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Charisma of Neuro Transmitters: Leveraging the Act of Suicide



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ABSTRACT

BACKGROUND:

Mental health, a word that has instated an elaborate amount of perturbation among the human race, especially in the last 2-3 years of the pandemic, where the number of suicides multi-folded in millions. But, it is neither the very first, nor is it going to be very last pandemic. The consortium of human will power in dealing with adversities has many folklores as well as modern tales. But, what is it which shoves us toward being burgeoned as phoenix? Researchers have christened it as "THE MIND", the very source which secerns us from lower organisms, animals and other species. It has intrigued scientists and researchers from millennia and there have been multitudinous papers and articles over working of the human brain, be it electrical synapses or biochemical based neurotransmitters, still, the question always lingered who is presiding over whom or is it a blind man following another blind man. Here, we will comprehend the physiology and pathology of human mind and have an understanding that it is not a single neurotransmitter calculable for the act of suicide, but there could be a fraternity of all of them. Some findings could be comprehended by us but there is a lot that is full of fallacy and others, still unprecedented. Hence, till then, the semblance should be to steward the neurotransmitters by YOGA and MEDITATION, which are free of side effects and have proved their efficacy over centuries.



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INTRODUCTION

For the one who has conquered the mind,

The mind is the best of friends;

But for one who has failed to do so,

His mind will be his greatest enemy.

This very famous line of the Bhagavad Gita holds true for everyone in all life events, whether tumultuous, mundane or ecstatic.

But, the real question lies in mind itself.

What is it that controls these emotions, behaviors, the identity, memory and the acts per se of suicide?

Is it the electrical synapses of brain or the cortical hormonal associations?

Or the communication fibers, or the interaction and relationship between all of them?

Do we control the mind, if yes, how? Or the mind controls us?

Before dwelling in all of that, let us have a brief introduction of history of research on the mind and how did it influence our understanding of human mind.

Starting from as far as 335 BC or maybe way beyond that, among the Greek Philosophers, the brain was considered as a radiator which is protecting the body organs from being overheated. Then around 170 BC, Roman physician Galen demonstrated the ventricles and also pointed out that it could be a place of memory, personality, thoughts and actions hotseat (1).

Discussion over presence of some chemicals was ongoing around that period of time as well but nothing conclusive came out of it or was materialised enough to be branded as the fountainhead of mental diseases (2).

From there it moved to first nervous sketch by Belgian anatomist Andreas Vesalius in 16th century where he drew detailed map of the brain and demonstrated how cerebrospinal fluid nourishing the brain cells and acts as a cushion for nervous system (1).

After demonstration of brain ventricles and CSF came electrical synapses and region differentiation of the brain in 1791 by Italian Luigi Galvani and in around 1860-70s by Paul Broca and Carl Wernicke respectively (1).

With the introduction of microscopes in 1900s came a new dawn in the field of neurobiology when demonstration of neurons, the unit of brain cells took place, for which neuroanatomists Santiago Ramon y Cajal and Camillo Golgi were bestowed with Nobel prize in 1906 (1).

So, after regions and neurons, now the question arose how the message is being transported inside brain and what is it which is acting like a boss.

That really intrigued our scientists and they spent day and night exploring that avenue. Finally, in 1932 Sir Charles Sherrington and Edgar Adrian broke the monopoly and coded the transmission of electrical synapses inside the brain and won the Nobel prize in the same year (1).

Last but not the least, from the 1960s, things did not just stop at the electrical synapses level.

People wanted to know more and with the upcoming surge in cases of brain diseases or in an explosion of cases like suicide, depression and the progression of diseases like Alzheimer and Parkinson's with no cure in hand, they ventured into the biochemical level and from there started the new age of Neurotransmitters which has been ruling the world of brain ever since.

These are the unchallenged kings and queens of the human mind with no formidable opponent to be seen in long run.

Curiosity led to more discovery and classification of neurotransmitters according to their chemical nature and structure (3).

