hallucinogens

- Rapidly changing feelings.
- Chronic use may cause persistent problems, depression, violent behavior, anxiety and distorted perception of time.
- Large doses may cause coma, heart and ruptured (broke) blood vessels in the brain.

3.3. Psychoactive Drugs Used for Treatment of psychiatric Illnesses

3.3.1Ant anxiety Drugs (Major Tranquilizers)

- ✓ Hypnotic—A drug that produces drowsiness and facilitates the onset and maintenance of sleep.
- ✓ Sedative—A drug that decreases activity and calm the recipient.
- ✓ Anxiolytic drug—a drug that decreases feelings of anxiety or panic
- ✓ Group of drugs are:
 - Benzodiazepines
 - 5 HTIA receptor agents

- Barbiturates
- B-adreno receptor antagonists
- Miscellaneous agents

Benzodiazepines

They are a group of medications which have been used since the 1960s to treat: anxiety, epileptic seizures, mania, alcohol withdrawal, sleeping problems

Based on their duration of action roughly divided into:

- Short acting (e.g. flurazepam, triazolam),
- Medium acting (e.g. alprazolam, lorazepam) and
- Long acting compounds (e.g. diazepam, chlordiazepoxide, and clonazepam).

Mode of Action

Benzodiazepines act on GABA receptors which mediates fast inhibitory response produced by activity in GABA-ergic neurons.

Are not effective in the absence of endogenous GABA.

There are three subtypes of benzodiazepine receptors:

- a. Omega-1 mediates hypnotic effect of drug
- b. Omega-2 mediates anxiolytic effect of drug
- c. Omega-3 mediates relaxant effect of drug

Pharmacologic effect on CNS

- Reduction of anxiety and aggression
- Induction of sleep
- Reduction of muscle tone
- Anti-convulsant effect (treatment of epilepsy and bipolar disorder)

Indications

- Treatment of anxiety, Diazepam 5 mg twice daily
- Treatment of insomnia, Temazepam 7.5 – 30 mg at bed time
- Treatment of epilepsy
- Treatment of muscle spasms (contraction)
- Treatment of ethanol withdrawal syndrome (Benzodiazepines are also used for alcohol withdrawal patients.)

Adverse Effect of Benzodiazepines

- Drowsiness (sleepiness)
- Confusion
- Amnesia (anterograde)
- Impaired coordination (motor skill)
- Tolerance and dependence

Advantages of Benzodiazepines:

- Milder side-effects - including less risk of respiratory depression.
- Less severe physical dependence.
- Less dangerous in over dosage.
- Less likely to interact with other drugs - as induction of hepatic microsomal enzymes does not occur to the same extent.

Barbiturates

Barbiturates have historically played an important role in the treatment of a variety of CNS disorders including;

- Anxiety disorders
- Sleep disorders
- Seizure disorder- phenol barbital (long acting)
- Muscle spasm and anesthesia- thiopental (short acting)

Most of their use in clinical practice are replaced by benzodiazepines but they are still in use in certain clinical situations e.g. Seizure disorder (phenol barbital), and anesthesia (thiopental).

Their use in outpatients has been more or less eliminated due to the narrow margin of safety, and risk of suicide in overdose.

Adverse effects

- High toxic in acute over dose (respiratory and cardiovascular depression)
- Drowsiness, incoherence, nystagmus, slurred speech.
- High degree of tolerance and dependence
- Strong inducers of hepatic drug metabolizing enzymes
- Withdrawal effects from barbiturates are more rapid and severe.
- Most symptoms resemble those of benzodiazepines.

- Benzodiazepines and barbiturates should give for the patient for short period of time
- B- adrenoreceptor antagonists (e.g. propranol)
- These are used to treat some forms of anxiety, particularly where physical symptoms such as sweating, tremor and tachycardia, are troublesome.
- Use by actors, musicians, politicians etc. to reduce symptom of stage fright. Have little effect on subjective feelings of anxiety.

