



Research Study on Migraine: A Neurological Disorder and Its Impact on Mental and Social Life

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Abstract:

Headaches are popular since several decades hindering normal day to day activities. One among this is migraine which is considered complex neurological and neurovascular disorders. This is a type of headache which affects functioning of neurons and nervous system and has an ability to make individual life physically and mentally uneasy.

According to the survey data analysis by WHO it is recorded that females are more prone to migraine attacks worldwide comparatively to men [21]. Although it is most common and tremendous category of headache globally, still the actual cause of it is a mystery which researchers are trying to solve by understanding it at its best. Migraines are more than a headache and are listed as the most severe type of reoccurring disorders worldwide. Pain intensity of migraine headaches are far behind an imagination. Migraine patients often get confused between normal headache and migraine attacks because most of the symptoms are common however they are two sides of same coin. It is a second leading cause of disability worldwide, it make its sufferers sensitive to environment along with pain. Its symptom varies from person to person. In the present research study, data was collected from individuals suffering from migraine of various age groups, certain parameters like sensitivity to light, sound, odours, stress, anxiety, anger, hunger were noted and analyzed to fetch out the common and frequent cause of migraine attacks. The data of both males and females aged between 20 to 58 was recorded in this study. The present research study was conducted both on basis of environmental and genetic factors. The results obtained was analyzed graphically.

Keywords: Migraine, complex, neurological, neurovascular, tremendous

Introduction:

Migraine is originated from Greek work “hemicrania” which means half of the head. Sensory and visual disturbances are observed by most of the patients before headache starts. Our brain needs oxygen for proper functioning and if sufficient amount of oxygen supply does not reach to brain blood vessels do contract and expand at an intensity which results in to throbbing pulsating pain. Migraine are the complex category of headache which does not show uniform side of pain as in case of tension headache[1].

The side of initiation of migraine attack may vary from person to person. In most of the people headache starts from left side while in others from right side, central part of skull or sometimes from back or front side. Attacks can be frequent or infrequent they can occur genetically or by environmental factors in an individual [25]. These attacks are reoccurring and cause throbbing pain which gives hammering sensation to the sufferer.[20] Role of brain anatomy is crucial enough to be known before finding actual cause of migraine. Several theories listed in relation to the cause of migraine are yet to be proven which are as follows:

1. Imbalance of neurotransmitter or nerve impulse is cause of migraine
2. Blood vessels are pain sensitive and pressure in them can cause migraine
3. Imbalance in nerve signaling can cause migraine.

Migraines cannot be distinguished by MRI's or CT Scans because these technologies do tell about abnormal structure of the brain whereas migraines are abnormal functioning of brain. Thus, migraines don't get reflect in reports. All migraines are not headache because in migraine an intense pinching pressure occurs in brain where it gets fluctuate based on its intensity. It is a disorder where one or more system of nerve cell communication such as electrical signaling, ion channels, neurotransmitters does not function properly. Migraine attacks are throbbing and pulsating because of the pressure created in blood vessels and is listed in the third highest category of headache all around cosmos [14]. There is no cure for migraine, so the treatment is given based upon the symptoms of the patients. Migraine headaches are moderate to severe.

Neurology Of Brain:

Brain acts as the command and control system and is well protected by skull. The brain is

covered by cranial meninges which consist of three layers: outer Dura mater which is composed of dense irregular connective tissue. Middle meninx is a vascular covering and called as arachnoid mater and the inner layer is called as pia mater. The Central Nervous System consists of brain and spinal cord. Spinal cord is protected by spinal meninges which are continuous with cranial meninges. In brain Cerebrospinal Fluid is present which is colorless liquid and acts as shock absorbing fluid and protects brain and spinal cord from physical injuries. It also carries oxygen, glucose and chemicals required from blood to neurons and neuroglia.

Brain consists of three major parts: forebrain, mid brain, hind brain.

Forebrain: it consists of cerebrum and diencephalon and diencephalon consists of thalamus and hypothalamus. Cerebrum is the largest part of brain and is divided into right and left hemispheres which are linked by mass of fibres called corpus callosum. The left hemisphere controls right side of body and right hemisphere controls left side of the body. The surface of cerebrum shows many folding which are referred to as Gyri and Sulci. The outer core of gray matter surrounds the inner core of white matter. Gray matter consists of densely packaged neuronal cell bodies and their dendrites as well as glial cells.

Thalamus is situated between cerebral cortex and midbrain it is a major coordination center for sensory and motor signaling.

- Hypothalamus is present at the base of thalamus and secrete hypothalamic hormone.
- Mid brain is located between hypothalamus and thalamus of fore brain
- Hind brain includes Pons, cerebellum and medulla oblongata
- Midbrain, Pons and medulla oblongata are collectively called as brain stem.