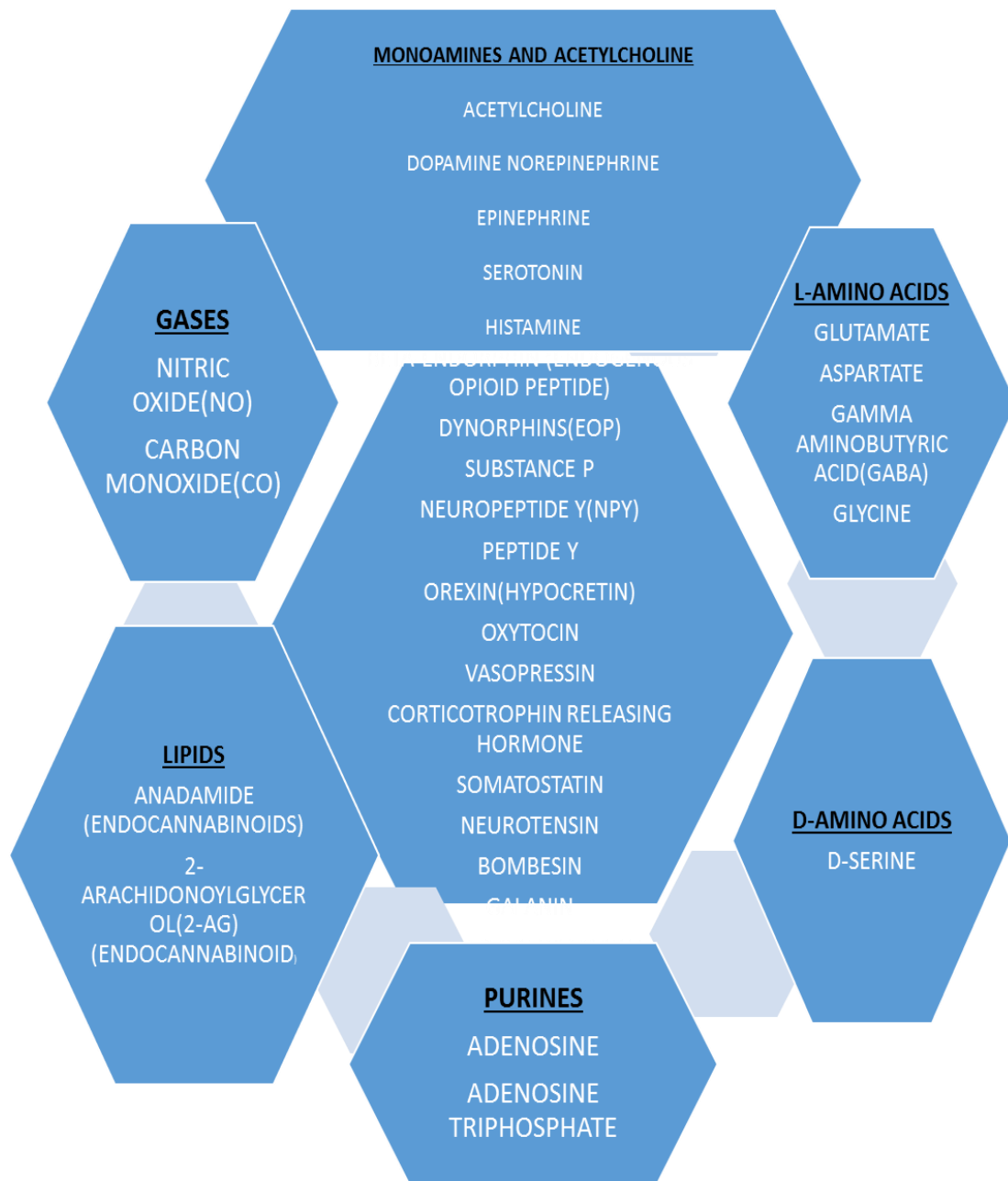


FIG 1: CLASSIFICATION OF NEUROTRANSMITTERS

What really sustained the world of neurotransmitters and proved their authenticity ever since is the unbreakable bond they share with neuropharmacology. With the introduction of drugs, which are supposedly acting at the neurotransmitters site and receptor level, and were

introduced as a sure shot to treat one at a mental level, people found it easier to pop pill than to be admitted into mental institution. Because, any sort of history or admission into mental institution was considered to be a blot on one's character and psyche then and still is considered one in 21st century, and hence no wonder, the stature of neurotransmitters and associated drugs rose and rose and still is rising.