Adverse effects

Contraindicated in patients with,

- Asthma
- Obstructive air ways disease
- Heart failure
- Second or third degree heart block

3.3.2. Antidepressant Drugs

Antidepressants are compounds used to treat depression. Specifically they reduce symptoms of depression. The agents approved for the treatment of depression, however, are also useful in an array of other disorders, including anxiety disorders, pain syndromes, attention deficit hyperactivity disorder (ADHD), smoking cessation.

Depression: Symptoms

- Depressed mood – irritable mood
- Decreased interest or pleasure
- Decreased body weight
- Increased or decreased sleep
- Psychomotor agitation or retardation
- Fatigue or loss of energy
- Worthlessness, excessive guilt
- Decreased concentration, indecisiveness
- Recurrent thoughts of death

Anti-depressant Drugs

- Cyclic anti-depressants- e.g. Imipramine, amitriptyline (1st generation)
- Selective serotonin reuptake inhibitors e.g. Fluoxetine, sertraline

- Monoamine oxidase inhibitors e.g. Phenolazine, tranyleypromine
- Atypical anti-depressants (second generation AD) e.g. Maprotiline, mianserin

Mania

At least 1 week in duration

Abnormally & persistently elevated, expansive or irritable mood

Additionally – 3 or 4 symptoms

- Inflated self-esteem or grandiosity
- Decreased need for sleep
- More talkative –pressure to talk
- Flight of ideas or thought racing
- Distractibility
- Increased in goal directed activity or psychomotor agitation
- Excessive involvement in pleasurable activities – buying sprees, sexual indiscretion, foolish investment

Functional impairment or need hospitalization*

Hospitalization when –harm to themselves, harm to others, psychotic features

To Treat Mania

- Mood Stabilizers
- Lithium
- Valproate
- Antipsychotics
 - *A typical:* Olanzapine, Risperidone, Quetiapine
 - *Typical:* Chlorpromazine, Haloperidol
- Benzodiazepines
- Diazepam
- Lorazepam
- Clonazepam

To Prevent Mania

- Lithium
- Valproate
- Carbamazepine

3.3.3 Antipsychotic Drugs (Narcoleptics)

Antipsychotic medication refers to the use of a group of psychoactive drugs that is mainly used to treat patients suffering from psychoses, most often schizophrenia but also mania and other delusional disorders.

Schizophrenia - Clinical picture

Typical or first generation anti-psychotics

These first appeared in the mid-1950s. These older drugs are often called 'typical' or 'first-generation' antipsychotics. They all block the action of dopamine, some more strongly than others.

Chlorpromazine	Thioridazine
Haloperidol	Flupenthixol

Fluphenazine.

Side-effects include:

- stiffness and shakiness, like Parkinson's disease
- feeling sluggish and slow in your thinking
- uncomfortable restlessness (akathisia)
- Problems with your sex life.
- Parkinsonism

Parkinsonism is a clinical syndrome that comprises four main features:

- bradykinesia (a slowness and poverty of movement),
- muscular rigidity (increased resistance of muscles to passive movement),
- resting tremor, which usually disappears during voluntary movement, and
- Abnormalities in posture and way of walking.

Atypical anti-psychotics

They still block dopamine, but much less so than the older drugs

Clozapine	Sulpiride
Risperidone	Olanzapine

Compared to the older drugs they seem:

- less likely to cause Parkinsonian side-effects
- Less likely to produce tardive dyskinesia.(involuntary muscle movement)
- more likely to produce weight gain

- more likely to produce diabetes
- More likely to give you sexual problems.

Depot' antipsychotics

The word 'depot' means that the medication is given not as tablets, but as an injection every 2 to 4 weeks

Long acting depot injections administered intramuscularly as an oil injection and slowly released in to the blood stream. The effects are generally the same as medications taken by mouth.