Nervous System: controls all the activities of animals it has two subdivisions Central Nervous System and Peripheral Nervous System. CNS includes brain and spinal cord, PNS includes all the nerves of the body associated with CNS, or brain and spinal cord. They are cranial nerves, spinal nerves, afferent nerves/sensory nerves, efferent nerves/motor nerves.

To understand migraine structure of neuron must be known in depth neurons possess electrical impulse and convert it into action potential which is electrical signal that travels along the plasma membrane of neuron. nerve impulse travels at speed from 0.5 to 130 meters per second.

Neurons consist of three parts a cell body, dendrites and an axon. And about 90% of the CNS is filled with neuroglia which are not neurons and are of two types present in PNS Schwann cells and satellite cells. The role of Schwann cells has been

recorded partially in causing migraine which is still under research. Neurons generate nerve impulse on myelinated and non myelinated nerve.

Transmission of nerve impulse on myelinated nerve fibre: here nerve impulse jumps from one node of Ranvier to next for speeding up its transmission. The speed of conduction of nerve impulse is very fast. A nerve impulse is transmitted from one neuron to another neuron through junction called synapse. Synapse is formed by the membrane of presynaptic neuron and post synaptic neuron which may or may not be separated by a gap called synaptic cleft. There are two types of synapse electrical and chemical synapse. At electrical synapse transmission of impulse across the synapse is similar to conduction along a single axon. At a chemical synapse, transmission of nerve impulse takes place through chemicals called neurotransmitters.

Transmission of nerve impulse on non myelinated nerve fibre: when the neuron does not conduct any impulse called resting state. at this time axonal membrane is comparatively more permeable to potassium ions and nearly impermeable to sodium ions. The membrane is also impermeable to negatively charged proteins present in axoplasm. The axoplasm inside the axon contains high concentration of potassium and negatively charged proteins and low concentration of sodium. these ionic gradients across the resting membrane are maintained by the active transport of ions by sodium, potassium pump which transports 3 sodium ions outwards for 2 potassium ions into cell, as a result the outer surface has positive charge whereas inner surface has negative charge and therefore is polarized state.

When a stimulus is applied at side 1 on polarized membrane the membrane at side 1 becomes freely permeable to sodium by which outer surface becomes negatively charged and inner surface become positively charged. The polarity of membrane at side 1 is thus reversed and hence depolarized so now a nerve impulse is conducted along the nerve fibre. So now at side 1 positive charge is present at outer surface and negative charge on inner surface at side 2 negative charge on outer surface and positive charge on inner surface which will generate a circuit of current flow and because of this action potential moves on axon up to the terminal.

Nerve cells send signals to brain, each electrical impulse is carried out from one end to the other end using ion channels. Charge particles pass through the channels and generate electrical current. These channels pass to the other end to neurotransmitters communications through electrical impulse do occur in brain and most of the functions of animals are controlled by brain stem, this is all about the healthy brain. But in migraine it is

reversed, the lack of communication in nervous system is assumed as a cause of migraine which is yet to be proven, here one or more system of communication does not function properly. Migraine do occur genetically and environmentally where in terms of genetics it is observed that most of the functions of signaling, ion channels, neurotransmitters is controlled by certain factors of genes and if mutation occurs in these genes , it tends to hinder communication thus results in migraine secondly the genes and loci associated to cause migraine is not yet disclosed as it genetic it can pass on to offspring as well however percentage of occurrence in offspring is based on the genotype of parents.

Environmental cause of migraine:

Change in temperature, change in weather, excessive exposure to sound and light , skipping meals, stress, anxiety, over thinking [18]

There are four phases of migraine attack:

Prodrome attacks, aura, headache, postdrome

➤ **Prodrome attack:** they are considered as premonitory symptoms such as yawning, mood change, dizziness, sensitivity to light and sound, thirst, sweating, food cravings. Around 77% of patients suffers from these stage up to 24 to 48 hours before headache starts.

➤ **Aura:** changes in cortical function , blood circulation and neurovascular integration occur in 25% of cases of migraine patient [20].

Positive symptoms may show rhythmic movements, bright lines, zigzag lines, shapes, tinnitus, and noises

Negative symptoms may show loss or reduction of vision, hearing sensation, motion

It can result in cause of visual aura, sensory aura ,motor aura ,language aura, where language aura are less frequent in occurrence as compare to visual and sensory aura while motor aura occur rarely [18].

➤ **Headache:** here extra changes in blood circulation and function of brain stem , thalamus, hypothalamus and cortex occur.

These are unilateral ,cause throbbing pain with pulsating affect where fluctuation in pain intensity occurs.

Intensity of pain can be related to nausea, vomiting, photophobia, phonophobia[26]

It can last from hours to days

Patients seems to get relaxed in dark or dim light while most of them gets comfort from pain after a sound sleep as headache gets partially terminated.

➤ **Postdrome** ; the last stage of migraine is postdrome where after affects of migraine seems to appear most common symptoms are problem in concentration , exhausted, lethargy, dizziness ,discomfort.