But, before, directly blaming one or the other neurotransmitter as the root cause of suicide attempt or committing the act itself, let us have profound and a brief discussion on the nature of chemicals inside our brain. How even after years of research and so much of back and forth by the researchers and scientists, we are yet to come to a conclusive mindset of naming any one of the brain neurotransmitters as a culprit or as a biomarker to diagnose or prognose suicide attempt or the act per se.

So, the question remains, are the neurotransmitters inside the brain working together with a mob mindset to control our individuality or their idiomatic action or inaction has led us this far?

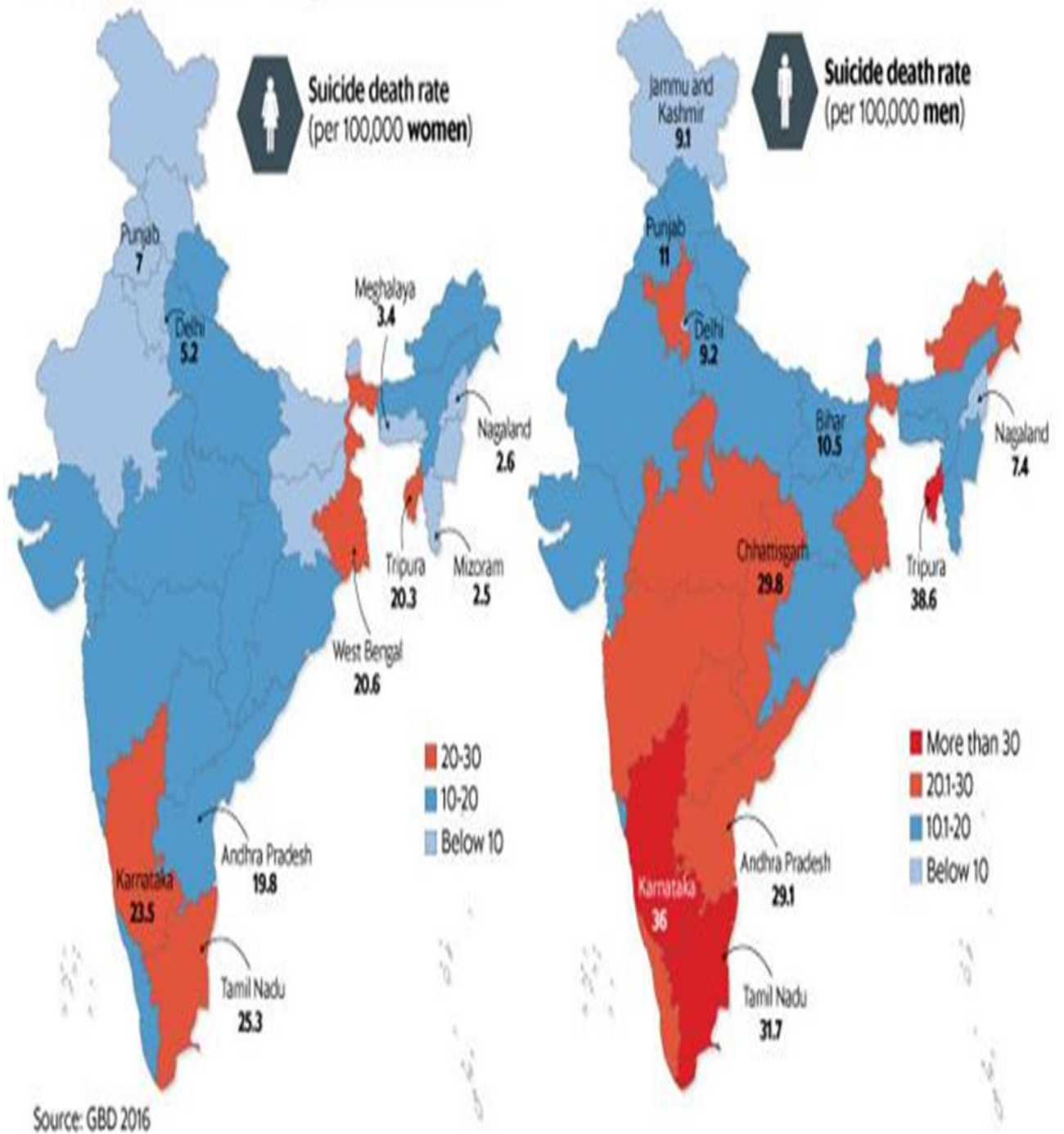
RESEARCHES AND THEIR IMPLICATIONS:-

According to the World Health Organisation, World data of suicide having seen a staggering growth at the rate of 800,000 suicides annually, with the major age group being 15-45 years old.

The world was in obligation to do the needful, hence transpired the commitment among the WHO member states in the WHO Mental Health Action Plan 2013-2030, to work towards the global target of reducing the suicide rates by one-third by 2030 (4).