Advantages

- Rapid initiation of effect
- For ensuring better patient compliance
- For controlling aggressive patients

Disadvantages

- May give rise to higher incidence of EPSE
- It takes a long time to know the effect of changing the dose.
- If a particular dose is giving you side-effects, lowering it may make little difference for several weeks.
- Nobody likes having injections
- Extrapyramidal symptoms (EPS)
 - Parkinsonism
 - Akinesia
 - Akathisia
 - Dystonia
 - Tardive dyskinesia
 - Neuroleptic malignant syndrome
 - Hyperglycemia and diabetes

Chapter Four

Theories and Treatments of Substance Related Disorders

4.1 Definition of Substance Related Disorder

Substance-related disorders are disorders of intoxication, dependence, abuse, and substance withdrawal caused by various substances, both legal and illegal. These substances include: alcohol, amphetamines, caffeine, inhalants, nicotine, prescription medications that may be abused (such as sedatives), opioids (morphine, heroin), marijuana (cannabis), cocaine, hallucinogens, and phencyclidine (PCP).

There are four defining substance related disorders recognized by DSM-IV:

Intoxication – A person is said to suffer from drug intoxication when the quantity of drug the person consumes exceeds the individual's tolerance for drug and produces behavioral or physical abnormalities. In other words, the person's mental and physical abilities are impaired. The person can't function and certainly should not be operating a motor vehicle. Generally, substance intoxication is a set of behavioral and psychological changes that occur as a result of the physiological effects of a substance on the CNS. When people are Intoxicated, they experience significant maladaptive behavior and psychological symptoms due to the effect of the substance on the CNS. These may include: change in perception (may see or hear strange things), diminished attention, poor judgment, inability to control the body, etc.

Withdrawal - When a drug dependent individual suddenly refrains from taking the drug, he or she typically suffers *drug withdrawal symptoms* (also known as alcohol withdrawal symptoms). A person is said to suffer from alcohol withdrawal when the quantity of alcohol the person consumes exceeds the individual's tolerance for alcohol and produces behavioral or physical abnormalities. In other words, the person's mental and physical abilities are impaired. The person can't function and certainly should not be operating a motor vehicle. Alcohol withdrawal symptoms or alcoholism withdrawal symptoms by some people). Alcohol withdrawal symptoms are, for the most part, responses by the body and by the brain to the lack of alcohol to which they have become accustomed. With the regular ingestion of alcohol, the brain, over time, adjusts to the alcohol in order to function "normally." This not only explains how physical tolerance develops but it also explains why increasingly more levels of alcohol are required in order to experience the same

"buzz" or "high" with regular use. When a person who has displayed a pattern of continuous and excessive ingestion abruptly stops drinking alcohol, however, he or she typically experiences alcohol withdrawal symptoms that might take days or weeks before the body returns to "normal."

To a great extent, then, alcohol withdrawal symptoms (also called alcoholic withdrawal symptoms by some individuals) are responses by the brain and by the body to the depletion of alcohol to which they had become adapted. Depending upon the level of addiction that the person has reached, furthermore, alcohol withdrawal symptoms can range from mild to moderate to severe and can include both behavioral and psychological aspects

The following is a list of mild to moderate alcohol withdrawal symptoms that usually occur within 6 to 48 hours after the last alcoholic drink has been consumed: sweating (especially on the face or the palms of the hands), rapid emotional changes, insomnia, sleeping difficulties , easily excited, irritability, Vomiting , feeling nervous or jumpy, depression , tremor of the hands, Headaches , difficulty thinking clearly ,fatigue looking pale, without color , involuntary, abnormal movements of the eyelids, nightmares ,anxiety , abnormal movements , eyes or pupils different size (enlarged, dilated pupils) , rapid heart rate ,nausea ,loss of appetite, etc.