Types Of Migraine:

Hormonal Migraine: These migraines are most common in females compared to males and are also known as menstrual migraine. They takes place during-

- Menstruation
- Pregnancy
- Menopause
- Menarche
- Ovulation

These migraines are result of fluctuation in estrogen, progesterone hormone and the level of LH and FSH in periodic cycles. It is often suggested to patients to stop hormonal therapy if their headache occur from hormonal imbalance [13].

Optical Migraine: also known as ocular migraine, retinal migraine

It occurs or starts from eye and results in disturbance in vision

Symptoms are blind spots, zigzag lines, scintillations which are called flashes of light, temporary loss of vision.

Vestibular Migraine: This migraine is associated with vertigo. Common symptoms are sensitivity to food

Migraine With Aura: also known as classical migraine, hemiplegic migraine [20].

According to International Headache Society patients must have at least two attacks to fit into aura stage.

Symptoms are: difficulty in vision, sensory problems of face, body or dizziness, numbness, tingling, fluctuation in alertness.

Each symptom lasts for over five or more minutes.

Migraine without Aura: also called as common migraine. Pain level is moderate to severe and gets worse while attempting physical activities (walking, climbing) phonophobic, photophobic, nausea , vomiting

Acephalgic Migraine: also known as migraine without headache, silent migraine here aura occurs but does not result in to headache.

Pathophysiology Of Migraine:

During migraine trigeminal nerve(cranial nerve V) gets activated this results in to release of neuropeptides in Cranial Nerve V, these neuropeptides include VIP, Sub P, CGRP which are responsible for causing painful neurogenic inflammation in the meninges and vascular tube, this results in to mast cell degranulation, plasma protein extravasation, vasodilation, activation of nociceptors [23]. These neuropeptides plays an important role in trigeminal nerve pain transmission in migraine headache. Frequent activity and abnormal signaling impose and considered as a fuel for brainstem to develop migraine attack [8][10].

Triggers of Migraine

Hormonal imbalance especially in females
Stress, anxiety, over thinking, depression

Skipping meals
 Alcohol consumption
 Excess consumption of caffeine
 Improper sleep cycles
 Exposure to bright light
 Exposure to high frequency of sound
 Sharp odors
 Excess exercise [18][12][21][15]

Medications For Migraine:

Ergots and triptans are suggested for consumption to migraine patients as they decrease the release of neuropeptides from Cranial Nerve V which decreases cerebral vasodilation and results in fall of migraine pain intensity. They releases auto receptors like 5-HT_{1B}, 5-HT_{1D} which makes decrease in neuropeptides release followed by less cerebral vasodilation and migraine pain in addition to this pain pathways in brainstem are inhibited which gives partial relief to sufferer from head pain during migraine attack.

Objectives Of The Present Study:

- To study the trigger, effects, symptoms of migraine

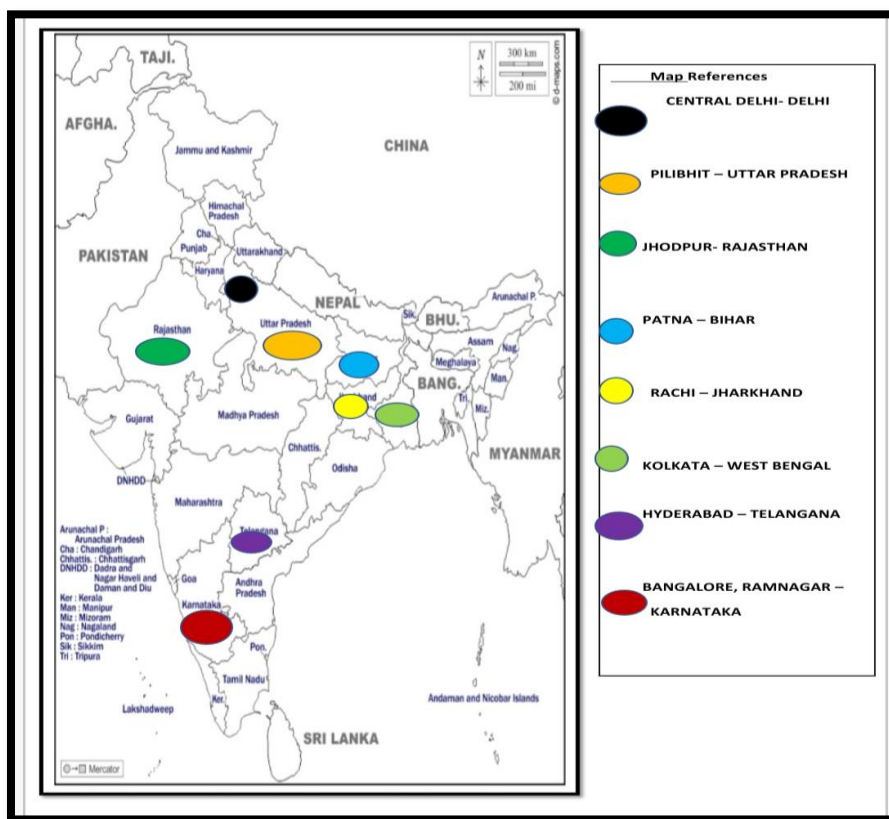
- To analyze root cause of migraine and its impact on social life
- To record genetic and environmental effects of migraine
- To report relation between migraine and brain functionality