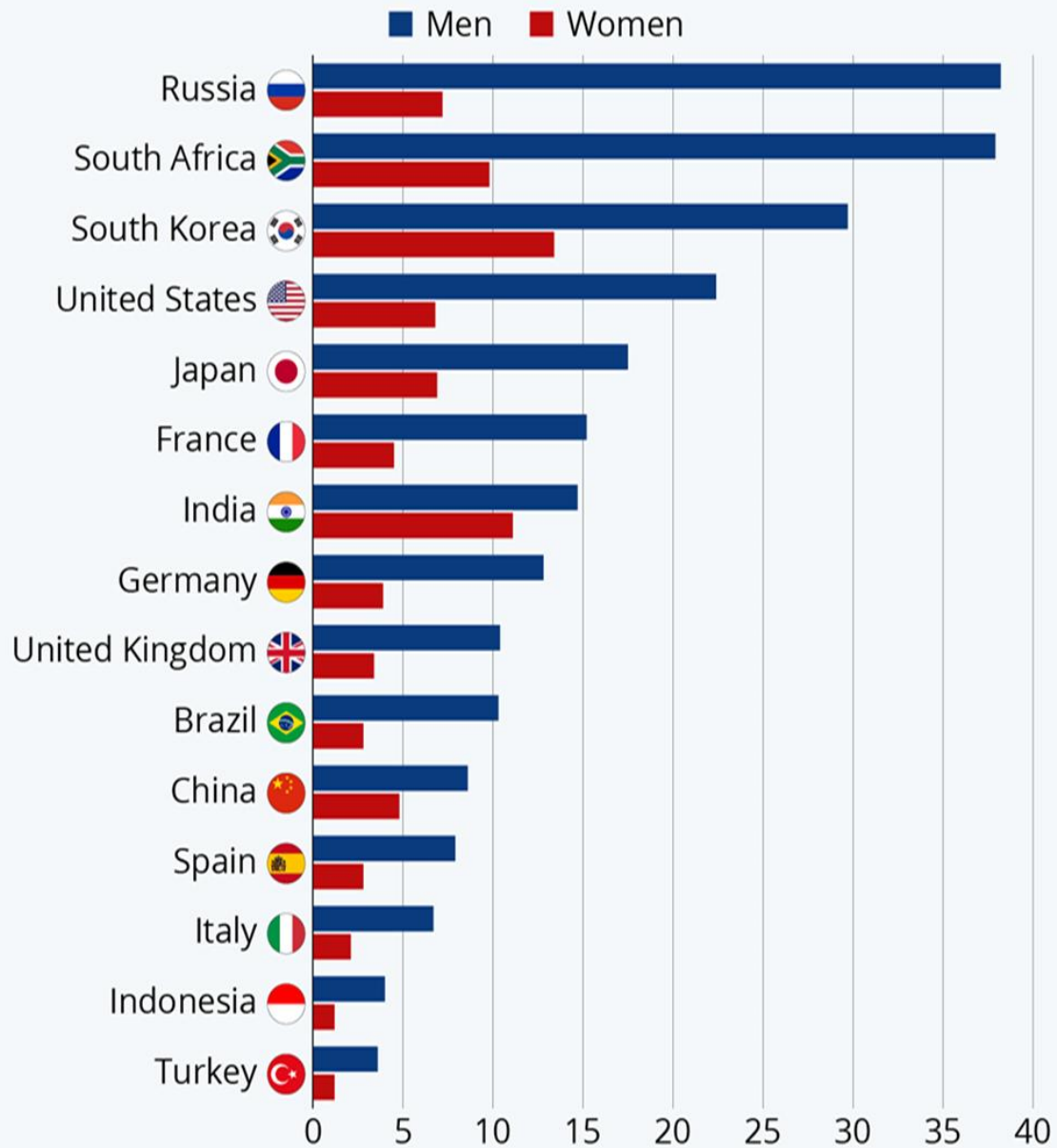
Chart 3

Developed states have higher suicide rates



Suicide Rates Around the World

Estimated rate of suicide per 100,000 population in selected countries in 2019



Source: WHO



Erstwhile exploration in the human mind about neurotransmitters along with the astonishing suicide data prompted more research in the field to give a definite diagnosis and prognosis regarding the menace of suicide.

With the sudden establishment of neurotransmitters as one of the ‘it’ material in early 1980s came along the ongoing claim by American and Swedish scientists of the National Institute of Mental Health in Bethesda, Maryland and at the Karolinska Institute in Stockholm respectively that they have isolated a “Suicide material”, which they named ‘Serotonin’, and reported that it just needed a simple laboratory test to be used a biomarker of suicide (5).

This claim came with a lot of fallacy which countered the notion of serotonin being a biomarker and again brought us back to fundamentals. It occurred because their idea was that a low level of serotonin causes depression and that leads to the act or attempt of suicide (5).



FIG 2: THEORY OF SUICIDE.

But the subsequent research over time proved that not all suicide attempters were suffering from either low levels of serotonin or depression, and hence, proved the biomarker theory of serotonin as futile (5).

Public and media trials are not just confined to the world of television. Sometimes, that happen in the world of Science and Research as well. We all need a culprit in life, maybe either to outdo the guilt or to share the misery or maybe an ego boost.

So, when serotonin could not be named as ‘The One’, the focus shifted to ‘Dopamine’, the neurotransmitter which has been discovered in 1950s, but whose role in Parkinson and other diseases took time to be established. Though, what cemented its position was its restriction to

Ventral Tegmental Area and its modulation in drug abuse, stress or reward physiology, which are one of the major risk factors to commit suicide (6). With the institutionalization of first-generation anti-psychotics, Dopamine is going to stay long, though not as a biomarker.

The world needed its culprit sooner than before, and with it came the idea that Norepinephrine and Epinephrine have a role in thyroid gland physiology. NE and E not only affect the thyroid gland but has quite an impact on immunity (7). Autoimmune diseases have a substantial part as a risk factor of suicide or derangement in association with other neurotransmitters, pushing one to the edge (8).

The thyroid gland has validated its function among humankind as one of the force behind cognitive function and mental health. So far, the research has established that low FT3 and TT4 levels have an implication on suicide (8).

Subsequent researches about neurotransmitters did not yield a biomarker, though have established a collective role in neurophysiology and pathology. So, the question still lingered?

But the ongoing researches and exploration in the field of the human mind betide a novel neurotransmitter in the picture by the year 2010. It was deciphered as ASPARTIC ACID, with two major types, D and L (9).