Abuse - the diagnosis of substance abuse is given when a person's recurrent use of substance results in significant harmful consequences. There are four categories of harmful consequences that suggest substance abuse;

- The individual fails to fulfill important obligations at work, school, or home
- The individual repeatedly uses substances in situations in which it is physically hazardous to do so, while driving a car.
- The individual repeatedly has legal problems as a result of substance use, such as arrests for possession of illegal substance or for drinking driving.
- The individual continues to use the substance even though he/she has repeatedly had social or legal problems as a result of the use.

A person has to show repeated problems in at least one of these categories within a 12 month period to qualify for diagnosis of substance abuse.

Dependence - a pattern of behavioral, physiologic, and cognitive symptoms that develop due to substance use or abuse; usually indicated by tolerance to the effects of the substance and withdrawal symptoms that develop when use of the substance is terminated. In other words, a person is physiologically dependent on a substance when he/she shows either tolerance or withdrawal from the substance.

4.2 Theories of Substance Use, Abuse, and Dependence

Biological Theories /Medical Model

- ✓ Drug addiction is a disease requiring medical intervention

Social Learning Theory

- ✓ Drug abuse is a learned behavior (explainable by classical & operant conditioning)
- ✓ Observational learning and modeling plays a vital role

Cognitive Theory

- ✓ Substance use is due to cognitive aspects like belief, thinking and expectation about the substance

Psychoanalytic Theory

- ✓ Early experience determines for substance use or dependence. It is related to fixation and repressed things in early experience of development.

Causes or Etiologies- Multiple etiological processes likely operating

Why do people use drugs?

- ▶ Fun/enhance pleasurable activities/intensify feelings
- ▶ Experiment, explore new experiences
- ▶ Cope with stress
- ▶ Escape reality, numb feelings
- ▶ Deal with emotional pain or discomfort
- ▶ Respond to social pressure or norms
- ▶ Make social contact easier, sexual purpose
- ▶ Enhance artistic creativity
- ▶ Spiritual or meditative pursuits
- ▶ Self-medicate for anxiety, depression, cognitive dysfunction

Variables Affecting Onset and Continuation of Drug Abuse and Dependence

Agent /drug

- ✓ Availability
- ✓ Cost
- ✓ Purity (potency)
- ✓ Mode of administration
- ✓ Speed of onset and termination of effects

Host/user

- ✓ Heredity
- ✓ Psychiatric symptoms
- ✓ Prior experiences/expectations
- ✓ Propensity for risk taking behavior

Environment

- ✓ Social setting
- ✓ Community attitude
- ✓ Availability of other reinforcers
- ✓ Employment and educational opportunities

Pharmacological Phenomenon

- ✓ Tolerance

Risk Factors for Drug Abuse

- ✓ Ineffective parenting/ Absence of Good Guidance
- ✓ Lack of mutual attachments/nurturing/ Ignorance/ alienation
- ✓ Failure in school performance
- ✓ Poor social coping skills
- ✓ Affiliations with deviant peers
- ✓ Perceptions of approval of drug-using behaviors in school, peer, and community environments
- ✓ Peer Pressure
- ✓ No Job and No aim in Life
- ✓ Racial/Ethnic Minority Status
- ✓ Lower Social Supports

- ✓ Previous History of Problems
- ✓ History of Using Substances as Coping Strategy

4.3 Treatment for Substance Related Disorders

4.3.1 Bio-psychosocial therapy

While traditional biomedical models of clinical medicine focus on pathophysiology and other biological approaches to disease, the bio-psycho-social approach in our training programs emphasize the importance of understanding human health and illness in their fullest contexts.

The bio-psycho-social approach systematically considers biological, psychological, and social factors and their complex interactions in understanding health, illness, and health care delivery.

To apply the bio-psycho-social approach to clinical practice, the clinician should:

- Recognize that relationships are central to providing health care
- Use self-awareness as a diagnostic and therapeutic tool
- Elicit the patient's history in the context of life circumstances
- Decide which aspects of biological, psychological, and social domains are most important to understanding and promoting the patient's health
- Provide multidimensional treatment

4.3.2 Biological (Drug) Therapy

Pharmacological Treatment -Taking drugs like Benzodiazepine, barbiturates, disulfiram, Nicotine gum, Nicotine Replacement Therapy (NRT), Nicotine inhaler and Nicotine nasal spray.