Methods And Methodology

In the research study, data was collected from individuals suffering from migraine of various age groups, certain parameters like sensitivity to light, sound, odours, stress, anxiety, anger, hunger were noted and analyzed to fetch out the common and frequent cause of migraine attacks. The data of both males and females aged between 20 to 58 was recorded in this study. The present research study was conducted both on basis of environmental and genetic factors.

Demography:

India officially the Republic of India is a country in South Asia. It is situated north of equator between 8°4' north to 37°6' north latitude and 68°7' east to 97°25' east longitude. The samples belonged to whole India.



Map No 1: Depicting the Location of Current Research Study and the States of India from Where Samples Were Collected For Analysis

Experimental Results:

Migraine is the most common medical issue in various age groups of males and females. It falls in category of headache, however is more than a headache.

Oxygen is required by brain in adequate amount for its proper functioning and even a few seconds of disturbance in oxygen supply can affect

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its productivity basic functions such metabolism of glucose which supply power to neurons. Hormonal imbalance in blood stream results in to migraine attack, role of brain stem is also reported in analyses for causing migraine as most of the major functions of body gets controlled from there. In addition to this release of CGRP a neuropeptide is also responsible for causing migraine attack.

Figures / Statistical Data:

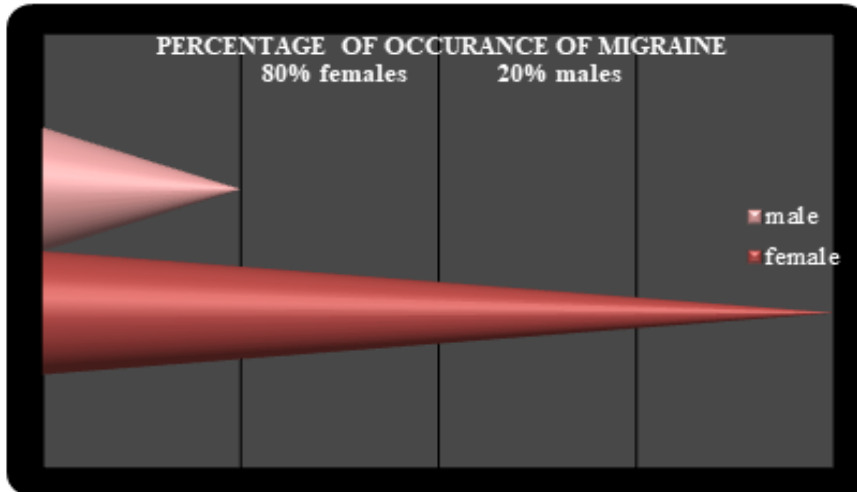


Figure 1.1: Graphical Data Representing Percentage of Occurance of Migraine in Males and Females

Migraine is more common in females compare to males. Around 80% of females, 20% of males worldwide are prone to it.

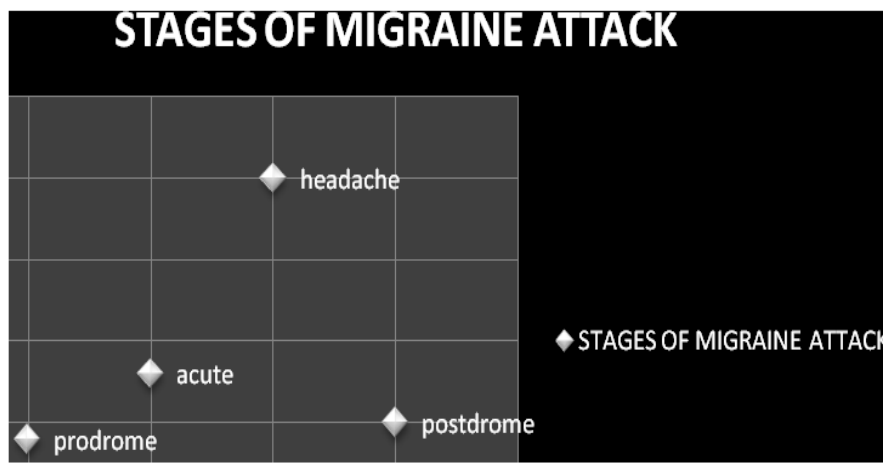


Figure 1.2: Graphical Data Representing Stages Of Migraine Attack

Migraine starts from its initial stage which is prodrome which later leads to acute phase of attack, soon after acute phase attack reach at its peak level headache stage where major symptoms are noticed in patients, this last for around 2-3 days and

varies from person to person. Stages of migraine gets terminated at postdrome phase where after affects of headache are recorded which results in to dizziness, lethargy.