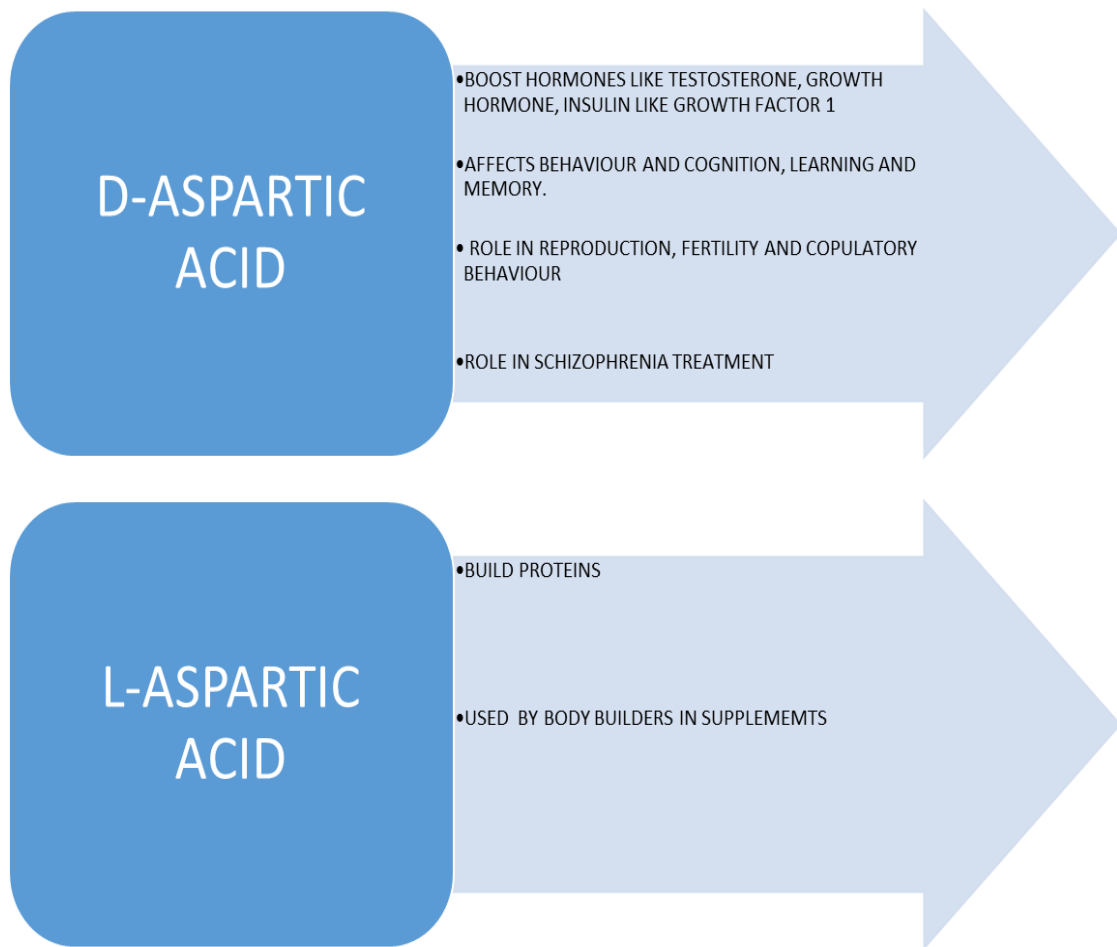


FIG 3: FEATURES OF ASPARTIC ACID.

DAA not only modulates Hypothalamic-pituitary-gonadal (HPG) axis, it also controls NMDAR (N-Methyl-D-Aspartate receptor) numbers in the animal's cortex, which raises Dopamine levels to have a protective mechanism around the neurons (10).

In the long term, the protective mechanism builds cognition, memory and psychomotor development. DAA sodality in HPG axis prompted researchers to encounter D-AA appearance in human seminal plasma and collaborated its role in infertility, which is a major risk factor for suicide as well as other psychosocial derangements, affecting the overall quality of life (10).

Hence, study of D-Aspartic acid is prerequisite for the present case scenario of research of biochemical markers as one in study of suicide markers.