Factors to Consider When Choosing a Pharmacotherapy

- ✓ Patient preference
- ✓ Clinician familiarity with the medications
- ✓ Contraindications for selected patients
- ✓ Previous patient experiences with a specific agent (positive or negative)
- ✓ Patient characteristics (concern about weight gain, history of depression)

4.3.3 Electroconvulsive therapy

Electroconvulsive therapy (ECT) is a procedure in which electric currents are passed through the brain, intentionally triggering a brief seizure. ECT seems to cause changes in brain chemistry that can quickly reverse symptoms of certain mental illnesses. It often works when other treatments are unsuccessful.

Much of the stigma attached to ECT is based on early treatments in which high doses of electricity were administered without anesthesia, leading to memory loss, fractured bones and other serious side effects.

ECT is much safer today and is given to people while they're under general anesthesia. Although ECT still causes some side effects, it now uses electrical currents given in a controlled setting to achieve the most benefit with the fewest possible risks.

When medication fails to ease the symptoms of clinical depression, there are other options to try. Brain stimulation techniques such as electroconvulsive therapy (ECT), for example, can be used to treat major depression that hasn't responded to standard treatments.

ECT is generally used when severe depression is unresponsive to other forms of therapy. Or it might be used when patients pose a severe threat to themselves or others and it is too dangerous to wait until medications take effect.

Although ECT has been used since the 1940s and 1950s, it remains misunderstood by the general public. Many of the procedure's risks and side effects are related to the misuse of equipment, incorrect administration, or improperly trained staff. It is also a misconception that ECT is used as a "quick fix" in place of long-term therapy or hospitalization. Nor is it correct to believe that the patient is painfully "shocked" out of the depression. Unfavorable news reports and media coverage have contributed to the controversy surrounding this treatment.

Electroconvulsive therapy (ECT) is a procedure in which a brief application of electric stimulus is used to produce a generalized seizure. It is not known how or why ECT works or what the electrically stimulated seizure does to the brain. In the U.S. during the 1940's and 50's, the treatment was administered mostly to people with severe mental illnesses. During the last few decades, researchers have been attempting to identify the effectiveness of ECT, to learn how and why it works, to understand its risks and adverse side effects, and to determine the best treatment technique. Today, ECT is administered to an estimated 100,000 people a year, primarily in general hospital psychiatric units and in psychiatric hospitals. It is generally used in treating patients with severe depression, acute mania, and certain schizophrenic syndromes. ECT is also used with some suicidal patients, who cannot wait for antidepressant medication to take effect.

How is it administered?

ECT treatment is generally administered in the morning, before breakfast. Prior to the actual treatment, the patient is given general anesthesia and a muscle relaxant. Electrodes are then attached to the patient's scalp and an electric current is applied which causes a brief convulsion. Minutes later, the patient awakens confused and without memory of events surrounding the treatment. This treatment is usually repeated three times a week for approximately one month. The number of treatments varies from six to twelve. It is often recommended that the patient maintain a regimen of medication, after the ECT treatments, to reduce the chance of relapse.

To maximize the benefits of ECT, it is crucial that the patient's illness be accurately diagnosed and that the risks and adverse side effects be weighed against those of alternative treatments. The risks and side effects involved with the use of ECT are related to the misuse of equipment, ill-trained staff, and incorrect methods of administration, persistent memory loss, and transient post-treatment confusion.

Why is ECT so controversial?

After 60 years of use, ECT is still the most controversial psychiatric treatment. Much of the controversy surrounding ECT revolves around its effectiveness vs. the side effects, the objectivity of ECT experts, and the recent increase in ECT as a quick and easy solution, instead of long-term psychotherapy or hospitalization.