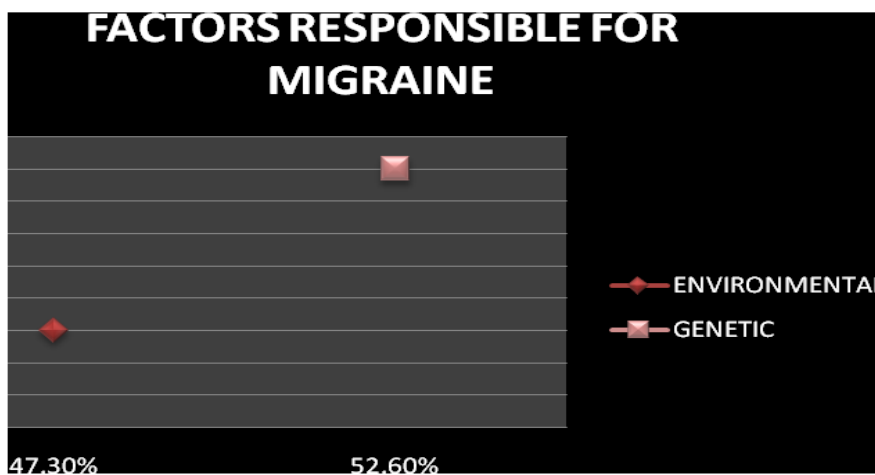


Figure 1.3: Graphical Data Representing Percentage Of Genetic And Environmental Factors Responsible For Causing Migraine Attack

It is reported from data that both environmental and genetic factors play crucial role in causing migraine. Percentage of occurrence of

both factors is closely related which is 47.30% of environmental factors and 52.60% of genetic factors.

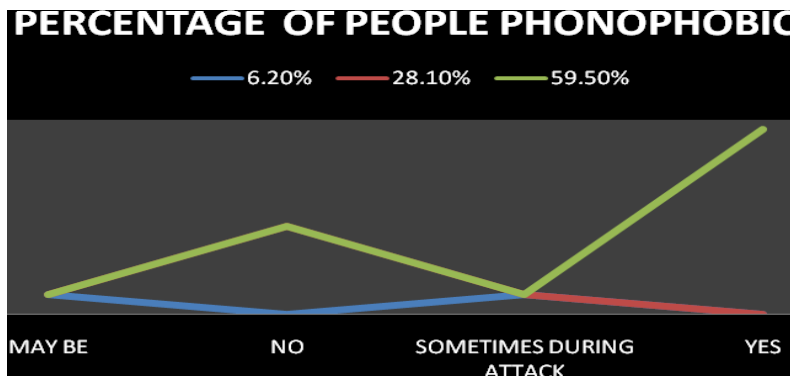


Figure 1.4: Graphical Data Representing Percentage of People Being Phonophobic During Migraine Attack

During migraine many people get sensitivity to sound, where percentage of sensitivity varies from patient to patient. 59.50% are sensitive to sound during an attack, 28.10% of patient shows

no response to sensitivity of sound while 6.20% of patients reported sensitivity to sound only sometimes during an attack and 6.20% patients shows partial sensitivity simultaneously.

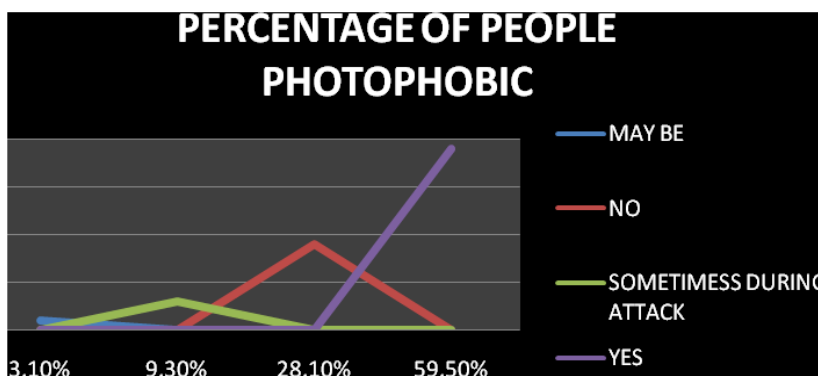


Figure 1.5: Graphical Data Representing Percentage of People Being Photophobic During Migraine Attack

During migraine sensitivity to light is common, where range of sensitivity to light varies from patient to patient. 59.50% of migraineurs are sensitive to light, while 28.10% shows no response

to light sensitivity. 9.30% of sufferers are sensitive to light only during a migraine attack, 3.10% shows partial sensitivity to light accordingly.