With no single offender to be branded as the 'Equisite', the whimsical idea has moved to dealing with all of them together. The discussion of neurotransmitters end on the objective that they all are affecting cognition, thoughts, memory, personality, reward psychology, anger

issues, immunity together which subsequently have an impact on uncontrollable thought or act of suicide. And they cannot be cast off because of the relationship they partake with neuropharmacology. With the institutionalization of neuropharmacology at the basic healthcare system all over the globe, neither the pharmaceutical companies nor the researchers are letting them go away.

They are in here for a long haul.

No infringe on hindsight, the question now lingers “Can we steward neurotransmitters”? If yes, at what level and with what intensity?

THE REDEEMER:-

Befall a ray of hope that how some provisions or deed could help in the long run to raise the levels of neurotransmitters and help us in yielding a much-needed transformation in our personality, thought process, actions. Researchers have pioneered the kind of food impacting our mood and behavior.

We become what we eat, this is very ideal description of today’s scenario at the both gross and subtle level. Our coverage is around the subtle level, “The Mind”.

Mind, soul and body are the tridents of life.

The world is sustained by their combination.

Charaka Samhita, one of the great work of Charaka Maharishi enunciates these lines and they have a stronghold.

Human biology or mind is very modest yet very sophisticated. From the teeny tiny microorganisms of the gut, more commonly known as Gut Microbiota to the kind, type, content, manufacturing, temperature, preservative presence or absence of solid food input we have, all is having a tremendous effect at our mind level (11).

Nourishment of the body is obsolete in relation to mind and also to maintain and follow the WHO definition of health, *A state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.*”

FEEL GOOD HORMONES	FOOD SOURCES
SEROTONIN	Banana, coffee, green beans and peas, hazelnut, kiwi, plum, pineapple, potato, strawberry, wild rice, lettuce, spinach
DOPAMINE	Aubergine, banana, avocado, apple, Orange, spinach
ACETYLCHOLINE	Foxglove, mistletoe, wild gooseberry, Strawberry, apple, orange, spinach
D-ASPARTIC ACID	Avocado, asparagus, molasses, Chicken, oysters and eggs

FIG 4: SOURCES OF NEUROTRANSMITTERS IN NATURE

One must always be prepared for the worst situation;

It is too late to show concern after facing a calamity.

One of the famous Sanskrit shloka has helped humankind for generations and still holds its space in science and research in this scenario.

In the same way, succeeding the exploration, and thorough probing of human mind over a century in regards to neurotransmitters, now the time has reached to augment the magnitude of neurotransmitters or maybe to preside over it.

From time immemorial, people have shown a keen interest in human mind and behaviour. Folklore has stories full of yogis who did meditation and controlled their breath, some could stand upside down, or may survive underwater for ages and many more.

A scientific mind should be radical, unconventional, liberal, and unorthodox. Though all of these big words are synonyms, what is intended is very fact that scientists must be pursuing

these adjectives not just at the thought level but in action too. Well, apple doesn't fall far from the tree. Our researchers have achieved this feat.

The Eastern part of world has always bridled that devoir. Folks in this part of world might come under in the umbrella term of "Third World Country", but for centuries they are having the perception of body and mind association. Patanjali, the pioneer of YOGA, is our knight in shinning armour, because research over time has proved different yogic techniques ameliorating not only the body or physical level deformities, likewise swaying the mind too.

No wonder, we are celebrating the YOGA DAY ON 21ST JUNE.

From Transcendental to Mindful to Buddhist practices, all have shown a positive result in humans as well as in mice studies. Implications has been apprehended in Positron emission tomography (PET) and in the study of brain waves. From boosting neurotransmitters like serotonin, acetylcholine, dopamine etc. quantity and quality, proliferating the cerebral blood flow in the cerebral cortex, which is directly proportional to the cognitive function, memory and emotion management and rescuing one from possessing the evil thoughts of committing the act of suicide (12).

Last but not the least, ceasing the whole screenplay with one of the ultimate insightful words:

A strong mind can carry a weak body;

But a strong body can not carry a weak mind.

One of the famous illustrations of these lines is Albert Einstein award winner, the famous scientist Late Stephen William Hawking.

World Mental Health is not a one-day affair, it is a long standing commitment to one self.

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