Because of the concern about permanent memory loss and confusion related to ECT treatment, some researchers recommend that the treatment only be used as a last resort. It is also unclear whether or not ECT is effective. In some cases, the numbers are extremely favorable, citing 80 percent improvement in severely depressed patients, after ECT. However, other studies indicate that the relapse is high, even for patients who take medication after ECT. Some researchers insist that no study proves that ECT is effective for more than four weeks.

During the last decade, the "typical" ECT patient has changed from low-income males under 40, to middle-income women over 65. This coincides with changing demographics. The increase in the elderly population and Medicare, and the push by insurance companies to provide fast,

“medical” treatment rather than talk therapy. Unfortunately, concerns have been raised concerning inappropriate and even dangerous treatment of elderly patients with heart conditions, and the administration of ECT without proper patient consent.

Is ECT an option?

The patient and physician should discuss all options available before deciding on any treatment. If ECT is recommended, the patient should be given a complete medical examination including a history, physical, neurological examination, and laboratory test. Medications need to be noted and monitored closely, as should cardiac conditions and hypertension. The patient and family should be educated and informed about the procedure via videos, written material, discussion, and any other means available before a written consent is signed.

The procedure should be administered by trained health professionals with experience in ECT administration as well as a specifically trained and certified anesthesiologist to administer the anesthesia. The seizure initiated by the electrical stimulus varies from person to person and should be monitored carefully by the administration team. Monitoring should be done by an EEG or “cuff” technique.

4.3.4 Psychosurgery

- ✓ More controversial than any other treatment for mental disorders
- ✓ Psychosurgery is seldom used today.
- ✓ **Psychosurgery** is a general label for any surgery that is performed on the brain to alleviate mental illness.
- ✓ Psychosurgery generally involves destruction of specific areas of the brain.
- ✓ Some cave paintings suggest that very early man attempted brain surgery.
- ✓ **Trephining** involved using a trephine tool to cut through portions of a person's skull. During that time it was believed that evil spirits caused mental illness and other brain disorders, and cutting holes in the skull would allow the spirits to escape.
- ✓ The most famous type of psychosurgery is the **lobotomy**.
- ✓ Lobotomy was first introduced in 1937 by a Portuguese neurosurgeon named **Egas Moniz**.

- ✓ A lobotomy involves severing the neural connections of the brain's frontal lobes.
- ✓ Moniz used lobotomy as a treatment for schizophrenia and won a Nobel Prize for his work in 1949.

4.3.5 Psychological therapy

- ✓ No single treatment is appropriate for all individuals
 - ✓ Effective treatment attends to multiple needs of the individual, not just his/her drug use
 - ✓ Treatment must address medical, psychological, social, vocational, and legal problems
1. **Cognitive Behavioral Therapy** – visiting a psychotherapist and counselor to get psychological services.
 2. **Aversive Therapy** - making an abuser to dislike a drug.
 - ✓ E.g. Giving an alcohol mixing with bitter substances = **disulfiram**
 - ✓ Making individual to drink more than his/her capacity at a time and to feel bad about it.
 3. **Family therapy:** the factors that make an individual to abuse substance may be due to problem in their marriage, children and the family in general. Therefore, giving psychological therapy for the family in a round table is recommendable.
 4. Vocational training
 5. Reinforce attitudes against drug use
 6. Replace drug using activities
 7. Counseling and other Behavioral Therapies
 8. Integrated pharmacological and psychosocial therapy.

Effectiveness of Treatment

- ✓ Goal of treatment is to return to productive functioning
- ✓ Treatment reduced drug use by 40-60%
- ✓ Treatment reduces crime by 40-60%
- ✓ Treatment increases employment prospects by 40%
- ✓ Drug treatment is as successful as treatment of diabetes, asthma, and hypertension

Finally, Remember 3 S's

- ✓ Do not **start** using drug.
- ✓ If you are drug user do not **Show** drug to others.
- ✓ **Stop** using drug immediately and save your future.