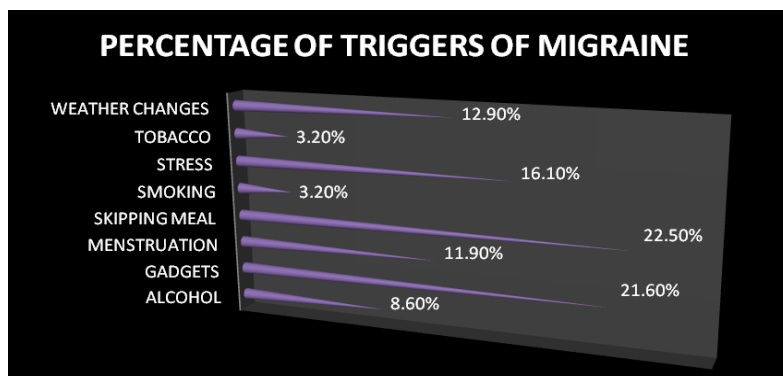


Figure 1.6: Graphical Data Representing Percentage of Triggers of Migraine Attack In Patients

Migraine is a type of headache where environmental and genetic factors are responsible for causing it. The environmental factors fall under the category of triggers of migraine in varying percentage. It is studied that 16.10% of migraine attack is by stress, 3.20% by smoking and tobacco

simultaneously, 8.60% of migraine attack by alcohol, 11.90% of migraine attack during menstruation and records depict peak triggers of migraine with percentage of 22.50% and 21.60% by skipping meal, use of gadgets accordingly.

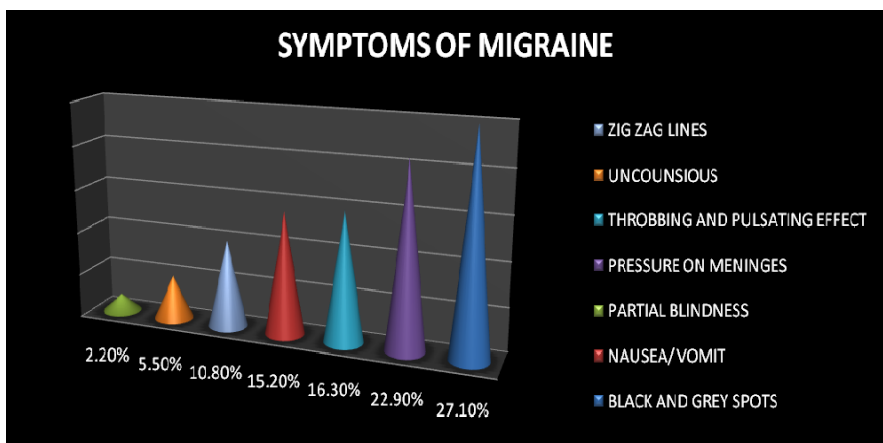


Figure 1.7: Graphical Data Representing Symptoms of Migraine During An Attack

All patients of migraine shows some or the other symptoms in various frequency range. Among which record of black and grey spots reported at peak percentage of 27.10% followed by pressure on meninges by 22.90%, throbbing and pulsating affect

on brain by 16.30%,nausea and vomit by 15.20%, zig zag lines by 10.80%,5.50% of patients gets unconscious during an attack, 2.20% of patients reported partial blindness respectively.

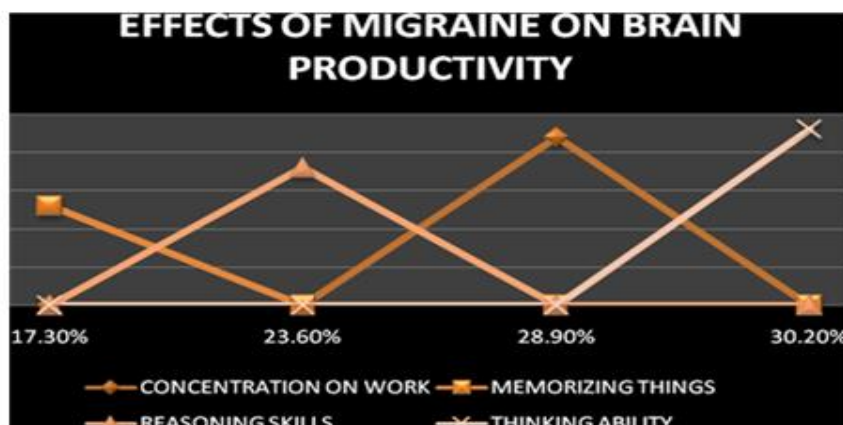


Figure 1.8: Graphical Data Representing Effects Of Migraine On Brain Productivity

Many patients reported affects of migraine on brain productivity, where data depicts that thinking / analytical skills of migraineurs gets affected at peak percentage by 30.20%, it hinders

concentrating on work or task by 28.90%, 23.60% of patients reported difficulty in reasoning skills while 17.30% of patients report hindrance in memorizing things during an attack.

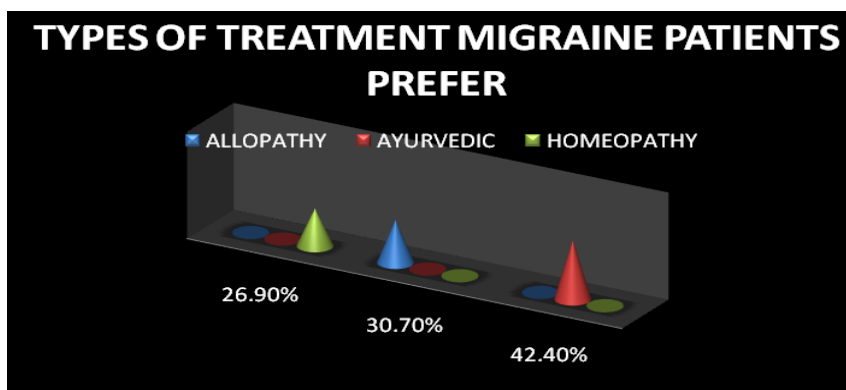


Figure 1.9: Graphical Data Representing Types of Treatment Migraine Patients Prefer

It is reported that during migraine attack majority of the migraineurs prefer to have ayurvedic treatment at most by peak percentage of 42.40% ,

30.70% of patients goes of allopathy treatment while only 26.90% of sufferers prefer homeopathic treatment as gives slow outcomes over any disease.

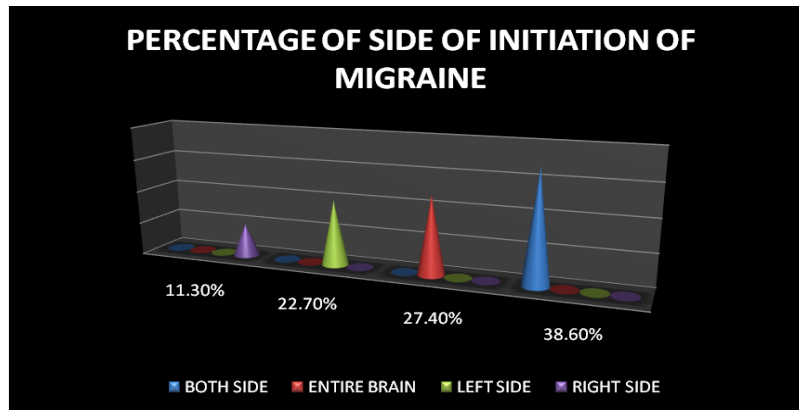


Figure1.10: Graphical Data Representing Percentage Of Side Of Initiation Of Migraine In Skull And Brain

Most of the patients reported that the side of initiation of migraine occurs from both side of brain (left and right side) by a percentage of 38.60%, while around 27.40% shows side of initiation of migraine in entire brain with fluctuations in pain

frequency at several intervals, while 22.70% of patients shows left side of brain for initiation of headache and 11.30% shows right side as initiation of headache accordingly.

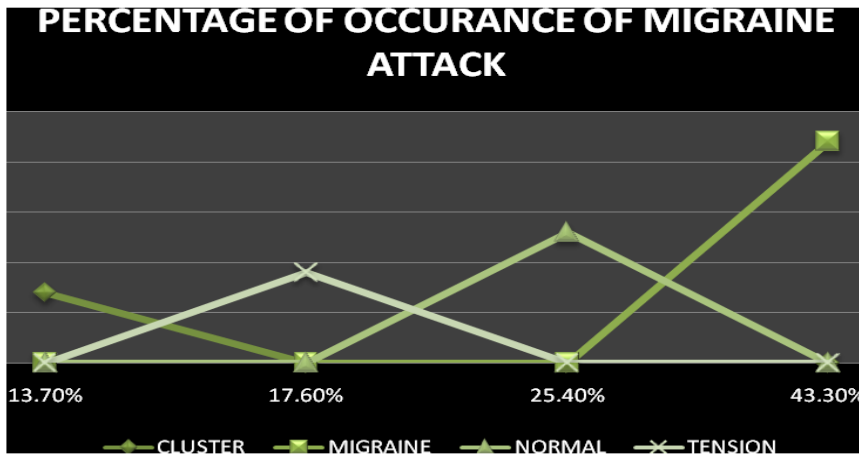


Figure 1.11: Graphical Data Representing Percentage of Occurance of Migraine Attacks Compare To Other Forms of Headache

Migraine is the peak category of headache in overall world population, where chances of its occurrence in population are more high by percentage of 43.30% , 25.40% of people face

normal, mild category of headache, 17.60% of population face tension headache, whereas 13.70% of population gets cluster

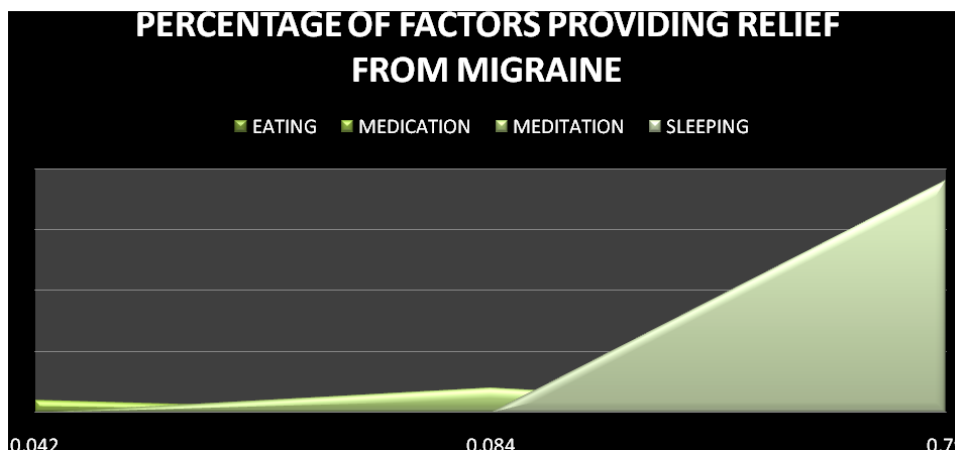


Figure 1.12: Graphical Data Representing Percentage of Factors Providing Relief From Migraine

Most of the migraineurs reported that sleeping provides major relief from attack by 79%,

8.4% of patients’ gets relief by meditation and eating, 4.2% get relief by medication.

Discussion:

Parameters such as sensitivity to light, sensitivity to sound, tinnitus, blur vision, zigzag lines, nausea, vomiting, unconscious, dizziness were analyzed and reported. Individuals suffering from migraine have increase in sensitivity to light by 59.50% at its peak level and sensitivity to sound by 59.50 % at peak level. The 79 % of migraine patients gets relief from sleeping, 8.4 % by meditation, 4.2 % by medication, 8.4% by eating. In the present study analysis side of initiation of attack with every migraineur were recorded where 38.60 % reported the initial side of attack in both side of brain and skull, 22.70 % declared initial side of headache as left side, 11.30 while % reported right side of brain for initializing headache. Certain triggers were reported in causing migraine with 16.10% for stress, 3.20% for smoking and tobacco, 8.60% for alcohol, 11.90% for menstruation, 22.50% for skipping meal, and 21.60 % for gadgets. Symptoms of migraine varies with frequency of percentage as of 10.80% of sufferers see zigzag lines, 27.10% of sufferers see black and grey spots, 15.20% of people feel nausea and vomiting, 2.20% see partial blindness while 22.90% feel pressure on meninges and 16.30% feels throbbing and pulsating affect during an attack, 5.50% of sufferers get unconscious during an attack due to improper oxygen supply to brain accordingly. So life of migraineurs is bit challenging.

Conclusion:

In the present study it was attempted to detect status of migraine patients in the society, mark the level of their mental health which is affected by the degree of pain at various frequency moreover diverse factors were noted in total which are responsible for causing migraine.

It is concluded that migraine is never caused by any single factor but is a cluster of partial defects in nervous system which migraineurs deal with every single attack where intensity of headache varies in every sufferer. This is a type of headache generated by partial disturbance in brain and its parts such as thalamus, hypothalamus. People who are suffering from migraine tend to have more sensitive brain cells compare to non- migraineurs.

Interpretation:

Mental health of migraine patients is not same as of common people, they get frequent change in their reasoning skills, thinking/analytical skills while many feel tedious to memorize stuffs, concentration on various simple task tends to get difficult during an attack or in postdrome stage. Migraineurs also have low oxygen supply to brain because of which glucose does not metabolizes and enough power to neurons is not supplied by which neurons functioning like electrical signaling, stimulations gets disturbed, the blood vessels in brain contract and expand to fulfill the oxygen

deficiency in brain because of which patients feels pulsating , throbbing ,pinpoint pressure in brain and its protective coverings meninges which gets worse by time and frequency of headache. As the brain cells don't get enough power by which brain dies partially however can get back to productivity if supply chain gets proper within seconds, it has been noted in few migraineurs that they get digestive issues as well during an attack, control and co-ordination gets fluctuated during migraine.

During migraine due to certain environmental and genetic factors hormones are released it to the blood stream which results in migraine attack such as stress releases stress, hormones like cortisol and adrenaline, hunger and dehydration releases ghrelin and vasopressin in blood stream. So it is reported that proper functioning of pituitary gland is also essential to prevent migraine. Moreover brain of migraine patients is too sensitive in response to environment during an attack or in postdrome phase this results in tough and heavy life of sufferers in addition to it even simple and normal task of day to day life can cause enormous problems which seems to be easy for non – migraineurs.

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